



Dedicated Issue:

"Back to Basics: Perioperative Issues"



AOGD SECRETARIAT

Room Number 001, Ward 6, Department of Obstetrics & Gynaecology
Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi- 110 029
Email: aogdsjh2021@gmail.com | www.aogd.org | Tel: 01126730487



For the use of a Registered Medical Practitioner or a Hospital or a Laboratory only



The trusted progestogen completes **60 years**[#]

IF IT'S **ORALLY** EFFECTIVE, IT'S[†]

Duphaston[®]
Dydrogesterone Tablets IP 10 mg

BACKED BY **EVIDENCE**

We have supplemented our range with

Estrabet[™]
Estradiol (as Hemihydrate) Tablets USP 1mg/2mg
A Novel[†] Safer^{*} Estrogen

Estrabet gel
Estradiol Transdermal Gel 0.06% w/w
A Novel[†] Safer^{*} Estrogen

Solfe^{*}
Sodium Ferredetate, Folic Acid & Vitamin B₉ Tablets
MADE FOR HER. CARES FOR HER

[#] Mirza F, et al. Dydrogesterone use in early pregnancy. Gynecol Endocrinol. 2016;32(2):97-106. [†] Schindler AE. Progestational effects of dydrogesterone in vitro, in vivo and on human endometrium. Maturitas. 2009;65(1):S3-S11.
[~] Novel-Estradiol hemihydrate first time in India. ⁺ Safer-As compared to conjugated equine estrogens. Smith NL et al. Lower risk of cardiovascular events in postmenopausal women taking oral estradiol compared with oral conjugated equine estrogens. JAMA Intern Med. 2014; 174(1):25-31. ^{*} As Prescribing Information of Solfe, version 1; Dated: 25th July 2013

For full prescribing information, please contact: Abbott India Limited, Floor 16, Godrej BKC, Plot C-66, 'G' Block, Bandra-Kurla Complex, Near MCA Club, Bandra East, Mumbai-400 051. www.abott.co.in

And strengthened our portfolio with

Novelon[®]
Desogestrel & Ethinylestradiol Tablets USP
Each uncoated tablet contains: Desogestrel BP: 0.15mg, Ethinylestradiol IP: 0.03mg

Femilon[®]
Desogestrel & Ethinylestradiol Tablets USP
Each uncoated tablet contains: Desogestrel BP: 0.15mg, Ethinylestradiol IP: 0.02mg



Copyright 2020 Organon (India) Pvt Ltd., a subsidiary of Merck & Co. Inc., Kenilworth, NJ, USA. All rights reserved.
Organon (India) Pvt Ltd.
Platina Building, 8th Floor, C-59, G-Block, Bandra Kurla Complex, Bandra (East), Mumbai 400051. Tel.no: 022-67898888
IN-XHB-00017 19/1/2021 to 14/1/2022
Please refer to full prescribing information before prescribing Novelon & Femilon
For reporting an Adverse Event visit contact us at www.msindia.in



Marketed and distributed by: **Abbott India Limited**,
Floor 16, Godrej BKC, Plot C-66, 'G' Block, Bandra-Kurla Complex, Near MCA Club, Bandra East, Mumbai - 400051
For Product Complaints/Adverse events or Queries please write to webmasterindia@abott.com

IND2177598 16 Feb 2021

AOGD Office Bearers 2021-22

Patrons

Dr S N Mukherji
Dr Urmil Sharma
Dr Kamal Buckshee
Dr Sheila Mehra
Dr Indrani Ganguli
Dr V L Bhargava

Advisors

Dr Alka Kriplani
Dr Neera Agarwal
Dr Pratima Mittal
Dr Renuka Sinha
Dr Shakti Bhan Khanna
Dr Sharda Jain
Dr Shashi Prateek
Dr Shubha Sagar Trivedi
Dr Sudha Salhan
Dr Suneeta Mittal
Dr Swaraj Batra

Ex Officio

Executive Past Presidents

Dr P Chaddha (1990-94)
Dr Neera Agarwal (1994-97)
Dr Maya Sood (1997-99)
Dr D Takkar (1999-2001)
Dr Sudha Salhan (2001-03)
Dr Swaraj Batra (2003-05)
Dr N B Vaid (2005-06)
Dr S S Trivedi (2006-07)
Dr Suneeta Mittal (2007-08)
Dr I Ganguli (2008-09)
Dr Shashi Prateek (2009-10)
Dr U Manaktala (2010-11)
Dr Neeraj Goel (2011-12)
Dr C Ragunandan (2012-13)
Dr Alka Kriplani (2013-14)
Dr U P Jha (2014-15)
Dr Pratima Mittal (2015-16)
Dr Sudha Prasad (2016-17)
Dr Shalini Rajaram (2017-18)
Dr Abha Singh (2018-19)
Dr Sunesh Kumar (2019-20)

Executive Members

Dr Amita Suneja
Dr Anjali Dabral
Dr Ashok Kumar
Dr Asmita Rathore
Dr Dinesh Kansal
Dr Ila Gupta
Dr Indu Chawla
Dr Kawal Gujral
Dr Manju Khemani
Dr Manju Puri
Dr Meenakshi Ahuja
Dr Mrinalini Mani
Dr Neeraj Bhatla
Dr Nisha Jain
Dr Ranjana Sharma
Dr Rekha Mehra
Dr Renu Mishra
Dr S N Basu
Dr Sangeeta Gupta
Dr Sanjeevani Khanna
Dr Sonia Malik
Dr Sunita Lamba
Dr Taru Gupta

Finance Committee

Dr Abha Singh
Dr Manju Puri
Dr N B Vaid
Dr Pratima Mittal
Dr Reva Tripathi
Dr Shalini Rajaram
Dr Sudha Prasad
Dr Sunesh Kumar
Dr U P Jha
Mr Pankaj Jain (CA)

Chief Advisor

Dr Pratima Mittal

President

Dr Achla Batra

Vice President

Dr Jyotsna Suri

Secretary

Dr Monika Gupta

Treasurer

Dr Upma Saxena

Editor

Dr Rekha Bharti

Web Editor

Dr Sumitra Bachani

Joint Secretaries

Dr Anita Kumar
Dr Divya Pandey

Co-Treasurer

Dr Ritu Aggarwal

Co-Editors

Dr Archana Mishra
Dr Sheeba Marwah
Dr Saumya Prasad

Co-Web Editors

Dr Sarita Singh
Dr Nishi Chaudhary

Scientific Committee

Dr Anjal Dabral
Dr H P Anand
Dr Rupali Dewan
Dr Sunita Malik
Dr Vijay Zutshi
Dr Sonam Topden
Dr Bindu Bajaj
Dr Harsha S Gaikwad
Dr Saritha Shamsunder
Dr Garima Kapoor

CME Co-ordinators

Dr Renu Arora
Dr K Usha Rani
Dr Sujata Das
Dr Dipti Sharma

Public Relation Committee

Dr Sunita Yadav
Dr Yamini Sarwal
Dr Kavita Aggarwal
Dr Kashika

Immediate Past President

Dr Mala Srivastava

Immediate Past Vice-President

Dr Kanika Jain

Immediate Past Secretary

Dr Mamta Dagar

Chairperson AOGD Sub-Committees

Dr Anita Rajorhia
Dr Anjila Aneja
Dr Deepthi Goswami
Dr Geeta Mediratta
Dr Jyoti Bhaskar
Dr Kanika Jain
Dr K Aparna Sharma
Dr Kavita Aggarwal
Dr Manju Puri
Dr Sangeeta Gupta
Dr Shashi Lata Kabra Maheshwari
Dr Seema Prakash
Dr Seema Thakur
Dr Sujata Das
Dr Sunita Malik
Dr Surveen Ghumman
Dr Sushma Sinha

AOGD Secretariat

Room Number 001, Ward 6, Department of Obstetrics & Gynaecology
VMMC & Safdarjung Hospital, New Delhi - 110 029
Tel: 01126730487
E-mail: aogdsjh2021@gmail.com | www.aogd.org



AOGD Bulletin

Volume 21 • Monthly Issue 2 • June 2021

• Foreword	5
• From the President's Pen	6
• From the Vice President's Pen	7
• From the Secretary's Desk	8
• From the Editor's Desk	9
• Obituary	10

Part 1: Invited Articles

• Perioperative Care- Evidence-Based Management <i>Saumya Prasad, Priyanka Ahuja, Rekha Bharti</i>	13
• Anterior Abdominal Wall Anatomy- Know Before You Incise <i>Archana Mishra, Pragati Dwivedi, Sakshi Nischal</i>	18
• Intricacies in Caesarean Section Techniques <i>Sheeba Marwah, Akanksha Dwivedi</i>	23
• Topical Haemostatic Agents- Which, When, How? <i>Taru Gupta, Divya Solanki</i>	28
• Surgical Wound Closure - Sutures and Needles <i>Leena Wadhwa, Jyoti Jaiswal</i>	33
• Management of Abdominal Wound Complications <i>Chhavi Gupta, Mayank Verma, Raj kumar Chhejara</i>	37

Part 2: Original Articles

• Surgical Site Infection after Caesarean Section <i>Ankita Kumari, Amrita Rathee, Jyotsna Suri, Rekha Bharti, Sumitra Bachani, Pratima Mittal</i>	42
• Urinary Tract Infection after Caesarean Section in Relation to Duration of Catheterization <i>Anamika Bharti, Harsha Gaikwad</i>	46
• Journal Scan <i>Saumya Prasad, Akanksha Dwivedi, Shubham Bidhuri</i>	50
• Proceedings of AOGD Monthly Clinical Meeting on 28.05.21	58
• Quiz Held at Monthly Clinical Meeting <i>Niharika Guleria, Rekha Bharti</i>	60
• Annexure: Management of COVID-19 in Pregnancy <i>Safe Motherhood and QI Committee, AOGD</i>	61

Disclaimer

The advertisements in this bulletin are not a warranty, endorsement or approval of the products or services. The statements and opinions contained in the articles of the AOGD Bulletin are solely those of the individual authors and contributors, and do not necessarily reflect the opinions or recommendations of the publisher. The publisher disclaims responsibility of any injury to persons or property resulting from any ideas or products referred to in the articles or advertisements.

Plagiarism Disclaimer

Any plagiarism in the articles will be the sole responsibility of the authors, the editorial board or publisher will not be responsible for this.

Publisher/Printer/Editor

Dr Rekha Bharti on behalf of Association of Obstetricians & Gynecologists of Delhi.

Printed at

Process & Spot C-112/3, Naraina Industrial Area, Phase-1, New Delhi 110 028

Published from

Department of Obstetrics & Gynaecology
Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi -110 029

Editor

Dr Rekha Bharti
Ph. No. 01126730487; Email: editorsaogd2021@gmail.com

AOGD Office-Bearers 2021-22



Dr Pratima Mittal
Chief Advisor



Dr Achla Batra
President



Dr Jyotsna Suri
Vice President



Dr Monika Gupta
Secretary



Dr Upma Saxena
Treasurer



Dr Anita Kumar



Dr Divya Pandey



Dr Ritu Aggarwal
Co-Treasurer

Joint Secretaries

Editorial Board



Dr Rekha Bharti
Editor-in-chief



Dr Sumitra Bachani
Web Editor



Dr Archana Mishra



Dr Sheeba Marwah
Co-Editors



Dr Saumya Prasad



Dr Sarita Singh



Dr Nishi Chaudhary

Co-Web Editors

Committees



Dr Anjali Dabral



Dr H P Anand



Dr Rupali Dewan



Dr Sunita Malik



Dr Vijay Zutshi



Dr Sonam Topden



Dr Harsha S Gaikwad



Dr Bindu Bajaj



Dr Saritha Shamsunder



Dr Garima Kapoor

Scientific Committee



Dr Renu Arora



Dr K Usha Rani



Dr Sujata Das



Dr Dipti Sharma



Dr Sunita Yadav



Dr Yamini Sarwal



Dr Kavita Aggarwal



Dr Kashika

CME Co-ordinators

Public Relation Committee

Foreword



It is indeed a great pleasure to greet and welcome each and every esteemed member of AOGD. Also a proud moment and an honour to write a foreword for the second issue of AOGD Bulletin, June 2021. With immense pleasure, I wish to laude the previous presidents and their teams for their commendable works and efforts. My heartiest congratulations to Dr Achla Batra, the President AOGD, for taking the association to yet greater heights with her newness, vigour and enthusiasm. I admire the editorial board and marvel the office bearers of scientific committees and CME coordinators for their tireless commitment during these challenging times for the meticulous planning in executing and bringing the monthly issues of the bulletin.

The theme of this issue is outstanding, **“Back to Basics: Perioperative Issues”**. Perioperative care is a continuum of quality care from the time patient goes to the hospital or doctor’s clinic for surgery and till the patient goes back home. It is a focused care to bring together the patient and care team (Surgeons, the Obstetrician/Gynaecologist, Anaesthetist, Physician, Nurses, Residents and Shifting Staff) to work together with professionalism and humanism during the pre-operative, intra-operative and post-operative stages of surgery, so as to reduce cost and complications.

Basics are crucial for building a strong foundation. Being an AOGD member and its past Secretary and Vice President, as well as past President of FOGSI, I feel proud to witness the illustrious growth and development of this association in terms of number and academicians who are skilled and trained in various sub specialities of Obstetrics and Gynaecology. Their innovation, team approach and confidence to march ahead to create public awareness in health and wellbeing, to lower maternal and perinatal morbidity and mortality by preventive care, early diagnosis and management of diseases and disorders, with committed quality care, is commendable.

Looking at visionaries and legends who laid the strong foundation, my earnest appeal to the youngsters is to be innovative in technology and surgical procedures which are patient oriented and cost-effective, keeping in mind the rural population and to fulfil my dream of making our health system, at par with National Health Service (NHS) by your professionalism, ethics, quality and uniqueness of Indian culture.

Wow to the clinical meetings, their step-wise presentations, planned cost effective investigations and management, are a great learning platform for the young post graduates, a must to attend.

In COVID pandemic, loss of human life and grief stricken homes have taught us to value the health, togetherness, importance of nutrition, hygiene, nature, value of preventive measures and how to add a rainbow to others’ lives.

Let us all remember and celebrate our inspiring, creative, hardworking, unique luminaries, the lighthouse, the legends of Obstetrics and Gynaec care with its sub-specialities, Dr SK Bhandari, Dr Prabha Manchanda and Dr Shashi Prateek.

A humble request to hold, read and move the pages with your beautiful pair of hands, the praise worthy and laudable efforts of the AOGD President and her team, the monthly gift, June issue. The bulletin is enriched with latest and up to date knowledge on ‘Perioperative Care- Evidence Based Management’, ‘Anterior Abdominal Wall Anatomy- Know Before You Incise’, ‘Intricacies in Caesarean Section Techniques’, ‘Topical Haemostatic Agents- Which, When, How?’, ‘Surgical Wound Closure- Sutures and Needles’ and ‘Management of Abdominal Wound Complications’.

Wishing you with love- safe, healthy, happy & stress free life

A handwritten signature in black ink, reading 'Kamal Buckshee'.

Dr Kamal Buckshee
Patron, AOGD

From the President's Pen



Greetings to all the member of AOGD!!

We can all now breathe a sigh of relief that the Corona Pandemic has started to decline and the vaccination drive is on the go. Though the unlocking has begun, but the threat of the deadly virus is yet to be gone. We shall continue to maintain our social distancing, use mask and frequently wash hands.

Last month has taken away a lot from all of us. We lost Dr SK Ghai Bhandari, Dr Prabha Manchanda, and on 12th June, we were shattered by the news of the sad demise of our dearest and most dynamic colleague, Dr Shashi Prateek Malik. All three were great icons in our field. We pray to Almighty that they rest in peace. We mourn for them and so many of our other colleagues, but the show must go on.

We now plan to connect with the women through public fora and contribution from all our members is so very important to build a large forum. I request all of you to please get the google form of public forum sent to you all, filled by your non medic contacts so that information can reach a large number of people.

Surgery goes hand in gloves with a gynecologist and obstetrician. None of us can afford to forget the principles of good surgery. To refresh ourselves with the art of correct surgical techniques and protocols we have this special issue on **"Back to Basics: Perioperative Issues"**, for which our editorial team has worked very hard. I am sure you all will find it very useful.

I wish all the best to our members. Be careful and stay safe while performing duties and day to day activities.

Long live AOGD!

"It's true. The storms won't last forever. The nasty weather will never last. There is always that light at the end of the tunnel." -Diana Rose Morcilla

Dr Achla Batra

President, AOGD (2021-2022)

Block your dates for 43rd Annual Conference 2021 to be held on 20th - 21st November, 2021

From the Vice-President's Pen



Dear Friends

Hope you and your loved ones are safe.

As the fury of COVID 19 is abating, the AOGD is trying its best to give you a holistic stimulation of mind and soul. Last month saw the culmination of several brilliant academic sessions conducted by the dedicated Sub Committee Chairpersons of AOGD as well as a widely attended and appreciated public forum on Pregnancy in COVID times. The icing on the cake was the wonderful spiritual journey which we undertook with Sister Shivani.

We look forward to the feedback of all our members for their suggestions and also invite you all to actively participate in all the activities of AOGD

This current bulletin is covering all the important areas of perioperative care in the field of Obs & Gynae. It is specially going to be extremely useful for our young Residents who are as yet learning the nuances of surgery. We hope that all of you will read this issue with great enthusiasm and also take part in the quiz during the monthly meeting.

Happy Learning to all of you

"There are no secrets to success. It is the result of preparation, hard work, and learning from failure."

-Colin Powell

Dr Jyotsna Suri

Vice President, AOGD (2021-2022)

From the Secretary's Desk



Warm greetings to all!

As we embark upon the release of yet another wonderful issue of AOGD bulletin by our able editorial team, I wish to thank all our AOGD members for their constant appreciation and support for all our endeavors in these unprecedented times.

In our efforts to fulfil our motto **“Promote Women’s Health by Strong Will & Quality Skill”**, we have ventured into the field of Public forums and made all efforts to bring women from all walks of life to a platform where they can have access to opinions of experts in field of gynecology with a click of a button.

We have also tried to add to the academic flavor of our AOGD monthly clinical meetings by adding the component of live online Quiz which was immensely appreciated by one and all who attempted as well who witnessed it.

As regards this month’s bulletin, the topic has been aptly chosen as **“Back to Basics: Perioperative Issues”**, where we have tried to emphasize on all the aspects from pre-operative to postoperative care throwing light on minutest details. I hope you will find this second issue as informative and engaging as our editorial team did while working on it. There are valuable inputs in the form for SOP’s as well for care of COVID positive pregnancies.

Though the current tough times have taken a toll on our mental and social wellbeing, we should still keep up the spirits and try to bring out the best within the limitations imposed due to pandemic.

William Ernst Henly has beautifully quoted....

**“Out of the night that covers me,
Black as the pit from pole to pole,
I thank whatever gods may be
For my unconquerable soul”**

Happy reading,



Dr Monika Gupta

Secretary, AOGD (2021-2022)

From the Editor's Desk



Greetings from the editorial team,

We are grateful to our readers for an overwhelming response to the first issue of AOGD bulletin. Your words of appreciation encourage us to work harder and perform better. We are thankful to Dr Kamal Buckshee, Patron of our association for blessing us with the foreword for this issue.

We are paying tribute to three esteemed members of our association, Dr S K Ghai Bhandari, Dr Prabha Manchanda and Dr Shashi Prateek who went for their heavenly abode.

The theme of our current issue is **"Back to Basics: Perioperative Issues"**. To improve surgical skills, it is always advisable to revisit the basics. In medical field, new evidences keep emerging to help us improve our overall management strategies to provide quality care to our patients. **Perioperative management** of patient plays an eminent role in the final outcome of any surgical procedure. To perform an abdominal surgery it is important to have thorough knowledge of **anatomy of the abdominal wall**. Caesarean section is the most commonly performed surgery worldwide. The **technique of caesarean delivery** has undergone countless modifications in order to enhance recovery of the mothers. For a successful surgery complete haemostasis is crucial. However, due to patient dependent or procedure dependent factors, at times achieving haemostasis becomes difficult and use of **topical haemostatic agents** is imperative. Good **closure of surgical wound** is vital for prevention of postoperative morbidity. The selection of appropriate suture and needle is crucial for good surgical outcome. It is equally important to recognize and appropriately **manage surgical wound complications**. Medicated dressing materials are available but accurate knowledge helps in effective use of these products.

We appreciate the efforts of the Safe Motherhood and QI committee for contributing much needed Guidelines for the **"Management of COVID-19 in Pregnancy"**.

The quiz based on the May issue of the bulletin, held at the end of the monthly clinical meeting was appreciated by all the attendees. We hope to receive the same response in the Monthly Clinical Meeting.

Please send your feedbacks and suggestions to aogdsjh2021@gmail.com.

Happy Reading!

Dr Rekha Bharti

Editor, AOGD (2021-2022)
editorsaogd2021@gmail.com



Editorial Board 2021-2022

First Row: Archana Mishra, Sheeba Marwah, Saumya Prasad

Second Row: Zeba Khanam, Rekha Bharti, Niharika Guleria

Third Row: Akanksha Dwivedi, Aakriti Batra, Shubham Bidhuri

Obituary



Dr S K Ghai Bhandari

1932-2021

Dr S K Ghai Bhandari was an epitome of grace, charm, humility and kindness. She was born in Islamabad, Pakistan in the year 1932. She received her early education at Hindu College and then went on to Lady Hardinge Medical College to receive her medical education. Thereafter, she pursued higher education in USA & UK and was awarded FRCOG and FRCS. She found happiness by seeing the spark of divinity in everybody she interacted with. She joined Sir Ganga Ram Hospital in 1970 and served there for almost six decades under various roles like Chairperson Board of Management and Trustee of the institute.

She was a doyen obstetrician and gynecologist, a teacher par excellence, a great administrator and above all a gentle and noble human being. Though she left for her heavenly abode but she will forever be alive in our prayers and memories.

On behalf of all AOGD members we express our earnest commiseration to the family and hope God gives them the strength to bear the loss.

"The darker the night, the brighter the stars, the deeper the grief, the closer is God"

– Fyodor Dostoyevsk

Obituary



Dr Prabha Manchanda

1934-2021

Dr Prabha Manchanda was a true icon, a great surgeon and a compassionate human being. She was born in 1934 in Rawalpindi, Pakistan in undivided India. Her early schooling was from Loretto house, Calcutta and further graduated from Calcutta Medical College. Like her father, Dr. S.S Ahluwalia trained in England and expertised in minimally invasive surgery. She was a pioneer in gynecological endoscopy and was first to bring TCRE to India.

She was an exemplary woman, kinder than kind, generous beyond measure and attentive to every detail in life. She was an inspiration to all, being full of life, courageous and strong. She will be cherished in our memories forever.

On behalf of the entire AOGD family, we wish for her peaceful journey to eternity.

"Those we love and lose are always connected by heartstrings into infinity."

– Terri Guillemets

Obituary



Dr Shashi Prateek Malik

1950-2021

Dr Shashi Prateek Malik, was the teacher of teachers, a vibrant, energetic and high spirited person. She was born in 1950, in Muzaffarnagar, graduated and completed her specialization from L.L.R.M Medical College, University of Merrut in the year 1980. She joined Safdarjung Hospital as faculty in 1989 and superannuated as head of the department in October 2012.

Her gentle, motherly attitude moulded many of us into the people we are today. She worked selflessly for the underprivileged and was the founder of Health Is Wealth foundation. She was honored with many awards such as Ayurvigyan Ratnaker Saraswat Samman by Dayanand Ashram, Kutesra, Muzaffar Nagar Vigyan Gaurav Award by Sanatan Dharm Yuva Sansthan, Sardhana, Meerut and many more. She had the eagerness and ardent interest to work for the upliftment of girls who were deprived.

She touched our hearts in very special ways that we can never fully explain with the mere tools of earthly written words.

On behalf of the entire AOGD fraternity, we express our deepest condolences to the family.

"At the blueness of the skies and in the warmth of summer, we remember them."

– Sylvan Kamens & Rabbi Jack Reime

Perioperative Care- Evidence-Based Management

Saumya Prasad¹, Priyanka Ahuja², Rekha Bharti³

¹Assistant Professor, ²Senior Resident, ³Professor, Obstetrics & Gynaecology, VMMC & Safdarjung Hospital, Delhi

Introduction: To achieve the optimal surgical outcome, management of perioperative period is very crucial. The stress of surgery is associated with metabolic derangements that increase cardiac demand and can lead to relative tissue hypoxia, increased insulin resistance, alteration in pulmonary and gastrointestinal functions. If not properly managed there could be a delay in recovery and subsequently increased morbidity. It is therefore important to maintain normal physiology in the perioperative period. Enhanced recovery after surgery (ERAS) program began in the late 1990 and was first evaluated in colorectal surgery to expedite postoperative recovery. By following ERAS pathway the length of hospital stay, postoperative complications and cost of treatment were significantly reduced. The same benefits have been replicated in all kinds of gynaecologic surgeries including open and minimally invasive surgeries; surgeries for benign and malignant conditions; and also in caesarean deliveries.¹ ERAS protocol begins in the outpatient setting and continues through the perioperative, intraoperative and postoperative periods.

The basic principles of ERAS are preoperative counselling and nutritional strategies that include avoidance of prolonged perioperative fasting; during intraoperative period- focus is on regional anaesthesia and non-opioid analgesia wherever feasible, fluid balance and maintenance of suitable body temperature; the postoperative strategies include early mobilization and appropriate thromboprophylaxis.

Advantages of following ERAS include short hospital stay without increasing need for readmission, decreased postoperative pain therefore less need for postoperative analgesia, more rapid return of bowel function and overall reduction in postoperative complications.

Four stages of ERAS are preadmission, preoperative, intra-operative, and postoperative. Each stage has specific enhanced recovery components to decrease surgical stress.²

In case of a caesarean delivery, ERAS pathway starts 30 to 60 minutes before skin incision until

discharge from hospital. An optimal antenatal pathway starts from 10-20 weeks gestation. Counselling should include preparation for delivery with possibility of either vaginal or caesarean delivery. In case of emergency caesarean section very little time may be permitted for counselling. All pregnant women should be informed about the potential need for caesarean delivery, risks benefits and alternative procedures. Information about the procedure before, during, and after the caesarean delivery should be provided. Information about the increased surgical risk of short-term complications (injuries to the abdominal organs, postoperative infection, thrombosis, and pain) and the known long-term effects (risk of uterine rupture and placental complications in subsequent pregnancies) should be provided. When a need for neonatal care of the newborn infant is identified and when time allows, the pregnant woman and her partner should have an option to meet the paediatrician before the caesarean delivery.²

Perioperative Management

Pre-Admission: Counselling regarding management options available to the patient include: expectant management, medical management and surgical management. Patients at increased risk of higher than expected postoperative pain should be identified. Diabetes and hypertension are two co-morbidities which very commonly co-exist. Diabetics with a poor glucose control are at higher risk of surgical site infection, and post-operative cardiovascular morbidity. *Optimizing sugar control is an important component of peri-operative care.* An important lifestyle risk factor which influences preoperative assessment is smoking. Tobacco chewing, results in tissue ischemia and delayed wound healing, which increase the risk of surgical site infection. It also adds to postoperative pulmonary complications. All patients should be urged to stop cigarette smoking weeks prior to surgery.

Preoperative counselling is effective to foster early postoperative mobilization. Therefore, it is important that utmost care is given in that regard. Prior to surgery, informed written consent should address the likely outcome of the procedure, as

well as the benefits and risks relative to surgery. This preoperative guidance helps reduce patient's anxiety, promote compliance in the postoperative period and hence reduce the hospital stay as well. When assessing the preoperative surgical risks, patient's characteristics and procedure aspects have to be considered.

Age of the patient is an important independent risk factor for peri-operative complications. With increase in age, come concomitant medical morbidities including diabetes, cardiac disease, renal failure, cognitive impairment, functional impairment, malnutrition and frailty.

Comorbidities- History of prior myocardial infarction, heart failure, cerebrovascular disease, insulin-dependent diabetes, and serum creatinine greater than 2.0 mg/dL are risk factors for major cardiac complications. Collaboration with a cardiologist is appropriate for patients who have history of myocardial infarction, or suspected heart failure, cerebrovascular disease, insulin dependent diabetes, or renal failure. *Perioperative cardiac risk calculator* developed by the American College of Surgeons National Surgical Quality Improvement Program (available at <https://riskcalculator.facs.org/RiskCalculator/PatientInfo.jsp>) provides the risk of peri-operative complications based on 21 pre-operative risk factors. It can help the surgeon to decide if additional cardiac testing is needed.³

Women with *renal failure* are at higher risk of developing peri-operative fluid and electrolyte imbalance, uncontrolled blood pressure, and increased bleeding complications. As a result, they are at increased risk of developing pneumonia, unplanned intubation, ventilator dependence, need for reoperation within 30 days of original procedure, vascular complications, and postoperative death. Risks are greatest in dialysis patients over the age of 65.

Obstructive Sleep Apnoea- Patients with obstructive sleep apnoea are at risk of respiratory complications, post operative cardiac events and need for ICU care. STOP-Bang questionnaire is a validated screening tool, consisting of eight questions- loud snoring; tiredness & sleepiness during daytime; observed stopped breathing, choking or gasping; high blood pressure; BMI >35 kg/m²; age more than 50 years; males with shirt collar ≥ 17 inches & women with shirt collar ≥ 16 inches; and male gender. Patients with ≤ 2 positive results are considered low risk, those with 3-4 results are at intermediate risk, and those with

≥5 positive results are at high risk. If pre-operatively such patients are assessed well, the complications can be prevented. In women with known obstructive sleep apnoea continuous positive airway pressure (CPAP) therapy should be continued up to the day of surgery and intra-operative serum bicarbonate level should be monitored.⁴

Functional Capacity- The patients' daily exercise routine is measured as "metabolic equivalents" (METs). If patient can perform ≥4 METs without chest pain or fatigue, the risk of post operative cardiovascular complications would be low. These may include activities like- Cycling, Climbing a flight of stairs, Golf (without cart), Walking 4 mph or Yardwork (e.g., raking leaves, weeding, pushing a power mower). Those with poor functional capacity (<4METs), are likely to experience serious post-operative complications.⁵

Frailty- Disability within one month from surgery is 7 times more common in frail patients. Hence, recognition of frailty is important and should be suspected in women with at least three of the following: muscle weakness poor endurance, low physical activity, slow gait speed, and significant weight loss. Such patients are encouraged to initiate strength training and conditioning and take nutritional supplements to improve post operative recovery and care.⁶

Antihypertensive- The sympathetic system gets activated on induction of anaesthesia and thereby elevates the blood pressure by 90 mm of Hg and increase the heart rate by 40 bpm in patients with untreated hypertension. Hence, hypertensive patients are advised to continue their oral antihypertensive medications up to the day of surgery. Potassium levels are to be closely monitored especially in patients on diuretics, as hypokalemia can potentiate the effect of muscle relaxants, increase the risk of paralytic ileus and cardiac arrhythmia.⁷

Bowel preparation- Traditional prolonged fasting is no longer recommended. The reduction in recommended fasting times, particularly of clear liquids, has improved surgical outcomes and patient comfort with no increased risk of aspiration. *In Gynaecologic surgery, mechanical bowel preparations are not recommended.* In case small and large bowel injuries are anticipated, enteral antibiotics can be considered to reduce infection. Even in women undergoing caesarean delivery it is strongly recommended to drink clear fluids up to 2 hours

before elective surgery. A light meal may be eaten up to 6 hours before surgery. Mechanical bowel preparation for enhanced visualization of operative fields during laparoscopic surgeries is not supported by available evidence.⁸

Preoperative medications- Though the level of evidence is low, it is highly recommended that *antacids and histamine H2 receptor antagonist* should be administered as premedication to reduce the risk from aspiration pneumonitis. *Preoperative analgesia* optimizes peri-operative pain management with minimal opioid exposure. Opioids are effective for pain relief but directly contribute to complications such as nausea, vomiting, delay in bowel function and respiratory depression. Paracetamol, acetaminophen, gabapentin, NSAIDs and COX 2 inhibitors have been shown to decrease postoperative pain and narcotic requirements in women undergoing hysterectomy. Transversus abdominis plane block reduces postoperative opioid use after laparoscopic surgeries and total abdominal hysterectomy.

Procedure- Specific Risk Factors- Surgical characteristics that impact peri-operative risk include surgical approach (vaginal, abdominal, laparoscopic, or robot assisted), type of surgery (e.g., myomectomy vs. hysterectomy), and characteristics associated with the gynaecologic disease (e.g., complexity of disease, extent of pathology, malignancy). Patients with history of previous abdominal surgeries, or with malignancy or with extensive pelvic pathology will have distorted anatomy, which increases the risk of bleeding or inadvertent injury to adjacent organs. In such cases, pre-operative planning allows the surgeon to secure adequate surgical assistance and personnel, as well as to select appropriate prophylactic antibiotics and blood products.⁹

Prophylactic antibiotics- Antibiotics should be administered within 60 minutes prior to start of surgery to ensure adequate circulating and tissue levels of antibiotics prior to bacterial inoculation. Selection of antibiotics should be based on coverage of vaginal and skin flora, including gram-positive, gram negative and anaerobic organism. For gynaecologic surgery, first generation cephalosporins or amoxicillin-clavulanic acid is recommended (ACOG Committee Opinion Number 750). Increased dose for women with BMI ≥ 30 mg/kg² and additional intraoperative dose if blood loss >1500 ml or surgery approaches 4 hours is required.¹⁰

In women undergoing caesarean delivery also, administration of first generation cephalosporin should be done within 60 minutes before skin incision. In women in labour or with ruptured membranes the addition of azithromycin to routine cephalosporins further reduces infectious complications from 12.0% to 6.1% ($P < .001$) and wound infections from 6.6 to 2.4%.¹⁰

Management of chronic medications in peri-operative period- Most medications can be continued in the peri-operative period and are beneficial for surgery. Beta blockers reduce myocardial ischemia by decreasing myocardial oxygen demand due to increased catecholamine release. It is essential to continue these medications in the peri-operative period. Alpha-2 agonist should be continued in the peri-operative period due to risk of withdrawal and rebound hypertension. Calcium channel blockers, H2 blockers, proton pump inhibitor, diuretics, statins and asthma medications are not required to be stopped before surgery. ACE inhibitors are safe to be used in patients with congestive heart failure or hypertension. But otherwise should be withheld for 24 hours prior to surgery and should be resumed within 48 hours after surgery. *Clopidogrel* is recommended to be stopped 5 to 7 days before surgery and restarted 12 to 15 hours after surgery. Begin with loading dose and then therapeutic dose is resumed after 12 to 24 hours post surgery. *Diuretics* are withheld on the morning of surgery due to risk of hypokalemia and hypovolemia. Patients on insulin should be posted as first case in the morning. Dosing should be reduced by one half to two thirds if the patient is using daily dosing and by one third to one half if insulin is administered two or more times a day. *Oral hypoglycemic drugs* should be continued until the morning of surgery and withheld that morning. Sulfonylureas can increase the risk of hypoglycemia. *Metformin* is contraindicated in conditions where tissue hypoxia, lactate accumulation or renal hypoperfusion can occur. Other than metformin, almost all other hypoglycemic agents can be restarted after surgery once the patient is eating, *metformin should be delayed in patients with renal hypo-perfusion, significant hepatic impairment, or congestive heart failure.* Careful preoperative monitoring of serum glucose is mandatory. *NSAIDs* are to be discontinued 3 days prior to surgery. *Ibuprofen* affects platelet function for only 24 hours, so it can be stopped 24 hours prior to surgery.¹¹

Surgical site preparation- Patients should bathe the night prior to surgery with either soap or antiseptic agent. In the operating room, abdominal wall should be prepped with 4% chlorhexidine gluconate with 70% isopropyl alcohol and the vagina should be prepped with either povidine iodine or chlorhexidine gluconate with 4% isopropyl alcohol. If there is history of allergy to iodine, then sterile saline can be used for preparing the vagina.

Antimicrobial vaginal preparation with a povidone iodine solution before caesarean delivery is recommended to reduce post-caesarean infections.¹²

Surgical Incision- Surgical anatomy and incisions used in gynaecologic surgeries are discussed in detail in next article.

For Caesarean delivery although there is no consensus on the most appropriate surgical technique; blunt expansion of the uterine hysterotomy, closure of hysterotomy in 2 layers, omitting peritoneal closure, reapproximation of the subcutaneous tissue if >2cm and subcuticular suture for skin closure are advocated.

Intraoperative medications- play an important role in postoperative pain management. Strong evidence recommends regional anaesthesia for caesarean delivery. Not only is it associated with lesser blood loss, neonatal outcomes are also said to be improved. In women undergoing laparoscopic surgery, a small dose of ketamine helps to reduce pain score and opioid use in the post operative setting.

Prevention of hypothermia- Decrease of one degree celsius from core temperature can stimulate adrenal steroid and catecholamine production and increase the risk of blood loss, cardiac arrhythmias and wound infections. It is associated with reduced skin integrity, prolonged hospital stay and poor patient satisfaction.

During caesarean delivery, hypothermia also has adverse effects on neonatal temperature, pH, and APGAR score. Forced air warming, intravenous fluid warming, and increasing operating room temperature are all recommended to prevent hypothermia during caesarean delivery.

Fluid management- is the mainstay of ERAS. Euvolemia results in fewer postoperative complications, earlier return of bowel function, and shorter hospital stay. It is important for better maternal and neonatal outcomes. Maintaining adequate uterine perfusion does not only optimize foetal

oxygenation and prevent acidosis but also deliver nutrients and eliminate waste products from the uterine myometrium. Achieving euvolemia requires a three-pronged approach, with preoperative, intraoperative, and postoperative fluid management. As discussed earlier, patients should ingest clear fluids till 2 hours before induction of anaesthesia (a complex carbohydrate drink 2 hours before surgery in nondiabetic patients). Mechanical bowel preparation should be avoided. Intra-operatively, goal directed fluid therapy based on stroke volume optimization should be considered to avoid excessive fluid administration which can lead to delayed recovery of gastrointestinal function. Postoperatively, the rapid transition to oral intake is encouraged and IV fluids should be discontinued. If patients require IV fluids, low-sodium and low-volume fluids should be administered to maintain zero fluid balance.

Tubes and Drains- Routine use of nasogastric tube, abdominal and vaginal drains, and vaginal packs hinder mobilization and prolong hospital stay with limited evidence of benefit. If indicated, should be removed as early as possible after surgery. Urinary catheter if used should be removed within 24 hours or as soon as feasible. Routine catheterisation during caesarean section does not reduce risk of urinary tract injuries and should be avoided. If preoperative bladder drainage is done, catheter should be removed immediately after caesarean delivery.¹²

Postoperative ERAS Components

Early mobilization and thromboprophylaxis-postoperative early ambulation is the concept of time spent outside bed as early as on the day of surgery. Early mobilization is associated with reduced thromboembolic complications, reduced insulin resistance and shorter hospital stay. Preoperative counselling and multimodal analgesia regimens with limited use of opioid are key elements to achieve early postoperative mobilization. Caprini score or Rogers score may be used to assess risk of venous thromboembolism. Regardless of the risk of thromboembolism, all postoperative patients should receive well fitted compression stockings, intermittent pneumatic compression and if indicated low molecular weight heparin. In surgeries done for gynaecologic malignancies extended thromboprophylaxis is needed.¹³ In patients undergoing caesarean delivery, pneumatic compression stockings should be used and routine use of heparin should be avoided.

Postoperative nutrition and Fluid balance-

Emphasis is given on early feeding and return to regular diet within 24 hours. Sham feeding with chewing gums in the immediate postoperative period reduces the risk of ileus. IV fluids beyond 24 hours are rarely indicated in patients who can take orally. If IV fluids are administered total hourly volume should not exceed 1.2 ml/kg to prevent fluid overload.

Early feeding within 2 hours after caesarean delivery as compared to conventional feeding within 18 hours, is associated with improved maternal satisfaction and reduced length of stay without significant impact on readmission and gastrointestinal symptoms.¹⁴

Perioperative glucose control- There is no consensus on ideal target range for blood sugar in the postoperative period. Capillary blood glucose levels should be maintained between 180-200 mg% but strict control may be required in selected patients. Blood glucose levels less than 139 mg% are associated with 35% reduction in the risk of surgical site infections in women with diabetes.

Discharge from Hospital- Women at the time of discharge should be provided information regarding when and where to seek medical help. A standardized written discharge slip clearly mentioning the diagnosis, surgical details, medication dosages, alarming signs and follow up visits should be provided.

Conclusion

Surgeon should evaluate the patient's pathology and co-morbidities to assess the risk of intraoperative and postoperative complications. Pre-operative assessment of functional capacity, perioperative cardiac risk and obstructive sleep apnea scoring should be assessed to avoid cardiac and respiratory complications. Collaboration between the surgeon, anesthesiologist, primary care provider, and medical specialists should be done prior to surgery. The use of ERAS pathways result in more rapid surgical recovery, shorter length of hospital stay and greater patient satisfaction. Successful ERAS pathway implementation across the spectrum of gynaecologic care has the potential to improve patient care and health care delivery system, and its use is strongly encouraged within institutions. In caesarean delivery ERAS pathway starts 30 to 60 minutes before skin incision (ideally from 10-20 weeks gestation) until discharge from hospital.

References

1. Varadhan KK, Neal KR, Dejong CH, et al. The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. *Clin Nutr* 2010;29:434-40
2. Victoria L. Handa, Linda Van Le. Preoperative Care of the Gynecologic Patient. In: Handa, V.L, Linda, V.L (12th) Te Linde's Operative Gynecology.: Lippincott Williams & Wilkins; 2020. p. 81-105.
3. Bilimoria KY, Liu Y, Paruch JL, et al. Development and evaluation of the universal ACS NSQIP surgical risk calculator: a decision aid and informed consent tool for patients and surgeons. *J Am Coll Surg* 2013;217(5):833-842.
4. Chung F, Abdullah HR, Liao P. STOP-Bang questionnaire: a practical approach to screen for obstructive sleep apnea. *Chest* 2016;149(3):631-638.
5. Fleischman LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *J Am Coll Cardiol* 2014;64(22):e77-e137.
6. Clegg A, Young J, Iliffe S, et al. Frailty in elderly people. *Lancet* 2013;381(9868):752-762.
7. Kheterpal S, O'Reilly M, Englesbe MJ, et al. Preoperative and intraoperative predictors of cardiac adverse events after general, vascular, and urological surgery. *Anesthesiology* 2009;110(1):58-66.
8. Siedhoff MT, Clark LH, Hobbs KA, et al. Mechanical bowel preparation before laparoscopic hysterectomy: a randomized controlled trial. *Obstet Gynecol* 2014;123: 562-7.
9. Nelson G, Altman AD, Meyer LA, et al. Guidelines for pre-and intra-operative care in gynecologic/oncology surgery: Enhanced Recovery After Surgery (ERAS) society recommendations-part I. *Gynecol Oncol* 2016;140(3):313-322.
10. ACOG Committee Opinion No. 750: Perioperative Pathways: Enhanced Recovery After Surgery. *Obstet Gynecol*. 2018 Sep;132(3):e120-e130.
11. Douketis JD, Spyropoulos AC, Spencer FA, et al. Perioperative management of antithrombotic therapy. Antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines. *Chest* 2012;141(2 Suppl):e326S-e350S.
12. Haas DM, Morgan S, Contreras K. Vaginal preparation with antiseptic solution before cesarean section for preventing postoperative infections. *Cochrane Database Syst Rev* 2014;12: CD007892.
13. Macones GA, Caughey AB, Wood SL, et al. Guidelines for postoperative care in cesarean delivery: Enhanced recovery after surgery (ERAS) society recommendations (part 3). *Obstet Anesth Dig*. 2020;40(2):69-70.
14. Masood SN, Masood Y, Naim U, et al. A randomized comparative trial of early initiation of oral maternal feeding versus conventional oral feeding after cesarean delivery. *Int J Gynaecol Obstet* 2014;126: 115-9.

Anterior Abdominal Wall Anatomy- Know Before You Incise

Archana Mishra¹, Pragati Dwivedi², Sakshi Nischal³

¹Professor, ²Associate Professor, ³Post-Graduate Resident, Obstetrics and Gynaecology

^{1,3}VMMC & Safdarjung Hospital, New Delhi, ²Rama Medical College Hapur, Uttar Pradesh

Introduction

Every abdominal surgery involves incision and closure of the abdominal wall, so correct knowledge of the layered structure of the anterior abdominal wall is a must to enter the abdominal wall with maximum efficacy and safety.¹

The abdominal cavity is bounded superiorly by lower edge of the rib cage (7-12), inferiorly by iliac crests, inguinal ligaments, and pubic bones and posterolaterally by lumbar spine and its adjacent muscles.

Skin and Subcutaneous Tissue: are the first structures to be incised during abdominal surgery. Dermal layer fibres are oriented in a predominantly transverse direction and in the lower part these fibres have a subtle concave curving in upward direction. The subcutaneous tissue is made up of superficial fatty layer, the *Camper's fascia* and deep layer of fibrofatty tissue, the *Scarpa's fascia*. Scarpa's fascia is not well defined in vertical incisions.

Surgical Importance

- There is more tension on the skin of a vertical incision that results in a wider scar and more chances of wound dehiscence. Transverse scars with slight cephalic concavity are more cosmetic. Placing the incisions in the pubic hair line or in a natural skin crease may enhance the cosmetic results. However, avoid incisions in deep skin fold of a large panniculus should be avoided where maceration of the skin can increase the risk of infection.
- When using electrosurgery or cold scalpel to incise skin, the rate of postoperative wound complications is similar but with less postoperative pain if electrosurgery is used.^{2,3} During sharp incision, multiple blade strokes should be avoided as it results in more tissue damage and increased risk of infection.
- Care should be taken to secure superficial epigastric arteries during incision of subcutaneous tissue (Fig: 1). These vessels arise from femoral

vessels and are found in the line between femoral pulsations and umbilicus, just above the Scarpa's fascia. Small subcutaneous vessels generally constrict, but persistently bleeding vessels can be dealt with electrosurgery. Use of excessive energy should be avoided to limit tissue destruction. If required vessels should be isolated, clamped with haemostat, and ligated.

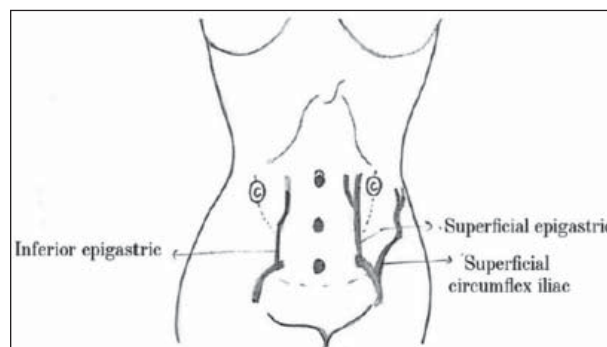


Fig 1: Epigastric Vessels

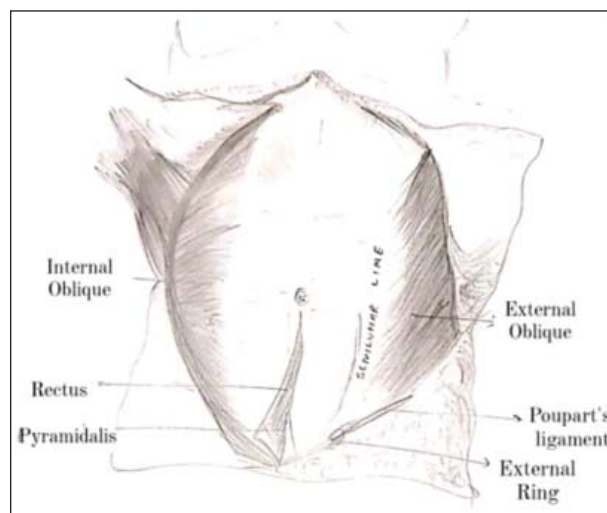


Fig 2: Muscles of Anterior Abdominal Wall

Musculoaponeurotic Layer

Deeper to subcutaneous tissue is the layer of fibrous tissue and muscle which functions to hold the abdominal viscera in place and controls movement of the lower torso. There are two major groups of muscles: Vertical muscles and Oblique flank muscles.

Vertical Muscles are the rectus abdominis muscle, found on either side of the midline and pyramidalis muscle, located just above the pubes. Rectus abdominis muscle originates from the sternum and cartilages of 5th to 7th ribs and inserts into the anterior surface of the pubic bone. The pyramidal muscles arise from the pubic bones and insert into the linea alba in an area several centimetres above the symphysis.

Flank Muscles are lateral to the vertical muscles: the external oblique (EO), internal oblique (IO), and transversus abdominis (TA). EO is most superficial muscle and its fibres run anteriorly and inferiorly. IO muscles fibres fan out from their origin in the anterior 2/3rd of the iliac crest and the thoracolumbar fascia, direction of these fibres is perpendicular to that of EO muscle. But in the lower part these fibres run in the direction of EO muscle. Transversus abdominis (TA), is the deepest layer and fibres run in transverse direction, fused with the IO muscle in the lower part. Therefore, in the lateral part of the transverse incision only 2 muscles can be identified, superficial layer of EO and deep layer of fused IO and TA muscles.

Rectus Sheath is the conjoined aponeuroses of three flank muscles that unite with their corresponding member of the other side, forming a dense white covering of the rectus muscle. It is separable lateral to the rectus muscles but fused near the midline. Rectus sheath in its lower one fourth lies entirely anterior to the rectus muscle. Above that point, it splits to lie both ventral and dorsal to it. The transition between these two arrangements occurs midway between the umbilicus and the pubes and is called the arcuate line. Cranial to the arcuate line, the rectus sheath unites in the midline to form the linea alba, the white line which is completely avascular.

Surgical Importance

While elevation of rectus sheath from the rectus muscle during pfannenstiel incision, sharp dissection is required to separate these layers at linea alba. When the peritoneum is opened vertically beyond the arcuate line, posterior rectus sheath is divided along with peritoneum and must be repaired during closure.

Each rectus muscle has 3 fibrous interruptions, tendinous inscriptions that are firmly attached to the rectus sheath (Fig 3). Generally they are found above the level of umbilicus but may occasionally be found at a lower level causing difficulty in separation of rectus sheath from rectus muscle. At the same

time these inscriptions help in keeping the muscle in place during Maylard incision.

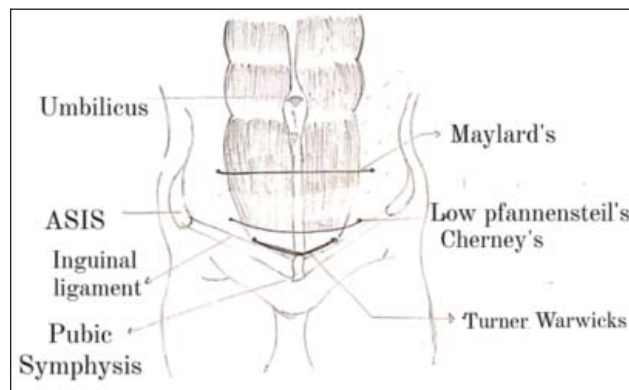


Fig 3: Transverse Incisions of Abdominal Wall

The pointed insertion of Pyramidalis muscle with the linea alba can be used to localise midline in cases of difficult abdominal wall entry.

In emergency surgeries, midline incision is usually preferred and rectus is opened at linea alba. Due to lack of muscular coverage this area is weak and these incisions are prone to formation of post-surgery ventral hernias.

Transversalis Fascia, Peritoneum, and Bladder Reflection

The peritoneum is a single layer of serosa supported by a thin layer of connective tissue that lines the abdominal cavity. Below muscle layer and superficial to the peritoneum lies transversalis fascia. It is dissected from the bladder before opening the peritoneum.

The peritoneum is thrown into following five vertical folds that are formed by underlying ligaments or vessels that converge at the umbilicus. The single *middle/median umbilical ligament* (the obliterated urachus); lateral to this are paired medial umbilical ligaments (remnants of the obliterated umbilical arteries) that connect the internal iliac vessels to umbilicus; and lateral most are paired ridges, the lateral umbilical folds caused by deep inferior epigastric vessels. Deep inferior epigastric artery is a branch of external iliac artery, lies lateral to the rectus muscle, deep to transversalis fascia, crosses rectus muscle midway between pubic symphysis and umbilicus to lie between the muscle and posterior rectus sheath where it branches extensively while traversing towards the umbilicus (Fig 4). Hesselbach's triangle is formed by the angle between these vessels and lateral border of rectus muscle with inguinal ligament forming the base.

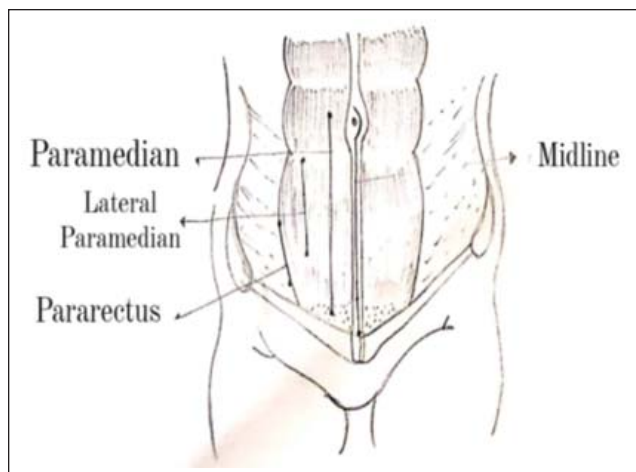


Fig 4: Vertical Skin Incisions of the Abdominal Wall

Surgical Importance

Bladder reflection onto the peritoneum is triangular in shape with its apex blending with urachus. As bladder reflection is highest in the centre, midline incisions can cause bladder injury. Therefore, peritoneum should be entered lateral to urachus.

During laparoscopy lateral umbilical ligaments should be localised to prevent injury to deep epigastric vessels during secondary port placement. Paired medial umbilical ligaments are important landmarks for the lateral extent of the urinary bladder. Deep inferior epigastric vessels should be isolated and ligated during Maylard incision.

Trauma to the deep inferior epigastric artery may result in considerable haemorrhage.

The perforating vessels in the rectus muscle often travel through the tendinous inscriptions of the rectus muscle and are accompanied by nerves. These vessels should be ligated only if bleeding occurs otherwise the cutaneous anaesthesia that may accompany injury to the nerves can be annoying for the patient.

Nerve Supply

The iliohypogastric and ilioinguinal nerves run to the iliac crest, across the quadratus lumborum muscle of the posterior abdominal wall (Fig 5). The iliohypogastric nerve perforates the transversus abdominis, and divides into its terminal branches, innervates the posterolateral gluteal skin in the pubic region. Ilioinguinal nerve innervates muscles of the anterior abdominal wall before passing through the superficial inguinal ring to innervate the skin of the genitalia and middle thigh.

Genitofemoral nerve forms in midsection of the psoas muscle then courses inferiorly within the psoas muscle to finally emerge on the anterior surface of the muscle distally. After leaving the psoas major muscle, the genitofemoral nerve quickly divides into a genital branch, and a femoral branch. The genital branch innervates the skin over mons pubis and labia majora. The femoral branch innervates the skin on the upper anterior thigh.

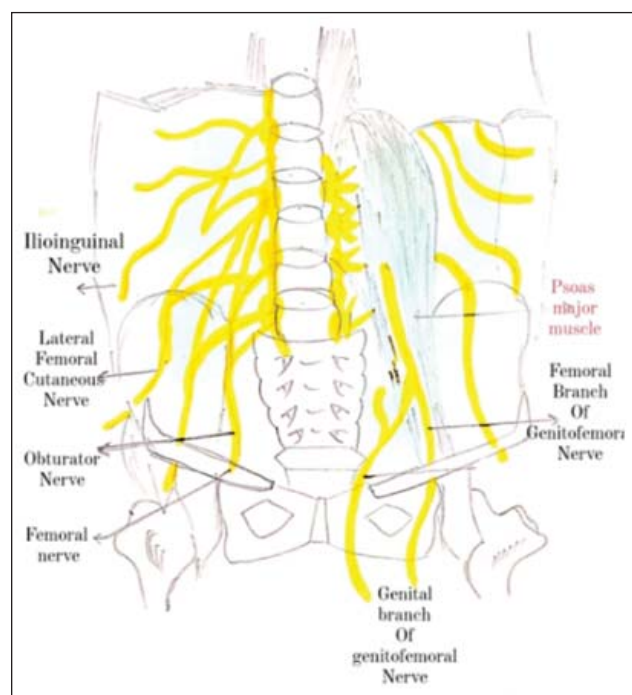


Fig 5: Anterior Abdominal Wall Nerves

Lateral cutaneous nerve of the thigh emerges on the lateral edge of the psoas muscle below ilioinguinal nerve then passes beneath the iliac fascia and the inguinal ligament.

Surgical Importance⁴

The genitofemoral and lateral cutaneous nerve of the thigh can be injured if transverse skin incision goes more lateral or can sometimes get entrapped in the lateral closure of a transverse incision leading to chronic pain syndromes.

These nerves can also be compressed by a retractor blade lateral to the psoas. Injury to genitofemoral nerve can cause anaesthesia in the medial thigh and lateral labia. Too much flexion of the hip in the lithotomy position can injure lateral cutaneous nerve of thigh, causing anesthesia over the anterior thigh, diminished knee jerk, and weakness of knee extension, which later on can lead to difficulty in climbing stairs.

The "Transverse Abdominis Plane [TAP] Block" anesthetizes nerves supplying the anterior abdominal wall (T6 to L1), given between the internal oblique and transversus abdominis muscles provides good postoperative pain relief.

Lymphatics Drainage: Superficial lymphatics above the umbilicus pass in a superior direction to the axillary nodes and below the umbilicus pass in an inferior direction to the superficial inguinal nodes.

Incisions on Anterior Abdominal Wall

Choice of incision- Points to be taken care while choosing an incision are- it should provide adequate exposure for the anticipated procedure, take into account the need for extending incision depending upon intraoperative findings or complications; it should interfere minimally with abdominal wall function by preserving important abdominal structures; and it should heal with adequate strength.⁵ Other factors guiding choice of incision are- need for rapid entry; certainty of the diagnosis; body habitus; location of previous scars; potential for significant bleeding; minimizing postoperative pain; and cosmetic outcome

Types of Incisions for a Pelvic Surgery

There are generally two main types of incision: longitudinal and transverse. *Longitudinal incisions* can be midline incision or paramedian incision (Fig 3). Lateral paramedian incision and pararectal incisions are rarely used in gynaecological surgery. *Transverse Incisions* commonly used are Pfannenstiel's incision, Cherney's incision, and Maylard's incision, Kustner's

incision and Turner -Warwick's. Incisions used in caesarean delivery are described in a separate article. The main advantages and disadvantages of midline and transverse incision are described in Table 1.

Paramedian incision: A paramedian incision is made 2 to 5 cm to the left or right of the midline. Main advantage is extensibility and less risk of dehiscence or hernia. Disadvantages include- longer time, restricted access to contralateral pelvis, risk of injury to the epigastric vessels and difficult closure than midline incision.

Pfannenstiel's incision: It is the most commonly used incision in gynaecology when the pathology is strictly confined to pelvis.

Technique: It is placed 2 to 5 cm above the pubic symphysis and is usually 10 to 15 cm in length. After the skin is entered, the incision is carried up to the anterior rectus sheath, which is incised transversely. The upper and lower fascial edges are grasped and elevated with a heavy toothed clamp and dissected by blunt and sharp dissection off the underlying rectus muscle from the umbilicus to the symphysis. The rectus muscle is separated along the midline raphe, exposing the transversalis fascia. Posterior rectus sheath is separated above the arcuate line. Peritoneum is incised vertically taking care of underlying structures and bladder. In this incision, fascia is closed with continuous delayed absorbable suture. Subcutaneous tissue is closed if depth is more than 2 cm. Skin is approximated with subcuticular stitches.

Advantages are excellent strength and cosmesis, and adequate exposure for procedures limited to the

Table 1: Advantages and disadvantages of transverse and midline incisions⁶

	Transverse Incision	Midline Incision
Advantages	<p>More suited in planned surgery</p> <p>Less wound dehiscence</p> <p>Cosmetic</p> <p>Lower incidence of adhesion formation and postoperative bowel obstruction</p> <p>Less painful and have less impact on pulmonary function compared to a longitudinal, midline incision, particularly in the early postoperative period.</p> <p>Lower incidence of incisional hernias</p>	<p>More suited in emergency or if diagnosis or location of bleeding is uncertain</p> <p>Most rapid entry, suited patients in shock or sepsis</p> <p>More exposure to upper abdomen</p> <p>Extensibility if need arises</p> <p>Is associated with less bleeding and less potential for nerve injury</p>
Disadvantages	<p>Limited exposure provided to the upper abdomen</p> <p>Limited extensibility</p> <p>Increased surgical time</p> <p>Relatively larger blood loss Problematic if the pannus is large.</p>	<p>More wound dehiscence and hernia</p> <p>Cosmetically less satisfactory</p> <p>More analgesia use</p> <p>More pulmonary compromise</p>

pelvis. *Disadvantages* are restricted speed of entry and increased risk of seroma, hematoma formation, and wound infection.⁷

If the rectus sheath incision is extended beyond the rectus muscle, the iliohypogastric and ilioinguinal nerves may be traumatized, and some patients will experience chronic pain due nerve entrapment and neuroma formation.

In case better exposure is required, the incision can be converted into Cherney's incision.

Cherney's incision: is similar to the Pfannenstiel incision except it is placed slightly lower on the abdomen. Rectus sheath is opened transversely and lifted off the rectus muscle in the lower part until pubic bone is reached. The incision is started laterally by perforating transversalis fascia medial to the inferior epigastric vessels then a finger is passed below the tendons and incision is given leaving half centimetre of tendon attached to the pubic bone. The muscles and tendons are retracted, and the peritoneum is incised longitudinally. If further exposure is needed, the vessels can be ligated and incision can be extended laterally above the anterior superior iliac spine. Closure of incision requires attachment of the muscle tendons to the lower rectus sheath.

Advantages: This incision combines the extensive exposure of a Maylard incision and the strength of pfannenstiel incision. It provides excellent exposure to the retropubic space of Retzius.

Maylard incision: is a transverse incision at the level of the anterior iliac spine.⁸ Before transection of the muscles, the deep inferior epigastric vessels are identified on their lateral undersurface. The vessels are isolated, clamped, transected, and ligated. During transection of the rectus muscles, dissection from the anterior rectus sheath should be avoided in order to limit retraction of the muscles. In addition, the cut edge of the muscle may be secured to the anterior sheath with 0-caliber absorbable mattress sutures to further prevent retraction.

Advantage: Adequate abdominal and pelvic exposure for complex gynaecologic surgery. *Disadvantages:* limited access to the upper abdomen and delayed bleeding from the cut edge of the rectus muscle or deep epigastric vessels.

In patients with significant aortoiliac occlusion, blood supply to lower limbs is dependent on collateral flow from the epigastric vessels. Maylard incision may result in leg claudication and even acute leg ischemia.

Kustner's incision: is a transverse skin incision approximately 5 cm above the symphysis and just below the anterior iliac spine. After skin, subcutaneous tissue is separated from the rectus sheath in a vertical plane to reveal the linea alba. Numerous small branches of the superficial epigastric plexus of vessels may be encountered and must be ligated to prevent excess oozing. Care must be taken to dissect only enough to expose the linea alba and not to separate the subcutaneous tissue too far laterally. A vertical midline incision is then made in the linea alba.

Theoretical advantage: decreased risk of hernia and wound dehiscence.

Disadvantages: time consuming, need of extensive haemostasis, no extensibility, limited utility and increased risk of infection. Risk of hernia is equal to midline incision.

Turner-Warwick's incision: Turner-Warwick's incision is centered 2 to 3 cm above the symphysis and placed within the lateral borders of the rectus muscles.

All gynaecologists should be well versed with anatomy of the anterior abdominal wall.

"Pray before surgery, but remember God will not alter a faulty incision." Arthur H. Keeney

References

1. Flament JB. [Functional anatomy of the abdominal wall]. *Chirurg* 2006; 77:401.
2. Ahmad NZ, Ahmed A. Meta-analysis of the effectiveness of surgical scalpel or diathermy in making abdominal skin incisions. *Ann Surg*. 2011 Jan;253(1):8-13
3. Ly J, Mittal A, Windsor J. Systematic review and meta-analysis of cutting diathermy versus scalpel for skin incision. *Br J Surg*. 2012 May;99(5):613-20
4. Whiteside JL, Barber MD, Walters MD, Falcone T. Anatomy of ilioinguinal and iliohypogastric nerves in relation to trocar placement and low transverse incisions. *Am J Obstet Gynecol*. 2003 Dec;189(6):1574-8; discussion 1578.
5. Meeks GR, Trenhaile TR. Management of abdominal incisions. *J Pel Surg*. 2002;6(295)
6. Brown SR, Goodfellow PB. Transverse versus midline incisions for abdominal surgery. *Cochrane Database Syst Rev*. 2005;(4):CD005199
7. Loos MJ, Scheltinga MR, Mulders LG, Roumen RM. The Pfannenstiel incision as a source of chronic pain. *Obstet Gynecol* 2008; 111:839.
8. Giacalone P. Pfannenstiel versus maylard incision for cesarean delivery: A randomized controlled trial. *Obstet Gynecol*. 2002;99(5):745-50.

Intricacies in Caesarean Section Techniques

Sheeba Marwah¹, Akanksha Dwivedi²

¹Associate Professor, ²Senior Resident, Department of Obstetrics and Gynaecology, VMMC & Safdarjung Hospital, New Delhi

Introduction

Caesarean section is probably the most familiar and most commonly performed operative procedure in today's world. According to NFHS-4, the rate of caesarean section in India is 17.4% and rising over years due to multiple factors. An attempt has been made in this article to do evidence based review of the surgical steps of caesarean section.

Steps of Caesarean Section

Skin incision: A wisely chosen skin incision based upon robust anatomical knowledge and case-based requirement plays a major role in success of any open surgical procedure.

Type of incision: For caesarean sections, a transverse or vertical incision can be used for skin incision. A transverse incision can be a **Pfannenstiel or Joel Cohen incision**. Pfannenstiel is a curvilinear incision, 2-3 cm above symphysis pubis with midportion of incision within clipped area of pubic hair whereas a Joel Cohen incision is a straight incision, 3 cm below the line joining bilateral anterior superior iliac spines Figure 1. A vertical incision can be a **median or paramedian** subumbilical incision and is preferred in certain cases where incision to delivery time is critical or there is an anticipated need of extension where transverse incision won't be helpful.

A transverse incision is preferred over a vertical incision for better cosmesis as well as decreased incidence of postoperative pain and hernia. Joel Cohen incision is preferred over Pfannenstiel with significant short-term advantages like lower rate of postoperative pain, fever, use of analgesia, blood loss along with shorter operative time and hospital stay.¹ Pfannenstiel incision, however continues to be a more common incision used by obstetricians more so because of a habit and also due to its position lower in abdomen thus having less negative cosmetic appearance.

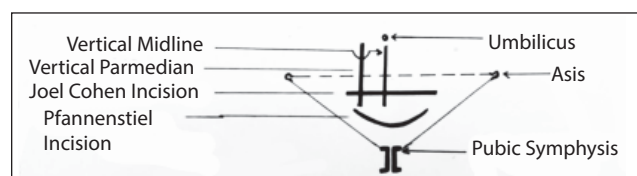


Fig 1: Illustrative diagram showing various types of skin incision used in caesarean section

Scalpel or electrosurgery: Both can be used for **skin incision** based on surgeon's preference and expertise as none of the available studies have been able to demonstrate superiority of one over another in short- or long-term consequences. Either approach or a mixture of both is acceptable.²

Subcutaneous tissue layer: Blunt dissection for subcutaneous tissue layer is associated with shorter operative time, less vascular injury and postoperative pain as compared to sharp dissection.³ There are no RCTs at present demonstrating preference of one over another. **Blunt dissection with fingers is usually preferred over sharp dissection.**

Fascial layer: A small transverse incision is made medially with the scalpel and **extended laterally with scissors or extended bluntly** by inserting fingers of each hand under fascia and pulling in cephalad-caudal direction. A randomized control trial of sharp versus blunt dissection did not show any significant difference in post-operative pain score.⁴

Rectus muscle layer: Rectus muscle is mostly **separated bluntly** as leaving the muscles intact preserves its strength in the early postoperative months.⁵ However, if transection is needed in cases with excessive adhesions, Cherney's incision is a better option than cutting muscles after separating rectus sheath.

Opening peritoneum: For opening peritoneum **blunt dissection** is preferred over sharp dissection, as this minimizes inadvertent injury to bowel or bladder or other adherent structures. The CORONIS trial found **no significant difference between blunt and sharp techniques** for primary composite outcome of maternal deaths, infectious morbidity, further procedures or blood transfusion.⁶

The **extraperitoneal approach** was primarily used in pre antibiotic era to decrease risk of intra peritoneal infection but is going extinct in modern obstetrics. It **avoids exposure of peritoneal cavity** to blood, amniotic fluid, vernix, and mechanical irritation and **reduces nausea, vomiting**, postoperative pain, and voiding disturbances.⁷

Bladder flap: A bladder flap is made by sharply

incising the vesico-uterine peritoneum to separate bladder from lower uterine segment. It should be done in cases with anticipated difficult delivery. The **short-term adverse outcomes** (bladder injury, blood loss, duration of hospitalization) are similar with decreased **incision-to-delivery** interval by 1.3 min, in patients where vesico-uterine peritoneum is not opened.⁸ Urinary symptom scores at 6 to 8 weeks are similar in women with and without bladder flap, but **women with bladder flap have more bothersome urinary symptoms.**⁹

Hysterotomy: Transverse incision: A **low transverse incision is preferred** as it is associated with lower risk of rupture in subsequent pregnancy (0.2-0.5%). However, conversion to a J or T shaped incision can result in a weaker uterine scar and increased risk of rupture in subsequent pregnancy. Blunt versus sharp hysterotomy- blunt expansion results in **lower rate of unintended extensions, lower drop in haemoglobin** and haematocrit and **shortened operative time** by two minutes.¹⁰

Low vertical or classical incision: a low vertical incision appears to be as strong as lower segment transverse incision but there are higher rate of extension to uterine fundus or caudally into bladder, cervix or vagina, with 1-7% risk of rupture in subsequent pregnancy. Risk of rupture with a classical incision is as high as 4-9%.

Blunt expansion of the transverse uterine incision with fingers in a cephalad-caudad direction as compared to transverse is associated with decreased: Mean postpartum blood loss, Hb & hematocrit drop 24h after CS, Unintended extension, Uterine vessels injury, Blood loss >1500mL & Need for additional stitches, Figure 2.¹¹

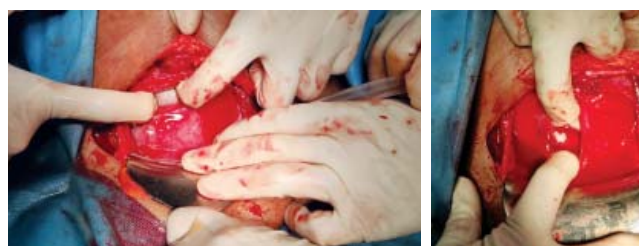


Fig 2: Blunt expansion of uterine incision in transverse (left) and cephalad-caudad (right) direction

Foetal extraction: There is a direct association between prolonged uterine incision to delivery time and lower foetal blood gas pH values and APGAR scores.¹² Care should be taken to place fingers around curvature of foetal head for lifting without overtly flexing the wrist and not using LUS as fulcrum,

which may result in extension. Modifications might be required in following special conditions:

For deeply impacted head: A well placed uterine incision, adequate uterine relaxation, slow careful and deliberate placement of operator's hand around foetal head and use of adjunctive manoeuvres or instruments to allow atraumatic extraction of head and reduce likelihood of uterine extension. Manoeuvres that can be used for delivering a deeply impacted foetal head are: Reverse breech extraction or pull method, Patwardhan technique or shoulder's first method, Abdominovaginal delivery or push method, or use of foetal head elevator devices like Coyne spoon, Sulheim spoon or Murless head elevator, Figure 3.

Abdominovaginal methods are associated with higher rate of extension of uterine incision than Patwardhan method

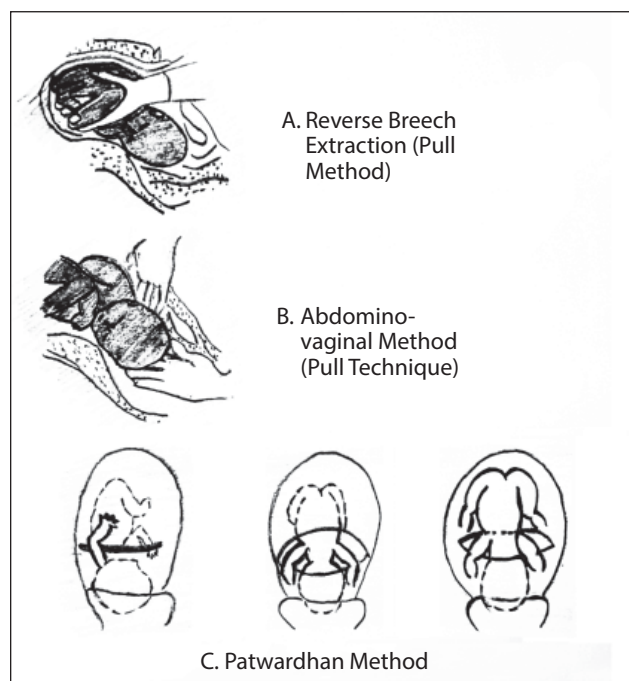


Fig 3: Illustrative diagram showing manoeuvres for delivery of deeply impacted foetal head

Free floating head: is difficult to grasp, following manoeuvres may be useful in delivering a free-floating head: Internal podalic version (IPV) followed by breech extraction, or Cephalic extraction using an instrument like vacuum, forceps or Coyne spoon.

Placental extraction: It is recommended to wait for spontaneous placental expulsion with gentle traction on cord and use of uterotonics rather than manual removal of placenta (MRP). **Manual extraction of placenta is associated with an increased risk of post-operative endometritis,**

increased blood loss and lower postoperative haematocrit.¹³

Changing gloves before MRP does not reduce risk of endometritis. There is insufficient evidence with low level recommendation for cleaning uterine cavity with gauge sponge.

Uterine closure: Exteriorizing the uterus does not cause significant difference in the amount of blood loss, intraoperative nausea, vomiting, return of bowel function, or postoperative pain.¹⁴

Choice of suture material: Use of chromic catgut or delayed absorbable synthetic sutures (polyglactin 910, poliglecaprone) does not result in statistically significant difference in maternal outcome.⁶ Hence choice of suture material is largely based on surgeon's preference and availability. *Natural absorbable sutures are associated with more tissue reaction than synthetic absorbable sutures.*

Choice of needle: A blunt tip or sharp tip needle may be used for closure of uterine incision as both have similar maternal outcome. A blunt tip needle is better for surgeon but performs less well surgically than sharp needles.

Single versus double layer closure: **A double layer closure is always preferred over single layer closure to reduce risk of uterine rupture in subsequent pregnancy.** In two-layer closure with delayed absorbable synthetic suture: **first-layer incorporates the myometrium plus the decidual edge** to achieve haemostasis, and second imbricating layer covers the exposed myometrial edges.

A metaanalysis of RCTs have shown similar incidence of caesarean scar defects, scar dehiscence and rupture in subsequent pregnancies with single and double-layer uterine closure.¹⁵ Single layer closures are usually done with locking technique which results in myometrial thinning thus a weaker scar and increased risk of rupture. Hence, even when a single layer closure is done to decrease the duration of surgery, unlocked single layer closure is recommended.

Locking versus unlocking technique: Locking sutures are associated with thin myometrial thickness and bell shaped uterine wall defects predisposing to dehiscence/ rupture in subsequent pregnancies. A locking suture is recommended only for haemostasis.

Inclusion of decidua: Including decidua in full thickness myometrial closure had a statistically

significant decrease in frequency of wedge type healing defects (niche) in post-partum ultrasound at 6 weeks. However, the recommendations for inclusion of deciduas are subject to change over time with evolving knowledge on the matter with a larger study population.

Closure of a classical incision: This requires surgical expertise as it involves a thick myometrial segment. Inner myometrial layers are closed with continuous sutures with the help of an assistant who manually re-approximates the incision to reduce tension as the sutures are placed and thus prevents the suture from tearing through the myometrium. Midportion is closed with second layer of sutures leaving approximately 1 cm of outer myometrium still open. Serosa and outer layer are then closed using a baseball stitch which is haemostatic and minimizes exposed raw edges thereby preventing adhesions, Figure 4.

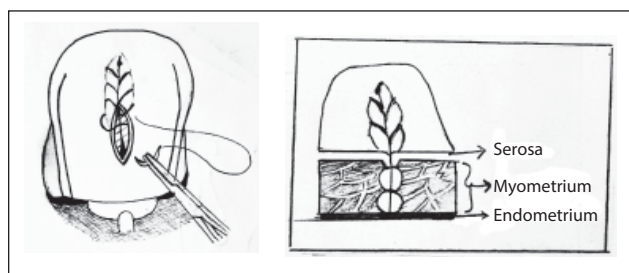


Fig 4: Baseball stitch

Abdominal Wall Closure

Abdominal wall closure should be attempted only when haemostasis is ensured and mops and instruments count is complete. Possibility of ongoing retroperitoneal bleed should be excluded.

Peritoneal Closure: Leaving the peritoneum open **does not increase the risk of adhesions** at any site, or time from incision to delivery at repeat caesarean section.¹⁶

Re-approximation of rectus muscle: Rectus muscle re-approximates naturally and suturing them together may unnecessarily cause post-operative pain.

Fascial closure: It is the most important aspect of incisional closure as it provides major strength to the wound while healing. Fascia should be closed using continuous non locking delayed absorbable suture. Monofilament, braided or barbed sutures can be used. Sutures are placed at gaps of 1 to 1.5 cm from edge of the incision and 1 cm apart without excessive tension.

Subcutaneous tissue: It is recommended to close the subcutaneous adipose tissue with interrupted delayed absorbable suture if thickness is ≥ 2 cm thick. Closure of dead space seems to inhibit accumulation of serum and blood which can lead to wound seroma or haematoma and subsequent wound breakdown.

Skin closure: Skin can be closed using subcuticular sutures, mattress suture, stapler or barbed suture. Subcuticular sutures with either monofilament (poliglecaprone) or braided (polyglactin 910) are preferred; the best suture material is still unclear. Subcuticular sutures are preferred over stapler. Mattress sutures should be employed in cases with higher propensity of wound disruption and surgical site infection. Lack of a randomized controlled trial on choice and method of closure of skin incision precludes making a strong recommendation of preference of one over another.

Practices to be Avoided During Cesarean Section:

Abdominal irrigation: It increases frequency of intraoperative and postoperative nausea and vomiting.

Wound irrigation: Irrigation of subcutaneous tissue does not decrease the incidence of surgical site infection

Drains: Compared with no drain, routine use of drain **does not reduce** the odds of seroma formation, hematoma, infection, or wound disruption.

Cervical dilatation: Meta analysis of randomized trials did not find a statistically significant difference in reducing postoperative morbidity by doing manual/instrumental dilatation of cervix in both laboring and non-laboring patients.

Special Situation

Obese women: Obesity predisposes to a lot of preoperative, intraoperative and postoperative complications.

Thromboprophylaxis: Obesity, postpartum state and caesarean delivery are independent risks for venous thromboembolism. Use of pneumatic compression devices at the time of caesarean delivery and both mechanical and pharmacologic thromboprophylaxis is recommended in obese women.

Antibiotic prophylaxis: Appropriate dose should be given according to maternal weight.

Technical issues: Appropriate equipment should be

available to ensure adequate exposure and reduce the risk of postoperative infection and abdominal wall dehiscence. Incision should be planned according to panniculus size, could be a transverse or mid-line vertical incision. No randomized trials have proven superiority of one over the other. **Bony landmarks should be used as points of reference for making the incision.** Incision could be a supra pubic incision or a supra umbilical incision. Facial closure should be done en masse to reduce risk of dehiscence and hernia formation. Subcutaneous layer should be closed using absorbable 3-0 suture. Skin is closed using subcuticular polypropylene sutures both for infra pannicular and supra umbilical incisions or a stapler can be used. Increasing BMI is associated with increasing incision to delivery time, which may increase neonatal morbidity, particularly in emergency situations.

Conclusion

Cesarean section is the most frequently performed major surgery. It is important to use evidence based surgical techniques that are shown to reduce maternal morbidity and mortality.

References

1. Mathai M, Hofmeyr GJ. Abdominal surgical incisions for caesarean section. Cochrane Database Syst Rev. 2007 Jan 24;(1):CD004453.
2. Elbohoty AE, Gomaa MF, Abdelaleim M, et al. Diathermy versus scalpel in transverse abdominal incision in women undergoing repeated cesarean section: A randomized controlled trial. J Obstet Gynaecol Res. 2015 Oct;41(10):1541-6.
3. Caughey AB, Wood SL, Macones GA, et al. Guidelines for intraoperative care in cesarean delivery: Enhanced Recovery After Surgery Society Recommendations (Part 2). Am J Obstet Gynecol. 2018 Dec;219(6):533-544.
4. Aabakke AJ, Hare KJ, Krebs L, et al. Sharp compared with blunt fascial incision at cesarean delivery: a randomized controlled trial with each case as her own control. Eur J Obstet Gynecol Reprod Biol. 2014 Jan; 172:40-5.
5. Giacalone PL, Daures JP, Vignal J et al. Pfannenstiel versus Maylard incision for cesarean delivery: A randomized controlled trial. Obstet Gynecol. 2002;99(5 Pt 1):745-50.
6. CORONIS Collaborative Group, Abalos E, Addo V, et al. Caesarean section surgical techniques (CORONIS): a fractional, factorial, unmasked, randomized controlled trial. Lancet 2013; 382:234.
7. Tappauf C, Schest E, Reif P, et al. Extraperitoneal versus transperitoneal cesarean section: a prospective randomized comparison of surgical morbidity. Am J Obstet Gynecol. 2013 Oct;209(4): 338.e1-8.

8. O'Neill HA, Egan G, Walsh CA, et al. Omission of the bladder flap at caesarean section reduces delivery time without increased morbidity: a meta-analysis of randomised controlled trials. *Eur J Obstet Gynecol Reprod Biol.* 2014 Mar; 174:20-6.
9. O'Boyle AL, Mulla BM, Lamb SV, et al. Urinary symptoms after bladder flap at the time of primary cesarean delivery: a randomized controlled trial (RTC). *Int Urogynecol J.* 2018 Feb;29(2):223-228.
10. Saad AF, Rahman M, Costantine MM, Saade GR. Blunt versus sharp uterine incision expansion during low transverse cesarean delivery: a metaanalysis. *Am J Obstet Gynecol.* 2014 Dec;211(6):684.e1-11.
11. Ozcan P, Ates S, Guner Can M, et al. Is cephalad-caudad blunt expansion of the low transverse uterine incision really associated with less uncontrolled extensions to decrease intra-operative blood loss? A prospective randomised-controlled trial. *J Matern Fetal Neonatal Med.* 2016;29(12):1952-6.
12. Dahlke JD, Mendez-Figueroa H, Rouse DJ, et al. Evidence-based surgery for cesarean delivery: an updated systematic review. *Am J Obstet Gynecol.* 2013 Oct;209(4):294-306.
13. Anorlu RI, Maholwana B, Hofmeyr GJ. Methods of delivering the placenta at caesarean section. *Cochrane Database Syst Rev.* 2008 Jul 16;(3):CD004737.
14. Zaphiratos V, George RB, Boyd JC, Habib AS. Uterine exteriorization compared with in situ repair for Cesarean delivery: a systematic review and meta-analysis. *Can J Anaesth.* 2015 Nov;62(11):1209-20.
15. Parantainen A, Verbeek JH, Lavoie MC, et al. Blunt versus sharp suture needles for preventing percutaneous exposure incidents in surgical staff. *Cochrane Database Syst Rev.* 2011 Nov 9;2011(11):CD009170.
16. Kapustian V, Anteby EY, Gdalevich M, et al. Effect of closure versus nonclosure of peritoneum at cesarean section on adhesions: a prospective randomized study. *Am J Obstet Gynecol.* 2012 Jan;206(1):56.e1-4.

Answer: May 2021 Issue

Crossword

- | | | |
|----------------|--------------------|------------------|
| 1. Forty | 5. Amnioinfusion | 9. Saltatory |
| 2. Terbutaline | 6. Six | 10. Remifentanyl |
| 3. Friedman | 7. Tranexamic acid | 11. Hayman |
| 4. Ergometrine | 8. Suspicious | 12. Five |

Topical Haemostatic Agents- Which, When, How?

Taru Gupta¹, Divya Solanki²

¹Professor & Head, ²Assistant Professor, Department of Obstetrics & Gynaecology, ESI PGIMS, Basaidarapur, New Delhi

Intraoperative bleeding complications are seen in nearly 30% of surgical procedures and can be associated with an increased risk of mortality and morbidity, longer hospital stays, and increased healthcare costs. Haemostasis is achieved with conventional techniques such as manual pressure, ligature and energy sources however, these can be ineffective in controlling bleeding from complex injuries and in less accessible areas. Topical haemostats are useful over broad areas of diffuse ooze where suturing may be impractical, or when there is a risk of thermal injury to adjacent structures like ureter or nerves.

A basic knowledge of the clotting cascade pathway is necessary to understand the role of topical haemostatic agents. Briefly, the intrinsic pathway and extrinsic pathway involve a variety of factors that eventually activate factor X. Activated factor X (Factor Xa) is needed to convert prothrombin to thrombin. Thrombin then can convert fibrinogen to fibrin. Fibrin becomes cross-linked and serves as a scaffold for platelets, ultimately resulting in a stable fibrin clot.

There are three broad categories of haemostatic agents:

Caustic
Physical
Biologic

Caustic Agents: Topical caustic agents include aluminium chloride, ferric subsulfate 20% (Monsel's solution), silver nitrate, and zinc chloride paste. They coagulate proteins leading to tissue necrosis and eschar formation, enhancing thrombus formation and

haemostasis. Although used in the cervix and vagina, they are not advocated for intraabdominal use.

Physical Agents: Also known as mechanical haemostats, promote haemostasis by utilizing a passive substrate, cause platelet activation and aggregation, form a matrix at the site of bleeding, thus allow clot to form. Since they are not biologically active, they rely on patient's own fibrin production to achieve haemostasis; these agents are considered passive haemostats and are *only appropriate for patients who have an intact coagulation system*. Physical agents use a substrate, such as cellulose, gelatin, starch, or collagen, to form a matrix at the site of bleeding which activates the extrinsic coagulation cascade and serves as a scaffold for clot formation. Physical agents are available in a variety of forms, including powder, sponges, a woven mesh, or foam.

Gelatin is a haemostatic agent made from hydrolyzed and purified animal collagen. Gelatin matrix is available in a powder or sponge form (Figure 1). It is *absorbed over 4–6 weeks* and is referred to as non -antigenic though it is of animal origin. The mechanism of action is more physical than chemical in coagulation cascade. A dry local haemostat absorbs body fluid of several times its own weight and expands postoperatively. Therefore, when an absorbable haemostatic agent is retained on or near bony or neural spaces, only a minimum amount should be left once haemostasis is achieved, otherwise, compression necrosis may occur. Gelatin matrix products have a neutral pH and therefore can be used with topical thrombin or other pH-neutral topical haemostatic agents.¹

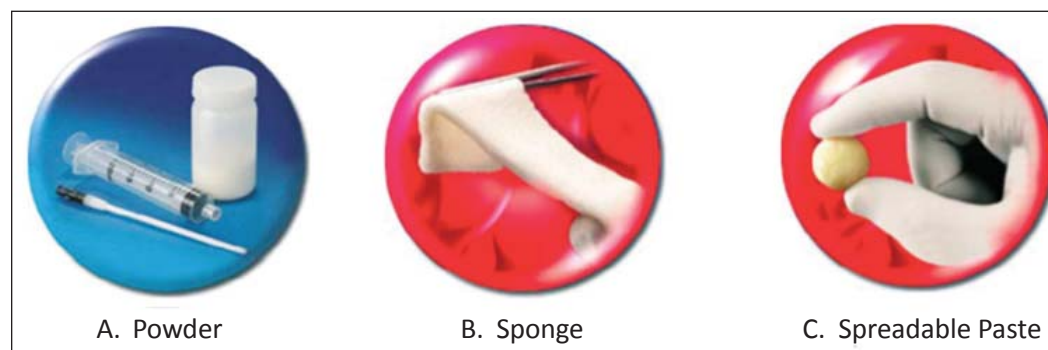


Fig 1: Gelatin-based haemostats- Surgifoam gelatin

Simple oxidized cellulose was first proposed followed by new topical haemostat- regenerated oxidized cellulose. It is plant-derived and is available as powder or a loose knit mesh that can be trimmed as needed as well as placed through laparoscopic ports. Oxidized regenerated cellulose has a low pH which helps to form an artificial clot and enhances surface interactions between platelets, collagen, coagulation factors, and causes small vessel vasoconstriction. Its acidic nature has mild antibacterial action.² The low pH can inactivate topical thrombin; thus, *oxidized regenerated cellulose and topical thrombin should not be used together*. It generally is absorbed over 1–2 weeks.

Microporous polysaccharide hemosphere (Arista) is a plant-derived polysaccharide powder haemostat. The powder absorbs water and concentrates platelets and other proteins to accelerate clot formation. Because the powder is absorbed in approximately 48 hours, it is less likely to cause foreign body reaction or to serve as a nidus for infection when compared with other physical agents.³

Microfibrillary Collagen, topical microfibrillar collagen (TMC) haemostats are produced by purifying bovine, equine or goat collagen fibres (dried protein), processed into microcrystals and then handled in commercial forms. Collagen based products activate the intrinsic pathway of coagulation cascade. TMC provides a large surface area, when while contact with blood allows adhesion, platelet activation and aggregation. It promotes thrombus formation within 2-5 minutes.³ The first collagen based topical haemostat was Avitene (Figure 2a). It is available as powder form and expanded into tissue like material, as well as sponge shaped and small pads or plaques (Instat) (Figure 2c). TMC is *less effective in thrombocytopenia or coagulopathies* however it *attains haemostasis in heparinized patients*. Unlike gelatins, TMC does not increase in volume and is absorbed in 8 weeks. It should be applied by surgical

instrument and not by surgeon's hand as it may adhere to gloves.

Biologic Agents: Biologically active agents contain fibrinogen and thrombin, stimulate the coagulation cascade locally at the bleeding site, and thus actively participate to form a fibrin clot. They are *effective in patients with spontaneous or drug-induced coagulation disorders*. These agents are known as adhesive haemostats because of their haemostatic and tissue sealing action. They are available in liquid flowable form (fibrin glues) or in association with stiff collagen fleece (fibrin patch).³

Topical thrombin: Thrombin is a natural enzyme with roles in haemostasis, inflammation and cell signalling. It is formed from prothrombin, as a result of the activation of intrinsic and extrinsic coagulation pathways, and forms the base of the fibrin clot, promoting the conversion of fibrinogen to fibrin. Topical bovine thrombin (Thrombin-JMI) induces antibodies against thrombin, prothrombin, factor V, and cardiolipin. It can lead to thrombosis, severe coagulopathy and bleeding in patients on haemodialysis. Thrombin derived from human plasma and recombinant human thrombin has same efficacy and safety profile, and a significantly lower immune response than bovine thrombin.²

Fibrin sealants: Fibrin sealant (eg, Tisseel, Evicel) is a two-component system that combines thrombin solution with a concentrated human fibrinogen solution that is applied directly to the bleeding site, allowing formation of a fibrin clot. Some products also contain aprotinin, an antifibrinolytic agent, to help maintain stable fibrin clots. Fibrin sealants can be used in *patients with coagulopathy, even in those with deficient fibrinogen*.²

One potential drawback of fibrin sealants is that they take longer to prepare compared with other topical haemostatic agents. This includes at least 10–20 minutes to allow thawing, depending on the specific

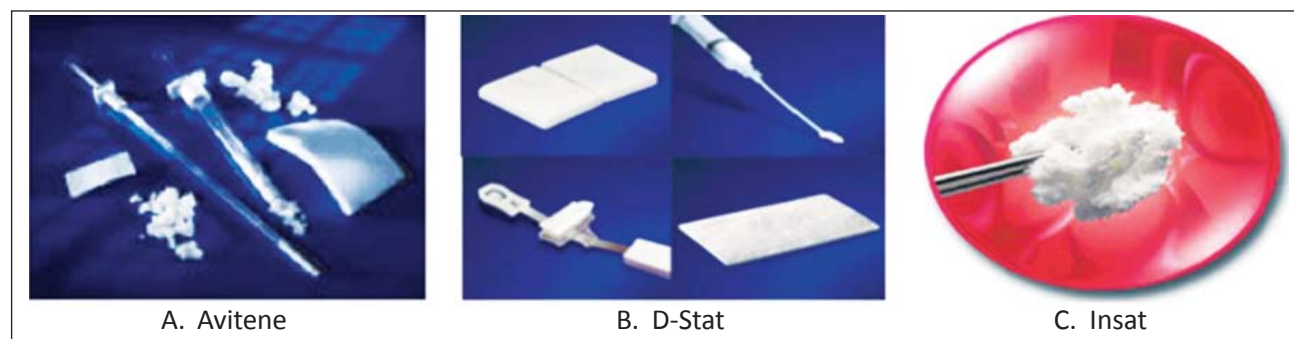


Fig 2: Collagen-based haemostats



Fig 3a: Gelatin-thrombin matrix kit

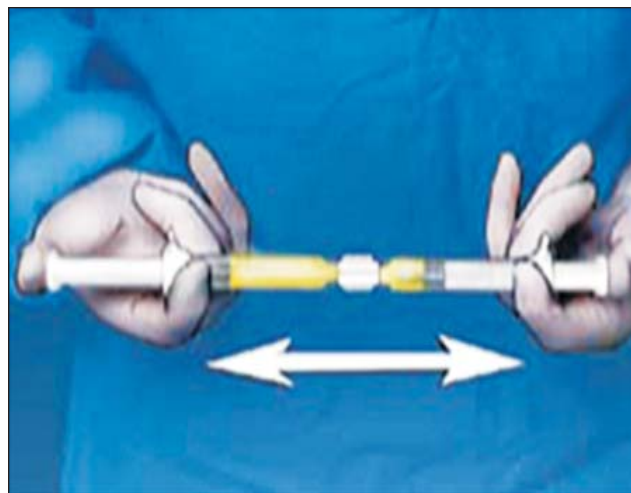


Fig 3b: Transfer of Gelatin matrix-thrombin solution mixture, back and forth between the syringes

product.^{2,3} They are also among the most expensive of all topical haemostatic agents. Fibrin glues are applied through a double syringe technique. Ideal application requires a dry operating field and it is effective when applied prior to bleeding. When used after the onset of bleeding, one should apply local pressure over the wound to allow polymerization.^{2,3,4} Evicel® does not contain antifibrinolytic agent and requires a minimum pre-application preparation time, making it easier to use. Tisseel®, Quixil® and Evicel® fibrin glues are especially suitable for controlling low pressure (venous) bleeding and from bloody surfaces such as kidneys, liver and spleen.³

Solid matrix fibrin sealant The combination with cellulose, gelatin and/or collagen with procoagulant substances, either fibrin or thrombin, is a newly created approach (Surgiflo®: gelatin + thrombin) to increase the effectiveness of topical haemostatics. These products combine the mechanical effects of physical agent with the haemostatic effects of the fibrin sealant. The collagen matrix induces platelet aggregation and stimulates factor XII coagulation. Upon contact with liquid, the solid components dissolve and form a viscous fibrin clot between the matrix and the wound's raw surface. A compression period is required for polymerization of the sealant components.

Floseal, liquid matrix fibrin sealant, is a gelatin matrix based on bovine collagen containing microgranules, cross linked with glutaraldehyde (biological glue) and human thrombin solution that are mixed at the time of its use. In contact with blood, gelatin particle swells and induces a buffering effect. This feature helps control moderate bleeding as compared to

other agents (Figure 3). There are many cases of obstetric haemorrhage managed with these topical haemostats.^{2,5} It does not require a dry surgical field for application. Other products (CoStasis®, Vitagel®) are composed of a microfibrillar collagen compound and bovine thrombin, mixed in a syringe with plasma. Plasma components provide fibrinogen, which is cleaved by thrombin to form a gelatinous matrix of collagen-fibrin. Crosseal® is composed of products of human origin (fibrinogen and clustered plasma thrombin) and tranexamic acid.⁶ In a multicenter prospective randomized study, Crosseal®/Quixil® was found to be most effective, required less time for effective haemostasis and had less intraoperative bleeding and lesser complications when compared with the control group (Avitene®, Surgicel®, Surgicel NuKnit®, Gelfoam, Gelfoam + thrombin).^{2,3,7}

Sealants are low viscosity liquids that polymerize to form solid film that connects the tissue surfaces atraumatically. This property makes these agents effective both as sealants and as haemostats. They can be divided in *synthetic* (cyanoacrylate and polyethylene glycol-PEG sealants) and *semisynthetic* (glutaraldehyde albumin-derived sealants).

Glutaraldehyde and bovine albumin adhesive (BioGlue®): The glutaraldehyde and bovine albumin adhesive (GBAA) consists of a solution of 10% glutaraldehyde and 45% bovine albumin solution purified by precipitation, heat and chromatography radiation. It is presented in a syringe with two separate compartments and the same dispensing nozzle, its components are mixed at the time of application. Within 20 seconds the adhesive has 65% binding power and obtains its full binding strength

in two minutes, regardless of the temperature or the application medium (air or water).

Cyanoacrylate Adhesives: marketed as Super Bonder, cyanoacrylates are liquid monomers that rapidly form polymers in the presence of water (hydroxyl ions) and thus quickly glue adjacent surfaces. The property of instant glue made promising the use of cyanoacrylates as adhesives and haemostatic agents, with reports of their use during the Vietnam War on open bleeding wounds. Another product having cyanoacrylate and indicated for use in vascular reconstructions and anastomosis is Omnex®.

Polyethylene glycol (CoSeal®): is a fully synthetic polymer used by surgeons to repair areas of potential bleeding in vascular anastomosis. It uses two synthetic polyethylene glycols that, once mixed, can be applied directly to the surfaces of the tissues or used to seal synthetic suture lines or grafts. It is reabsorbed by the body in about four weeks. CoSeal® can increase up to four times its original size.

It is an effective agent for vascular and cardiac haemostasis or in surgical applications where volume expansion of the product is not a concern. Its performance in the anastomotic seal is equivalent to Gelfoam with thrombin, but the main advantage of CoSeal® lies in the rapidity with which it reaches haemostasis.

Efficacy: Studies comparing the efficacy of different topical haemostatic agents are limited. Fibrin

sealants have the highest success rate in achieving haemostasis. Haemostasis is quicker than other agents, and it could be effective when other haemostatic agents have failed.² However, it is more expensive and takes longer to prepare.

Gelatin matrix often is combined with topical thrombin and is found to be more effective than gelatin. Several randomized trials comparing the flowable combination liquid thrombin and gelatin granules (FloSeal) to gelatin sponge (Gelfoam) soaked in thrombin demonstrated that the flowable liquid thrombin and gelatin granules combination (FloSeal) was superior. All three forms of topical thrombin- bovine, human, recombinant have similar efficacy.^{1,3}

Potential Complications

Infection is the most commonly reported complication associated with topical haemostatic agents. To reduce the risk of infection use the minimum required amount and remove any excess topical agent once adequate haemostasis is achieved. Oxidized regenerated cellulose may have a lower risk of infection because of its acidic pH ^{2,3,4}

Foreign body reactions such as granuloma formation and fibrosis have been reported with physical agents, including microfibrillar collagen, oxidized regenerated cellulose and gelatin-based agents. Adhesions and small bowel obstruction at the site of

Types, Trade Name and Mechanism of Action of Topical Haemostatic Agents

Topical hemostatic	Commercial name	Mechanism of action
Oxidized regenerated cellulose	Surgicel Original®, Surgicel Nu-Knit®, Surgicel Fibrillar®, Interceed®, Gelitacel®	Physical matrix for initiation of the clot. The low pH promotes antimicrobial effect
Gelatins	Surgifoam®, Gelfoam®, Gelfilm®, Gelita-spon®, Geli putty®	Physical matrix for initiation of the clot
Gelatine + Thrombin	FloSeal®, Surgiflo®	Combination of effects of gelatin and thrombin
Microfibrillar collagen	Instat®, Helitene®, Helistat®, Avitene®, Avitene flour®, AviteneUltrafoam®, EndoAvitene®, AviteneUltrawrap®	Platelet Adhesion and Activation
Fibrin sealants	Evicel®, Tisseal®, CrosSeal®, Quixil®	Thrombin and Fibrinogen are combined at the time of application. Thrombin degrades fibrinogen into fibrin, forming clot
Topical thrombin	Evithrom®, Recothrom®, Thrombin-JMI®	Converts Fibrinogen into fibrin to form clot. Promotes activation of coagulation factors
Glutaraldehyde and bovine albumin adhesive	BioGlue®	Glutaraldehyde interacts with bovine albumin and protein cell at wound site to form a resistant matrix
Cyanoacrylate adhesives	Dermabond®, Omnex®	Liquid monomers form polymers in the presence of water and glue two surfaces
Polyethylene glycol	CoSeal®	Two polyethylene glycol polymers mix and react at wound site

previous application also have been reported with flowable thrombin-gelatin matrix products. Post op surgical site infection is seen in few cases.⁶ For a thrombin-gelatin product, excess substance that is not incorporated into the haemostatic clot should be removed by gentle irrigation.³

Risk of viral transmission- Pooled human thrombin and fibrin sealants, that contain human fibrinogen in addition to thrombin, have a theoretical risk of viral transmission.⁵

Allergic reactions and immunologic events can occur with the use of biologic agents. Re-exposure to bovine-derived thrombin for patients with antibodies to bovine thrombin should be counselled about potential risks associated with re-exposure during future surgical procedures.^{2,3,6}

Gas embolism, including death, has been reported with spray fibrin sealants. Risk may increase if the sealant is sprayed too close to the tissue or when the maximum recommended spray pressure is exceeded.

Conclusion

Topical haemostatic agents have distinct mechanisms of action, different potential adverse effect profiles, and varying costs. An understanding of these differences is essential to making the most appropriate and cost-effective decisions regarding their use. Physical agents can be considered in patients without coagulation abnormalities and

in less severe bleeding situations. Physical agents generally are less expensive than biologic agents, but infection and foreign-body reactions may occur. Although fibrin sealants are the most expensive type of biologic agent, they are associated with higher rates of bleeding control and may be appropriate to consider when bleeding does not respond to other agents or in the presence of severe coagulopathy.

References

1. Peralta E. Overview of topical hemostatic agents used in the operating room 2011. <http://www.uptodate.com/contents/overview-of-topical-hemostatic-agents>
2. Topical Hemostatic Agents at Time of Obstetric and Gynecologic Surgery: ACOG Committee Opinion, Number 812. *Obstet Gynecol.* 2020 Oct;136(4):e81-e89.
3. Pereira BM, Bortoto JB, Fraga GP. Topical hemostatic agents in surgery: review and prospects. *Rev Col Bras Cir.* 2018 Oct 18;45(5):e1900. Portuguese, English.
4. Ferschl MB, Rollins MD. Thromboemboli, acute right heart failure and disseminated intravascular coagulation after intraoperative application of a topical hemostatic matrix. *Anesth Analg.* 2009 Feb;108(2):434-6.
5. Wohlmuth, C. and J. Merced. "Topical Hemostatic Agents in Obstetric Hemorrhage: International Case Reports." 2012.
6. American Association of Blood Banks. Standards for perioperative autologous blood collection and administration. 8th ed. Bethesda, MD: AABB; 2018.
7. Thrombin topical. In: Facts and Comparisons [after login]. St. Louis, MO: Wolters Kluwer Health, Inc; 2020. Available at: https://fco.factsandcomparisons.com/lco/action/doc/retrieve/docid/fc_dfc/5548460. Retrieved May 23, 2021.

Surgical Wound Closure - Sutures and Needles

Leena Wadhwa¹, Jyoti Jaiswal²

¹Professor & IVF Incharge, ²Post Graduate Resident, Department of Obstetrics & Gynecology
PGIMSR & ESI Hospital, Basaidarapur, New Delhi

Introduction

Surgical wound closure is important to provide strength to the wound and protect it from infections. During the first postoperative week wound strength is totally dependent on the sutures used to close the wound. It is important to perform wound closure without tension to avoid ischemia of the cut edges and reduce the postoperative pain and dehiscence.

Suture Placement

The way sutures are tied determine the extent of necrosis, wounds with loosely tied sutures are stronger. Also, the distance between the wound edges and the suture placement is an important factor that determines the strength of the wound. The collagenases produced at wound edges as a part of the inflammatory process remove the necrotic debris and cause degradation of collagen for around 1.5 cm from the edge. Therefore, sutures should be placed at least 1 to 1.5 cm from the edge.

Choice of Closure Technique

Running or interrupted stitches are the most commonly used techniques for wound closure. The main advantage of running stitch is that the time taken is less than in the interrupted stitches. It is assumed that running stitches are weak as disruption of any portion of the suture line may lead to disruption of the entire wound. On the contrary, running stitches evenly distribute the tension along the entire stitch line and allow better perfusion and reduce risk of wound dehiscence. Therefore running stitches are preferred over the interrupted.

Sutures

Sutures are material used to close surgical wounds. The use of sutures maximizes wound healing and support tissue. The basic suture characteristics are

Size- The diameter of the suture denotes its size. The accepted surgical practice is to use the smallest diameter suture which will hold the wounded tissue and minimize the trauma to tissue & ensures that the minimum foreign material is left in the body. Suture size is stated numerically; as the number of

0s in the suture size increases, the diameter of the strand decreases. For example, size 5-0, or 00000, is smaller in diameter than size 4-0, or 0000.

Tensile Strength- Knot tensile strength is measured by the force, which the suture strand can withstand before it breaks when knotted. The tensile strength of the tissue to be sutured determines the size and tensile strength of the suturing material. The accepted rule is that the tensile strength of the suture need never exceed the tensile strength of the tissue. The smaller the size of suture, the lesser is the tensile strength.

Memory- This refers to the tendency of a suture to return to its original packaged configuration. Sutures that have better memory return to their original position rather than remaining as a knot.

Elasticity- The ability of material to return to its prior length following stretch defines its elasticity.

Sutures are categorized on the basis of several characteristics as absorbable, non absorbable, filamentous, biological or synthetic derivatives, Table 1.

Table 1: Types of Sutures

Type	Name
Natural	Silk, Catgut
Monofilament	Nylon, Polydioxanone (PDS), Polyglyconate (maxon), Polybutester (novafil)
Polyfilament	Polyglycolic acid (dexon), Polyglactin (vicryl), Nylon (Ethilon, Dermalon), Polyester (Dacron, Ethibond)
Absorbable	Catgut (Plain & chromic), Dexon, Vicryl, PDS, Monocryl
Nonabsorbable	Silk, Nylon, Prolene (polypropylene) Mersilene, Ethibond, Dacron, Polytetrafluoroethylene (ptff)

Monofilament vs. Multifilament Sutures: Sutures are classified according to the number of strands of which they are comprised. Monofilament sutures are made of a single strand of material; they encounter less resistance as they pass through tissue. *Monofilament sutures resist harbouring organisms* which may cause infection. *Multifilament sutures*

provide greater knot security than monofilament sutures. Multifilament sutures have greater tensile strength, pliability, and flexibility.

Absorbable vs. Nonabsorbable Sutures: Sutures are classified according to their degradation properties. Sutures that undergo rapid degradation in tissues, losing their tensile strength within 60 days, are considered absorbable sutures. Sutures that generally maintain their tensile strength for longer than 60 days and which are not digested by body enzymes or hydrolyzed in body tissue are nonabsorbable sutures.

Absorbable sutures may be used to hold wound edges in approximation temporarily, until they have healed sufficiently to withstand normal stress. These sutures are prepared either from the collagen of healthy mammals or from synthetic polymers. Natural absorbable sutures undergo proteolysis, digestion by body enzymes and synthetic absorbable sutures are hydrolyzed. *Compared to, the absorption of natural absorbable sutures by enzymatic action (proteolysis), absorption of synthetic absorbable sutures by hydrolyzation results in lesser degree of tissue reaction (Table 2).*

Non absorbable sutures are made from a variety of non-biodegradable materials (Table 3) and are ultimately encapsulated or walled off by the body's fibroblasts. Nonabsorbable sutures ordinarily remain where they are buried. When used for skin closure, they must be removed postoperatively. Nonabsorbable

sutures may be used in a variety of applications: Exterior skin closure, to be removed after sufficient healing has occurred; within the body cavity, where they will remain permanently encapsulated in tissue; in patients with history of reaction to absorbable sutures, keloidal tendency, or possible tissue hypertrophy; and for Prosthesis attachment (i.e., defibrillators, pacemakers, drug delivery mechanisms). They maintain tensile strength for more than two months.

Triclosan-coated versus noncoated sutures- Sutures coated with Triclosan, a broad spectrum antimicrobial compound may not prevent surgical site infection (SSI) in contaminated wounds as development of SSI is multifactorial, and modification of one factor (eg, suture) may not be beneficial.

Barbed suture is the latest addition to various suture materials. It is a synthetic suture that can anchor to the tissue without knots. It can be made of both absorbable and nonabsorbable monofilament materials polydioxanone, polyglyconate, poliglecaprone 25, glycomer 631, nylon, and polypropylene. It can be either bidirectional (Quill's) or unidirectional (V-Loc), commonly used in laparoscopic myomectomy for uterine wound closure and in laparoscopic hysterectomy for vaginal cuff closure.

Sutures Used in Common Obstetric & Gynaecological Procedures

Perineal repair- Absorbable suture material is the best choice in the perineum. Although collagen

Table 2: Absorbable suture

Suture	Type	Absorption rate	Tissue reaction
Surgical gut suture (serosal layer of beef or submucosal fibrous layer of sheep) Chromic is processed	Plain Chromic	5 days 14 days	Moderate Moderate
Vicryl rapid (irradiated polyglactin 910)	Braided	42 days	Minimal to moderate
Monocryl (poliglecaprone 25)	Monofilament	91-119 days	Minimal
Coated vicryl polyglactin 910	Braided Multifilament	56-70 days	Minimal
Coated vicryl plus (Triclosan coated polyglactin 910)	Braided Multifilament	56-70	minimal
PDS II (polydioxanone)	Monofilament	3-6 month	Slight reaction

Table 3: Non absorbable suture

Suture	Type	Tissue reaction
Silk suture	Braided Multifilament	Acute inflammatory reaction
Surgical stainless steel suture	Monofilament	Minimal
Ethilon	Monofilament	Minimal
Mersilene	Braided Monofilament	Minimal
Ethibond	Braided Monofilament	Minimal
Prolene	Monofilament	Minimal

sutures, such as chromic gut were previously used, the newer synthetic absorbable suture materials elicit less inflammatory tissue response than chromic gut and, thus, it has been hypothesized that the use of synthetic materials in perineal repairs might translate into reduced postpartum pain e.g. *Vicryl Rapid 910*.

Fascia repair- Delayed absorption monofilament materials such as *polydioxanone (PDS)* or *polyglyconate (maxon)* are commonly used. Nonabsorbable sutures should provide increased and prolonged tensile strength, but the superiority of nonabsorbable sutures has not been consistently found in meta-analyses of randomized trials for midline closure. Nonabsorbable sutures increase the risk of suture sinus formation and prolonged wound pain compared with synthetic absorbable suture (odds ratio 2.18, 95% CI 1.48-3.22; OR 2.05, 95% CI 1.52-2.77, respectively).

Uterine surgeries- The most logical suture material of choice for closing the well-vascularized uterus during a caesarean delivery would seem to be either poliglecaprone 25 (Monocryl) or Glycomer 631 (Biosyn). For closing the uterus in the less vascular nonpregnant state, either the same sutures or longer lasting polydioxanone (PDS) or polyglyconate (maxon) would seem to be the best options, although, again, one cannot conclusively discount chromic gut (catgut) or polyglycolic acid based sutures (Vicryl) given their long safety history in obstetrics.

Vaginal cuff repair- The ideal suture for vaginal cuff closure should inhibit bacterial growth, elicit minimal tissue reactivity, be pliable, and maintain a

reasonable amount of tensile strength for at least 2 to 4 weeks even though absorbable. Chromic gut has been demonstrated to lead to more postoperative granulation tissue. Reasonable choices would include one of the multifilament polyglycolic acid-based sutures (Vicryl) if stiffness is a greater concern than capillarity, or one of the delayed absorption monofilament materials such as polydioxanone (PDS) or polyglyconate (maxon).

Mersilene is used for cervical Incompetence surgery

Skin closure- Silk suture & Monocryl are most commonly used for skin closure. Poliglecaprone 25 (Monocryl) for subcuticular skin closure after caesarean delivery had lesser wound complications as compared with polyglactin 910 (Vicryl) suture.

Surgical Needles

Needles are designed to lead suture material through tissue with minimal injury. Needles can be- *straight or curved* and *swaged or eyed* (Table 4). They are made up of either Stainless steel (SS) or carbon steel. Needle is selected according to the type of tissue to be sutured, tissue accessibility and diameter of suture material.

Needle has three parts- Point, Body and Swagged End

Shape of needles- Straight- there is a high risk of accidental needle stick injury, mainly used in easily accessible tissue, skin closure, rhinoplasty and for uterine compression sutures in case of PPH. 1/2 circle- used in skin, muscle, peritoneum, eye, abdominal

Table 4: Needle Shapes and Application

Shape of needle	Applications
Straight	High risk of accidental needle stick injury, mainly used in easily accessible tissue, skin closure, rhinoplasty and for uterine compression sutures in case of PPH
3/8 Circle	Used in large and superficial wound, skin, hand surgery, fascia, muscle and for subcuticular stitches
½ Circle	Used in skin, muscle, peritoneum, eye, abdominal surgery and gastrointestinal tract.
5/8 Circle	Perfect for deep and confined cavities, make maneuvering in small location easier, used in Intraoral, urogenital, and anorectal procedures
Compound Curved	Eye, Laparoscopy
Type of needles	
Cutting	Skin, Sternum
Reverse Cutting	Skin, Fascia, Ligament, Mucosa, Tendon Sheath, Nasal & Oral Cavity
Point Cutting	Skin
Side Cutting Spatula	Eye
Taper cut	GIT, Biliary Tract, Aponeurosis, Dura, Laparoscopy, Muscle, Myocardium, Nerve, Peritoneum, Pleura, Subcutaneous Fat, Urogenital Tract, Vessel, Valve
Blunt	Blunt Dissection, Cervix, Fascia, Intestine, Kidney, Intestine, Liver, Spleen

surgery and gastrointestinal tract. 3/8 circle-used in large and superficial wound, skin, hand surgery, fascia, muscle, subcuticular. 5/8 circle-perfect for deep and confined cavities, make maneuvering in small location easier. Used in Intraoral, urogenital, and anorectal procedures.

Principle for choosing surgical needle

- Taper point needles are most often used to suture tissues that are easy to penetrate. Cutting or Tapercut needles are more often used in tough, hard to-penetrate tissues. When in doubt about whether to choose a taper point or cutting needle, choose the taper point for everything except skin sutures.
- Select the length, diameter, and curvature of the needle according to the desired placement of the suture and the space in which the surgeon is working



Fig 1: Non Absorbable Silk Suture on 3/8 circle reverse cutting needle



Fig 2: Non- Absorbable Polypropylene Suture on 1/2 circle, round body needle

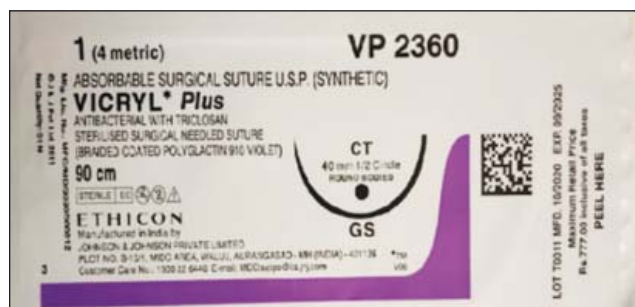


Fig 3: Absorbable Suture Triclosan-coated Polyglactin 910 on 1/2 circle round body needle

- When using eyed needles, try to match needle diameter to suture size. Swaged needles, where the needle is already attached to the suture strand, eliminate this concern.

Observation is the best guide to needle selection if the surgeon has no preference



Fig 4: Absorbable Monofilament Triclosan-coated Polydioxanone on 1/2 circle, taper cut needle

Conclusion

The choice of suture material and needle depend upon the site of application, thickness of tissue, amount of tension to be exerted on the wound. A surgeon must plan sutures and needles needed before entering the abdominal cavity. The most commonly used absorbable suture in Obstetrics and Gynaecology is Vicryl and most commonly used non absorbable sutures are Prolene and Silk.

Suggested Reading

1. Dodd JM, Anderson ER, Gates S. Surgical techniques for uterine incision and uterine closure at the time of caesarean section. Cochrane Database Syst Rev. 2008;(3):CD004732
2. Leroux N, Bujold E. Impact of chromic catgut versus polyglactin 910 versus fast-absorbing polyglactin 910 sutures for perineal repair: a randomized, controlled trial. Am J Obstet Gynecol. 2006;194(6):1585-90.
3. Kettle C, Johanson RB Absorbable synthetic versus catgut suture material for perineal repair. The Cochrane Database Syst Rev. 2000;(2): CD000006
4. O'Dwyer PJ, Courtney CA. Factors involved in abdominal wall closure and subsequent incisional hernia. Surgeon. 2003 Feb;1(1):17-22.
5. Ethicon, Inc. Ethicon Product Catalog Sutures: Absorbable Web site. <http://ecatalog.ethicon.com/sutures-absorbable>. Accessed May 28, 2021.
6. Ichida K, Noda H, Kikugawa R, et al. Effect of triclosan-coated sutures on the incidence of surgical site infection after abdominal wall closure in gastroenterological surgery: a double-blind, randomized controlled trial in a single center. Surgery. 2018 Mar 10;S0039-6060(17)30893-0.
7. Diener MK, Voss S, Jensen K, et al. Elective midline laparotomy closure: the INLINE systematic review and meta-analysis. Ann Surg. 2010 May;251(5):843-56.

Management of Abdominal Wound Complications

Chhavi Gupta¹, Mayank Verma², Raj kumar Chhejara³

¹Senior Resident, ²Postgraduate Resident, ³Professor & Senior Specialist

¹Obstetrics & Gynaecology, ^{2,3}Surgery, VMMC & Safdarjung Hospital

Surgical wounds in normal healthy individuals heal by inflammation, epithelialization, fibroplasia, and maturation. Failure of wound healing results in complications that may lead to early and late postoperative morbidity.

Surgery can be Classified as per CDC Criteria for Surgical Wound Classification^{1,2}

Clean: An uninfected operative wound in which no inflammation is encountered and where respiratory, alimentary, genital, or uninfected urinary tracts are not entered. Elective Infection rate is less than 2%.

Clean-Contaminated: Operative wounds in which the genital, urinary or alimentary tracts are entered under controlled conditions and without contamination, e.g. operating in a prepared bowel i.e. colorectal surgeries. Infection rate is 2-10%.

Contaminated: Includes open, fresh, accidental wounds; operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract. Incisions in which acute, non-purulent inflammation or necrotic tissue is encountered, e.g. operating an unprepared bowel like in obstruction. Infection rate is 10-20%.

Dirty or Infected: Includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera i.e. organisms causing postoperative infection which were present in the operative field before the operation. Infection rate is more than 20-40% without antibiotic prophylaxis.

Caesarean delivery before labour and before rupture of membranes is considered class I wound and caesareans done after rupture of membranes or in active labour or in second stage labour or with chorioamnionitis are classified as class II. However, few of the clean contaminated caesareans may fall into the category of class III.

Complications of Surgical Incision: The main complications are seroma, hematoma, wound dehiscence, stitch abscess, surgical site infection, fascial dehiscence, necrotizing infection and nerve injury. These complications result in prolonged

hospital stay and are a major cause of postoperative morbidity and mortality.

Classification of Infection Site: is important for audits and clinical trials of antibiotic prophylaxis. Surgical wound needs to be assessed in post-operative period and can be described according to Southampton Wound Scoring System, Table 1.

Table 1: Southampton Wound Scoring System

Grade	Appearance
0	Normal healing
I	Normal healing with mild bruising or erythema
Ia	Some bruising
Ib	Considerable bruising
Ic	Mild erythema
II	Erythema plus other signs of inflammation
IIa	At one point
IIb	Around sutures
IIc	Along wound
IId	Around wound
III	Clear or haemoserous discharge
IIIa	At one point only (≤ 2 cm)
IIIb	Along wound (> 2 cm)
IIIC	Large volume
IIId	Prolonged (> 3 days)
	Major Complications
IV	Pus
IVa	At one point only (≤ 2 cm)
IVb	Along wound (> 2 cm)
V	Deep or severe wound infection with or without tissue breakdown; hematoma requiring aspiration

Seroma: is a collection of liquefied fat, serum, and lymphatic fluid under the incision. The fluid is usually clear, yellow, and viscous and is found in the subcutaneous layer of the skin. It is likely to occur when large skin flaps are developed in the procedure. Prevention of seroma may be achieved with placement of suction drains under the flaps. Premature removal of suction drains often results in large seromas that require aspiration under sterile conditions. An infected seroma is treated with open drainage. A seroma that recurs after at least two

aspirations is evacuated by opening the incision and packing the wound, to allow healing by secondary intention.

Hematoma: is an abnormal collection of blood, usually in the subcutaneous layer of a recent incision or in a potential space in the abdominal cavity caused by inadequate haemostasis, depletion of clotting factors or underlying coagulopathy due to drugs, liver disease, renal failure or sepsis. It is more worrisome due to potential for secondary infection.

The clinical manifestations vary with its size, location and presence of infection. It may cause paralytic ileus, anaemia and ongoing bleeding in retroperitoneum and compartment syndrome in peritoneal cavity and extremity.

Hematoma formation can be prevented by discontinuing anticoagulants before surgery and placing closed suction drains that are removed postoperatively when output is not bloody and scant. Small hematoma (<4 cm) does not require any intervention and is eventually reabsorbed. Larger haematomas may require closed or open drainage.

Surgical Site Infection (SSI) is defined as infection related to a surgical procedure that occurs near the surgical site within 30 days following surgery or up to 1 year following surgery where an implant is involved.¹ SSIs account for almost 40% of hospital acquired infections among surgical patients. Superficial SSIs present with localized redness, swelling, tenderness, warmth, presence of purulent discharge, or failure of wound healing. Deep SSIs may present with systemic signs and symptoms of infection, including fever, wound dehiscence, and purulent discharge from deep tissues.

Organ or deep space infection can present as purulent discharge from surgical drains or with systemic signs of sepsis, including fever, tachycardia, tachypnea, and leukocytosis with associated signs of organ failure (deranged SOFA score).

Gram positive cocci accounts for half of the infections with *Staphylococcus aureus* being most common, followed by coagulase negative staphylococcus aureus and enterococcus. In one third of SSI cases, gram negative bacilli are isolated i.e. *E. coli*, *pseudomonas* and *Enterobacter*.

Prophylactic Antibiotics should be given in clean-contaminated and contaminated surgery. Therapeutic antibiotics should be given when wounds are heavily contaminated.⁶

Treatment of SSI

The treatment includes pathogen identification; source control by opening the incision in superficial or deep surgical site infections or by image guided percutaneous drainage, laparoscopic or open drainage if indicated in organ space SSI; immediate empiric antibiotic coverage; timely antibiotic de-escalation and local wound care.

Pathogen Identification: Wound cultures should be taken when SSIs are evident and before starting empirical antibiotics. If possible, swabs should be sent in transport medium, the larger the volume of pus sent, the more likely is the accurate identification of the organism involved. If bacteraemia is suspected, blood culture should be taken. A rapid report on infective material can be based on an immediate gram stain.

Source Control: Source control requires opening of the incision site and irrigation, drainage, and debridement of devitalized or infected tissue as needed. Organ space infections often can be controlled by *image-guided drainage* using computed tomography (CT) scan or ultrasound (US) if localized and well contained. If an infected wound is under tension, sutures or clips need to be removed, with curettage if necessary, to allow pus to drain adequately. Delayed primary or secondary closure can be undertaken when the wound is clean and granulating.

Antibiotic Coverage: Antibiotics alone are rarely sufficient to treat SSIs, which may also need open drainage and debridement.

Wound Care: The management of wound is of utmost importance as it reduces bacterial load, promotes healing, decreases related morbidity and allows early discharge of the patient. This can be achieved by proper surgical techniques and use of appropriate dressing material for different wound types.

Characteristics of Ideal Dressing Material: It creates a moist environment; Removes excess exudates; Prevents desiccation; Allows for gaseous exchange; Impermeable to micro-organisms; Thermally insulating; Prevents particulate contamination; Nontoxic to beneficial host cells; Provides mechanical protection; Nontraumatic; Easy to use; Cost effective.

Occlusion and Absorption: These two concepts are critical when selecting appropriate dressings for wounds. The rate of epithelialization under a moist occlusive dressing is twice that of a uncovered

and dry wound. An occlusive dressing provides a mildly acidic pH and low oxygen tension on the wound surface, which is conducive for fibroblast proliferation and formation of granulation tissue.

However, wounds that produce significant amounts of exudate or have high bacterial load require a dressing that is absorptive and prevents maceration of the surrounding skin. These dressings reduce the bacterial load while absorbing the exudate produced.

Types of Dressings

Gauze: is most conventional and widely used dressing material; made of nonadherent fabrics (cotton, rayon, polyester); has fine mesh to augment occlusive and non-adherent properties; facilitates healing; and provides moist environment for wound healing. It is not effective when saturated, can be used for wound debridement if in contact with wound.

Bandages: are made of natural (cotton wool, cellulose) or synthetic (polyamide) substance; used to retain light dressings and provide sustained compression in venous ulcers.

Occlusive Films (Fig 1): are clear polyurethane membranes with acrylic adhesive on one side; provide insulation, moisture retention and protective barrier against bacteria; are waterproof, permeable to oxygen, carbon dioxide, and water vapour; allow visualization of wound, and may slow wound contraction. Their removal may disrupt new epithelium. E.g. Tegaderm, Opsite, Primapore.



Fig 1: Occlusive Films

Semipermeable Foam (Fig 2): high resorptive capacity is similar to occlusive films; outer layer is hydrophobic and protects from liquid and bacteria but allows gaseous exchange; prevents leakage and bacterial contamination; inner layer is made of hydrophilic silicone or polyurethane based foam which absorbs wound discharge; some foams require a secondary adhesive dressing. It is opaque, needs to be changed frequently and is not for low exudating or dry wounds as they depend on exudates for healing. E.g.- Lyofoam, Allevyn, Biotain



Fig 2: Semipermeable Foams

Hydrogels: made of matrix of various synthetic polymers (Polymethacrylates, Polyvinyl Pyrrolidone) with > 80% water formed into sheets, gels, or foams sandwiched between two sheets of removable film; Absorb–or donate water depending on hydration status of wound; Decrease temperature of wound and provides soothing and cooling effect for pain relief; Promote autolytic debridement; Suitable for all 4 stages of wound healing (except for infected, heavy drainage wounds). It may cause exudate accumulation, maceration and bacterial (gram negative bacterial) proliferation. It is useful in necrotics, dry chronic wounds. E.g.-Tegagel, Megaheal, Hydroheal.

Hydrocolloids (Fig 3): made of hydrocolloid matrix (Carboxymethyl cellulose, Gelatin, Pectin) on a carrier of self-adhesive polyurethane film; Outer layer is permeable to water vapor but impermeable to bacteria; Inner hydrocolloid layer comes in contact with wound exudates to form gel which traps exudate and creates moist environment and protects granulation tissue. Gel causes autolytic debridement of the wound. But, it is not useful in high exudating or dry necrotic wounds. E.g.- Tegisorb, Duoderm.



Fig 3: Hydrocolloids

Alginate Dressings: made of natural complex cellulose like polysaccharides derived from calcium salt of alginate. These are insoluble in water, but in sodium rich wound fluid, these complexes exchange calcium ions for sodium ions and form amorphous gel pack which covers the wound. Gel absorbs excess exudates, augments haemostasis, activates macrophages to produce TNF to initiate inflammatory signals and promote autolytic debridement. It can stay on wound for several days.

Need secondary dressing or else it dehydrates the wound, not to be used in dry wounds. E.g. Kaltostat, Algisite.

Bioactive Dressings: Derived from natural (collagen, hyaluronic acid) or artificial (chitosan, alginate, elastin) sources i.e. from materials which play an important role in the healing process. Collagen initiates fibroblast formation and increases endothelial migration or contact with wound, hyaluronic acid forms part of extracellular matrix, chitosan promotes formation of granulation tissue during proliferative stage. Sometimes, it is incorporated with growth factors, antimicrobials that further promote healing.

Negative Pressure- Assisted Wound Therapy (Fig 4)



Fig 4: Negative Pressure- Assisted Wound Therapy

One of the most significant discoveries in wound management in recent decades was the improvement in wounds with negative pressure-assisted wound therapy (NPWT).

Controlled sub-atmospheric pressure of -125 mm of Hg is applied continuously or intermittently to a wound covered with a foam dressing.

The negative pressure reduces edema surrounding the wound, stimulates circulation, increases rate of granulation tissue formation and wound contraction.

It is used for large defects with clean, granulating base that may take more than a week to heal. Fragile structures present within the wound, are protected with an interposition layer (vicryl mesh or vaseline gauze) placed beneath the foam.

NPWT dressings are changed less frequently and anticipated pain can be managed pre-emptively.

Accelerated wound healing.

Only disadvantage is the need to carry the portable pump.

It is a costlier device but decreases overall length of hospital stay and is therefore cost effective for the patients and hospital.

Contraindicated in case of exposed vital structures, presence of malignant tissue, ischemic wounds, fragile skin or actively discharging infected wounds.

Wound Coverage

For wounds with skin contracture or tissue loss from debridement, delayed primary closure may require skin grafting or flap reconstruction to provide adequate coverage of the wound. Careful planning at the time of the initial debridement may lead to improved options for wound closure.

Fascial Dehiscence

Fascial disruption is due to abdominal wall tension overcoming tissue or suture strength, or knot security. It can involve a portion of the incision (i.e., partial dehiscence) or the entire incision (i.e., complete fascial dehiscence). Early fascial dehiscence i.e. 4-14 days postoperatively with intact skin may result in evisceration while late fascial dehiscence may cause incisional hernia.

Suture breakage, knot failure, excessive stitch interval (allows protrusion of viscera), suture pulled through the fascia (fascial necrosis from sutures being placed too close to the edge or under too much tension). Sutures should be 1cm from the wound edge and 1cm from the adjacent suture. For continuous closure, the total length of suture should be 4 times the length of the incision. Elective midline abdominal closure should be performed with continuous mass closure or interrupted Smead-Jones closure (vertical mattress) with #1 or #2 delayed absorbable sutures. Heavy weight lifting should be avoided for 4-6 weeks following abdominal surgery to avoid increase in intraabdominal pressure and minimize stress on the healing fascia.

Diagnosis is mostly clinical characterized by absence of healing ridge in incision by post-operative day 6, impaired healing, profuse serosanguinous salmon coloured fluid drainage on valsalva manoeuvres. CT can be done to confirm the diagnosis.

Treatment: When fascial disruption is suspected, wound is explored in OT. Complete fascial dehiscence has 10% mortality rate and is a surgical emergency.

Wound is opened, edges are thoroughly debrided and mass closure with continuous, slowly absorbable suture is done. Skin may or may not be left open. Internal/ external retention sutures may be used to reapproximate fascial edges.

Necrotizing Infection:

It manifests rapidly after surgery (24 hours for group A streptococcus and clostridia) and presents with severe peri incisional pain, skin blistering, friable subcutaneous tissue, pale/devitalized fascia, copious, dishwater-like drainage.

Well-perfused overlying skin may have underlying necrosis. Infection may rapidly spread through any tissue (myositis/fasciitis) and often patient presents in sepsis. Early operative wound exploration and definitive debridement is required to decrease the bacterial load. Attempt at closure is not done since it may increase the risk of anaerobic infection and increase the spread of infection. Patient is kept in intensive care unit in postoperative period and vitals to be monitored.

Summary: Practical Approach to a Patient with Abdominal Stitch Wound Line

Post-operative patient with an abdominal wound who had undergone a clean/clean contaminated surgery (e.g. Midline laparotomy wound)

Abdominal binder to decrease tension on the suture lines.

Dressing can be done with primapore, tegaderm, opsite which are semi-occlusive.

Early mobilisation and nutrition to be observed.

Post-operative patient who had undergone a contaminated/dirty abdominal surgery (e.g. Faecal peritonitis)

Skin is usually kept open and sheath closed due to high contamination.

Wound to be cleaned with betadine till post-operative day 1-2.

Thereafter, saline soaked gauze can be used for dressing.

Semipermeable foam dressings such as biotain or allevyn can be used.

Dressings to be changed regularly to decrease the bacterial load from the wound.

Post-operative patient with fascial dehiscence

Wound should be cleaned in OT and attempts should be made to close the fascial defect.

If closure is not possible or there is risk of abdominal compartment syndrome, wound can be managed with conservative approach.

Regular saline wash to be given to decrease the bacterial load from the wound.

Once wound is healthy, negative pressure wound therapy can be used. It promotes granulation and wound contraction.

Pressure to be maintained at minus 125 mm of Hg. Can be continuous or intermittent.

Once granulation develops and wound heals, patient can be discharged.

References

1. National Healthcare Safety Network, Centers for Disease Control and Prevention. Surgical site infection (SSI) event <http://www.cdc.gov/nhsn/pdfs/psccmanual/9pscscscurrent.pdf>. Published January 2021.
2. Martone WJ, Nichols RL. Recognition, prevention, and management of surgical site infections: introduction to the problem and symposium overview. Clin Infect Dis. 2001;33:S67-S68.
3. Emori TG, Culver DH, Horan TC, Jarvis WR, White JW, Olson DR, Banerjee S, Edwards JR, Martone WJ, Gaynes RP, et al. National nosocomial infections surveillance system (NNIS): description of surveillance methods. Am J Infect Control. 1991;19(1):19-35.
4. Andrzejowski J, Hoyle J, Eapen G, Turnbull D. Effect of prewarming on post-induction core temperature and the incidence of inadvertent perioperative hypothermia in patients undergoing general anaesthesia. Br J Anaesth. 2008;101(5):627-631.
5. Leaper DJ, Melling AG. Antibiotic prophylaxis in clean surgery: clean non-implant wounds. J Chemother. 2001;13 Spec No 1(1):96-101.
6. Bosco JA, Slover JD, Haas JP. Perioperative strategies for decreasing infection: a comprehensive evidence-based approach. Instr Course Lect. 2010;59:619-28.

Surgical Site Infection after Caesarean Section

Ankita Kumari, Amrita Rathee, Jyotsna Suri, Rekha Bharti, Sumitra Bachani, Pratima Mittal

Postgraduate Resident, Senior Resident, Professor & Consultant, Professor, Professor & Consultant
VMMC & Safdarjung Hospital, New Delhi

Abstract

Background: Surgical site infection (SSI) after caesarean is a common complication and results in increased duration of hospitalization, morbidity and mortality. **Objective:** To evaluate the risk factors contributing to postcaesarean SSI. **Methods:** 380 women undergoing caesarean delivery were followed for development of SSI, defined as presence of any of the following- erythema, wound tenderness, induration, wound discharge, and wound gaping within 30 days of surgery. The risk factors evaluated were age, BMI, parity, anaemia, diabetes, type of surgery (elective/emergency) and membrane status. Wound swab was taken for culture to identify the common causative organism. **Results:** Out of 380 women, 13 (3.4%) developed wound infection. Only 1 out of 13 women with SSI had history of diabetes, other 6 women who had diabetes did not develop SSI. In 13 women with SSI, 12 (92.31%) had undergone emergency surgery and 10 (76.92%) had history of rupture of membrane before surgery. Among the risk factors studied, nulliparity and rupture of membranes before caesarean section were the only significant factors for development of SSI, $p=0.009$ and $p=0.0004$, respectively. *Staphylococcus aureus* was found to be the most common organism in wound culture (30.77%). Mixture of growth was found in 38.46% of patients. **Conclusion:** Nulliparity and rupture of membranes before caesarean section are significant risk factors for surgical site infections and *Staphylococcus aureus* is the most common organism isolated from wound cultures of these women.

Keywords: Surgical Site Infection, SSI, Caesarean section, Risk Factors, Rupture of Membrane

Introduction

Caesarean section is the most common operative procedure in obstetrics and is recognized as a lifesaving surgery.¹ Currently 18.6% of all births occur by caesarean worldwide; ranging from 6-27.2% in developing and developed countries. Latin America and Caribbean region has the highest caesarean rates of 40.5% followed by Northern America (32.3%) and least in Africa (7.3%).² In India

it is 18% overall; lower in rural and higher in urban area.³ With increase in the rate of caesarean section, there is an increase in post-operative complications and SSI is one of the common complications.

Surgical site infection (SSI) is defined as infection that occurs within 30 days after a surgical procedure involving the skin, subcutaneous tissue, and soft tissue.⁴ Various risk factors for SSI include maternal obesity, high parity, gestational diabetes, prolonged leaking, history of previous surgery and procedural risks like emergency procedure and surgical technique. SSI mostly develops from 4th to 7th day of caesarean delivery, presenting with discharge, erythema and induration at the incision site. It complicates 2-7% of caesarean deliveries.^{5,6} When infection develops within 48 hours of caesarean, the commonest organisms are groups A or B haemolytic *Streptococcus*. Other organisms involved in SSI are *Ureaplasma urealyticum*, *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Escherichia coli*, and *Proteus mirabilis*.⁷

Materials and Methods

It was a prospective study conducted in the department of Obstetrics and Gynaecology at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. Pregnant women undergoing elective and emergency caesarean section, consenting to participate in the study and willing for 30 days follow up after caesarean section were included in the study. Ethical clearance was taken from the Institutional Ethical Committee before starting the study. Women with chorioamnionitis rupture of membrane for more than 24 hours and women having fever in pre-operative period were excluded from the study. As per hospital protocol, all the patients were given pre operative antibiotics. A wound culture swab was taken in all cases of SSI. Patients were managed according to the existing institutional protocol. The outcome studied was surgical site infection which was defined as the presence of any of the following- erythema and wound tenderness; induration; wound discharge; wound gaping within 30 days of surgery. All women were followed in the post operative period

for development of SSI. The evaluated risk factors for development of SSI included age, BMI, parity, anaemia, diabetes, type of surgery (elective/emergency) and membrane status.

Statistical Analysis: The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean \pm SD and median. Normality of data was tested by Kolmogorov- Smirnov test. If the normality was rejected then non parametric test was used. Statistical tests were applied as follows- Quantitative variables were compared using Unpaired t-test/ Mann-Whitney Test (when the data sets were not normally distributed) between the two groups. Qualitative variables were compared using Chi-Square test /Fisher's exact test. A p value of <0.05 was considered statistically significant.

Results

Out of the 380 women included in the study, 13 (3.4%) developed surgical site infection during the

follow up period of one month. Fifty six women did not report physically for 30 days follow up and were contacted telephonically. None of these women were symptomatic for wound infection. Most of the patients (94.47%) belonged to 20-30 years of age group. The mean age and BMI of women with and without SSI were comparable, $p= 0.091$, & $p= 0.952$, respectively. SSI was more common in nulliparous women, $p= 0.009$, Table 1.

Out of 13 women with SSI, 69.23% had moderate anemia as compared to 42.51% in women without SSI, but the difference was not statistically significant. Total of 7 patients had history of diabetes, out of which only one developed SSI, Table 2. Among women who developed SSI, 92.31% had undergone emergency surgery and 76.92% had history of rupture of membrane before surgery, $p= 0.701$ and $p= 0.0004$, respectively, Table 3.

In wound cultures, Staphylococcus aureus was the most common organism isolated in 30.77% and mixed or insignificant growth was found in 38.46%. E. Coli were isolated in 1 patient and Enterococcus in 2 patients, Table 4.

Table 1: Comparison of Demographic Data Between Patients with and without SSI

Demographic Data	With SSI	Without SSI	Total	P value	Test performed
Age (years)					
18-20	1 (7.69%)	4 (1.09%)	5 (1.32%)	0.245	Fisher's exact test
21-30	12 (92.31%)	347 (94.55%)	359 (94.47%)		
31-40	0 (0%)	16 (4.36%)	16 (4.21%)		
Sample Size	13	367.0	380	0.091	Mann Whitney test;1733
Mean ± SD	24.08 ± 2.56	25.44 ± 2.87	25.39 ± 2.87		
Median (25 th -75 th percentile)	24 (23-25)	25 (23-27)	25 (23-27)		
Range	20-29	20-37	20-37		
Body mass index(kg/m²)					
18.5-22.9 (Normal BMI)	10 (76.92%)	300 (81.74%)	310 (81.58%)	0.746	Fisher's exact test
23-24.9 (Overweight)	3 (23.08%)	63 (17.17%)	66 (17.37%)		
25-29.9 (Pre-obese)	0 (0%)	2 (0.54%)	2 (0.53%)		
≥30 (Obese)	0 (0%)	2 (0.54%)	2 (0.53%)		
Mean ± SD	21.5 ± 1.81	21.45 ± 1.64	21.45 ± 1.64	0.952	Mann Whitney test;2362
Median (25 th -75 th percentile)	20.9 (20.1-22.5)	21.4 (20.1-22.5)	21.4 (20.1-22.5)		
Range	19.3-24.5	19.1-31.9	19.1-31.9		
Parity					
Primi	11 (84.62%)		182 (47.89%)	0.009	Fisher's exact test
Multi	2 (15.38%)		198 (52.11%)		
Total	13 (100%)		380 (100%)		

Table 2: Comparison of Anaemia and Diabetes between Patients with and without SSI

Anaemia/Diabetes	With SSI	Without SSI	Total	P value	Test performed
Haemoglobin(gm/dL)					
≥11	4 (30.77%)	184 (50.14%)	188 (49.47%)	0.185	Fisher's exact test
8-10.9	9 (69.23%)	156 (42.51%)	165 (43.42%)		
5-7.9	0 (0%)	27 (7.36%)	27 (7.11%)		
Mean ± SD	10.3 ± 1.04	10.77 ± 1.43	10.76 ± 1.42	0.152	Mann Whitney test;1829
Median(25 th -75 th percentile)	10.3 (9.8-11)	11.1 (9.9-11.8)	10.7 (9.9-11.8)		
Range	8.2-11.8	7.9-13.9	7.9-13.9		
Patients with diabetes					
No	12 (92.31%)	361 (98.37%)	373 (98.16%)	0.218	Fisher's exact test
Yes	1 (7.69%)	6 (1.63%)	7 (1.84%)		
Total	13 (100%)	367 (100%)	380 (100%)		

Table 3: Comparison of Type of Surgery and Membrane Status before Surgery between Patients with and without SSI

Type of surgery/membrane status	With SSI	Without SSI	Total	P value	Test performed
Elective/emergency caesarean					
Elective	1 (7.69%)	58 (15.80%)	59 (15.53%)	0.701	Fisher's exact test
Emergency	12 (92.31%)	309 (84.20%)	321 (84.47%)		
Total	13 (100%)	367 (100%)	380 (100%)		
Membrane Status					
Intact	3 (23.08%)	267 (72.75%)	270 (71.05%)	0.0004	Fisher's exact test
Rupture	10 (76.92%)	100 (27.25%)	110 (28.95%)		
Total	13 (100%)	367 (100%)	380 (100%)		

Table 4: Evaluation of microbiological profile in patients with wound sepsis

Microbiological profile	With SSI
No growth	1 (7.69%)
MRSA	1 (7.69%)
E.coli	1 (7.69%)
Enterococcus	1 (7.69%)
Mix and insignificant growth	5 (38.46%)
Staph aureus	4 (30.77%)
Total	13 (100%)

Discussion

Infectious morbidity of the patients is affected by various intrinsic and extrinsic factors, intrinsic factors are patient related and may include some demographic characteristics, whereas extrinsic factors are related to management and care. In the present study 380 women undergoing caesarean section were followed for development of SSI and the risk factors contributing to SSI were evaluated.

The mean age of our study population was 24.08±2.56 in women with SSI and 25.44 ± 2.87 in those without SSI. A study by Devi SL et al. also found that most of the patients developing SSI belonged to the age group of 21-25 years, contributing to 55% of

the cases.⁸ Although there is no definite association between the age of patient and post caesarean infectious morbidity but women in extremes of age may be more susceptible to infections as proposed by some authors.⁹

Obesity is one of the most significant risk factor for wound infection (BMI>30kg/m²; OR 2 to 2.8 and >35 kg/m²; OR 3.7).¹⁰ In our study also, it was found that 23.08% of the patients who developed SSI were overweight, however, BMI was not found to be a significant factor contributing to SSI.

Few authors have reported nulliparity and emergency surgery as a risk factors for postcaesarean wound infection.^{8,10} In our study also, 84.62% of

women with SSI were primigravida compared to 46.59% without SSI, $p=0.009$. But we did not find emergency caesarean section as a risk factor for development of SSI, $p=0.701$. Out of 380, 321 (84.47%) women in our study had emergency caesarean delivery.

After rupture of membranes, amniotic fluid is no longer sterile and may act as a transport medium by which bacteria come into the contact with uterine and skin incision. Also, it has been seen in some studies that the risk of infection increases with every passing hour after rupture of membranes.^{8,10} In our study, 10/13 (76.92%) women with SSI had rupture of membranes before surgery compared to 100/367 (27.25%) in women without SSI, $p=0.0004$.

Patients with anaemia have been reported to be more prone to SSI and other infections, as there is diminished resistance to the infection. Pre-operative anaemia was found to be an important predictor of infection.⁸ However we did not find anaemia to be a risk factor for SSI. The mean patient haemoglobin in our study was 10.3 ± 1.04 g% and 10.77 ± 1.43 g% in women with and without SSI, $p=0.152$. Diabetes was also not a significant risk factor for SSI in our study, $p=0.218$.

The most common organisms isolated from surgical wounds of women with postcaesarean SSI are Staph aureus and beta haemolytic streptococci.^{8,12} Simon M. Scheck et al. identified *S. aureus* or beta-haemolytic streptococci from 65 (2.9%) women (51 of which were *S. aureus*), anaerobes from 34 (1.5%), enteric Gram-negatives from 8 (0.4%), and skin organisms from 10 (0.4%) wound cultures.¹¹ We also found Staph aureus in 30.77% of the wound cultures from women with SSI. All four women with Staph aureus growth from surgical wound culture had undergone emergency surgery but only one of them also had rupture of membranes before surgery. In our study 38.46% of the wound cultures showed mixed or insignificant growth. This could be due to poor sampling technique as the samples were taken by different health care workers and the technique was not standardised for the purpose of this study.

The strength of our study was 30 days postcaesarean follow up of all the patients included in the study, 56 patients who could not come for 30 days follow up were contacted telephonically. Small sample size and poor wound culture collection technique were the main limitations of our study.

Conclusion

Nulliparity and rupture of membranes before caesarean section are important risk factors for SSI after caesarean delivery. The most common causative organism was found to be *Staphylococcus aureus*.

References

1. Saeed KB, Greene RA, Corcoran P, et al. Incidence of surgical site infection following caesarean section: a systematic review and meta-analysis protocol. *BMJ Open*. 2017 Jan 11;7(1):e013037.
2. Betrán AP, Ye J, Moller AB, Zhang J, et al. The Increasing Trend in Caesarean Section Rates: Global, Regional and National Estimates: 1990-2014. *PLoS One*. 2016 Feb 5;11(2):e0148343.
3. Jamwal N. Led By Wealthy Urban Women, Cesarean Sections rise In India [Internet] Available from: <https://www.indiaspend.com/led-by-wealthy-urban-women-caesarean-sections-rise-in-india-45728>. Last accessed June 1, 2021.
4. Kaboré B, Soudouem G, Seck I, et al. A case-control study of risk factors for surgical site infection after cesarean delivery in eastern Burkina Faso. *Int J Gynaecol Obstet*. 2016 Nov;135 Suppl 1:S107-S110.
5. Olsen MA, Butler AM, Willers DM, et al. Risk factors for surgical site infection after low transverse cesarean section. *Infect Control Hosp Epidemiol*. 2008;29(6):477-84.
6. Blumenfeld YJ, El-Sayed YY, Lyell DJ, et al. Risk factors for prolonged postpartum length of stay following cesarean delivery. *Am J Perinatol*. 2015; 32(9):825-32.
7. Roberts S, Maccato M, Faro S, et al. The microbiology of post-cesarean wound morbidity. *Obstet Gynecol*. 1993 Mar;81(3):383-6.
8. Devi SL, Durge DVK. Surgical site infections post cesarean section. *Int J Reprod Contracept Obstet Gynecol*. 2018;7:2486-9.
9. Suarez-Easton S, Zafran N, Garmi G, et al. Postcesarean wound infection: prevalence, impact, prevention, and management challenges. *Int J Womens Health*. 2017 Feb 17;9:81-88.
10. Kawakita T, Landy HJ. Surgical site infections after cesarean delivery: epidemiology, prevention and treatment. *Matern Health Neonatol Perinatol*. 2017 Jul 5;3:12.
11. Scheck SM, Blackmore T, Maharaj D, et al. Caesarean section wound infection surveillance: Information for action. *Aust N Z J Obstet Gynaecol*. 2018 Oct;58(5):518-524.
12. De D, Saxena S, Mehta G, et al. Risk factors analysis and microbial etiology of surgical site infections following lower segment caesarean section. *Int J Antibiot*. 2013;10:1155-60.

Corresponding Author

Dr Amrita Rathee, Senior Resident, Department of Obstetrics & Gynaecology, VMMC & Safdarjung Hospital, New Delhi-110029.
Email: amrierathee09@gmail.com.

Urinary Tract Infection after Caesarean Section in Relation to Duration of Catheterization

Anamika Bharti¹, Harsha Gaikwad²

Postgraduate Resident, Professor, Obstetrics & Gynaecology, VMMC & Safdarjung Hospital, New Delhi

Abstract

Objective: To estimate the occurrence of urinary tract infection, urinary retention, ambulation time and symptoms of lower urinary tract infection after removal of urinary catheter in post caesarean section (CS) patients. **Material and**

Methods: This was a prospective, observational study conducted in the Department of Obstetrics and Gynaecology at Vardhman Mahavir Medical College and Safdarjung Hospital. A total of 200 eligible women were recruited who were undergoing CS. A preoperative urine sample was taken and sent for routine, microscopy, culture and sensitivity, before administering prophylactic antibiotics, anaesthesia and surgery. A Second sample was taken after 48 hours of urinary catheter removal for urine culture and microscopy and data was entered in MS EXCEL sheet and analyzed using Statistical Package for Social Science (SPSS) version 21.0. **Results:** The incidence of UTI was more with increasing duration of indwelling catheterization and E. coli was most common organism identified on urine culture. **Conclusion:** Early removal of indwelling catheter was associated with lower risk of developing UTI.

Keywords: Urinary Tract infection, UTI, caesarean section, catheter, duration

Introduction

Catheter Associated Urinary Tract Infection (CAUTI) is one of the most common nosocomial infections accounting for up to 40% of all the hospital acquired infections.¹ Eighty percent of these are associated with the use of urinary catheters.² Caesarean section is one of the commonly performed surgical operations in obstetric practice and its prevalence is rising each year.³ The rate of caesarean section has been in past few decades, varying from 0.4% to as high as 41.9% across the world.⁴ Urethral catheterization is one of the routine preoperative procedure in caesarean section.⁵ The reason for catheterization is to prevent bladder injury, intraoperative difficulties and postoperative urinary retention, emptying the bladder to improve the visualization of surgical field.⁶ The present study was planned to find out

incidence of urinary tract infection, urinary retention, ambulation time and symptoms of lower urinary tract infection after removal of urinary catheter in post caesarean section (CS) patients.

Materials and Methods

This was a prospective, observational study conducted in the Department of Obstetrics and Gynaecology at Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi. Before starting study, ethical clearance was taken from the Institutional Ethics Committee. Women planned for caesarean delivery who consented to participate in the study were screened. A total of 200 women with singleton pregnancy were recruited in the study. Women with previous caesarean section or any other surgery, medical co-morbidity which may require prolonged catheterization, rupture of membrane >4 hours, obstructed labour, multiple pregnancy, urinary symptoms and women already on antibiotics were excluded from the study.

A preoperative urine sample was obtained in a sterile container for routine, microscopy, culture and sensitivity, before administering antibiotics, anaesthesia and surgery. The patients were observed for timing of catheter removal in the post-operative wards. Catheter removal was done as per the hospital protocol, need based on the indication or when the patients is ambulatory. The patients were observed for urinary complaints like burning micturition, retention of urine, need of re-catheterization, inability to pass urine or voiding difficulty, ambulation and fever. A 2nd sample of urine was taken on the second post-operative day for microscopy and culture. Other routine investigations were done as per the hospital protocol. After 48 hours of urinary catheter removal 3rd urine sample was taken for urine microscopy and culture, the data was recorded on a predesigned proforma.

Statistical Analysis: The data were entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Science (SPSS) version 21.0.

Results

Out of 200 women recruited in the study, maximum were between 26 to 30 years of age (55%). Most of the study population had gestational age between 37 to 39 weeks (76%). Most of the women were primigravida (56%) and most common indication of CS was foetal distress (54%), meconium-stained liquor (29.5%) and non-reassuring foetal heart rate (24.5%), Table 1. A total of 36 (18%) women developed urinary symptoms in the post-operative period. Increased urinary frequency was the most common clinical features (72%) followed by burning

sensation (61%), dysuria (53%), and abdominal Pain (27%), Table 2. E. Coli was the most common organism identified on culture (47%) followed by Klebsiella (27%), Proteus (19%) staphylococcus (7%), Table 3.

Incidence of urinary tract infection was significantly higher in patients having catheter for more than 24 hours (15.0%), $p=0.002$, Table 4. Need for recatheterization was significantly higher in patients having catheter for less than 12 hours (8%) followed by 12 to 24 hours (4%) and more than 24 hours (0%), Table 5.

Table 1: Distribution of cases according to maternal characteristics

Parameters	frequency	Percentage
Age group		
18 to 25 years	68	34
26 to 30 years	110	55
>30 years	22	11
Total	200	100
Gestational age		
36 to 37 weeks	22	11
37.1 to 38 weeks	74	37
38.1 to 39 weeks	78	39
>39 weeks	26	13
Total	200	100
Parity		
Primigravida	112	56
Second gravida	56	28
Multigravida	32	16
Total	200	100
Indication of LSCS		
Non reassuring fetal NST	49	24.5
Meconium-stained liquor	59	29.5
Non progression of labour	35	17.5
Primi breech	18	9
CPD	16	8
2 nd stage arrest	6	3
Abruptio placenta	4	2
Placenta previa major	4	2
Anhydramnios	9	4.5
Total	200	100
Haemoglobin status		
Mild anaemia	104	52
Moderate anaemia	74	37
Severe anaemia	22	11
Total	200	100

Table 2: Urinary symptoms amongst study population

Clinical features	Frequency	Percent
Increased urinary Frequency	12	72.0
Dysuria	9	53.0
Abdominal Pain	5	27.0
Burning Sensation	10	61

Table 3: Organisms identified on urine culture

Organism Identified	Frequency	Percent
E Coli	8	47.0
Klebsiella	5	27.0
Proteus	3	19.0
Staphylococcus	1	7
Total	17	100

Table 4: Incidence of urinary tract infection according to duration of catheter removal

Incidence of urinary tract infection			Duration of catheterization			Total	P value
			< 12 hours	12 to 24 hours	> 24 hours		
Culture	Positive	Number	2	5	10	17	0.002
		%	3.0%	7.0%	15.0%	8.5%	
	Negative	Number	64	61	58	183	
		%	97.0%	93.0%	85.0%	91.5%	
Total %		Number	66	66	68	200	
		100.0%	100.0%	100.0%	100.0%		

Table 5: Need for recatheterization in relation to duration of catheter removal

Need for recatheterization		Duration of catheterization			Total	p value
		< 12 hours	12 to 24 hours	> 24 hours		
No	Number	61	63	68	192	0.001
	%	92.0%	96.0%	100.0%	96.0%	
Yes	Number	5	3	0	8	
	%	8.0%	4.0%	0.0%	4.0%	
Total	Number	66	66	68	200	
	%	100.0%	100.0%	100.0%	100.0%	

Discussion

Caesarean delivery is associated with a small increase in the risk of postpartum UTI as compared with vaginal delivery. The frequent use of urinary bladder catheterisation prior to surgical procedures could explain this association. Non-use of urinary catheter during caesarean section is associated with significantly low rate of UTI and less first voiding discomfort. However, indwelling urinary catheter is a routine part of most surgeries including caesarean section.⁷ The reasons cited are: better bladder exposure during surgery, decreased risk of intraoperative injury to the urinary system, urine output assessment, and prevention of postoperative urinary retention.⁸ However, catheterization of the urinary tract during CS has been implicated as a main cause of urinary tract infection (UTI).⁹ Urinary infection is one of the most common complications of CS, accounting for greater than 80% of nosocomial UTI and greater postoperative pain.¹⁰ Bacteriuria develops in about 10 – 15% of the hospitalized patients with indwelling urinary catheter and the

risk of infection is approximately 3 – 5% per day of catheterization.¹¹

Several studies have shown that CS performed without using urethral catheter is safe and is associated with less voiding discomfort, early ambulation and shorter hospital stay.¹²

In the present study, incidence of urinary tract infection was significantly higher in patients having catheter for more than 24 hours (15.0%) followed by 12 to 24 hours (7 %) and < 12 hours (3%). In our study, the incidence of UTI following caesarean delivery was 8.5%. The overall incidence of urinary tract infection following caesarean delivery in the study conducted by Kingsley V et al was 26.9%. It was higher in women who had their urethral catheter removed after 24 hours.¹³ This could be as a result of increased formation of biofilms around the indwelling urethral catheter following prolonged placement as reported in these studies.¹⁴ Several studies have investigated the effects of removing the catheter at various times and compared with an indwelling catheterization.⁵ The results suggest that

immediate post-operative removal of the urethral catheter is associated with a lower risk of urinary tract infection compared with indwelling catheter. This is consistent with the findings of this study.

In the present study, E Coli (47%) was the most common organism identified on culture followed Klebsiella (27%) and Proteus (19%). Similarly in the study conducted by Kingsley V et al, Escherichia Coli was the commonest organism isolated from positive urine cultures.¹³ This is in contrast to another study, which showed Klebsiella as the predominant organism following post caesarean section urinary tract infection.⁵ The difference may be as a result of technique of urine collection or the difference in the population personal hygiene disposition. The proximity of the urethra to the vagina and rectum allows faecal flora (with Coliforms such as uropathogenic Escherichia Coli) to colonize the periurethral area of women.¹⁵ This relationship increases the prevalence of Escherichia Coli causing urinary tract infection by forward wipe from the anus into the vaginal area after a bowel movement. This may have played a role in the high prevalence of Escherichia Coli in this study. It also accounted for 80% of urinary tract infection in pregnancy, according to another study.¹⁶ In a study conducted by Amiri et al. reported that E. coli was indicated to be the cause of 83% of UTIs in pregnant women and Staphylococcus Saprophyticus (%10), Enterococcus (4%) and Proteus (3%) were other causes of UTIs.¹⁷ Also, the results from the studies of Mobbasheri et al. reported that E.coli (%33.3) Coagulase Negative Staphylococcus (30.3%) and Klebsiella (%15.2) are the major causes of UTIs among pregnant women.¹⁸

Conclusion

The incidence of urinary tract infection increases with increasing duration of indwelling catheterization, however the need of recatheterization is less if the catheter is kept for a longer duration. However, larger studies are needed to support our findings.

References

1. Gastmeier P, Kampf G, Hauer T, et al. Prevalence of nosocomial infections in representative German Hospitals. *J Hosp Infect* 1998;38:37-49.
2. Wagenlehner FM, Naber KG. Hospital acquired urinary tract infections. *J Hosp Infect* 2000;46(3):171-81.
3. Stanton C, Holtz S. Levels and trends in Caesarean birth in the developing world. *Stud Fam Plann* 2006;37:41-48.

4. Lumbiganon P, Laopaiboon M, Gulmezoglu AM, et al. Method of delivery and pregnancy outcomes in Asia: The WHO global survey on maternal and perinatal health 2007-08. *Lancet* 2010;375:490-99.
5. Tangtrakul S, Taechaiya S, Suthutvoravut S, et al. Post-caesarean section Urinary Tract Infection: a comparison between intermittent and indwelling catheterization. *J Med Assoc Thai* 1994;77:244-248.
6. Senanayake H. Elective caesarean section without urethral catheterization. *J Obstet Gynaecol Res* 2005;31:32-37.
7. Lang JF, Bowen JC, Strong P. Use of indwelling urinary catheter at cesarean delivery. *Obstetrics & Gynecology*. 2001;97(4):S 66.
8. Onyegbule OA, Udigwe GO, Ezebialu I, et al. Catheter associated urinary tract infection following caesarean section. *Bri Microbiol Res J*. 2014;4(9):1025-1034.
9. Ghorieshi J. Indwelling urinary catheters in caesarean delivery. *Int J Gynecol Obstet* 2003;83(3):267-70.
10. Ercole FF, Macieira TG, Wenceslau LC, et al. Integrative review: evidences on the practice of intermittent/indwelling urinary catheterization. *Revistalatinamericana de enfermagem*. 2013;21(1):459-68.
11. Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL. *Harrison's principles of internal medicine*. 16th ed. McGraw Hill Publishers; 2005:1717-18.
12. Acharya S, Uprety DK, Pokharel HP, et al. Caesarean section without urethral catheterization: A randomized control trial. *Kathmandu Univ Med J* 2012;38(2):18-22
13. Kingsley V, Solomon N. Comparative Analysis of the Duration of Urethral Catheterization for Ceasarean Delivery. *IOSR-JDMS*. 2018;17(4): 01-05.
14. Nicolle LE. Uncomplicated urinary tract infection in adults including uncomplicated pyelonephritis. *UrolClin North Am* 2008;35(1):1-12.
15. Foon R, Tooze-Hobson P, Millns P, Kilby M. the impact of anaesthesia and mode of delivery on the urinary bladder in the post delivery period. *Int J Gynaecol Obstet*. 2010;110:114-7.
16. Amiri M, Lavasani Z, Norouzrad R, et al., Prevalence of Urinary Tract Infection Among Pregnant Women and its Complications in Their Newborns During the Birth in the Hospitals of Dezful City, Iran, 2012 – 2013. *Iran Red Crescent Med J*. 2015;17(8):e26946.
17. Mobbasheri ET, Ghaemi E, Moujlou M, Vakili MA. Prevalence of bacteriuria during pregnancy in Gorgan, Iran. *Gorgan Medical Journal*. 2001;9:42–7.
18. Gristina A. Biomaterial centered infection: microbial adhesion versus tissue integration. *Science* 1987; 237: 1588 – 95.

Corresponding Author

Dr Harsha Gaikwad, Professor, Department of Obstetrics & Gynaecology, VMMC & Safdarjung Hospital, New Delhi-110029.
Email: dongre.harsha1@gmail.com

Journal Scan

Saumya Prasad¹, Akanksha Dwivedi², Shubham Bidhuri³

¹Assistant Professor, ^{2,3}Senior Resident

Obstetrics & Gynaecology, Vardhman Mahavir Medical College & Safdarjung Hospital, New Delhi

Enhanced Recovery after Surgery at Cesarean Delivery to Reduce Postoperative Length of Stay: A randomized controlled trial

Teigen NC, Sahasrabudhe N, Doulaveris G, Xie X, Negassa A, Bernstein J, Bernstein PS.

Am J Obstet Gynecol. 2020 Apr;222(4):372.e1-372.e10.

Objective: The objective was to determine whether an enhanced recovery after surgery pathway at the time of cesarean birth would permit a reduction in postoperative length of stay and improve postoperative patient satisfaction compared to standard perioperative care.

Materials and Methods: Patients undergoing nonemergent cesarean delivery at ≥ 37 weeks of gestation were randomized to enhanced recovery after surgery or standard care. Enhanced recovery after surgery involved multiple evidence-based interventions bundled into 1 protocol. The primary outcome was discharge on postoperative day 2. Secondary outcome variables included pain medication requirements, breastfeeding rates, and various measures of patient satisfaction.

Results: From September 27, 2017, to May 2, 2018, a total of 58 women were randomized to enhanced recovery after surgery and 60 women to standard care. The groups were similar in medical comorbidities and in demographic and perioperative characteristics. Enhanced recovery after surgery was not associated with a significantly increased rate of postoperative day 2 discharges when compared with standard care (8.6% vs 3.3%, respectively; odds ratio, 2.74; 95% confidence interval, 0.51-14.70), but it was associated with a significantly reduced postoperative length of stay when compared with standard care, with a median length of stay of 73.5 hours (interquartile range, 71.08-76.62) vs 75.5 hours (interquartile range, 72.86-76.84) from surgery, difference in median length of stay (-1.92; 95% confidence interval, -3.80 to -0.29). Enhanced recovery after surgery was not associated with a reduction in postoperative narcotic use (117.16 ± 54.17 vs 119.38 ± 47.98 morphine

milligram equivalents; mean difference, -2.22; 95% confidence interval, -20.86 to 16.42). More subjects randomized to the enhanced recovery after surgery protocol reported breastfeeding at discharge (67.2% vs 48.3%; $P = .046$). When patients were surveyed 6 weeks postpartum, those in the enhanced recovery after surgery group were more likely to feel that their expectations were met and that they had achieved their postoperative milestones earlier, and to report continued breastfeeding.

Conclusion: Enhanced recovery after surgery at cesarean delivery was not associated with an increase in the number of women discharged on postoperative day 2, but that may have been related to factors other than patients' medical readiness for discharge. Evidence that enhanced recovery after surgery at cesarean delivery may have the potential to improve outcomes such as day of discharge is suggested by the observed reduction in overall postoperative length of stay, improved patient satisfaction, and an increase in breastfeeding rates. Even better results may accrue with more provider and patient experience with enhanced recovery after surgery.

Prophylactic Negative Pressure Wound Therapy for Surgical Site Infection in Obese Women Undergoing Cesarean Section: An evidence synthesis with trial sequential analysis

Huang HP, Zhao WJ, Pu J, He F

J Matern Fetal Neonatal Med. 2021 Aug;34(15):2498-2505.

Objective: Current evidence for negative pressure wound therapy (NPWT) on surgical site infection (SSI) and wound complications in cesarean section is conflicting. The objective of this study was to evaluate the efficacy of prophylactic NPWT for preventing SSI and other wound complications in obese women undergoing cesarean section (CS).

Methods: We systematically searched PubMed, Embase, the Cochrane Library and clinicalTrials.gov to identify randomized controlled trials (RCTs) that compared NPWT with standard dressing for cesarean

section. The primary outcome was SSI. Secondary outcomes were overall wound complications and hospital readmission. Risk ratio (RR) with 95% confidence intervals (CIs) was calculated using random-effects models. Review Manager 5.3 was applied to analyze the collected data.

Results: Eight RCTs involving 1972 patients were included in this meta-analysis. The pooled results showed that the risk of SSI was significantly lower with the use of NPWT when compared with standard dressing (RR = 0.68, 95%CI = 0.51-0.90, $p = .008$). However, there was no difference in overall wound complications (RR = 0.93, 95%CI = 1.17-0.74, $p = 0.52$) and hospital readmission (RR = 1.03, 95%CI = 1.60-0.67, $p = .89$) between two groups. Current evidence was not confirmed by trial sequential analysis. **Conclusion:** On the basis of our findings, NPWT decreases the risk of SSI after cesarean section in obese women after CS, despite this approach does not reduce the overall wound complications and hospital readmission. However, further RCTs are needed to make conclusive evidence.

The results of the study should be interpreted with caution because of the following limitations. First, the skin closure type, timing of prophylactic antibiotics, and definition of "standard dressing" vary among studies. Therefore, how these factors affect the results is unclear. Second, a double-blind method is unfeasible in the included studies, which may lead to performance and detection bias.

Subcuticular Sutures Versus Staples for Skin Closure in Patients Undergoing Abdominal Surgery: A meta-analysis of randomized controlled trials

Feng J, Jiang X, Zhi Z.

PLoS One. 2021 May 4;16(5):e0251022.

Background: Surgical site infections (SSIs) are common postoperative complications. Whether the use of staples or sutures makes a difference in abdominal surgery's infection rate remains elusive.

Methods: A systematic review was performed to identify randomized clinical trials comparing staples

and sutures after abdominal surgeries. Eligibility criteria involved the SSI occurrence as the primary outcome and the incidence of wound dehiscence, closure time, cosmesis, and patient satisfaction as the secondary outcomes.

Results: Of the 278 studies identified, seven randomized controlled trials representing 3705 patients were included in this review. There was no significant difference in SSI rates between sutures and staples in general (OR = 0.98, 95% CI = 0.79–1.22, $I^2 = 44\%$, $P = 0.1$) or in a subgroup of gastrointestinal surgery, where subcuticular suturing was found with a comparable SSI risk with skin stapling (OR = 0.85, 95% CI = 0.66–1.09). Staple closure was associated with a shorter surgery duration, whereas sutures appeared to provide better cosmesis and patient satisfaction. Sutures and staples achieved a comparable incidence of dehiscence. There was no significant between-study publication bias.

Conclusion: Our study demonstrated similar outcomes in SSI rate between subcuticular sutures and staples for skin closure in patients undergoing abdominal surgery.

However, the results of this meta-analysis had a few limitations. There was scarce data on the impact of sutures and staples on laparoscopic surgeries. Each study involved multiple types of abdominal procedures, but due to lack of relevant information they were not used. Consequently, the relationship between skin closure techniques and patient outcomes in different kinds of surgeries still warrants investigation. This analysis is not representative of all populations. Obesity increases the risk of SSI in many ways: demanding exposure during surgery and resultant longer operating time, inadequate oxygenation and decreased penetration of antibiotics. But still BMI was only available in two studies. As a result, contribution of obesity could not be assessed. Similarly, other factors that can affect wound dehiscence include advanced age, diabetes mellitus, malnutrition, smoking, immunosuppressive medications, and several others were not taken in account. These limitations warrants need for well- designed randomized controlled trials to validate the results of this meta- analysis.

Events Held in May, 2021

1. FOGsd organising updates on “Periconceptional Folate Deficiency and Implications in Neural Tube Defects and Pearls of Wisdom on How to Cope up this COVID Period and Stay Motivated” was held under aegis of NARCHI, AOGD, RCOG North Zone on 17th April, 2021.
2. Web CME on “Management of COVID in Pregnancy: A Medical Perspective for Obstetrician” was held on 7th May, 2021 by AOGD Safe Motherhood & QI Committee.
3. Virtual CME on “Prevention & Management of Thalassemia Major: An Obstetrician’s Perspective” was organised by AOGD Fetal Medicine and Genetics Committee on 8th May, 2021.
4. AOGD Oncology Subcommittee held online panel discussion on “Management of Gynaecologic Cancers amidst the COVID 19 Pandemic” on 15th May, 2021.
5. Public Forum on “5 tips to Stay Safe from Anaemia during Pregnancy” was held on 15th May, 2021, by Multidisciplinary Committee AOGD.
6. A Public Forum on “Pregnancy and Postpartum Care in COVID Era” was organised by Safdarjung Hospital under the aegis of AOGD in association with iMumz app on 17th May, 2021.
7. A webinar on “Thyroid Disorders in Pregnancy” was organized by AOGD Adolescent Subcommittee on 18th May, 2021.
8. VMMC & Safdarjung Hospital under the aegis of AOGD, organised online Group Discussion on “Mental and Social Wellbeing of Health Care Workers in COVID Era: Challenges and Solution” on 21st May, 2021.
9. CME on “Thyroid Disorders and Women’s Health” was held on 24th May, 2021 by Adolescent Health Committee in association with Reproductive Endocrinology Committee, AOGD and DMF.
10. A webinar on “Dilemmas to Decision” was organised under Happy Learning Master Class Webinar Series on 25th May, 2021. Talks on “Hypothyroidism in Pregnancy”, “Hyperthyroidism in Pregnancy” and “Legalities in IUFD” were followed by Panel discussion on “Recurrent Pregnancy Loss”.
11. Webinar on “Step by Step Management of COVID Positive Pregnant Women: Basics to Advanced” was organised on 26th May, 2021 by AOGD Safe Motherhood & QI Committee in association with Faridabad Obstetrics & Gynaecology Society.
12. ART Fertility Clinics in association with AOGD Multidisciplinary Committee & Gynae Forum IMA, Dwarka organised webinar on “Genital Tuberculosis and ART”, on 27th May, 2021.
13. eCME on “MTP Act Old and New”, organised by Delhi Gynaecologist Forum, North-West under the aegis of AOGD, was held on 27th May, 2021.
14. A CME on “Trends in the Management of Recurrent Pregnancy Loss, Approaching to a Consensus” was held on 27th May, 2021.
15. Virtual Monthly Clinical Meeting was held on 28th May, 2021 by BL Kapoor Hospital. Four interesting cases presented were: TLH for uterus didelphys with septum in hemi-vagina, Herculean task of removing more than 100 fibroids, Lap creation of neovagina in MRKH by pretoneal pull through, and Rare case of Harlequin Ichthyosis. The case discussions were followed by a quiz on kahoot platform, it was based on the articles published in the May bulletin.
16. A virtual Inspirational Talk was given by Sister Shivani on “Stress Free Healers Heal Better” on 29th May, 2021.
17. RCOG in association with AOGD and NARCHI organised a webinar on “Evidence Based Management of Intrahepatic Cholestasis of Pregnancy” on 30th May, 2021.

Forthcoming Events for June, 2021

1. "Trials and Tribulations with Hysteroscopy", a webinar will be held by AOGD Endoscopy Subcommittee on 3rd June, 2021.
2. Virtual Annual Conference of "Delhi Gynaecological Endoscopists Society" will be organised on 4th and 5th June, 2021 in association with IAGE and AOGD.
3. CME on "Optimizing outcome of LSCS" will be held on 8th June, 2021 under Happy Learning Master Class Webinar Series, in association with AOGD.
4. DGF outer Delhi and AOGD Safe Motherhood Committee has planned a webinar on "APH: Anticipate, Prepare & Handle", to be held on 8th June, 2021 from 3 to 5 pm.
5. CME on "Thyroid Disorders from Womb to Tomb" will be organised on 10th June, 2021 by Endocrinology committee of AOGD.
6. FOGSI Safe Motherhood Committee in collaboration with AOGD has scheduled "Metabolic Women's Health Workshop" on 15th June, 2021 between 5 to 7 pm.
7. Teleconsultation on "Medico legal aspects" will be held on 16th June, 2021 by QI committee of AOGD.
8. A Panel discussion on "A to Z of GDM" will be jointly organised by Multidisciplinary Committee of AOGD, NARCHI and DGF South West on 19th June, 2021 between 3 to 5 pm.
9. Webinar on "Investigations in Infertility, adjuvants in male and female infertility" will be organised on 22nd June, 2021 by Infertility Committee of AOGD.
10. To commemorate the World Population Day on 23rd June, 2021, AOGD and Directorate of Family Welfare, Govt. of NCT of Delhi, are organising a Webinar on "Contraception".
11. Webinar on Endoscopy in COVID era Practice, Innovations, will be organised on 24th June, 2021, by AOGD Endoscopy Committee.
12. A virtual, "AOGD Monthly Clinical Meeting" will be held on 25th June 2021 by All India Institute of Medical Science. This will be followed by a quiz based on the articles published in the June issue of AOGD bulletin.
13. A webinar on "Twin Pregnancy" will be held on 27th May, 2021 by RCOG and AOGD.
14. A webinar on "Cosmetic Gynae" will be held on 30th June, 2021 by Urogynae Committee of AOGD.

Pictorial Quiz Answers of May Issue 2021

- A 1. Offer companion/ pain relief/ correct hydration/ Augment uterine contractions / arrange blood/ careful labour monitoring in view of occiputoposterior position.
- A 2. Occipeto-posterior position/ Late deceleration with Caput (3+)/ Moulding (3+) /Meconium (3+)
- A 3. Arrest of active phase of labour with features of Obstructed labour with fetal distress → stop oxytocin-prepare for Em LSCS

Events held under the aegis of AOGD in May 2021

Chief Guests  Dr Randeep Guleria Director, AIIMS  Dr Alpesh Gandhi President, FOGSI		Organising Chairperson  Dr Anita Sabharwal Secretary FOGSI		Special Guest  Dr Urmil Sharma Former HOD, Apollo Hospital	
Presidents  Dr Asmita Rathore NARCHI, Delhi  Dr Achla Batra Past NARCHI, Delhi  Dr Mala Srivastava AOGD  Dr Ranjana Sharma Chairperson, AICC RCOG NZ  Dr Shashi Prateek FOGSI  Dr Jaydeep Tank Secretary General, FOGSI  Dr Mandakini Megh Chairperson, ICOG					
Topic: Pearl's of wisdom on How to cope up this covid period and stay Motivated by Dr Kamal Buckshee Topic: Periconceptional Folate Deficiency and Implications In neural defects by Dr Poonam Tara Thakur					
Speakers  Dr Poonam Tara Thakur Senior Consultant Fetal Medicine  Dr Kamal Buckshee Former PROF & HOD Obs. & Gynae, AIIMS  Dr Sudha Prasad President IFS  Dr Sudha Sahlan Former HOD, SJH  Dr Pushpa Chandra Chairpersons  Dr Kiran Guleria Professor GTB Hospital  Dr Surveen Ghumman IVF Max Hospital New Delhi  Dr Tanya Rohatgi Max Super Speciality Hospital, Delhi  Dr Chanchal Fetal Medicine Birthright Madhukar, Rainbow Childrens					

Webinar under aegis of NARCHI, AOGD, RCOG North Zone



Web CME on Management of COVID in Pregnancy



Web CME on Prevention & Management of Thalassemia Major



Public Forum on Stay Safe from Anemia During Pregnancy



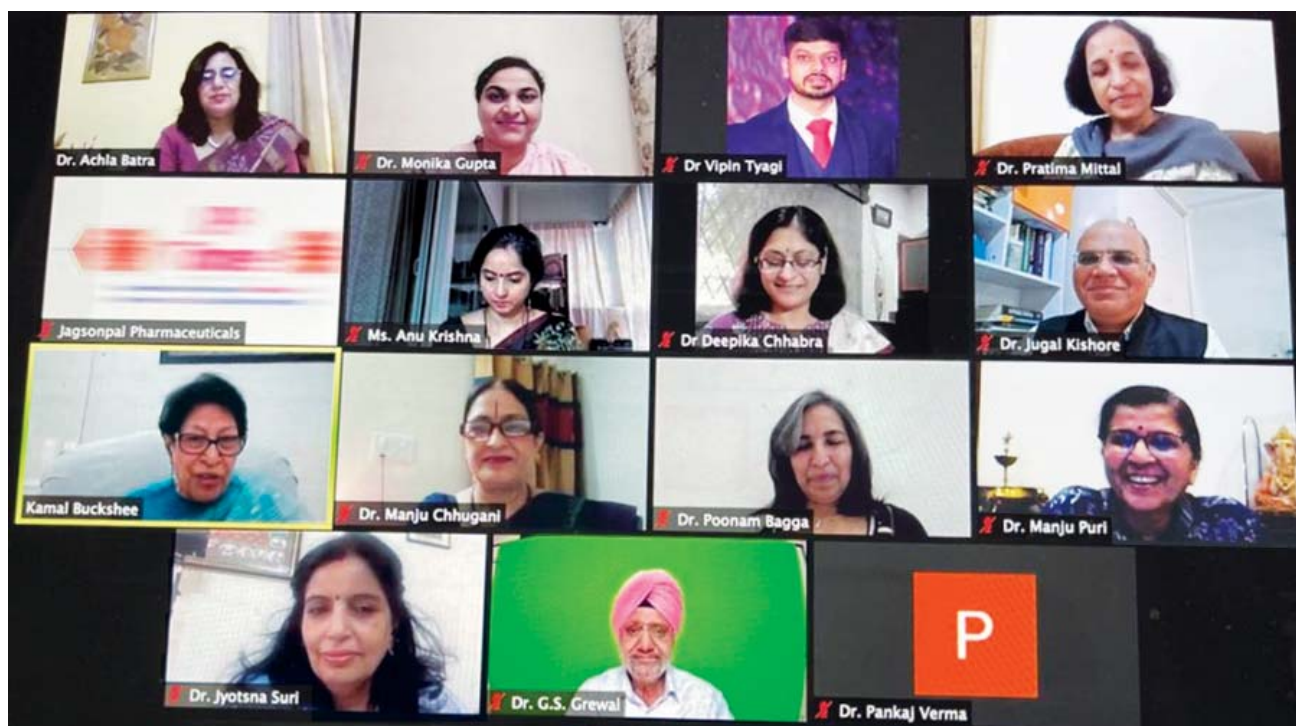
Panel Discussion on Management of Gynaecologic Cancers during COVID-19



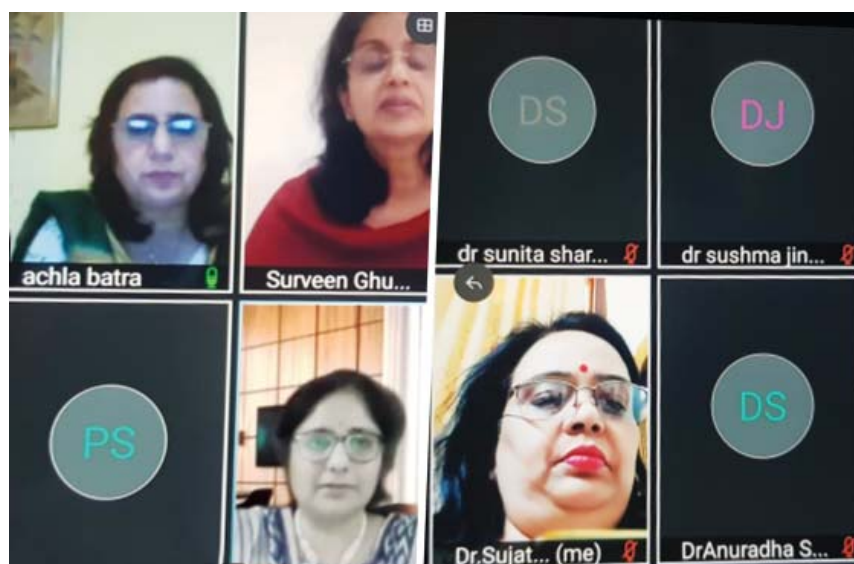
Public Forum on Pregnancy and Postpartum Care in COVID Era



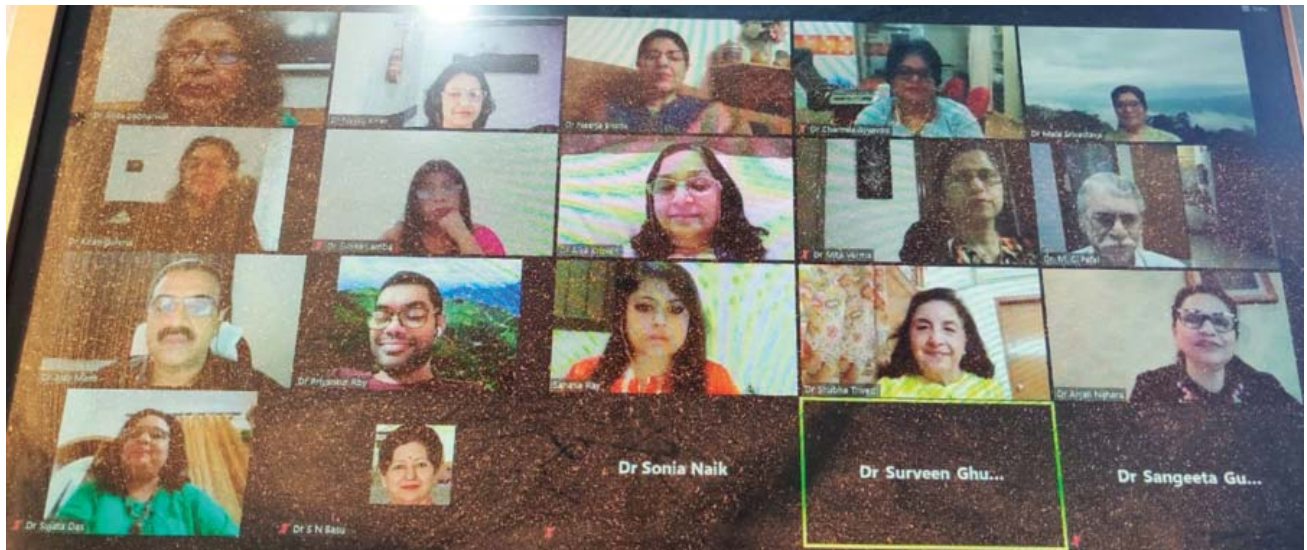
Webinar on Thyroid Disorders in Pregnancy



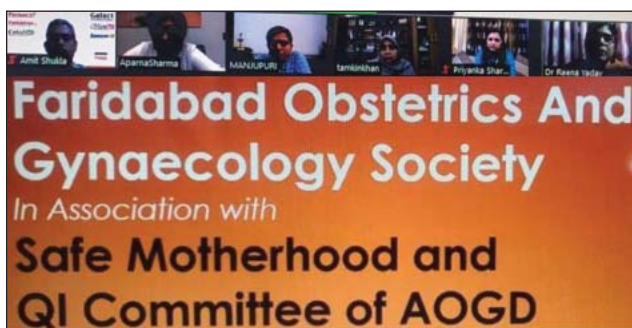
Group Discussion on Mental and Social Wellbeing of Health Care Workers in COVID Era



Webinar on Thyroid Disorders and Women's Health



CME on Thyroid Disorders in Pregnancy, "Dilemmas to Decision"



Webinar on Management of COVID Positive Pregnant Women



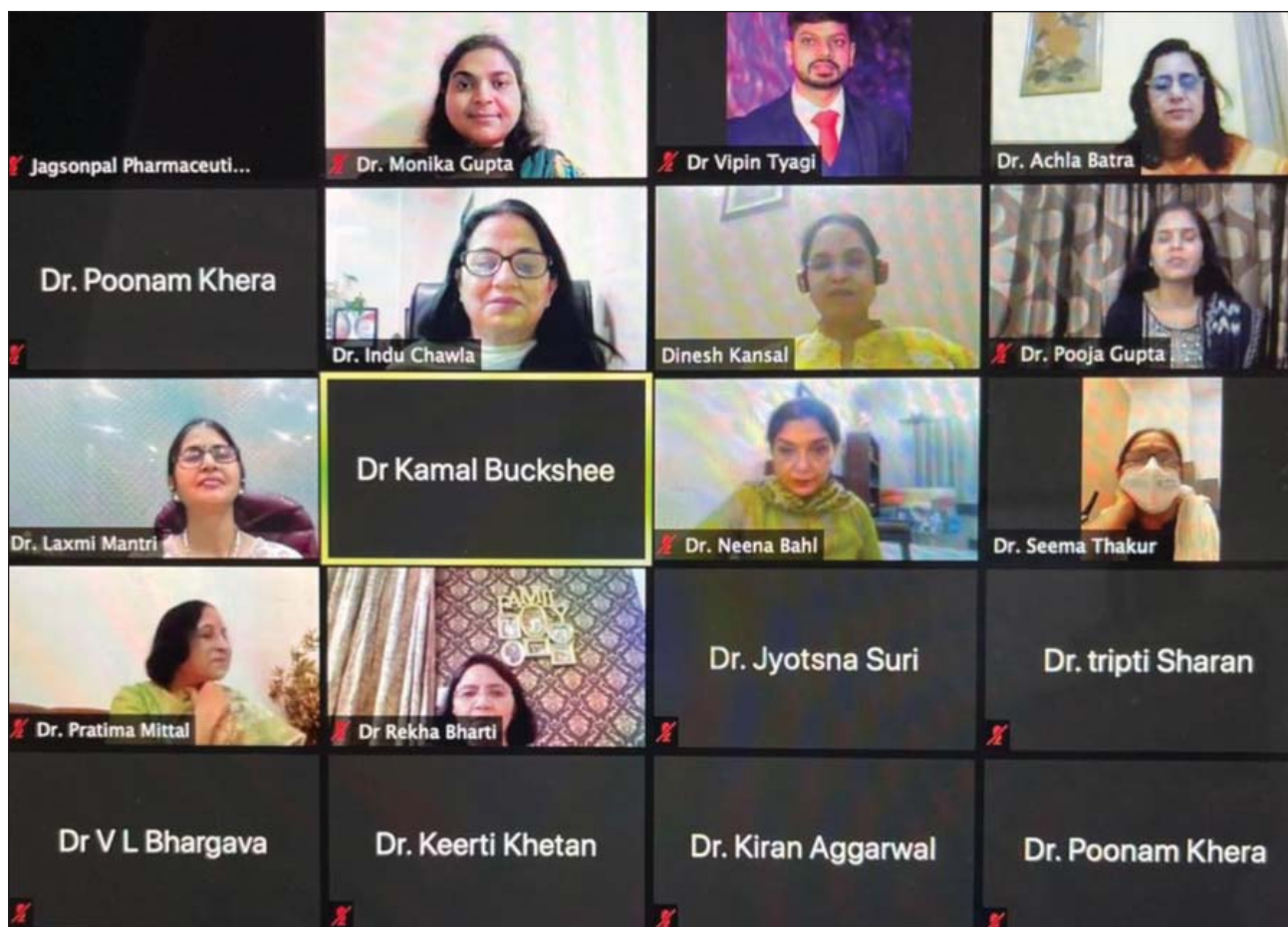
CME on "Genital Tuberculosis & ART"



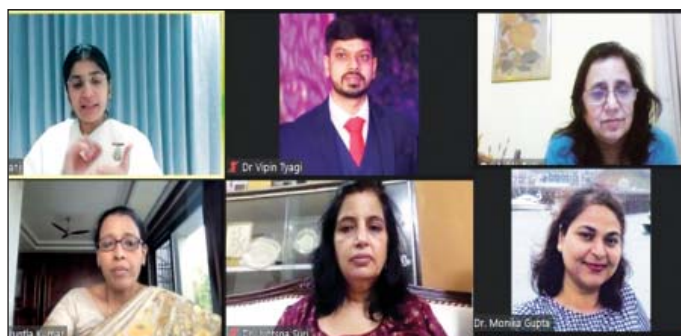
E- CME on "MTP Act Old and New"



CME on "Management of Recurrent Pregnancy Loss"



AOGD Monthly Clinical Meeting by BL Kapoor Hospital



An Inspirational Talk by Sister Shivani



RCOG webinar on Evidence Based Management of IHCP

Proceedings of Virtual AOGD Monthly Clinical Meeting held at B L Kapoor Superspecialty Hospital, New Delhi on 28th May, 2021

TLH in Rare Case of Didelphys Uterus with Hemi Vaginal Septum

Poonam Khera, Kanika Garg, Laxmi Mantri
Preeti Yadav

Uterus didelphys is a rare congenital Mullerian duct anomaly caused by failure of fusion of two Mullerian ducts (Class III anomaly). It is characterized by two hemi uterus, 2 endocervical canals and two cervixes. Vagina can be single or double, depending upon the presence of septum. Each hemi uterus has one fallopian tube. The prevalence is reported as 8.3 % of all Mullerian duct anomalies. It can be associated with renal anomalies in 10% of cases. Herlyn-Werner-Wunderlich is the triad of didelphys uterus, obstructed hemi vagina septum and ipsilateral renal agenesis, involving both Mullerian duct and Wolffian structures.

A 50-year-old P4L4 presented with complaints of menorrhagia and metrorrhagia for 1 year, received medical treatment for 1 year but had no relief. D&C was done 2 months back and HPE report showed inflamed polyp. She had history of lap ligation done 22 years back. P/A - NAD. P/S - Cervix seen on left side of vagina, right side cervix not seen, only fistular opening seen on the vaginal septum right side from where blood was coming out during menstruation. USG and MRI report showed complete duplication of uterine horns and cervix with single vaginal, no renal abnormality. She had no relief with conservative management so was planned for total laparoscopy hysterectomy with BSO. Intraoperatively on inspection of the pelvic cavity, lots of omental adhesions were seen with anterior abdominal wall and right lateral pelvic wall, two uterine corpora almost same size with broad vesico-rectal fold were seen, anteriorly continuing with bladder peritoneum and posteriorly with peritoneum over the bowel. Right side tube and ovary were adherent with pelvic wall and posteriorly also. Because of adhesion all around the right corpora, decision was taken to do subtotal hysterectomy on right side to make surgery easy and to avoid ureteric and bladder injury as uterine elevator was not used on the right side due to vaginal septum. Vesicorectal fold opened,

taking care of rectum posteriorly and bladder anteriorly. Bladder pushed down. Right corpora divided below the isthmus after coagulating the uterine arteries to do subtotal hysterectomy on right side. Cervical stump looked normal after subtotal hysterectomy. Then, left side TLH done, both uteri delivered vaginally. After delivering both uterus, right side cervix was seen from the colpotomy area which was held with vulsellum. Para vaginally, paracervical clamps were applied after excision of vaginal septum, cervical stump was easily removed from vagina. Endo suturing was done, A drain put, cystoscopy was done after finishing surgery and patient was discharged after 48 hours.

Herculean Task of Removing More Than 100 Fibroids

Pooja Gupta, Dinesh Kansal

Diffuse uterine leiomyomatosis (DUL) is a rare condition that poses a unique management challenge. Hysterectomy is the standard treatment as myomectomy might be unable to achieve a complete clearance and repair of uniformly involved myometrium, but in women who want to preserve their fertility hormonal treatment, transcervical resection, uterine artery embolization and myomectomy are the other treatment modalities.

A 29 Years unmarried female came with complaints of abdominal distension, heaviness lower abdomen and increased bleeding during periods for last 2 years. We did a myomectomy for the same patient in 2015 and removed 48 fibroids. Her sister was also operated for multiple fibroids at some other hospital but expired due to DVT post operatively. Her uterus was enlarged up to 36 weeks size. Patient was counselled for hysterectomy but patient and their parent wanted to conserve the uterus as she was unmarried. All the risk of myomectomy was explained to the patient. Pre operatively hemoglobin was built up by Injectable iron and DVT prophylaxis given. Myomectomy was done by midline vertical incision. Dense bowel and omental adhesions were present, which were removed by sharp dissection. Injection vasopressin injected in the uterus. 106

Fibroids were removed of varying size from 0.5 cm to 9 cm. Bilateral uterine artery ligation was done. Blood loss was approximately 4 liters. Patient was shifted to ICU on ventilatory support. She was shifted to ward on 4th day. She developed paralytic ileus on day 5, which was managed conservatively. She was discharged on day 8 in stable condition. She came for follow up on day 14, Stitches were removed and injection GnRH agonist 11.25 mg was given to prevent the recurrence.

Laparoscopic Creation of Neovagina in MRKH by Peritoneal Pull Through

Dinesh Kansal, Pooja Gupta

Type I or Typical MRKH refers to isolated symmetrical uterovaginal aplasia or hypoplasia with normal ovarian function. For many years, McIndoe's method has been the gold standard. However, laparoscopic methods are being utilized more often to avoid an unsightly scar at the site of skin graft, incomplete uptake of graft and high incidence of rectal-bladder complications associated with McIndoe's. Among the two laparoscopic methods, Davydov's is being preferred due to less pain, short hospital stay, longer vagina and higher sexual satisfaction.

Our patient was 26 years old, married and had 1-inch vaginal dimple. A neovagina was created for sexual function by using peritoneal pull through method-Davydov's technique. Counselling is of paramount importance in these patients regarding need of regular dilatation, expectations from surgery and future fertility options. In this patient, complete dissection was done laparoscopically.

Initially, releasing incision was given posterior to urinary bladder which also helps in keeping it safe from harm. Peritoneal incision was given at the potential POD just anterior to rectal fat and rectum was pushed down. A sponge on holder was used to push through vaginal dimple. Laparoscopically, an incision was made transversely over the bulge with harmonic from one uterosacral ligament to the other. Vaginal space was thus created to reach the skin at introitus. The space was lined anteriorly and posteriorly by pulling down peritoneum. Peritoneal edges were fixed to introitus with absorbable sutures. Vaginal vault was formed by taking a purse string suture that included uterosacral ligaments, sero-muscular layer of rectum and uterine horns. A soft mould was kept in vagina.

A Rare Case of Harlequin Ichthyosis

Laxmi Mantri, Manali Paul, Poonam Khara

Harlequin Ichthyosis (HI) is a rare genetic condition affecting the skin. The skin of the newborn is covered with thick diamond-shaped plates that resemble fish scales. These hard plates can make it difficult for the baby to breathe and eat. It is a life-threatening condition requiring immediate intensive care. Its incidence is 1 in 300,000 births. Approximately 200 cases of HI have been reported worldwide. Protective or the barrier function of the skin is disrupted, making it more difficult for affected infants to control water loss, regulate their body temperature, and fight infections. Infants often experience excessive dehydration and develop life-threatening infections. HI has an autosomal recessive inheritance. It is due to mutation in adenosine triphosphate binding cassette A 12 gene (ABCA 12 gene). This ABCA 12 gene is responsible for the exocytosis of the lipid-containing lamellar granules that control the desquamation process. The locus for ABCA 12 gene is located on chromosome 2q35. The recurrence of this condition in the following pregnancy is 25%. Our patient was 28 years old, second gravida, presented at 34 weeks pregnancy with labor pains. Her antenatal ultrasound at 32 weeks showed that baby had the possibility of Harlequin syndrome. The patient had a spontaneous preterm vaginal delivery, and a female baby weighing 1.9 kg with all features of Harlequin Ichthyosis was delivered. The baby was shifted to NICU immediately for conservative management. The baby had white porcelain-like skin with deep creases all over the body with bleeding from the creases. Eyelids and lips were everted, showing ectropion and eclabium. The mouth was open with thick lips. Genetic counseling was offered to the patients. Next genome sequencing was done. Both parents turned out to be heterozygous (carriers) of the ABCA 12 gene, and the affected baby was homozygous for the mutation. Although HI is a rare and life-threatening condition, yet no definitive cure has been established. As it is a rare genetic disorder, prenatal genetic testing in the form of CVS or amniocentesis to check for the mutation in ABCA 12 gene is the mainstay of diagnosis.

Quiz Held at Monthly Clinical Meeting

Niharika Guleria¹, Rekha Bharti²

¹Senior Resident, ²Professor, VMMC & Safdarjung Hospital

A quiz based on the May month Bulletin was held after the above presentations. The answers are highlighted in bold italic font.

Ques 1: Second stage arrest is diagnosed after at least 2 hours of pushing in nulliparous women

- a. True b. **False**

Ques 2: Suspicious and pathological tracings have a limited capacity to predict low APGAR score

- a. **True** b. False

Ques 3: Patient Controlled Intravenous Analgesia is programmed dose of IV medication

- a. **Self administrated with lockout intervals between doses**
b. Self administrated without lockout intervals between doses

- c. Administrated by nurse with lockout intervals between doses
d. Administrated by nurse without lockout intervals between doses

Ques 4: When oxytocin is used for induction of labour, the target is to achieve

- a. Strong uterine contractions every 2-3 minutes
b. Uterine activity of 200-250 Montevideo units
c. **a & b**
d. None of the above

Ques 5: Shock index is calculated by dividing

- a. Heart rate divided by diastolic blood pressure
b. Diastolic blood pressure divided by heart rate
c. **Heart rate divided by systolic blood pressure**
d. Systolic blood pressure divided by heart rate

Winners of the Monthly Clinical Meeting Quiz, May Issue 2021



Dr Priyanka Chauhan

3rd year Junior Resident from
Shri Ram Murti Medical
College, IMS, Bareilly

2nd Position



Dr Neha Katare

SR, Gajra Raja Medical College
& Kamla Raja Hospital,
Gwalior, Madhya Pradesh

1st Position



Dr Shakti Sharma

Gynaecologist, Germany

3rd Position

The Winner of May Month Crossword and Pictorial Quiz is **Dr Ruchi Hooda**.

Annexure: Management of COVID-19 in Pregnancy

Safe Motherhood and QI Committee, AOGD

COVID-19 pandemic is one the biggest public health emergencies for mankind. Pregnant women are a special and vulnerable group of population. Pregnancy does not seem to increase the risk of acquiring the infection, but the clinical course of infection does appear to be worse in pregnant women as compared to age matched non-pregnant women. There is an increased risk of complications leading to severe maternal morbidity and mortality and neonatal complications too.

Outline

1. Identification of symptoms of COVID-19 and classification of disease severity in pregnancy
 - Common symptoms
 - Classification of disease severity in pregnancy
2. Management of confirmed cases: Asymptomatic/ Mild disease
 - Tips for home isolation
 - When to consider inpatient management?
 - Antenatal contact after recovery from illness
3. Management of confirmed cases: Moderate and Severe disease
 - Place of admission Oxygen bed in ward/HDU
 - Role of inflammatory markers and imaging
 - Drug therapy
4. Management of Critically ill patients and those with refractory hypoxemia
 - Indications for admission/transfer to ICU
 - Indications for intubation
 - Indications for delivery
5. Intrapartum care
 - Mode of delivery
 - Timing of delivery
6. Postpartum care

1. Identification of symptoms of COVID-19 and classification of disease severity in pregnancy

I. Common symptoms: Flu-like symptoms/ fever/cough/myalgia/ anosmia/ shortness of breath

II. Classification of disease severity in pregnancy:

Asymptomatic: No symptoms, tested positive on screening.

Mild disease: Flu-like symptoms, such as fever, cough, myalgias, and anosmia without dyspnoea, shortness of breath.

Moderate disease: Lower respiratory tract disease with evidence of dyspnoea, pneumonia on imaging, abnormal blood gas analysis, refractory fever of 39.0 °C /102.2 °F or greater not relieved with paracetamol while maintaining oxygen saturation of greater than or equal to 94% on room air.

Severe disease: Respiratory rate greater than 30 breaths per minute (bpm), oxygen saturation less than 94%, greater than 50% lung involvement on imaging.

Critical disease: Multi-organ failure or dysfunction, shock, respiratory failure requiring mechanical ventilation.

Refractory hypoxemia: Persistent, inadequate oxygenation and/or ventilation despite substantial and appropriate measures to optimize it. (PaO₂ < 70 mm Hg or PaO₂/FiO₂ < 150 mm Hg)

2. Management of confirmed cases: Asymptomatic/ Mild disease

Majority of pregnant women with COVID-19 infection have no or only mild symptoms. To decide for inpatient versus outpatient management, various co-morbidities such as hypertension, diabetes, asthma, HIV, heart disease, chronic liver, kidney or lung disease, blood dyscrasia, patients on immunosuppressive medications need to be assessed along with assessment of any obstetric complications or high-risk factors. If none are present, outpatient care with a 14-day quarantine is considered optimal. There is no need for any test for inflammatory markers or chest imaging (Xray chest) or CT scan.

I. Tips for home isolation:

- a. *Place of stay:*
 - Isolate
 - Well-ventilated room with cross ventilation
 - Do not share personal items with other people in the household.
 - Ensure cleaning of surfaces in the room that are touched often with 1% hypochlorite solution.
- b. *Respiratory and hand hygiene:*
 - Use triple layer medical mask.
 - Discard mask after 8 hours of use or earlier if wet Respiratory etiquettes always.
 - Frequent hand washing with soap and water for at least 40 seconds or clean with alcohol-based sanitizer.
- c. *Medications and other interventions:*
 - Take rest, maintain hydration, and have a balanced diet.
 - Rest in prone/lateral position
 - Symptomatic treatment for fever, running nose and cough.
 - Warm water gargles or take steam inhalation twice a day.
 - If fever not controlled with a maximum dose of Tab. Paracetamol 650 mg four times a day, consider other drugs like NSAIDs (Tab. Naproxen 250 mg twice a day).
 - Drugs that have no role and are contraindicated in pregnancy- Ivermectin and Doxycycline.
- d. *Self-monitoring 4 hourly using thermometer and pulse oximeter. Record on a chart*
 - Temperature
 - Heart rate
 - SpO₂

II. When to consider inpatient management?

- a. *High risk patients*
 1. Uncontrolled HTN
 2. Inadequately controlled gestational/ pregestational Diabetes Mellitus
 3. Chronic kidney disease
 4. Chronic cardiopulmonary disease
 5. Malignancy
 6. Immunosuppressive states

- b. *Inability to isolate at home*
- c. *Any concern regarding well-being of self or fetus*
- d. *Danger signs during home isolation*
 1. < 95% O₂ saturation either at rest or exertion
 2. RR > 20 bpm; worsening shortness of breath
 3. Unremitting fever(>39°C) despite antipyretics
 4. Inability to tolerate oral hydration
 5. Persistent pleuritic chest pain
 6. New onset confusion or lethargy
 7. Cyanotic lips/face or finger tips
 8. Obstetric complications

III. Antenatal contact after recovery from illness

- a. Recovery from infection in first trimester: Consider detailed mid-trimester anatomy ultrasound examination.
- b. Recovery from infection in latter half of pregnancy: Consider sonographic assessment of fetal growth 2 weeks after infection

3. Management of confirmed cases: Moderate and Severe disease

These patients need inpatient management and multidisciplinary care with specialists from infectious disease and critical care. The place of care is decided based on the condition of the patient and severity of illness

I. Monitor the trends of inflammatory markers and perform relevant imaging

- CBC Absolute lymphocyte count, KFT/LFT: 24-48 hours
- CRP, ESR, Procalcitonin, IL-6, LDH, Ferritin & D-dimer: 48-72 hours
- Role of CT scan:
 - Only recommended for hospitalized patients when benefits outweigh the risks with abdominal shield

II. Drug therapy

1. Oxygen therapy
Target SPO₂ ≥ 95%
Non-rebreather Mask (NRBM)/ venturi masks/nasal cannula can be used
HFNC (High flow nasal cannula)- if SpO₂ not maintained

2. Inhalational Budesonide (with spacers): 800 mcg BD inhalation for 5-7 days if required
3. Steroids: Inj. Methylprednisolone 0.5 to 1 mg/kg in 2 divided doses for 5-10 days

Indications:

- Moderate to severe rise in RR or a fall in SpO_2 even without pneumonia (Consult Physician)
- Bronchopneumonia
- Marked rise in pro inflammatory markers with symptoms

- **If steroids are needed for fetal lung maturity, usual dose of dexamethasone is given.** This can be followed by Methylprednisolone or dexamethasone to complete the usual course of treatment for COVID

- **Prednisolone is preferred as it does not cross the placenta**

4. Antibiotics: In cases of bacterial pneumonia
5. Anticoagulation:

Thromboembolic risk assessment should be done for all pregnant women who have COVID

Low molecular weight heparin (LMWH) is given in a prophylactic dose if patient is hospitalised for COVID infection.

Weight	Enoxparin	Dalteparin	Tinzaparin (75 u/kg/day)
< 50 kg	20 mg daily	2500 units daily	3500 units daily
50-90 kg	40 mg daily	5000 units daily	4500 units daily
91-130 kg	60 mg daily	7500 units daily	7000 units daily*
131-170 kg	80 mg daily	10,000 units daily	9000 units daily*
> 170 kg	0.6 mg/kg/day*	75 u/kg/day	75 u/kg/day*
High prophylactic dose for women weighing 50-90 kg	40 mg 12 hourly	5000 units 12 hourly	4500 units 12 hourly

In moderate to severe infection, LMWH is administered in a therapeutic dose (twice daily).

No thromboprophylaxis indicated for low risk asymptomatic or pregnant women with mild disease if admitted for obstetrical indications like labour, PROM etc

- Antepartum: Continue thromboprophylaxis

for 10 days after hospital discharge, longer duration if persistent morbidity

- Postpartum: If had a CS and immobilization, stop when patient planned for home isolation at discharge

6. Remdesivir: May be considered only in patients with

- Moderate to severe COVID
- Within 10 days of symptoms
- Renal/ hepatic functions should be normal
- 200 mg IV on day 1 followed by 100 mg IV OD for next 4 days
- No known fetal toxicity with its use

7. Tocilizumab:

- Very limited use when benefits more than risks
- Preferably within 24-48 hours of onset of severe disease/ICU admission
- CRP &/or IL-6 very high
- Patient not improving despite steroids
- No active bacterial/fungal/tubercular infection in patient

4. Management of Critically ill patients and those with refractory hypoxemia

I. Indications for admission to ICU:

- Inability to maintain $\text{sPO}_2 \geq 95\%$ with supplemental oxygen/rapidly escalating supplemental oxygen need
- Hypotension (MAP < 65mmHg) despite fluid resuscitation
- Evidence of new end-organ dysfunction (altered mental status, renal insufficiency, hepatic insufficiency, cardiac dysfunction, etc)

II. Indications for intubation:

- When oxygen requirements for a target of >95% are:
 - 15 L per minute (by common nasal cannula or mask)
 - > 40 to 50 L per minute (by HFNC)
 - > 60% FiO_2 (by Venturi mask)
- Inability of a patient to protect the airway due to altered mental status (GCS < 8)

III. Indications for delivery:

- It is unclear whether delivery provides a substantial improvement in each of these cases.

- Individualise each case, final decision based on condition of mother and viability of fetus as mechanical ventilation alone is not an indication for delivery.

5. Intrapartum care

I. Mode of delivery:

Indications for Caesarean delivery:

COVID infection is not an indication for caesarean delivery apart from routine obstetric indications.

- CS indicated for:
 - Standard obstetric indications
 - In women with severe disease or critically ill in refractory hypoxaemia

II. Timing of delivery:

Termination of pregnancy by planned induction will be based on period of gestation, indication for termination of pregnancy and severity of disease.

- 37- 38 6/7weeks:
 - Check indication for termination of pregnancy
 - If indication present: Termination of pregnancy can be done.
 - If no indication to terminate pregnancy continue antenatal care
- ≥ 39 weeks:
 - Assess severity of disease
 - If asymptomatic/ mild disease: Termination of pregnancy as per local protocol
 - Moderate disease: Individualize decision balancing the urgency of termination of pregnancy with maternal condition
 - If severe disease:
 - Multidisciplinary approach to stabilize patient first
 - Plan termination of pregnancy after initial stabilization
 - Delivery may be considered if it allows for further optimization of care

Stop anticoagulants if patient goes in labour or induction is planned. LMWH at least 24 hours and UFH 6 hours before the procedure. In women with moderate to severe disease and near term it is preferable to start the patient on UFH rather than LMWH due to short half life of UFH.

III. Pain Management in labour

Epidural analgesia:

- Can be given
- Not given in patients with thrombocytopenia or on anticoagulants

Pudendal Block: Can be given

IV. Birth Companion

There are no clear guidelines on allowing birth companion. It will depend upon the type of facility. The birth companion should be allowed according to GOI guidelines and should be tested negative and the same person should remain with the parturient throughout labor and immediate postpartum period.

6. Postpartum care

- I. Maintain hydration, ensure ambulation and a balanced diet
- II. Screen for any mental health issues using standard validated scales like PHQ , PHQ 9

III. Rooming In:

Rooming in unless baby or mother sick.

Baby can be kept at 6ft distance with caregiver when not feeding.

IV. Breastfeeding:

Breast feeding can be done by mother with the following precautions:

- Mother to wear a N 95 mask
- Observe hand hygiene
- Observe respiratory etiquettes
- Those who can not breast feed as either the baby or the mother is unwell the baby can be fed by expressed breast milk. However care is taken to keep a separate breast pump for a COVID positive woman to prevent spread of infection.

These precautions should be taken till:

- After 10 days of positive RTPCR report in asymptomatic mothers
- In symptomatic mothers 10 days after appearance of first symptoms (up to 20 days if they have more severe to critical illness or are severely immunocompromised) and at least 3 days of afebrile period without the use of antipyretics

Note: DO NOT COVER THE NOSE AND MOUTH OF THE BABY WITH MASK

V. **Timing of discharge:** Depends upon need for monitoring and hospital care and availability of home isolation facilities.

1. Mild disease/Asymptomatic patients:
 - After 24-48 hours of NVD
 - D3-D4 of CS
2. Moderate to severe disease
 - Symptoms have improved
 - 10 days after appearance of first symptoms (up to 20 days if they have more severe to critical illness or are severely immunocompromised)
 - At least 3 days of afebrile period without the use of antipyretics

VI. Counselling and advise at discharge

- Explain danger signs related to postnatal issues and COVID.
- Observe all COVID appropriate precautions. at home.
- Teleconsultation numbers can be provided.
- Routine postnatal advice including iron and calcium supplementation, perineal care, diet, general hygiene etc is given.
- Contraception counseling is done and a shared decision on the accepted method is taken and method specific counseling provided.

Suggested Reading

1. RCOG guidelines. Coronavirus (COVID-19) Infection in Pregnancy. Available from. <https://www.rcog.org.uk/globalassets/documents/guidelines/2021-02-19-coronavirus-covid-19-infection-in-pregnancy-v13.pdf>
2. Clinical Management Protocol: COVID-19. [https://www.moh.gov.in/pdf/Clinical Management Protocol for COVID 19.pdf](https://www.moh.gov.in/pdf/Clinical%20Management%20Protocol%20for%20COVID%2019.pdf).
3. WHO. Clinical management of severe acute respiratory infection when COVID-19 is suspected: interim guidance; 25 Jan 2021. Available from: [https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected)
4. RCOG. Coronavirus (COVID-19) Infection in Pregnancy: Information for healthcare professionals Version 6; 3 April 2020 [July 2020]. Available from: <http://www.rcog.org.uk/globalassets/documents/guidelines/2020-07-24-coronavirus-covid-19-infection-pregnancy.pdf>
5. SMFM. Coronavirus (COVID-19) and Pregnancy: What Maternal-Fetal Medicine Subspecialists Need to Know; 2021. Available from: [http://s3.amazonaws.com/cdn.smfm.org/media/2734/SMFM_COVID Management of COVID pos preg patients 2-2-21 \(final\).pdf](http://s3.amazonaws.com/cdn.smfm.org/media/2734/SMFM_COVID_Management_of_COVID_pos_preg_patients_2-2-21_(final).pdf)
6. FOGSI GCPR. Good Clinical Practice recommendation on pregnancy with COVID-19 infection; Version 1; 28 March 2020 [cited 08 April 2020]. Available from: [https://www.fogsi.org/wp-content/uploads/covid19/fogsi_gcpr on pregnancy with COVID 19 version 1.pdf](https://www.fogsi.org/wp-content/uploads/covid19/fogsi_gcpr_on_pregnancy_with_COVID_19_version_1.pdf)
7. RANZCOG. COVID-19 statement; 2020 [Cited 08 April 2020]. Available from: <https://ranzcog.edu.au/statements-guidelines/covid-19-statement>



In pandemic/natural calamity etc..reproductive health services are one of the first which need to be restored and continued unhindered



And here is the opportunity

World Population Day Campaign 2021

आपदा में भी परिवार नियोजन की तैयारी,
सक्षम राष्ट्र और परिवार की पूरी जिम्मेदारी
Provision of family planning services even in a crisis,
for a self reliant nation and family

Mobilization Fortnight
27 Jun - 10 Jul
WPD 11 JULY 2021
Population Stabilisation Fortnight
11 Jul - 24 Jul

Call For Action



Revitalize
Family Planning
Services
Satisfy
acceptors
Generate
Demand
for Family Planning

OUR PLEDGE:
WE OWN THE
RESPONSIBILITY
OF RENDERING
FAMILY PLANNING
SERVICES

OUR COMMITMENT:
FREE COUNSELING/TELE
COUNSELING SERVICES
DURING THE CAMPAIGN

Let us Encourage :

- Counseling of eligible couples on various modern methods of contraception
- Promote SARC and LARC for needy couples
- Eligible Couples with limiting need of contraception to prefer NSV over Female Sterilization
- Intensive information education and communication(IEC activities)



Directorate of Family Welfare e-mail : dirdfw@nic.in, spofpdfw3@gmail.com

दिल्ली सरकार
स्वास्थ्य की सदैव

Block your dates for 43rd Annual Conference 2021 to be held on 20th - 21st November, 2021

Calendar of Virtual Monthly Clinical Meetings 2021-22

28 th May, 2021	B L Kapoor Hospital
25 th June, 2021	All India Institute of Medical Sciences
30 th July, 2021	Sitaram Bhartia Hospital
27 th August, 2021	Army Hospital (Research & Referral)
24 th September, 2021	Deen Dayal Upadhyay Hospital
29 th October, 2021	PGIMSR & ESI Hospital
21 st - 23 rd November, 2021	43 rd Annual Conference
26 th November, 2021	MAMC & Lok Nayak Jai Prakash Narayan Hospital
31 st December, 2021	Sir Ganga Ram Hospital
28 th January, 2022	ABVIMS & Dr Ram Manohar Lohia Hospital
25 th February, 2022	UCMS & Guru Tek Bahadur Hospital
25 th March, 2022	VMMC & Safdarjung Hospital
29 th April, 2022	LHMC & Smt. Sucheta Kriplani Hospital
27 th May, 2022	Apollo Hospital

In Pregnancy & 4th trimester
Recommend **Macprot**
POWDER

Fulfills dream of healthy baby

In Preterm Labour & BOH[#] Patients
Rx **Macgest SR**
Natural Micronized Progesterone Sustained Release Tablets 200/300 mg

Advanced Progesterone

In LPD, TM, RPL, PTL*
Rx **Macgest** 100mg
Natural Micronized Progesterone Soft Gelatin Capsules 200mg

Her companion for 9 months...

In High Risk Pregnancy & Pre-conception
Recommend

Macfolate *Active*

Quatrefolic equivalent to Folate 500 mcg + Vit B₆ 2.5 mg + Vitamin B₁₂ 1.2 mcg, Softgel Capsules

The innov**ACTIVE** folate!

[#]BOH: Bad Obstetric History

*LPD: Luteal Phase Defect, TM: Threatened Miscarriage, RPL: Recurrent Pregnancy Loss, PTL: Preterm Labor

MACLEODS

MACLEODS PHARMACEUTICALS LTD.,
Atlanta Arcade, Marol Church Road, Andheri (E), Mumbai - 400 059.

Osteva
A Division of Macleods

For the use of Registered Medical Practitioner or Hospital or Laboratory only .



CELEBRATING THE STRENGTH OF EVERY WOMAN

To ensure her life
isn't disrupted
despite of Thyroid
disorders

To ensure she
continues to
perform miracles.

To ensure that she
emerges triumphant,
every single time



ELTROXIN

Thyroxine Sodium 25/50/75/88/100/125 mcg
Championing women - since 1950

Supports her in managing hypothyroidism



Easily absorbed

Supports her with strong bones

CEFTUM

Cefuroxime Axetil Tablets 125, 250, 500mg
EXPERT'S CHOICE

Supports her to fight infections

For the use only of Registered Medical Practitioners or a hospital or laboratory.

Refer to full prescribing information before prescribing. Registered medical practitioners can refer company website

<http://india-pharma.gsk.com/en-in/products/prescribing-information/> for full Product Information. Please report adverse events with any GSK product to the company at india.pharmacovigilance@gsk.com
PM-IN-CCC-ADVR-210001 Date of preparation March 2021

With Best Compliments

Naari CalTM

Calcium Citrate Malate 1000mg + Vitamin D3 100 I.U. + Folic Acid 50mcg Tablets

Calcium for today's NAARI

LycoRed[®] 
Preg

Sachet

L-arginine 3g + Lycopene 4mg + DHA 200mg

Improve Uteroplacental Blood Flow

For dysmenorrhoea pain

Algos SpasTM

Drotaverine HCl 80mg + Mefenamic Acid 250mg Tablets

Assured way to relieve dysmenorrhoea

LycoRed[®]
Cell Protector

Essential For Growing Fetus

EndoReg[®] 
Dienogest Tablet 2 mg

Endometriosis regression at its best

Maintane[®] 
INJECTION 17 α - Hydroxyprogesterone caproate

Nourish the dream of Motherhood

Cystelia-M[®]

Myo-Inositol 1.1 gm, D-Chiro-Inositol 27.6 mg (40:1),
L-methylfolate 1 mg, Vitamin D3-1000 IU Tablet

Comprehensive treatment for PCOS

JPTone
S Y R U P

Supports Pregnancy Restores Vitality

For uterine fibroids

 **Fibrystone**TM 25
Mifepristone 25 mg Tablet

Tones down fibroid

CycloReg[®]
TABLET Norethisterone 5mg

Control Bleeding, Regulate Cycles

NAARI
A division of JAGSONPAL



JAGSONPAL PHARMACEUTICALS LIMITED
T-210 J, Shahpur Jat, New Delhi - 110 049