

**FOGSI FOCUS**

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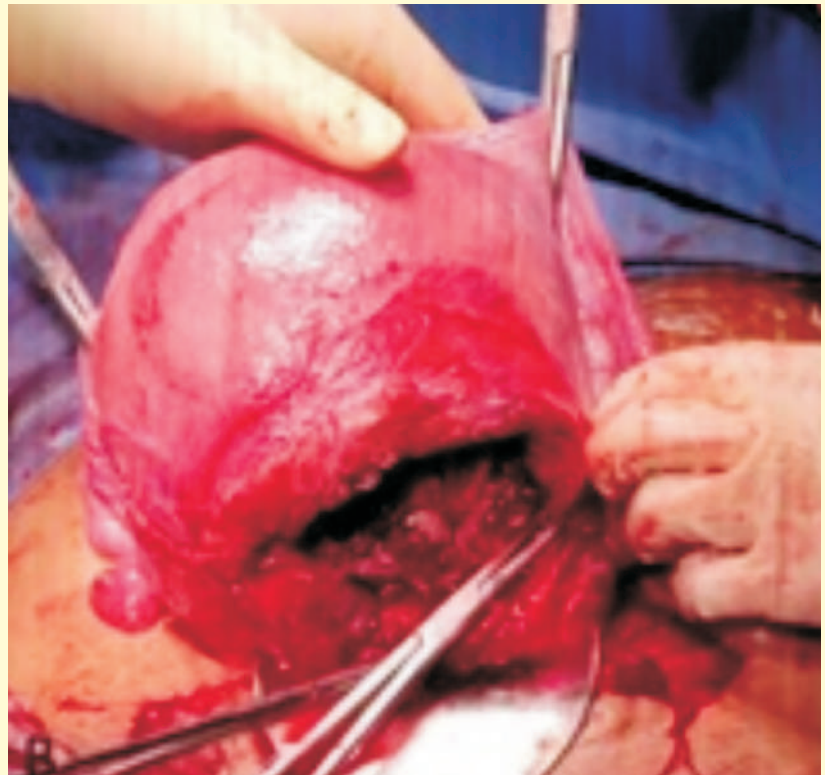


# Life Saving Emergency Obstetric Surgeries

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**Dr. Hrishikesh D. Pai**

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**Dr. Mitra Saxena**  
**Dr. Hrishikesh D. Pai**  
**Dr. Suvarna Khadilkar**  
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# Life Saving Emergency Obstetric Surgeries



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He was the Past Secretary General of FOGSI; Past President of Indian Society of Assisted Reproduction:

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Past Senior Vice President of FOGSI;

Past President : Indian Association of Gynaecological Endoscopists(IAGE); and Mumbai Obstetric and Gynecological Society (MOGS).

He has been practicing IVF since the last 30 years and is a pioneer in bringing the latest technology in IVF to our country.



### Dr. Mitra Saxena

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Dr Mitra Saxena is a Senior Consultant & Director of Shri Ashwini Saxena Hospital, Rewari.

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respected mentor and a Quality Champion



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# FOGSI FOCUS

## Life Saving Emergency Obstetric Surgeries



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# Message



**Dr. Hrishikesh D. Pai**  
Fogsi President 2022-2023

## From President's Desk

It gives me immense pleasure to introduce to our FOGSI colleagues, the FOGSI FOCUS “Life Saving Emergency Obstetric Surgeries” by Dr. Mitra Saxena, Chairperson Practical Obstetrics Committee and her committed team.

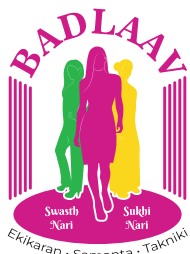
Obstetrics as a specialty requires knowledge, skill, quick reflexes and an aptitude of humility since obstetricians are involved in the care of two patients (mother and child). It then becomes a responsibility of each and every obstetrician to practice safely as well be aware of all the recent advances in the field so that their patients can benefit.

This book has a practical and a step-by-step approach to management of obstetric emergencies. The reader will definitely benefit from the combined experiences of the authors.

The authors have included very important and relevant topics of tackling hemorrhage, tears, rupture of uterus, internal iliac artery ligation and the approach to obstetric peripartum hysterectomy (hopefully in an extremely rare situation!). The authors have also touched upon the injuries to neighboring structures such as bladder, bowel, fallopian tube and ovary.

This then is a comprehensive text which I hope will be of great value to all the practicing obstetricians and it will find its rightful place in their offices and their labor rooms.

This year my FOGSI slogan is Swasthya Nari, Sukhi Nari. My CSR activity is defined as Badlaav (Change) including three arms- Ekikaran (integration of thought and action), Samanta (equality of treatment irrespective of economic status) and Takniki (technology to achieve these objectives). I would like to request you all to join forces and become a volunteer for our Badlaav initiative by conducting free gynecology checkups in your clinics on 18th of every month.



With sincerest warm wishes and congratulations

**Dr. Hrishikesh D. Pai**

MBBS MD FCPS FICOG FRCOG (UK) MSc (USA)

MBBS & MD - Obstetrics & Gynecology

Seth G. S. Medical College & KEM Hospital

President FOGSI 2022 -23

Federation of Obstetricians & Gynecologists of India



# Message



**Dr. Madhuri Patel**

Sec Gen FOGSI  
2022-2023

Dear FOGSIans,

“Prediction and Prevention is the Mantra for Safe Obstetrics.”

Despite following all guidelines and protocols, Labour and a Labouring women do not always behave in a predictable way and infrequently an Obstetrician may find herself/himself in a distressing situation of "Between devil and the deep sea."

This FOGSI FOCUS is dedicated to compiling all the "Emergency Obstetric surgeries, strategies, which may be done in ANY order as per need of the case .

Beautiful high density images, self explanatory line diagrams, easy to understand and follow, self practice tips are shared by all the eminent contributors to this focus .

It is hoped that all our fellow FOGSIans shall find this volume extremely useful and it will find its place of importance on their desks and in OT.

Warm and Personal Regards

**Dr. Madhuri Patel**  
Secretary General  
FOGSI



# Message



**Dr. Alka Pandey**  
Vice-President FOGSI  
2022-2023

## From Vice – President's Desk

There are many obstetric emergencies such as bleeding per vaginum due to incomplete abortion, molar pregnancy, ectopic pregnancy, accidental haemorrhage, placenta previa, placenta accreta syndrome, rupture uterus, inversion of uterus, retained placenta etc. Timely intervention in the form of fluid, blood and blood components, oxytocics, antibiotic and operative interventions can save many lives.

Obstetricians must know and be well versed with what to do, when to do and how to do and be familiar with obstetric procedures.

I congratulate Dr Mitra Saxena for choosing this topic “Life Saving Emergency Obstetric Surgeries” for FOGSI Focus and I hope the readers will find it useful. Dr Mitra Saxena under the guidance of FOGSI President Dr. H. D. Pai is toiling hard in imparting skills by doing live workshops on life saving obstetrical operations. I wish all the best to her.

**Dr. Alka Pandey**  
Vice-President  
FOGSI





# Preface

*The winds and the waves are always on the side of the ablest navigators.* — Edward Gibbon

*Obstetrics is the most satisfying as well as challenging discipline .*

This FOGSI Focus has been written with the aim of compiling all possible life threatening obstetric surgical conditions in one volume, for the benefit of our fellow practising obstetricians.

We compare enjoying the fruits of a normal labour and then unexpectedly dealing with a near miss maternal condition in a few minutes, to the state of a surfer enjoying his rides when caught unaware of a giant rough wave which may engulf and knock him off board.

Our goal is to allow easy to comprehend flow of topics with emphasis on the anatomy, preoperative considerations, steps of surgery, instrumentation, documentation, along with illustrations and actual pictures of surgical steps wherever possible. We have included the whole spectrum of conditions from common ones like cervical tear and vulvovaginal haematomas to rare ones like inversion uterus and injuries to neighbours. Practical tips have been summarised at the end of each chapter.

Topics related to traumatic postpartum haemorrhage, cervical tears, vaginal tears, hematomas have been included to alert the reader of these injuries as they may become dangerous and cause a sudden and unexpected deterioration of patient's condition.

The topic of “Injuries to neighbours” is the most neglected area although of utmost importance for our patients due to related morbidity. Most injuries to bladder, ureter, bowel, fallopian tube, and ovaries do not occur during straightforward obstetrical surgeries @ lower segment caesarean section, obstetric hysterectomy. These injuries usually happen when situation is compounded with placenta accreta syndrome, ongoing postpartum haemorrhage, coagulopathy, anaemia, adhesions and repeat caesarean sections.

We feel it is crucial to be mindful, anticipate, detect these complications, and manage them timely to decrease maternal morbidity and mortality.

We are grateful to all our colleagues who have contributed clinical knowledge and their vast experience to this book. This has truly enriched our book.

Special acknowledgement to Dr. Geetha Devi Kantamneni, who has very willingly and enthusiastically contributed line-coloured diagrams in all chapters.

We are indebted to Editor in Chief, dynamic President FOGSI Dr Hrishikesh Pai for reposing his faith in us.

At the end, we hope our fellow FOGSIans, practising obstetricians will find this book indispensable in their daily practice. We hope that each one of us stays aboard and enjoys riding the waves like an experienced surfer. After all there is no match to the exhilarating feeling of navigating a rough wave easily ....

With regards and best wishes

Dr. Mitra Saxena

Dr. Manju Puri



# Foreword



**Dr. V.P. Paily**

Senior Consultant and HOD  
Rajagiri Hospital, Aluva (Kerala)

## Life-Saving Emergency Obstetric Surgeries

The editors, Mitra Saxena and Manju Puri, have to be congratulated along with the FOGSI team for focusing on Emergency Obstetric Surgeries as a step towards saving maternal lives. Most of the emphasis in this “focus” is on tackling haemorrhage, and that is rightly so. Haemorrhage still remains the leading cause of maternal death, either directly as in Post-Partum Haemorrhage (PPH) or indirectly as in cases of Amniotic Fluid Embolism or Severe Sepsis where Disseminated Intravascular Coagulation (DIC) develops and leads to death. Active management of third-stage of labour (AMTSL) is the first step to prevent PPH. However, once excess haemorrhage has set in, surgical steps will be essential. The editors have compiled a list of conditions wherein recourse to surgical steps will be life-saving. These include steps to arrest bleeding from an atonic uterus or various tears in the genital tract. They have rightly included the Placenta Accreta Spectrum (PAS) disorders where proper steps to arrest the bleeding before tackling the abnormally invading placenta (PAS) is critical in saving lives. Fortunately, we have developed an affordable clamp (Common Iliac Artery/Aorta Clamp) which has helped in saving many mothers with PAS. The devices like suction cannula (by Samartha Ram) to bring about vacuum retraction of an atonic uterus and the transvaginal and transabdominal uterine artery clamps (TVUAC or TAUAC by Paily) have to be employed promptly if excessive bleeding is noted in spite of resorting to AMTSL. It can be debated whether they belong to the group of surgeries but as procedures helping to stop bleeding promptly, they have to be considered in this context. These devices have taken away the need for various surgical steps like stepwise devascularization, compression sutures, and internal iliac artery ligation. The relevance for internal iliac artery ligation has totally changed in our practice. It is now employed in managing various types of traumatic PPH including extensive vaginal and perineal lacerations, but not atonic PPH.

This volume of focus has chapters on topics like rupture uterus and inversion of uterus, relatively rare events in modern obstetric practice. For the same reason, this will act as a reference book for the practicing obstetricians faced with such rare events.

It is interesting that editors have included a chapter on injuries to the “neighbors.” Ureter and bladder of course bear the brunt in the majority of situations in this category, but the pelvic veins should not be forgotten.

I hope the reader will find this focus a very useful handbook when faced with life-threatening obstetric emergencies.

**Dr. V. P. Paily**

Senior Consultant and HOD,  
Rajagiri Hospital, Aluva, Kerala  
And State Coordinator,  
Confidential Review of Maternal Deaths, Kerala



# Acknowledgement

Dedicated to my Parents



**Dr. S.N. Saxena & Dr. Tara Saxena**

Dr. Tara Saxena the first lady doctor of South Haryana who is an inspiration and role model for me and all who know her first hand..!

First and Foremost thanks to God for always holding me.

I would like to express my sincere gratitude to my advisor, mentor Dr Hrishikesh Pai our FOGSI President & Chief Series Editor, a man with ideal mix of vision, enthusiasm, dynamism in ensuring that this FOGSI FOCUS on “**Life Saving Emergency Obstetric Surgeries**” be completed on time, his constant encouragement and useful inputs have been value addition.

It has been a pleasant learning experience to connect & communicate with my Editors Dr Suvarna Khadilkar, Dr Alka Pandey, Dr Manju Puri & co-editors Dr Anu Chawla & Dr Indranil Dutta, sweet natured Dr Manisha Takhtani (Joint Secretary, FOGSI) Dr Manju Puri an eminent teacher and also active contributor to articles in this volume has held my hand and guided me through out.

To all our contributors who are sincere, experienced, knowledgeable obstetricians from all over the country who met with our deadlines and cooperated unquestionably, I am truly indebted. I hope they have enjoyed this assignment as much as I have .

Dr Geetha Devi from Vijaywada deserves special mention for making coloured diagrams for many of the chapters. Dr Renu Yadav and Dr Ravina Yadav have also helped in this enjoyable job of drawing, colouring with pencils and sketch pen. Thanks to Dr Ravina Yadav my SR for proof reading.

Deepak Bohra my silent, sincere secretary for typing, retyping and bearing with my mood swings.

Lalit Khanna Sparsh Computer Designers for helping me print and publish.

Last but not the least my family my best friend and husband Dr Adesh Saxena, my elder sister Professor Dr Chitra Prasad (Professor of Genetics and Metabolism at Western University, London Ontario, Canada) and children, Doctors Ashima, Akshay Agnihotri, Akshay Saxena, Anchal Dixit Saxena who have encouraged me in all my pursuits.

**Dr. Mitra Saxena**

Chairperson

Practical Obstetrics Committee

FOGSI



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2. Bowel
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**Dr. K. Geetha Devi**  
MD, FICOG  
Senior Consultant  
Aayush Hospitals, Vijaywada

## STEP WISE DEVASCULARIZATION OF UTERUS (UTERINE ARTERY LIGATION)

Step wise devascularization of uterus has a pivotal role in the management of post-partum hemorrhage and is proved to be safe, easy, fast, and effective procedure and all obstetricians must be well versed with it. The original case series of step wise devascularization of uterus on 103 patients with intractable PPH not responding to medical management was effective in all cases without the need for hysterectomy, leading some clinicians to propose that step wise devascularization should be the first -line conservative surgical treatment to control PPH<sup>1</sup>

### Indications :

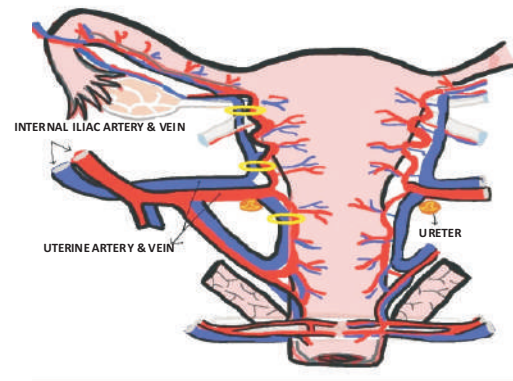
- ☞ Uterine atony: when medical and non-surgical approaches fail
- ☞ Bleeding from placenta previa/ accreta after delivery of the baby
- ☞ Uterine artery laceration or extension of uterine incision during cesarean section

### Mode of action:

Bilateral uterine artery ligation (both high and low) does not stop the blood flow to the uterus but lower the perfusion pressure to allow a clot to be formed and aids in myometrial contraction<sup>2</sup>.

### Surgical Anatomy:

Uterine artery arises from anterior division of internal iliac artery and runs inferomedial within the leaves of broad ligament and crosses the ureter, remembered by the phrase 'water' (ureter) under the 'bridge' (uterine artery) and reaches the cervix where it divides into an ascending branch and a descending branch. Ascending branch runs superiorly along the lateral border of uterus and gives off multiple small branches, entering the uterine wall and further divide into arcuate, radial, and spinal artery. At ovarian hilum, it divides into ovarian and tubal branches which anastomose with corresponding branches of ovarian artery which is a direct branch of aorta. Descending branch passes inferiorly towards vagina and anastomose with branches of vaginal artery and supplies the cervix and vagina.



**Fig 1: Surgical anatomy and sites of uterine artery ligation**

Step wise devascularization procedure :-

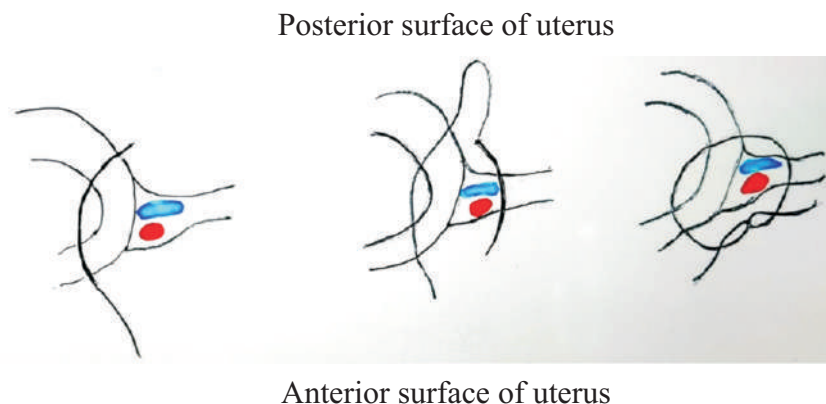
Includes successive ligation of

1. One uterine artery
2. Both uterine arteries
3. Low uterine arteries
4. One ovarian artery
5. Both ovarian arteries

There are two methods of ligating the uterine vessels.

1. Original O'Leary technique :

Deliver the uterus out of the abdomen and visualize/palpate the uterine vessels. No - 0 or No - 1 chromic catgut or polyglycolic acid or polyglactin suture is passed through myometrium 1-2 cm medial to uterine artery at a level where a transverse uterine incision is made during caesarean section, from anterior to posterior surface of uterus and the needle is then brought from posterior to anterior through an avascular area in the broad ligament and tied<sup>3</sup>

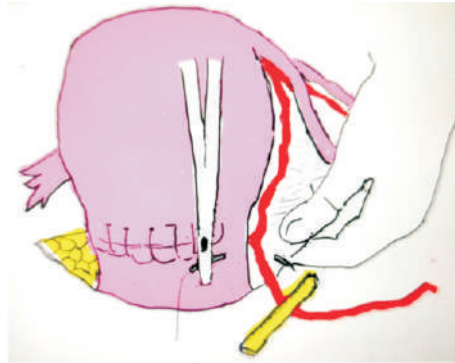


**Fig 2: O'Leary technique of uterine artery ligation**

High ligation or utero ovarian artery ligation is done by the same procedure 1cm below the insertion of ovarian ligament. Caution must be taken not to injure the tube. Low ligation of descending uterine branch to be done with the same technique after reflecting the bladder down and by staying close to the uterus and not to damage the ureter.

### 2. Alternative method

Instead of going from anterior to posterior myometrium, the needle passes medially from anterior surface of uterus through the myometrium directly into an avascular area in the broad ligament lateral to the vessels.



**Fig 3 : Direct method of uterine artery ligation**

#### Complications :

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>☞ Injury to vessels</li> <li>☞ Injury to ureters</li> </ul> | <ul style="list-style-type: none"> <li>☞ Broad ligament hematoma</li> <li>☞ Injury to the tube in case of high ligation</li> </ul> |
|--|--|

#### Tips and tricks:

- ☞ Stand on right side of patient and on right side of uterus enter anterior to posterior in the myometrium and pierce broad ligament under transillumination from posterior to anterior and ligate. On left side first go anterior to posterior in broad ligament and enter myometrium from posterior to anterior.
- ☞ Do the procedure early while managing PPH as it gives better results.
- ☞ Better not combine step wise devascularization procedure with compression sutures as chance of uterine ischemia is more<sup>1</sup>.

#### Conclusion

Compared to compression sutures, step wise devascularization is simple, rapid and easy to perform. Studies have not shown any negative effects of uterine artery ligation on ovarian reserve that is D3 FSH, AFC or AMH levels compared to controls and on ovarian blood supply<sup>2</sup>

#### References:

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**Pic. courtesy Dr. Geetha Devi**



**Dr. Kavita Mandrelle Bhatti**

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## UTERINE COMPRESSION SUTURES

Uterine compression sutures were first described by Christopher B Lynch in 1997. Since then, various other modifications have been described. The B- Lynch suture is also known as brace sutures as after its application it resembles the braces which are used to hold up the trousers of a man.

### Indications

Atonic PPH refractory to medical management.  
Placenta previa to control oozing from lower uterine segment.

### Mode of action

The blood flow to the uterus at term is 500-800 ml/min. After delivery of placenta the bleeding from the open sinuses at placental site is controlled by contraction of uterus. The interlacing myometrial fibres strangulate the sinuses. If the uterus fails to contract the woman can exsanguinate in 10 min. Hence the importance of keeping the walls of the uterus apposed to stop bleeding till uterus contracts. This is the principle of management of atonic PPH by applying brace sutures.

### Steps of surgery

- ★ B-Lynch sutures are applied in case of refractory uterine atony at caesarean section after medical management has failed to control the bleeding.<sup>1</sup>
- ★ The uterine cavity which has been opened during the caesarean section is kept open for application of B-Lynch sutures.
- ★ The uterus is exteriorised.
- ★ **Tamponade Test :** Apply manual compression to the uterus by placing one hand anterior and one hand posterior to the uterus. Check whether the bleeding is controlled by compressing the uterus between both hands. If bleeding is controlled proceed to the next step.
- ★ Pass a large round bodied needle with delayed absorbable suture such as vicryl no. 1 or chromic catgut no 2, approximately 3 cm below the lower flap of uterine incision and 3 cm from lateral uterine wall.
- ★ The suture should exit 3 cm above the upper flap of uterine incision.
- ★ The suture is looped over the uterine fundus to the posterior surface (back) of the uterus
- ★ Pass the suture from the posterior surface into the uterine cavity again at the same level as the pass in the anterior surface upper flap.
- ★ Take the suture within the uterine cavity horizontally to the other side of the uterus and bring it out on the posterior surface of uterus at the same level.
- ★ Next loop the suture over the uterine fundus and bring it anteriorly.
- ★ Pass the suture 3 cm from the edge of the upper uterine flap and 3-4 cm away from the lateral uterine wall into the uterine cavity at same level as the previous suture passed through upper edge.



- ★ Bring the suture out through a 3 cm below the lower edge of the uterine incision and 3 cm away from the lateral uterine wall. The exit point will be the same as the entry point of the first brace.
- ★ Free ends of the suture will be seen to lie anteriorly below the uterine incision.
- ★ Now tighten the suture progressively while the assistant manually compresses the uterus.
- ★ Tie the ends together and the knot comes to lie below the uterine incision anteriorly.
- ★ Close the uterine incision with a separate suture.

### B-Lynch Suture ( Figure1)

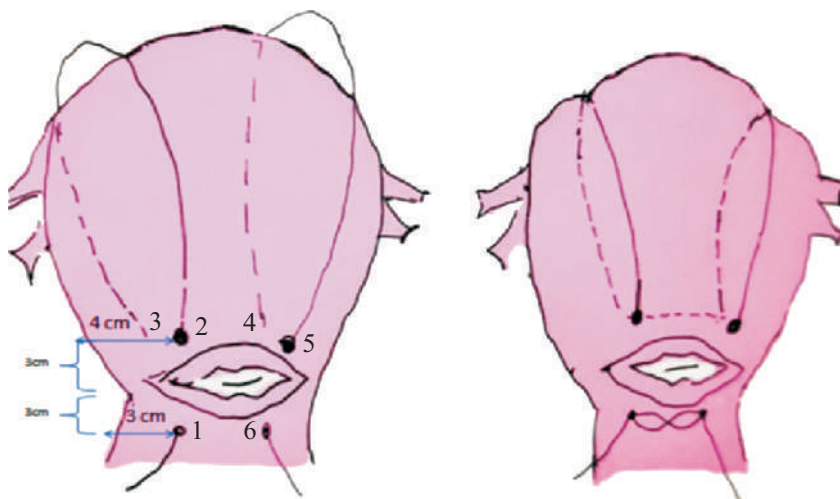


Figure 1: Entry and exit points on anterior and posterior surface of uterus

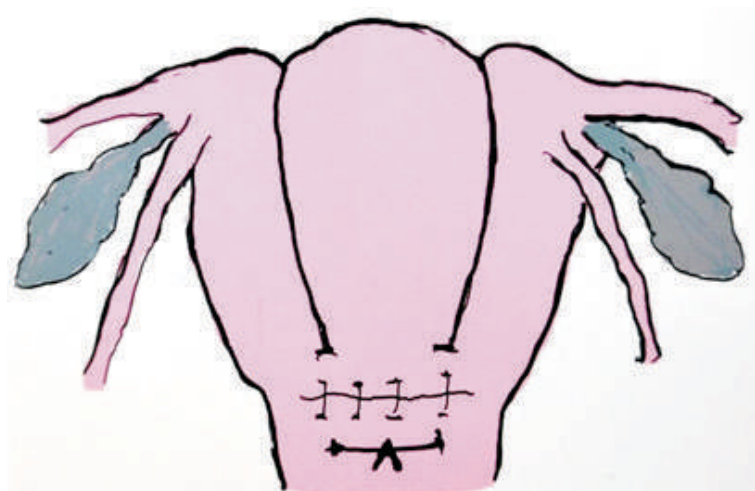


Figure 2: At Completion of B-Lynch Sutures

### Modifications of Brace compression sutures

#### Vertical Compression Sutures

Also known as Hayman sutures are compression sutures applied vertically approximately 2 to 4 in number depending upon the width of the of the uterus. (Figure 3)

It is a modification of the original brace suture. The advantage of Hayman compression suture is that it does not require uterine incision and an open uterine cavity. It is also much faster than the B-Lynch suture application.<sup>2</sup>

A No.1 absorbable suture is passed through the uterus from front to back using a straight needle. The suture is taken above the reflection of the bladder.

The suture is taken as a loop on each side of uterus to the fundus and held by assistant.

Take two to four sutures more in a similar manner with free ends at the uterine fundus.

The sutures are tied simultaneously while the assistant compresses the uterus with both hands. If the sutures are tied together, it will prevent the sutures from sliding down off the sides of the uterus.

The sutures are then tied horizontally together at the fundus to prevent sliding from the side.

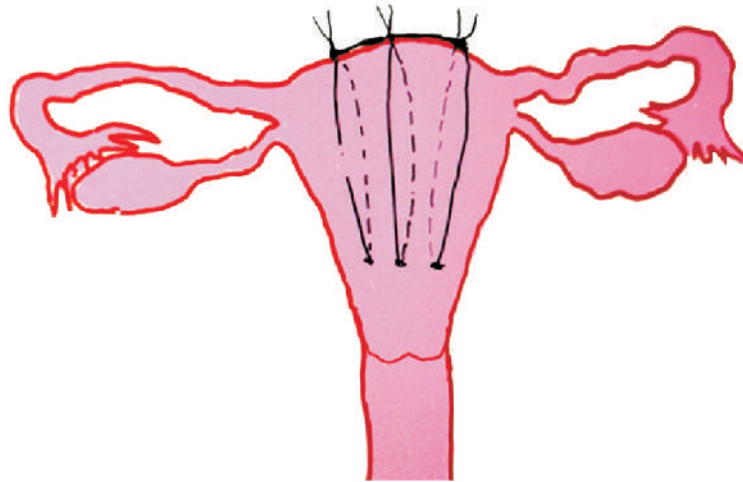


Figure 3: Hayman sutures

### Square Compression Sutures ( Figure 4)

Square compression sutures are also known as “Cho” sutures and as the name suggests, these are applied in square pattern through the anterior and posterior uterine wall to effectively control bleeding due to an atonic uterus.<sup>3</sup>

No.1 absorbable suture preferably on a straight needle is passed from anterior uterine wall to posterior uterine wall in a square configuration with approximately 3 cm spacing.

Tie the free ends of the suture while the assistant compresses the uterus.

Repeat the procedure at other sites. These are especially useful in women with oozing from lower uterine segment in placenta previa.

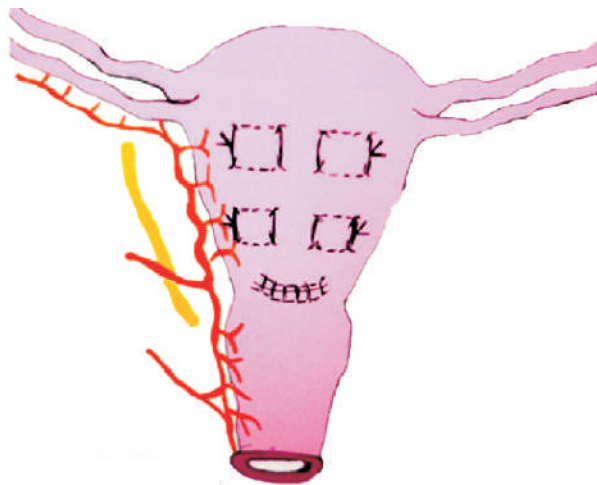


Figure 4: Square Compression sutures or Cho sutures



### Tips and Tricks

- ★ It is an effective procedure in women with atonic PPH at caesarean section.
- ★ It must be applied on time.
- ★ In Hayman's stitches it is important to pass all stitches and tie them together
- ★ Excessive tension is avoided while tying the stitches to prevent uterine ischaemia.
- ★ It is important to place horizontal stitch across vertical stitches to hold the braces in place.
- ★ In cases of Cho stitches in lower uterine segment, care should be taken to keep the internal os free for drainage of lochia.

### Complications

Complications are rare. These include

1. Uterine Ischemia
2. Hematometra or pyometra
3. Intrauterine synechiae
4. Uterine rupture in subsequent pregnancy

### Conclusion

Uterine compression sutures are useful in managing PPH due to uterine atony. B Lynch is the preferred suture for atonic PPH at caesarean section whereas Hayman's is a better option for atonic PPH after vaginal delivery. Cho sutures are suitable for bleeding from lower segment in Caesarean section for placenta praevia.

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3. Cho JH, Jun HS, Lee CN. Hemostatic suturing technique for uterine bleeding during caesarean delivery. *ObstetGynecol* 2000; 96:129.

Pic. courtesy Dr. Geetha Devi



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## ACUTE INVERSION OF UTERUS

### Introduction:

Uterine inversion is the invagination of the fundus of the uterus into the endometrial cavity turning the uterus partially or completely inside out.

It is a rare obstetric emergency. The incidence is 1 in 10,000 vaginal or caesarean births. It is associated with a maternal mortality rate of 15% in cases where it is not corrected rapidly.<sup>1,2</sup> More than 95% of inversions are puerperal. According to time of occurrence inversion can be acute that is within 24 hrs of birth, subacute that is more than 24 hrs but within 4 weeks of childbirth or chronic that is after more than 1 month postpartum. Majority of cases are acute.

The various risk factors predisposing to inversion during or after childbirth include :-

- ★ Short cord
- ★ Fundal attachment of placenta
- ★ Retained placenta
- ★ Adherent placenta
- ★ Use of uterine relaxants

However, it is precipitated by mismanagement of third stage of labor that is excessive cord traction or fundal pressure on a relaxed uterus.

### Diagnosis

It presents as PPH. It must be suspected if the maternal shock is out of proportion to blood loss due to added neurogenic shock consequent to traction on the ovaries.

On per abdomen examination the uterus is not felt or there is fundal notching.

On per speculum examination a reddish globular mass may be seen with a cervical rim all around or lying in the vagina.

On per vaginum examination the inverted fundus of the uterus may be felt in the vagina with a cervical rim all around. Uterus is not felt on bimanual examination. The mass may protrude outside the introitus. Sometimes the whole inverted uterus with placenta attached to it may be seen outside the uterus.

Milder degrees of inversion may be missed at the time of childbirth and may present later as subacute or chronic inversion.

There are 4 degrees of inversion

- ★ 1st degree: Inverted fundus remains in the uterine cavity
- ★ 2<sup>nd</sup> degree: Complete inversion of uterus fundus protrudes through the cervix.
- ★ 3<sup>rd</sup> degree: Inverted fundus protrudes to or through the introitus
- ★ 4<sup>th</sup> degree: Both the uterus and vagina are inverted

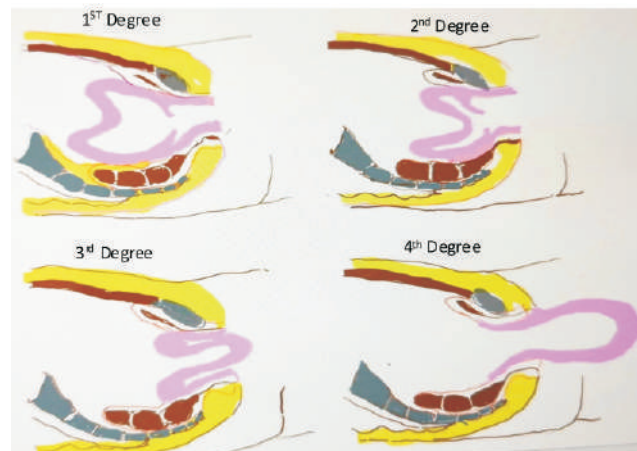


Figure No. 1 Classification of Puerperaluterine Inversion

### Management:

The principles of management include

- ☞ Replace the uterus
- ☞ Manage shock and haemorrhage
- ☞ Prevent recurrence of Inversion

The initial steps include

- ☞ Call for help
- ☞ Stop oxytocic
- ☞ Secure 2 intravenous lines with wide bore cannula no. 16 or no 18
- ☞ Restore circulation with fluids and blood
- ☞ Do not remove the placenta if attached to uterus
- ☞ Reposit the uterus immediately in labor room itself
- ☞ Shift the patient to operation theatre for reposition under general anesthesia if it fails in labor room

### Reposition of Uterus:

Prompt reposition of the uterus is essential to treat neurogenic shock and prevent haemorrhage.

### Non-surgical methods

#### Manual replacement of uterus (Johnson's manoeuvre Figure no. 2)

This manoeuvre requires adequate analgesia. Unless it is possible to administer general anaesthesia immediately, administer pethidine 50 mg iv slow and proceed with the uterine reposition in labour room itself in acute cases.

- ☞ The operator extends the hand at the wrist to place the palm on the inverted fundus and fingertips at the uterocervical junction. Lifting the uterus above the level of the umbilicus creates adequate tension for the cervical ring to dilate and for the fundus to revert to its normal position. This could be helped by 'working the fingers up' gradually from the cervical ring towards the fundus, with gentle but persistent pressure applied. It might involve introducing two thirds of the obstetrician's forearm.
- ☞ If the reposition is difficult muscle relaxant can be used by anaesthetist to facilitate reposition. Once reduced, hold the fundus in place for a few minutes (making a fist inside the uterus with upward pressure on the fundus helps).
- ☞ Give uterotonics oxytocin 5-10 IU intramuscular followed by oxytocin infusion at the rate of 5-10 IU/hour whilst the hand is still inside.
- ☞ When the uterus begins to contract, slowly remove the hand.

- ☞ Administer broad spectrum antibiotics to prevent sepsis.
- ☞ The oxytocin infusion can be continued for 6-12 hours or injection methergine 0.2 mg can be administered every 8 hours to keep the uterus well contracted. Pressing on the uterus per abdomen firmly to assess its tone is avoided to prevent recurrence

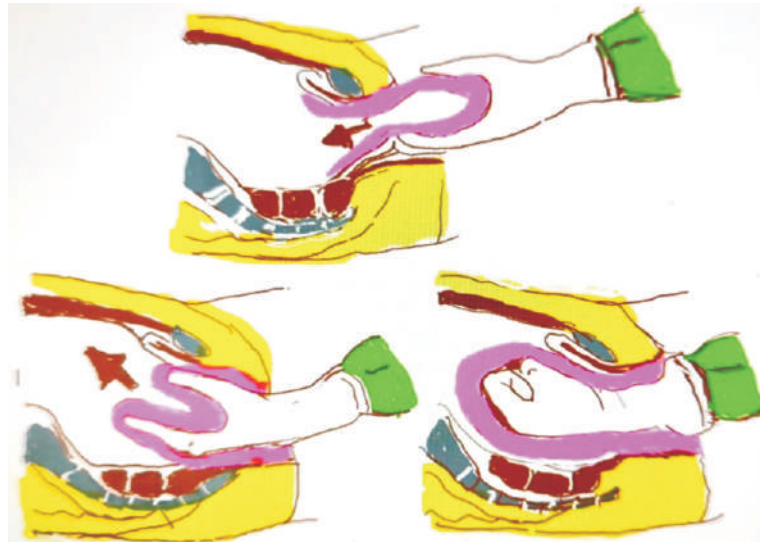


Figure no. 2 Manual replacement of uterus

### Hydrostatic reduction (O'Sullivan 1945)

Insert 6 cm silastic ventouse cup into vagina, making sure that it is directed at the posterior vaginal fornix and not at, or cupping the fundus. Place hand at introitus to maintain seal between cup and vagina. Connect a IV set to a bag of warmed normal saline placed 1- 1.5 metres above the level of the patient. Infuse normal saline (typically 2 litres) into vagina to reposit the uterus by hydrostatic pressure. Once reduced and contracted, remove the placenta manually if still attached and proceed as in the previous section.

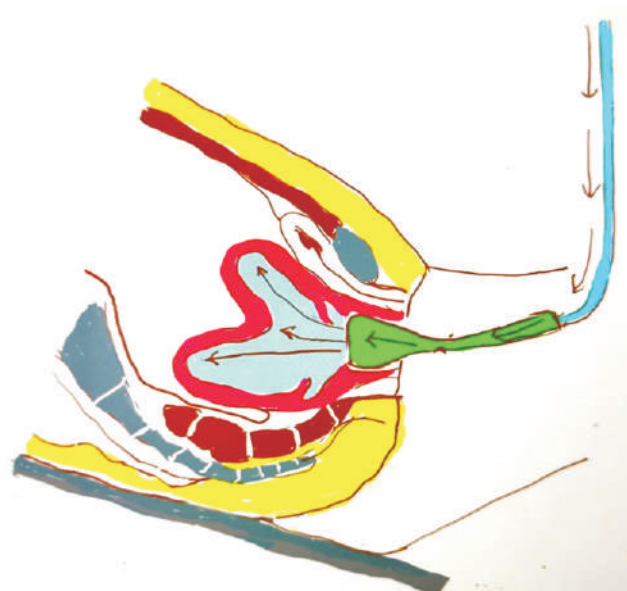


Figure No. 3 Hydrostatic method for correction of puerperal uterine inversion

## Surgical methods

These are rarely required if reposition is attempted soon after inversion occurs.

### Huntington's technique

After a laparotomy, the indrawn uterine cup is identified near the region of the cervix with the tubes and round ligaments pulled into the cup. (Figure 4) Using two Allis forceps the uterus is pulled out of the constriction ring in a progressive fashion and restored to its normal position.

Recently combined laparoscopic and vaginal manual reposition of uterus has been described in the literature.



Figure No. 4 Indrawn uterine cup on laparotomy

### Haultain's operation

In this technique a longitudinal incision is made in the midline of the posterior portion of the cervical ring. This releases the constriction pressure and uterine replacement is facilitated by holding the cut edges with allis forceps and gently drawing up the uterine fundus. After replacement has been completed the hysterotomy site is repaired in 2 layers.

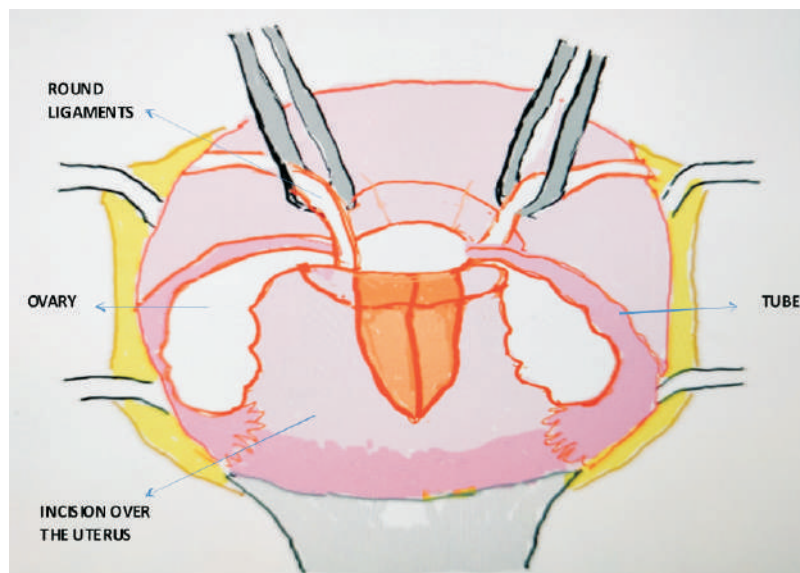


Figure No. 5 Haultain's Operation Incision on the posterior part of cervical ring



## Fogsi Focus Life Saving Emergency Obstetric Surgeries

### Practical tips:

- ☞ Call for help
- ☞ Resuscitation and reposition go hand in hand if inversion occurs in labour room
- ☞ It is best repositioned in the labour room itself and immediately after giving analgesics
- ☞ The part of uterus which comes out last goes in first
- ☞ Keep your fist inside the uterus till the oxytocic is given and the uterus contracts
- ☞ Keep the patient on oxytocics for 24 hours post reposition
- ☞ Avoid pressing on the fundus post reposition to prevent recurrence

### Conclusion

Uterine inversion is a rare life-threatening emergency which is best managed at the place of birth immediately by prompt reposition of the uterus in its place. The placenta must be separated only after the uterus has been repositioned and contracts. In cases that fail reposition under general anaesthesia must be attempted. Surgery is rarely required.

You tube link for correction of uterine Inversion:

<https://www.youtube.com/watch?v=GHVuMJtVxc&t=3s>

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**Line diagram Pic. courtesy Dr. Geetha Devi**  
**Operative pic courtesy Dr. Rajshree Dayanand Katke**





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# CERVICAL TEARS

### **Introduction:**

The cervix projects into the anterior part of the vault of vagina. It gets its blood supply from the branches of internal iliac artery namely vaginal, uterine, internal pudendal and middle rectal arteries. The venous drainage is into internal iliac vein by vaginal vein. The tears can be unilateral, bilateral, or stellate (multiple on both lips). Left lateral cervical tear is more common. Sometimes there can be partial or complete or annular detachment of the cervix. The causes of cervical tear include forceps delivery, breech delivery, attempted manual dilatation/stretching of the cervix, precipitate labor, cervical dystocia, rigid or scarred cervix due to previous surgical procedures like cervical amputation, conization etc.

### **Diagnosis:**

Cervical tear is suspected in a woman with postpartum hemorrhage when the uterus is well contracted. There is continuous fresh bleeding compared to intermittent bleeding in atonic PPH. Sometimes it may be diagnosed on routine exploration of the cervix after instrumental delivery.

### **Preoperative assessment and requirements:**

The general condition of the patient is assessed, and resuscitation initiated if the patient is in shock. Two wide bore cannulas are fixed and isotonic solution that is normal saline or Ringer's lactate started. Blood samples are sent for CBC, blood group and crossmatching and kidney function tests. Blood and blood products are arranged as per need. A per speculum examination is done with Sim's speculum and cervix is visualized. Good light and proper assistance are required to suture the cervical tear.

Cervical tears where the apex can be either seen or palpated can be repaired in the labor room but those where the apex is not visualized need to be repaired in operation theatre under anesthesia. The instruments required for exploration and suturing are shown in fig no 1



Figure No. 1 Instruments and suture material required for cervical tear repair

### Operative steps:

Cervical tears should be repaired immediately after proper exploration. Asymptomatic cervical tears less than 2 cm diagnosed incidentally on routine exploration may be left unstitched. Those > 2cm must be repaired to prevent ectropion later in life. The various steps of repair are listed as below:

- ☞ Insert Sim's speculum and retract the posterior vaginal wall. Expose the cervix with the help of an anterior vaginal wall retractor or another Sim's speculum.
  - ☞ Explore the cervix in a clockwise manner to identify the tear with the help of 2 or 3 sponge holding forceps.
  - ☞ Apply one at 12 o'clock position on cervix another at 3 o'clock position inspect the portion of cervix in between the two. Then apply another at 6 o'clock position see in between 3 and 6 o'clock positions and finally remove the one at 3 o'clock position and apply it at 9 o'clock position and inspect the cervix between 6 and 9 o'clock position and then between 9 and 12 o'clock position. Once the tear is identified grasp both margins of the tear and start repairing 1 cm above the apex of tear. (Fig no 2)
  - ☞ Stitch the cervical tear by interrupted sutures or by a continuous suture taking the whole thickness of cervix with 1-0 chromic catgut or polyglycolic acid on round body needle. Mattress suture may be taken to prevent rolling in of the edges
  - ☞ In case the apex of tear is not visualized clearly ask the assistant to push down the fundus of uterus gently to improve visualization or apply gentle traction on the sponge holders grasping both margins of the tear or apply a suture as high as possible and then take another suture above it by applying traction on that suture and keep repeating till you reach beyond apex.
- If the cervical tear is extending to the lower segment or vault or the apex cannot be reached, it warrants laparotomy and an abdominoperineal approach to repair the tear.

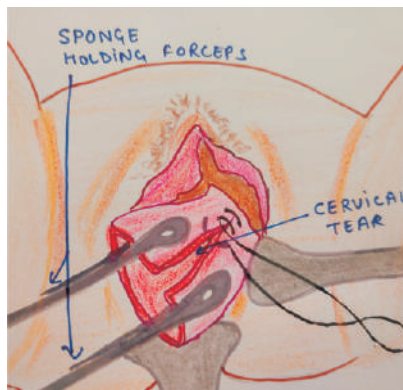


Figure No. 2 Repair of left lateral cervical tear

### Practical tips:

- ☞ It is a good practice to do routine exploration of the cervix in women with instrumental birth, precipitate birth, patients who are bearing down prematurely.
- ☞ It is essential to explore the cervix in good light, with right assistance, instruments and anesthesia.
- ☞ Sometimes to visualize cervix the anterior vaginal wall needs to be retracted by another Sim's speculum.
- ☞ Always apply the first stitch beyond the apex to occlude the descending cervical artery
- ☞ Pressing the fundus abdominally and applying gentle traction on the sponge holders applied to the edges of the tear facilitates visualization of the apex of the tear

### Conclusion

Cervix bears the brunt of labour forces. Very strong uterine contractions, inelastic cervical tissue may be fore runner for cervical tears. If repaired timely it heals very well, otherwise, torn cervix, ectropions are reasons for excessive vaginal discharge in later life.



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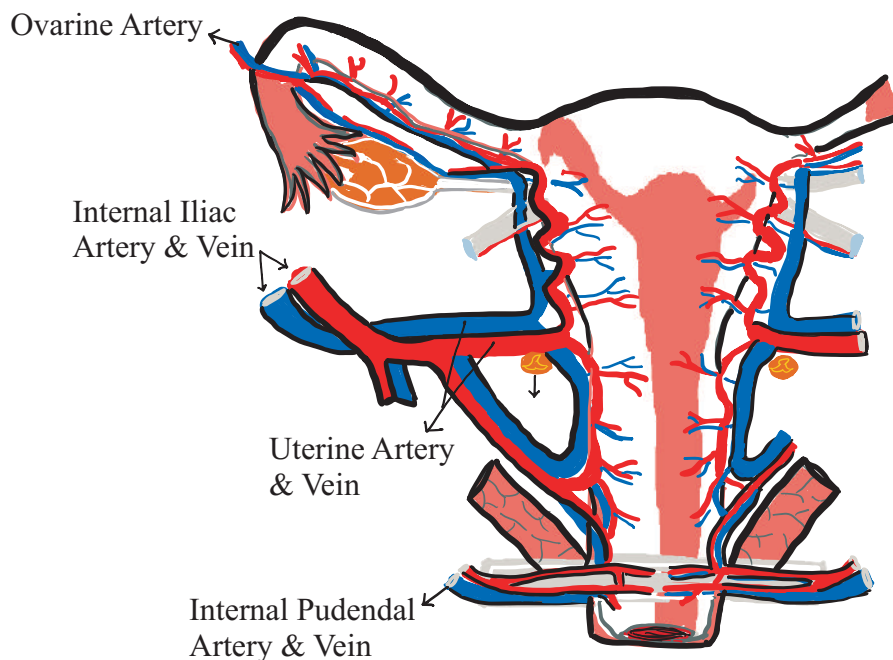
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## VULVOVAGINAL HEMATOMA

### Introduction:

Vulvovaginal hematoma is an uncommon yet potentially life-threatening complication of child birth. It is associated with significant puerperal morbidity and prolonged convalescence. At term the vascularity of vagina and vulva is markedly increased and vaginal venous pool is engorged. It is at risk of trauma during birth process.

Mostly puerperal hematomas arise from bleeding laceration related to operative vaginal deliveries or episiotomy but some are known to form spontaneously due to stretching and avulsion of the vessels during delivery in the absence of laceration / incision of the surrounding tissue mostly in women with preeclampsia with thrombocytopenia or those with vulvovaginal varicosities. The incidence ranges from 1:300 to 1:1500 deliveries and reflects the poor quality of obstetric care being provided. (ref).



	<b>INFRALEVATOR HEMATOMA</b>	<b>SUPRALEVATOR HEMATOMA</b>
Classified as	Vulval / Vulvovaginal	Paravaginal / Supravaginal / Sub Peritoneal / Broad Ligament
Mode of delivery	Usually associated with vaginal delivery	Associated with operative vaginal deliveries /difficult caesarean section/cervical tears
Vessels involved	Arise From Injury To The Branches of The Pudendal Artery ★ Inferior Rectal ★ Transverse Perineal ★ Posterior Labial Arteries	Arise From Injury To The Branches Of Uterine Artery; ★ Paravaginal from Descending Branch ★ Supravaginal from Branches In The Broad Ligament
Clinical features	★ Vaginal or vulval swelling and discoloration ★ Continued vaginal bleeding ★ Severe rectal tenesmus/vaginal/Perineal pain ★ Urinary retention	★ Cardiovascular collapse, tachycardia, hypotension ★ Upward and lateral displacement of uterus ★ Rectal pressure ★ Palpable bladder ★ Rectal or vaginal mass
Diagnosis	Clinical diagnosis through per vaginal and per rectal examination of external genitalia, vagina, cervix and rectum can tell the location and size of hematoma.	★ On P/V-a bulge or bogginess can be felt in one of the fornices. ★ USG, CT in silent supralelevator hematoma

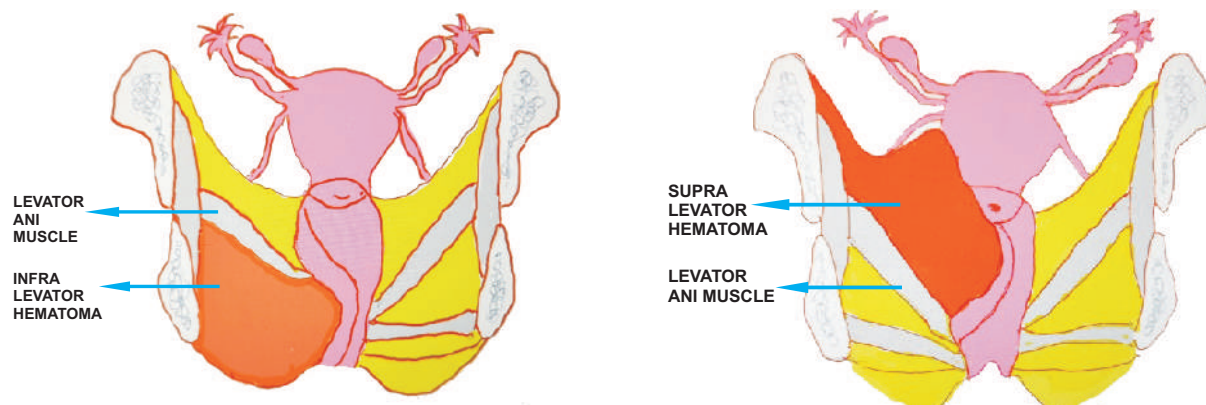


Figure 2 & 3 Infralevator & Supralelevator Vulvovaginal Haematoma

### **Preoperative assessment and requirements:**

General measures include maternal resuscitation and stabilization, assessment of blood loss and replacement, essential investigations such as CBC, platelet count, coagulation profile, informed consent, analgesics, and preoperative antibiotics.

Conservative approach may be indicated in small spontaneous hematomas < 5 cm in size which are nonexpanding and not communicating with vaginal canal. Surgical approach is indicated in others.

The procedure of evacuation of hematoma, exploration and repair needs to be done under appropriate anesthesia in operation theatre. Good lighting and assistance are required. Infralevator hematomas are evacuated vaginally usually under regional block whereas supralevatorhematomas require an exploratory laparotomy and Internal Iliac Artery Ligation. Rarely a peripartum hysterectomy may be required if there is colporrhexis. Selective arterial embolization may be offered in women with recurrent hematoma.



Figure no 4 shows the instruments required for vaginal exploration, evacuation, and repair of vulvovaginal hematoma



Figure 4

The operative principles include:

- ☞ Exploration/ examination under anaesthesia
- ☞ Evacuation of hematoma
- ☞ Achieving haemostasis
- ☞ Obliteration of dead space
- ☞ Closure of vaginal mucosa or abdomen

### Operative steps:

#### Infralevator haematoma:

- ☞ Patient is put in lithotomy position
- ☞ Bladder is catheterized
- ☞ Episiotomy stitches are removed
- ☞ In spontaneous lateral wall hematoma, a liberal linear incision is given on the vaginal surface of the hematoma
- ☞ Hematoma is evacuated with the help of fingers and suction.
- ☞ Bleeders are identified and secured
- ☞ Sometimes the bleeder may not be identified. The cavity is thoroughly irrigated with saline
- ☞ Dead space is obliterated by interrupted sutures. Avoid passing sutures through vaginal submucosa as it can incite bleeding
- ☞ Vagina and cervix are explored for any other tears or lacerations.
- ☞ Episiotomy repaired. Full thickness vaginal mucosa is closed in continuous or interrupted. Muscles and skin can be approximated by polyglycolic acid suture no 1-0 interrupted sutures without tension.

A closed suction drain may be left if the haematoma was very big or there is oozing. The drain is taken out through the most dependent part and not through the perineal stitch line. A tight vaginal packing may be considered in these cases for 24 hours

#### Supravaginal haematoma:

Supravaginal haematoma is more complicated due to extension into retroperitoneal space / broad ligament. In those following vaginal birth, the patient must be placed in low lithotomy position so that both abdominal and perineal access is there.

Exploration of cervix and upper vagina is done and tears if present are repaired.

It is important to take full thickness of cervix and or vaginal mucosa and apply interrupted sutures with polyglycolic acid suture no 1-0 after identifying the apex and passing the first stitch above the apex.



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If apex not identified, then a combined vaginal and abdominal approach for evacuation, hemostasis and repair is done. Usually unilateral or bilateral internal artery ligation is required to achieve hemostasis.

Rarely hysterectomy may be indicated if there is colporrhexis

Post procedure care is important. The patient is monitored carefully for vitals, input output chart and any recurrence. Analgesics and antibiotics, cold packs and care of the perineal wound is important. Self retaining catheter can be kept in for 24 hours

### Practical tips

- ☞ Careful monitoring in the postpartum period and post operative period can help in the early detection of vulvovaginal hematomas
- ☞ Infralevator vulvovaginal hematoma must be suspected in patient complaining of excessive pain in perineum, difficulty in passing urine or rectal /vaginal pressure.
- ☞ Supralevator hematoma must be suspected in postpartum women with unexplained tachycardia, hypotension, non-hemorrhagic collapse, uterus lifted and deviated to one side on per abdomen examination, boggy in one of the fornices or bulge in upper vagina on vaginal examination
- ☞ Early diagnosis is essential to reduce morbidity
- ☞ Stabilization and timely replacement of blood and blood products is important
- ☞ Always explore in OT under appropriate anesthesia and adequate light. Exploration must not be done under local infiltration
- ☞ The episiotomy must be approximated without tension using least suture material.

### Conclusion

Vulvovaginal hematoma is an infrequent yet serious complication of childbirth with a high potential for medicolegal complication.

Patients at high risk, big babies, prolonged second stage, instrumental delivery, PIH, deranged coagulation profile need to be monitored very closely for early pick up.

All parturient must be monitored closely for this complication as its best managed at the first time of recognition.

The most important factor in correct diagnosis is clinical awareness and high index of suspicion.

Excessive perineal pain must alert the nursing staff and prompt a quick thorough assessment by a PV, PR examination to confirm or rule out a developing hematoma.

Informed consent, counselling and documentation, help of colleague when hematomas are supralevator, will be of great benefit in ensuring safety of patient and primary treating obstetrician.

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1. J Clin Diagn Res 2017 May;11(5):QC01-QC03. doi: 10.7860/JCDR/2017/24060.9777. Epub 2017 May Risk Factors and Incidence of Puerperal Genital Haematomas Shikha Rani 1, Meesha Verma 2, Dilpreet Kaur Pandher 3, Navneet Takkar 4, Anju Huria 5

Pic. courtesy Dr. Geetha Devi



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## MANAGING EXTENSIONS OF UTERINE TEARS DURING CAESAREAN SECTION

### Introduction

Uterine incision at caesarean section can extend in any direction during difficult extraction of the baby such as in deeply engaged head, malposition, transverse lie with impacted shoulder, large baby, previous scar, uterine anomaly like unicornuate or didelphys uterus etc. It can extend laterally into the uterine artery or broad ligament, vertically up or down, lateral extension turning downwards involving the vault and may extend laterally to involve posterior wall.

### Applied Anatomy

The lower segment of the uterus has following structures related to it

- ★ Lateral to uterine incision – uterine artery, uterine vein, ureter
- ★ Inferior to incision – cervix and bladder
- ★ Infero-lateral to incision – vaginal fornix, vaginal artery

### Instruments required

Following instruments must always be available on the trolley while doing Caesarean section to manage extensions of incision.

- Extra mops (sponges)
- 8 long Allis forceps
- 8 long Arteries
- 2 Babcock's
- 2 Right angle Arteries (Mixer)
- Small ½” Deaver's Retractors

### Surgical steps

The choice of surgical management depends upon

- ★ General condition of the mother
- ★ Extent of tear or damage
- ★ Degree of hemorrhage
- ★ Whether torn edges are ragged and irregular
- ★ Parity
- ★ Mother's desire for future childbearing



## Fogsi Focus Life Saving Emergency Obstetrics Surgeries

The choices include

- ★ Repair of uterine tear without tubal ligation
- ★ Repair of uterus with tubal ligation
- ★ Removal of uterus (Hysterectomy) – total or subtotal

### Dos and don'ts

- ★ Always be gentle with the tissues. Remember that the torn tissue is edematous, friable, and vascular
- ★ Always delineate the tear completely and identify the apex. Hold it with an Allis forceps or a stay suture. Do not pull on it.
- ★ It is better to exteriorize the uterus and pull it up and away from the site of injury. This will improve the visualization of the injured site.
- ★ Avoid panic
- ★ In case of ragged tears, first align the torn edges and then start stitching

### Tips and tricks

- ★ Gentle handling of tissues by holding the torn edges with Allis forceps
- ★ In the lower segment tears the uterine muscle fibers split. Hold the full thickness of muscle away from the site of tear and trace it towards the tear to hold it full thickness
- ★ It is always preferable to identify, understand and then start suturing
- ★ In case of lateral tear or broad ligament hematoma, identify the ureter first, lateralize it or keep it marked before suturing. The tied suture should not kink the ureter.
- ★ Open the anterior leaf of broad ligament under vision from a transparent area or hold the round ligament with a babcocks to delineate the transparent area, in case of a broad ligament hematoma. Drain the hematoma gently. Identify the bleeding vessel and ligate it if possible. If no bleeding vessel is identified, one can put in a drain and close.
- ★ In cases of lateral rupture involving lower segment and uterine artery where hemorrhage and hematoma obscure the operative field, keeping the area pressed and ligation of ipsilateral hypogastric artery to stop the bleeding may be warranted.

### Complications

- ★ Injury to uterine or vaginal vessels
- ★ Injury to ureter
- ★ Massive maternal hemorrhage
- ★ Coagulopathy

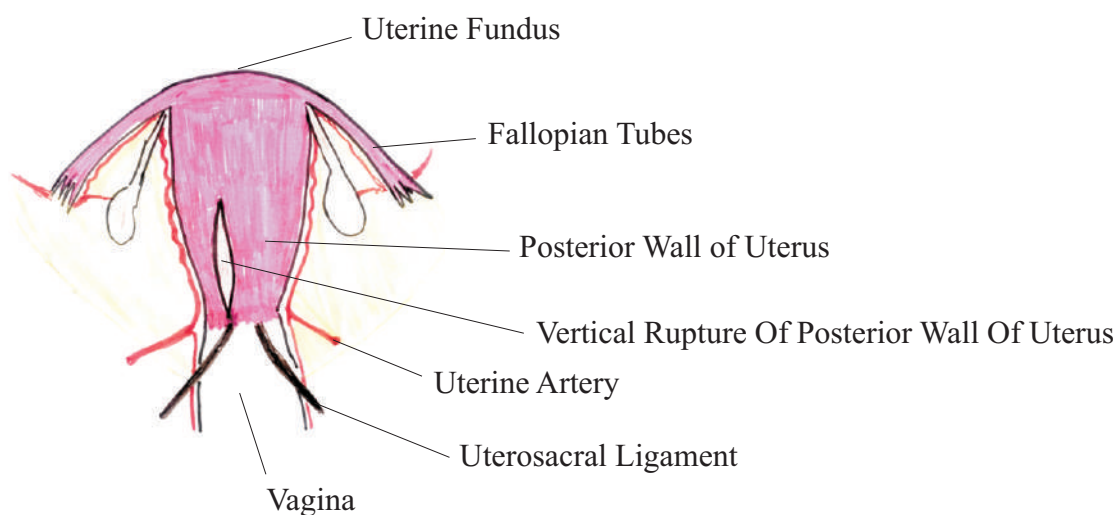
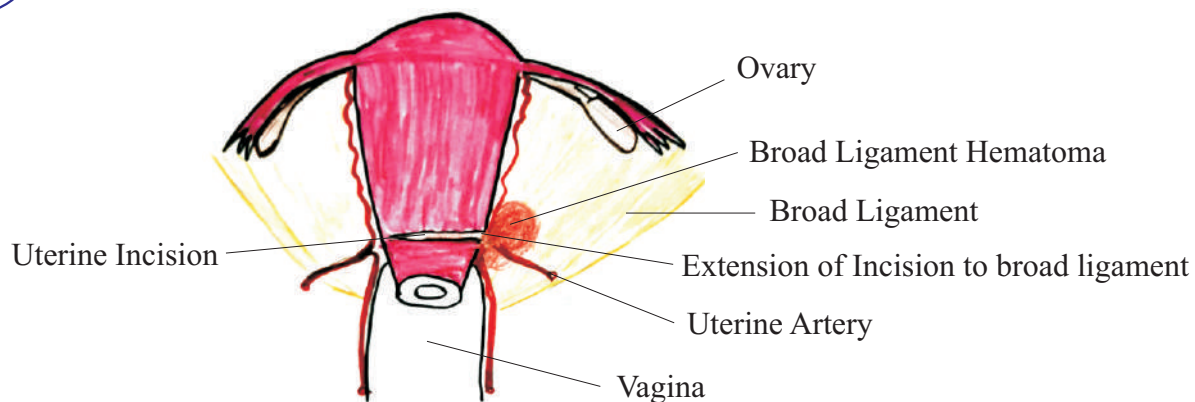
### Documentation

It is very important to document the detailed description of the tear and repair not only on the case sheet but also on the discharge papers, for future use. This is important for the future reference in her next pregnancy.

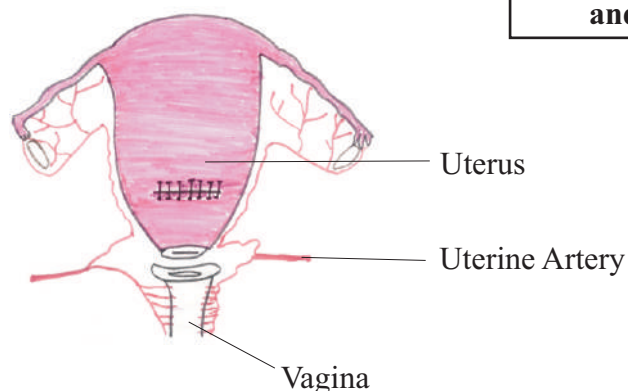
### Counseling for future pregnancies

- ★ If tubal ligation was not performed and defect reaching upper segment or is T-shaped, explain the increased risk of chances of rupture uterus in subsequent pregnancy. If the family is complete, discuss permanent ligation instead of contraception.
- ★ If defect confined only to lower segment, the risk of rupture in subsequent pregnancy is like that of previous caesarean section.
- ★ In case of extensive tears involving the upper segment, future pregnancy may not be advisable.
- ★ Women may have to be delivered between 37-38 weeks depending upon the extent of tear.





**Pic courtesy Dr. Mitra Saxena  
and Dr. Ravina Yadav**



The circumferential tearing of vaginal vault separating the cervix and vagina with a preserved uterine arterial supply. Complete separation of the vaginal vault from uterus, a rare complication of cesarean delivery requiring assistance with vaginal hand.

CASE : 24 year old nulliparous woman at 40 weeks 3 days pog with arrest of second stage of labour and a vaginal hand was required during C-Section to disimpact a deeply engaged fetal head.

Result : following delivery complete detachment of vaginal vault from cervix was noted without disruption of uterine vessels. Normal anatomy was surgically restored without complication.



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## UTERINE RUPTURE

### Introduction

Uterine rupture is a life-threatening pregnancy complication for both the mother and the fetus. The overall incidence of uterine rupture in patients with a prior cesarean birth is approximately 0.3 percent (3 ruptures per 1000 deliveries) regardless of mode of delivery in the pregnancy in which the rupture occurs. (Ref 1)

### Risk factors

Factors that increase the risk of rupture of uterus are:

- ★ Previous cesarean section
- ★ Previous fundal or high vertical hysterotomy - This includes an inverted T or J incision or extension of a low transverse incision into the upper uterine segment.
- ★ Patients with a previous low vertical hysterotomy - Although few studies have evaluated the risk of uterine rupture in patients with a previous low vertical incision, these studies have reported similar rates of uterine rupture as in patients with a low transverse incision (Ref. 2)
- ★ Induction of Labor (especially in multigravidas) - Misoprostol and Oxytocin
- ★ Obstructed labor in multiparous woman

### Other high risk factors associated with rupture uterus :

- ★ Increasing maternal age
- ★ Gestational age >40 weeks
- ★ Birth weight >4000 grams
- ★ Interdelivery interval less than approximately 18 months
- ★ Single-layer uterine closure, especially if locked
- ★ More than one previous cesarean birth
- ★ Previous second-trimester hysterotomy

Uterine rupture in an unscarred uterus is a rare event. It can occur in cases of trauma, such as from a motor vehicle crash or an obstetric maneuver (e.g., internal, or external cephalic version, fundal pressure) or due to weakness of the myometrium which can be congenital or acquired. Congenital in women with mullerian anomalies and acquired in grand multiparous women.

### Diagnosis of uterine rupture

#### Symptoms :

1. Sudden onset of lower abdominal pain which is continuous at the scar site or may be diffuse.
2. Fresh Vaginal bleeding.



3. Hematuria
4. Cessation of uterine contractions.

### Examination :

1. Signs of obstructed labour - dehydration, exhaustion, hypotension, tachycardia, raised temperature
2. On per abdominal examination -
  - i). Abdominal tenderness
  - ii). Uterine contour is lost
  - iii). Fetal parts are palpated superficially
  - iv). Fetal heart rate absent :- Prolonged deceleration (category II/category III) - is the earliest sign of C-Scar Rupture.
3. On Pervaginum examination
  - i). Fresh Vaginal bleeding
  - ii). Loss of station of the presenting part



Pic Courtesy – Dr M Shree Devi (Asst. Professor AMC, Vishakhapatnam)

### Management

- ★ Stabilize patients with hemodynamic instability
- ★ Notify the anesthesia team & neonatology team
- ★ Take high risk consents for emergency laparotomy, repair with or without ligation hysterectomy, massive blood transfusion, ICU admission, assisted ventilation, sepsis
- ★ Arrange blood and blood products
- ★ Give prophylactic broad spectrum antibiotics intravenously
- ★ Keep patient nil per oral
- ★ Anticipate and prepare for complications like Atony, Bladder trauma, Broad ligament hematoma, Colporrhexis, Peritonitis

The decision to perform hysterectomy is based on a combination of factors, including:

- ★ The patient's desire for future pregnancy
- ★ The extent of uterine damage from the rupture
- ★ The patient's intraoperative hemodynamic and anesthetic stability
- ★ The skill of the surgeon for repairing a complicated rupture

### Step by step repair of ruptured uterus

- ★ Open the abdomen by a midline vertical incision in layers from below the umbilicus to pubic symphysis



## Fogsi Focus Life Saving Emergency Obstetric Surgeries

- ★ Open the peritoneum near the umbilicus carefully, to prevent bladder injury.
- ★ Examine the abdominal cavity and the uterus for the site of rupture and remove clots
- ★ Place a bladder retractor over the pubic bone and place self-retaining abdominal retractors.
- ★ Extract the baby and placenta.
- ★ Start oxytocin infusion 20 units in 1 L IV fluids (normal saline or Ringer's lactate) at 60 drops per minute until the uterus contracts and then reduce it to 20 drops per minute.
- ★ Lift the uterus out of the pelvis to note the extent of the injury.
- ★ Examine both the front and the back of the uterus.
- ★ Hold the bleeding edges of the uterus with Green Armytage clamps or ring forceps or Allis forceps.
- ★ Separate the bladder from the lower uterine segment by sharp or blunt dissection.
- ★ If the previous scar has ruptured it is important to freshen the fibrotic margins prior to repair.
- ★ Repair the tear with a continuous stitch or interrupted stitches with polyglycolic acid suture 1-0.
- ★ If required place a second layer of suture if hemostasis is inadequate or if the rupture is through a previous classical or vertical scar.
- ★ Ensure that the ureter is identified and exposed to avoid including it in a stitch.
- ★ If the rupture is too extensive for repair, proceed with hysterectomy.
- ★ Place an abdominal drain.
- ★ Give a thorough abdominal lavage with warm saline
- ★ In all cases, check for injury to the bladder by distending it with at least 200 ml of saline with betadine. If a bladder injury is identified, repair the injury.
- ★ If there are signs of infection, pack the subcutaneous tissue with gauze and place loose 0 catgut (or polyglycolic) sutures. Close the skin with a delayed closure after the infection has cleared.
- ★ Do a gentle vaginal toileting

### Special situations :

#### Vertical extension through cervix and vagina

- ★ If the tear is extending vertically through the cervix and vagina, mobilize the bladder at least 2 cm below the tear.
- ★ To reach 1cm beyond the lowermost edge of tear place a suture at the lower most accessible part of the tear and apply traction on this suture to pass another suture below this and repeat the same with this stitch till you reach beyond the end. Take interrupted stitches with wide horizontal bites 1-2 cm through the edges to prevent the suture from cutting through the cervical or vaginal edges.

#### Lateral extension through uterine artery

- ★ If the tear extends laterally involving one or both uterine arteries, hold the bleeder if visible and ligate the torn artery.
- ★ It is important to place 2 fingers behind the broad ligament to avoid inadvertent injury to the bowel and ureter
- ★ If the bleeder is not identified pack the area tightly and proceed with internal iliac artery ligation of the same side

#### Rupture uterus with broad ligament hematoma

- ★ If the rupture is associated with a broad ligament hematoma, clamp, cut and tie the round ligament.
- ★ Open the anterior leaf of the broad ligament.
- ★ Drain off the hematoma manually with the help of suction.



- ★ Inspect the area carefully to identify the bleeding vessel. Hold with a hemostat and ligate any bleeding vessels.

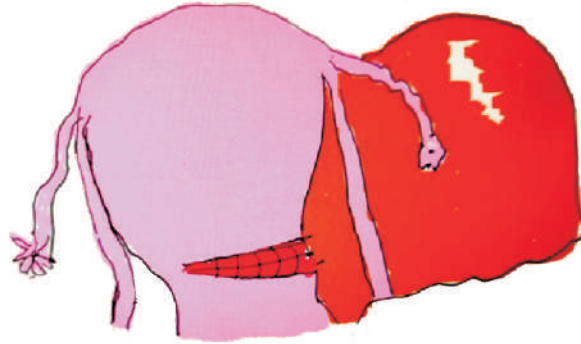


Fig. 2 Pic Courtesy Dr Geetha Devi

### Post-procedure care

- ★ If there are symptoms and signs of infection give intravenous antibiotics to cover gram positive, gram negative and anaerobic organisms until culture sensitivity report is available or she is fever-free for 48 hours.
  - \* Ampicillin 2 g IV every 6 hours or Augmentin 1.2 gm IV every 8 hours.
  - \* PLUS, gentamicin 5 mg/kg body weight IV every 24 hours.
  - \* PLUS, metronidazole 500 mg IV every 8 hours.
- ★ If there are no signs of infection, remove the abdominal drain after 48 hours.
- ★ If tubal ligation was not performed, offer suitable contraceptive method. If the woman wishes to have more children, advise her to have an elective cesarean section for future pregnancies.
- ★ The elective caesarean section in subsequent pregnancy is planned from 36-37 weeks depending upon the extent of injury repaired.

### Practical tips

- ★ The diagnosis of caesarean scar rupture can be suspected if the woman has abdominal discomfort or pain in the abdomen in between the contractions.
- ★ Sudden cessation of contractions and acute onset pain abdomen are pathognomonic of uterine rupture.
- ★ The contour of the uterus is lost, fetal parts are felt superficially, the flanks are dull due to haemoperitoneum and FHS is not localized.
- ★ On per vaginum examination there is fresh bleeding, and the presenting part recedes in the abdomen.
- ★ The patient needs to be stabilized, consents taken for Exploratory Laparotomy, blood and blood products arranged and proceed to either the repair of the ruptured site or proceed to hysterectomy.
- ★ Uterus is delivered out of the incision and assessed for any tears or extensions.

### References

Ref. 1. RCOG Green Top Guideline 45

Ref. 2 : Mark B Landon, Heather Frey. Uterine Rupture : After previous cesarean birth



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# INTERNAL ILIAC ARTERY LIGATION

## Introduction

Internal artery is a branch of common iliac artery which is a branch of abdominal aorta. There are two internal iliac arteries one on each side. The uterus is mainly deriving its blood supply from uterine artery which is a visceral branch of internal iliac artery. Ligation of the anterior division of internal iliac artery is a **lifesaving procedure** in patient shaving PPH and in some other obstetric and gynecological emergencies.

## Mode of action

Bilateral internal artery ligation results in 85% reduction in pulse pressure and 50% reduction of blood flow. The arterial flow gets converted into low pressure venous flow. The bleeding reduces and clot formation is facilitated.

## Applied anatomy (Figure no. 1)

- ★ The abdominal aorta bifurcates into two common iliac arteries at the level of sacral promontory. This is at the level of umbilicus.
- ★ The common iliac artery divides into external and internal iliac arteries at the level of sacroiliac joint.
- ★ The external artery runs parallel to the medial border of psoas muscle on lateral pelvic wall and exits below the inguinal ligament to continue as femoral artery.
- ★ The external iliac vein lies medial to the external iliac artery.
- ★ The internal iliac artery runs posteromedial to external iliac artery.
- ★ The internal iliac vein lies posteromedial to the artery and the external iliac vein lies lateral to the internal iliac artery
- ★ The internal iliac artery divides into anterior and posterior division about 3-4 cm after leaving the common iliac artery.
- ★ The posterior division leaves the internal iliac artery from its lateral surface.
- ★ Ureter crosses the bifurcation of common iliac artery from lateral to medial side at its bifurcation

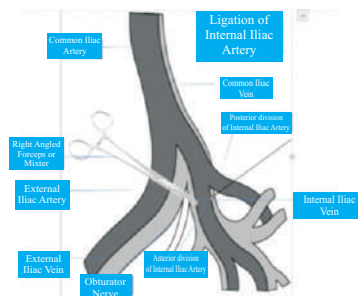
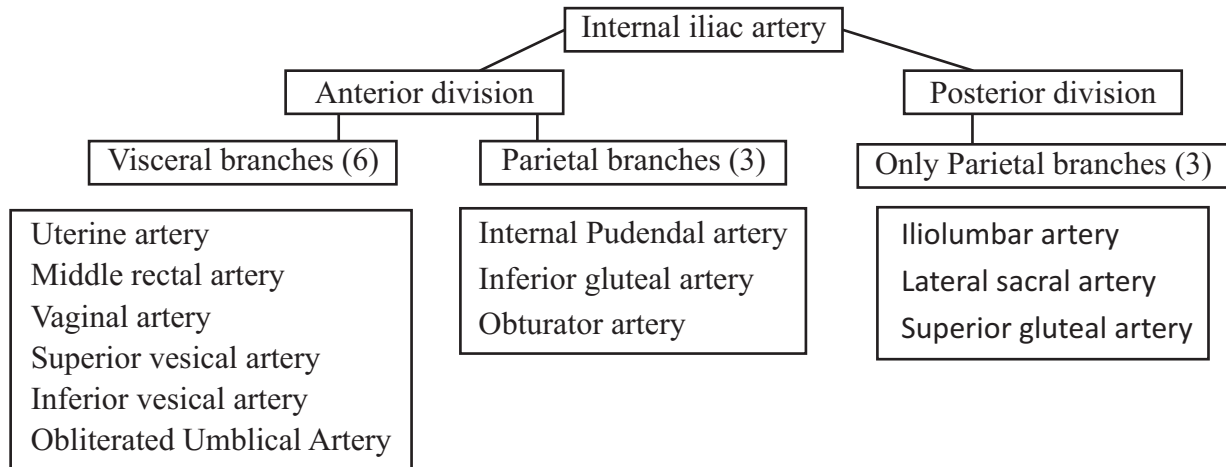


Figure No. 1 Relationship of iliac arteries and veins to each other



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Branches of internal iliac artery are as given in Fig 1



### Preoperative considerations:

The selection criteria as regards the right patient, right indication, and right place for internal artery ligation include

- ★ Patients who are hemodynamically stable with near normal or normal coagulation profile
- ★ Those with atonic PPH where medical management, compression sutures and low and high ligation of uterine arteries have failed.
- ★ Those with traumatic PPH where the upper end of cervical tear is not accessible vaginally or there is a broad ligament hematoma
- ★ During caesarean section with lateral extension of incision where bleeder has retracted
- ★ Other indications like rupture uterus, advanced cervical or caesarean scar pregnancy etc
- ★ The place where this procedure is planned must have an experienced obstetrician (skilled in both internal artery ligation and obstetric hysterectomy), experienced anesthetist, free availability of blood and blood products and a surgeon on call.
- ★ Right instruments including deep Deaver retractors, mixer or right-angled clamps, long artery forceps, needle holders and forceps, vascular clamps or bulldog clamps, silk no. 1 or polyglycolic acid no 1-0, polypropylene 4-0 must be available.

### Documentation

For medicolegal purposes proper documentation of following points in case records is essential

- ★ Detailed notes including name of the surgeon performing the procedure
- ★ Indication
- ★ Vitals of patient at the time of performing IAL and postoperatively
- ★ All procedures done before to resolve hemorrhage
- ★ Document that the procedure was performed as a lifesaving procedure if done in emergency and consent was not obtained preoperatively
- ★ Document that relatives informed of the procedure if done in emergency and inform patient after she comes out of anaesthesia. Take their signatures
- ★ Per operative findings
- ★ Document palpation of femoral artery before and after the procedure
- ★ Any procedure related complication

### Step by step procedure

1. Entry into retroperitoneum
2. Recognize bifurcation of common iliac artery
3. Recognize external and internal iliac arteries by palpating femoral artery
4. Trace internal iliac artery till the site of ligation
5. Dissect the covering sheath
6. Pass the mixer with a double loop thread below the internal iliac artery
7. Hold the thread and remove the mixer
8. Tie the thread after reconfirming anatomy
9. Ensure hemostasis and closure of peritoneum
10. Palpate the femoral artery

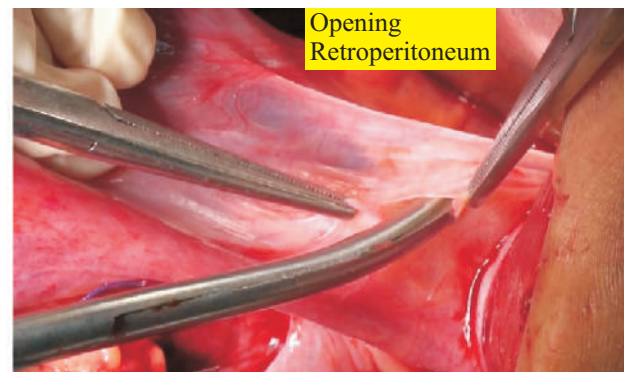
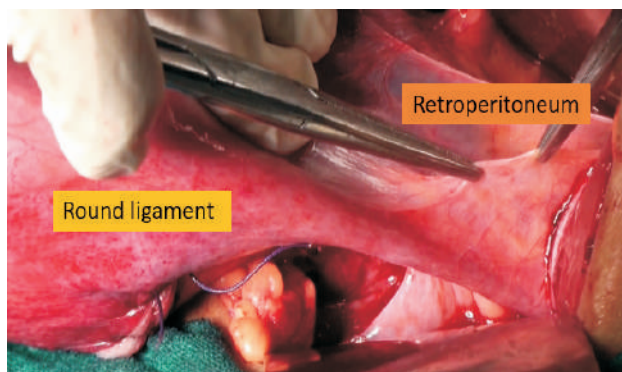
#### 1. Entry into retroperitoneum:

There can be two approaches of entering the retroperitoneum: anterior and posterior. Anyone can be used depending on the surgeon's choice. In women with endometriosis where the pouch of Douglas is obliterated anterior approach is preferred.

#### Anterior approach

In women where the uterus is present it is pulled towards the pelvic wall opposite to the side where we plan to enter the retroperitoneum. Peritoneum behind the round ligament at the junction of medial 1/3<sup>rd</sup> and lateral 2/3<sup>rd</sup> or sometimes in the middle of round ligament if it is short, is tented with two long artery forceps and cut with scissors. The incision is extended parallel to the infundibulo-pelvic ligament along the paracolic gutter for about 7-8cm. Care to be taken not to injure any structure underneath it by keeping the tip of the scissors pointing up.

When uterus is already removed insert the scissors in between the cut ligated end of round ligament and the tubo-ovarian pedicle and cut upwards along the paracolic gutter as described above.



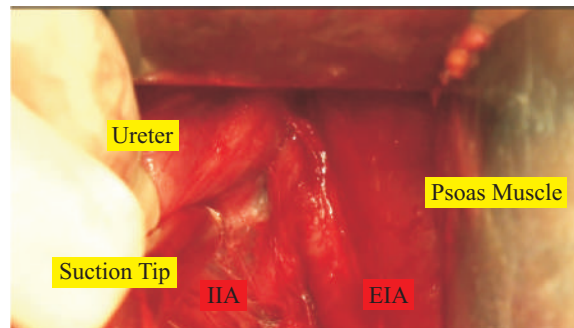
#### 2. Recognize bifurcation of common iliac artery

The psoas muscle is identified under the peritoneal incision with genitofemoral nerve coursing over it. External iliac artery runs along the medial border of psoas muscle and can be traced up to common iliac artery and then aorta in midline.



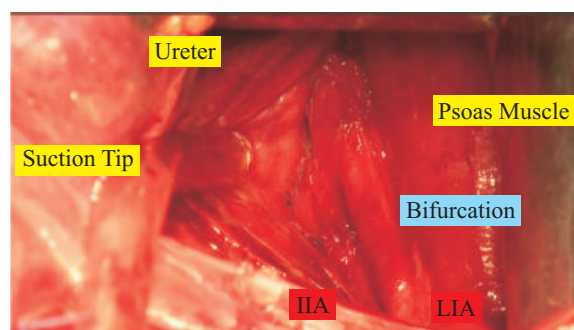
### 3. Recognize external and internal iliac arteries

The external iliac artery runs along lateral pelvic wall to exit under the inguinal ligament as femoral artery whereas internal iliac artery runs posteromedial. On pressing the external iliac artery, the pulsations in femoral artery disappear whereas there is no change if internal iliac artery is pressed.



### 4. Identification of the site of ligation on internal iliac artery

The site of ligation is a point immediately after the internal iliac artery gives off posterior a division. It is 3-4 cm after the origin of internal iliac artery from the common iliac artery.



### 5. Dissection of the covering sheath

Careful and gentle dissection of the fascial sheath enclosing the internal iliac vessel is done at the proposed site of ligation. Do not do dissection along the whole length of iliac vessels. It can be done with a small swab (peanut) by linear movements along the wall of internal iliac artery. A gap is made on either side of the artery gently to pass the mixer.

### 6. Making a thread loop

Suture material silk no. 1 or vicryl no 1-2 is doubled up and held with the tip of a mixer

Figure shows Double thread loop

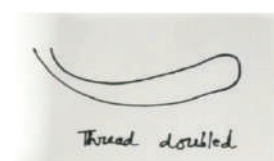


Figure 2

### 7. Passing the mixer or right-angled clamp under the artery

A right-angled clamp carrying the thread at its tip is passed under the proposed site of ligation from lateral to medial side to avoid injury to the external iliac vein lies that lies to the lateral side of internal iliac artery. The clamp grazes transversely across the posterior wall of the artery to save the internal iliac vein posterior to it.

Sill can be added showing passage of mixer under artery

### 8. Grasping the thread and removing the mixer/right angled clamp

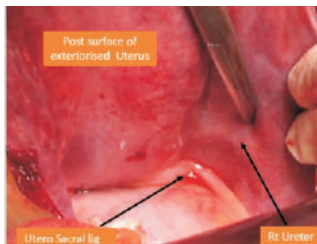
The thread is grasped by a long artery forceps and the mixer/ right angled clamp is gently removed in the same

direction as it was introduced. The loop of the thread is divided and the suture is tied.

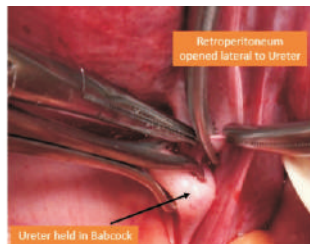
A double thread is passed so that if the accidentally thread breaks during tying, we do not have to make another pass under the artery

### Posterior approach

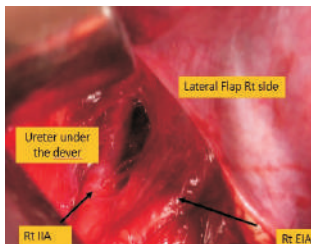
The retroperitoneum may be opened 2-3 cm below and 2-3cm lateral to the lateral end of upper border of the sacral promontory. This will open at the bifurcation of common iliac into external and internal iliac arteries. Rest of steps are the same. Same procedure is followed on the opposite side. The ureter can be identified crossing the bifurcation of common iliac artery from lateral to medial side. The peritoneum can be opened lateral to the ureter above the insertion of uterosacral and extended upwards so that it stays with the medial peritoneal fold.



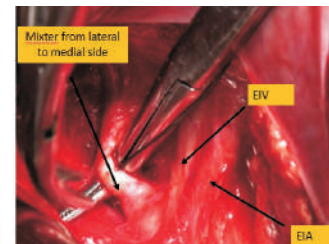
Step-1



Step-2



Step-3



Step-4

### 9. Closure of peritoneum

After ensuring complete hemostasis the peritoneal incision is closed in continuous with polyglycolic acid 2-0 or chromic catgut 2-0 in continuous.

### 10. Palpation of femoral artery

The femoral artery must be palpated to rule out inadvertent ligation of the external iliac artery

### Complications

The complications include

- ★ Injury to the internal iliac vein
- ★ Inadvertent ligation of the external iliac artery
- ★ Inadvertent ligation of ureter
- ★ Injury to external iliac vein

For prevention of injuries, it is important to carefully dissect the sheath covering the internal iliac vessels by lifting the fascia and giving a small nick with scissors and careful passage of mixer/ right-angled clamp grazing the artery to prevent injury to external and internal iliac veins. Cessation of the femoral artery pulsations by pressing on external iliac artery helps to prevent accidental alligation of external iliac artery and ischemia and gangrene of lower limb. Ureter must be carefully pushed to medial side attached with medial flap of peritoneum. Injury to external iliac vein is prevented by passage of mixer/ right angled clamp from lateral to medial side.



### Practical Tips

- ★ Sound knowledge of anatomy is essential.
- ★ Open peritoneum adequately for good exposure
- ★ Dissect through the loose areolar tissue with your fingers with linear strokes along the length of blood vessels guided by the pulsations of external iliac artery.
- ★ Use suction cannula for dissection
- ★ Use deep retractors
- ★ Identify psoas muscle on lateral side
- ★ External iliac artery is identified on its medial side and external iliac vein medial to the artery
- ★ Identify ureter medial to external iliac artery along the medial edge of peritoneum
- ★ Identify internal iliac artery medial to the external iliac artery more posteriorly
- ★ Trace internal iliac artery from the bifurcation of common iliac artery at sacroiliac joint
- ★ Open the sheath of internal iliac artery and loop the artery with a mixer/ right-angled clamp from lateral to medial side
- ★ Palpate femoral artery before and after the procedure

### Tips for self-learning of internal iliac ligation

- ☞ Master the anatomy from illustrations and if possible, on cadaver.
- ☞ Palpate the aorta and trace the common iliac artery on both sides till its bifurcation during caesarean section many times. Also palpate the bony landmarks like sacral promontory, sacroiliac joints and make a mental note of their relationship with the major vessels.
- ☞ Open the retroperitoneum and identify the anatomy of arteries, veins, ureter during uneventful caesarean sections by both approaches, identify vessels and expose internal iliac arteries.
- ☞ Do all the above steps many times till you befriend the vessels and ureter.
- ☞ Now you are ready to do internal artery ligation under supervision when indicated.

**Pictures for Dissection by Anterior Approach and Posterior Approach  
contributed by Dr. Manju Puri.**



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# EXTRA-PERITONEAL APPROACH FOR INTERNAL ILIAC ARTERY LIGATION

### Introduction:

Traditionally, the anterior division of Internal Iliac Artery (IIA) is exposed, dissected and ligated through either the Anterior or Posterior approach. In both approaches one feature is common: they result in the formation of a medial and lateral peritoneal flap. The ureter is always beneath the medial flap and may be visualized, reflected, and protected with ease. The ureter normally crosses the common iliac artery from lateral to medial at a point just proximal to the bifurcation, hence ureter helps to identify the Common Iliac Bifurcation (CIB).

### Extra-peritoneal Approach :

The vessels supplying the pelvis and lower extremities are completely retroperitoneal. The parietal peritoneum is not incised, but reflected away from the midline along with the viscera, uterus etc. The Obliterated Umbilical ligament is identified and traced downwards and laterally leading to the desired site of ligation of anterior division IIA. Ureter has a big role in helping identify the Bifurcation of Common Iliac, IIA, and EIA apart from avoiding injury to it.

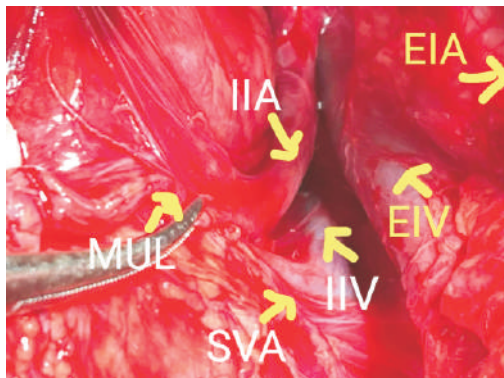
1. The area between the rectus muscle and peritoneum should be dissected one side at a time. The left side of the patient is easy to approach by surgeon being on same side, as a matter of habit and convenience. The obliterated umbilical artery is identified and dissected **downwards and laterally**. Good retraction with right angled retractor or Landon's retractor and proper overhead OT lamp helps in proper identification and tracking of the Internal Iliac Arteries.
2. The obliterated umbilical artery turns upwards after the superior vesical artery close to the external iliac vein. Careful dissection of the Internal Iliac artery upwards leads to the anterior division which is free and not as fixed as the posterior division. There are no major vessels in the area as the external iliac artery lies lateral to the external iliac vein and is far away.
3. Ureter should be kept secure on the medial side by gentle retraction after its identification.
4. The internal iliac artery can be occluded here which will also stop the uterine artery flow. Mixters can be used to pass the thread from lateral to the medial aspect to prevent the injury to external iliac vein.

5. The same procedure has to be repeated on the other side. The dissection being extra peritoneal and close to major vessels will require steady state of mind of the operating surgeon and good capable assistant to use the instruments carefully for proper retraction.
6. After both internal Iliac arteries are ligated, the obstetrician should now estimate the reduction in post-partum haemorrhage. Most of the time, the ligation of both internal Iliac arteries effectively controls the bleeding, and the uterus and abdomen can be closed.
7. However if the bleeding is not controlled and the patient continues to be unstable, obstetric hysterectomy may have to be resorted to in few cases.

### Complications and Precautions :

Though safe and effective, IIA ligation by either extra-peritoneal or traditional intra-peritoneal approach, the operating obstetrician should be familiar with the surgical anatomy and managing the inadvertent injury to the major veins by using bulldog clamps and suturing or have a surgeon on call.

The extraperitoneal approach can be employed with baby in utero, where IIA is to be prophylactically ligated. The sutures can be passed, then proceeded with C-Section closure and ligation of IIA anytime when needed.



Pictures courtesy Dr. Abhay Gajanan Shete



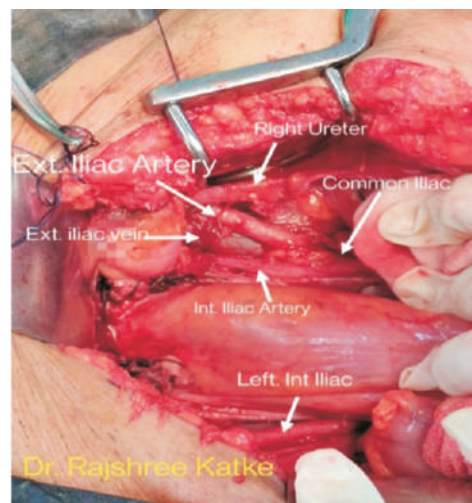
**Dr. Rajshree Dayanand Katke**  
Professor & Unit Chief  
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Mumbai

## COMPLICATIONS OF INTERNAL ILIAC ARTERY LIGATION

For understanding the complications of internal iliac artery ligation, it is important to familiarize ourselves with the anatomical relationships of internal iliac artery.

### Anatomical Relations at Internal Iliac Artery

Anterior	Peritoneum
Medial	Ureter
Inferomedial	Internal Iliac Vein
Lateral	Psoas Major muscle
Inferolateral	Obturator Nerve



### Complications of Internal Iliac Ligation

#### Injury to internal iliac vein

This is the most common complication since it lies very closely beneath the internal iliac artery.

If an injury to the vein is suspected first compress it by applying direct pressure over the site of injury. Bleeding from small lacerations is controlled with the application of pressure.

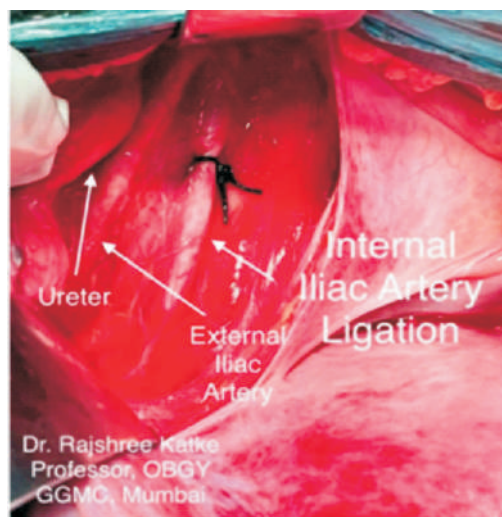
If bleeding persists you can apply the vascular clamps at upper and lower part of the site of injury and repair it with a fine 4-0 non absorbable polypropylene suture on a round body needle. Help from a vascular surgeon may be sought.

For large iliac veins, a 3-0 suture is a reasonable choice as small needles supplied with 4-0 sutures can be difficult to retrieve during repair of large veins and present a small danger of becoming 'lost' inside the vein.

### **Injury to the External Iliac veins**

External iliac veins lie medial to external iliac artery and lateral to the internal iliac artery. Hence the mixer is passed from lateral to medial side while ligating the internal iliac artery to prevent injury to the external iliac vein.

**Fig.2 Correct site of Internal iliac Anterior Division**



### **Inadvertent ligation of external iliac artery :**

This will lead to ischemia of lower limb. It can be prevented by

- ★ Following the common iliac artery to its bifurcation and then identify external iliac artery as it runs anterior and lateral over the psoas muscle and internal iliac artery as it runs inferomedial.
- ★ It is important to feel the femoral pulsations in the groin and/or dorsalis pedis pulsations to make sure that external iliac artery is not ligated.

In case the external iliac artery has been tied the classical signs are whiteness or pallor of the foot and there will be absence of distal pulses. It is difficult to assess it in a hypotensive, vasoconstricted patient.

- ★ The ligature can be cut and checked for adequate flow because the inner layer of the wall may have been disrupted.
- ★ If the artery has been transected, then it needs to be repaired by end-to-end anastomosis and a graft may be required. The attendance of a vascular surgeon becomes essential.

### **Ligation of the posterior division of the internal Iliac Artery :**

It may lead to gluteal ischemia. This can be prevented by ligating the anterior division of the Internal Iliac Artery 3 cm distal to it's origin after the posterior division has taken its origin of Internal Iliac Artery.

### **Ligation of the Common Iliac Artery :**

It is unlikely and rare. It will require help of a vascular surgeon and depending on the extent and site of injury the vascular surgeon will repair it.



### **Injury to the ureter :**

One should be familiar with the anatomical relationship of the iliac vessels and the ureter which lies medial to the Internal Iliac Artery. It is identified by observing its peristalsis and a snapping sound on palpation. The ureter should be identified and refracted medially using Kelly retractors to keep it away from the operating field.

In life-threatening surgery or delayed intervention to control massive hemorrhage, accidental damage to a ureter may occur. Ligature is more probable than transection. Prompt diagnosis and remedial surgery by a urological colleague are essential. Accidental ligature of one ureter may not lead to renal failure but increase morbidity.

### **Limitations of IIAL**

In haemodynamically unstable patients obstetric hysterectomy may be preferred to internal artery ligation.

Pictures courtesy Dr. Rajshree Dayanand Katke





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# TIPS AND TRICKS FOR SELF DIRECTED LEARNING OF INTERNAL ILIAC ARTERY LIGATION

Ligation of anterior division of internal iliac artery (IIA) is lifesaving and uterus preserving surgery, and it can reduce obstetric hysterectomies. However, it needs expertise and if attempted by an inexperienced obstetrician it can be disastrous. Hence it is important for all obstetricians to learn the skill of IIA ligation.

### Prerequisites for self-directed learning

One should be

1. Aware of the importance of performing IIAL
2. Must be familiar about the indications and contraindications
3. Must have the motivation to perform the procedure.
4. Must know detailed anatomical relations of pelvic vessels and ureter.

### Steps of self-directed learning

#### For post graduate students

1. Best learning period is while you are doing post-graduation as few cases which you witness during this period, leave a lifelong impact on you.
2. Post graduate students have a great opportunity to go to the dissection hall and revise the anatomical relations of IIA and ureter.
3. They can ask the teachers to show them the pelvic vessels and ureters in gynaecological and obstetrical surgeries wherever feasible.
4. They can be made to palpate and trace the vessels and ureter
5. Laparoscopic surgeries are good for clear visualization and learning the relationship of various structures to each other

#### For the stand-alone practitioners

1. Watching videos of procedures especially those which are done for cancer surgeries where pelvic lymphadenectomy is performed either by laparoscopy or open surgery provide a great impression of the relations of the pelvic vessels, ureter, and surrounding structures.
2. Using atlas to see the enlarged diagrams which very well depict various branches and their relations at different angles, lateral, antero-posterior, superior, and inferior.
3. Attending various workshops where hands on training on cadavers is possible.



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4. While doing pelvic surgeries including Caesarean sections try to visualise and palpate the tubular structures in the following order
- ★ See and palpate sacral promontory and aorta just above that.
  - ★ Visualize and trace the aorta dividing into common iliac arteries (Aortic Bifurcation).
  - ★ Trace common iliac arteries to the sacroiliac joints
  - ★ See and palpate common iliac artery divide into external and internal iliac arteries (CIB).  
Gluteal Bifurcation : A bifurcation of Internal Iliac Artery into anterior and posterior division can only be visualised after retroperitoneum is opened. So, the site of ligation (3-4 cm after common iliac bifurcation) is visualised.
  - ★ Trace the external iliac artery running along the medial border of psoas and exiting below the inguinal ligament.
  - ★ Feel for femoral artery pulsations below the inguinal ligament in the groin
  - ★ See the ureter crossing the common iliac artery on the right side from lateral to medial side
  - ★ Ureter may not be visible on left side due to sigmoid colon. Identify it by lifting it with your thumb and index fingers and snap

Do these many times.

This can be followed by opening the retroperitoneum as described both by anterior and posterior approach to expose the vessels and directly view them. This also must be repeated many times to overcome the anxiety by familiarization.

Repetition of practice sessions, workshops, assisting procedures, watching videos, using atlas is very important to gradually built up the confidence of doing this procedure in emergency.



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## PERIPARTUM HYSTERECTOMY

### Introduction:

Peripartum Hysterectomy is defined as hysterectomy performed at the time, or at any time from delivery to the discharge of the parturient after the index obstetric event in pregnancies beyond 20 weeks of gestation. It is a primary peripartum hysterectomy if undertaken within 24 hours of delivery, and secondary or delayed peripartum hysterectomy if undertaken after 24 hours from the index obstetric event.

Emergency peripartum hysterectomy is performed in an emergency such as severe intractable PPH, uterine rupture, morbidly adherent placenta etc. Where as planned peripartum hysterectomy is performed in patients with an antepartum diagnosis of placenta accreta, or more rarely for stage IA2 and IB1 cervical carcinoma or very large fibroids.

Worldwide, the rate varies widely from less than one in 1,000 deliveries (0.1%) to as high as 50/1,000 (5%) deliveries. In Southeast Asian countries it is between 0.7 to 2.3 per 1000 deliveries.

The risk factors for peripartum hysterectomy are :

- |                                      |                              |
|--------------------------------------|------------------------------|
| ☞ Abnormal placentation              | ☞ Advanced maternal age      |
| ☞ Multiparity                        | ☞ Previous cesarean delivery |
| ☞ Multiple gestation                 | ☞ Antepartum hemorrhage      |
| ☞ Preeclampsia                       | ☞ Bleeding disorders         |
| ☞ Assisted reproductive technologies |                              |

### Applied anatomy

Peripartum hysterectomy differs from hysterectomy in nonpregnant women due to the following factors:

- The uterus is large and fills the pelvis
- Tissues are soft, sometimes friable and prone to tearing
- Blood vessels are dilated and tortuous increasing the risk of massive hemorrhage which may obscure the operative field
- Increased risk of leaving endometrium behind with subtotal hysterectomy due the stretched lower uterine segment
- Cervix is soft and dilated making it difficult to identify the lower limit



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### Indications

- ☞ Uterine atony
- ☞ Uterine rupture
- ☞ Carcinoma cervix stage 1A2 or 1B1
- ☞ Placenta accreta spectrum (PAS) disorders
- ☞ Cervical pregnancy

### Documentation

It is important to document the indication of hysterectomy and condition of patient at the time of decision making. An informed consent of the patient is taken if she is in a condition to give. Sometimes when it is done as a lifesaving procedure and the patient is either under anesthesia or not fit to give consent in that situation the relatives may be informed and consent is taken from them, and the patient is informed about the procedure postoperatively and documented.

### Preoperative considerations:

- ★ Experienced anesthesia team is required to manage massive hemorrhage and transfusion.
- ★ Experienced nursing staff and surgical assistants.
- ★ Experienced pelvic surgeon, urologist, or gynecologic oncologist to be involved in cases of PAS.
- ★ Adequate intravenous access with two large bore cannulas
- ★ Adequate reserves of blood and blood products
- ★ Availability of appropriate instruments including hysterectomy clamps, allis forceps, right angled Clamps or Mixer, long arteries, needle holders etc must be ensured on trolley
- ★ Vagina should be prepared with povidone-iodine if no placenta previa
- ★ If total hysterectomy is planned, external os may be sutured or a taped sponge is placed just beneath the Cervix to help intraoperative identification of cervix.
- ★ Patient may be placed in allow lithotomy position using stirrup for better assessment of intra operative vaginal blood loss and for ready access to the bladder or vagina from below.
- ★ Blood loss assessment should be done during surgery and at the end of surgery.

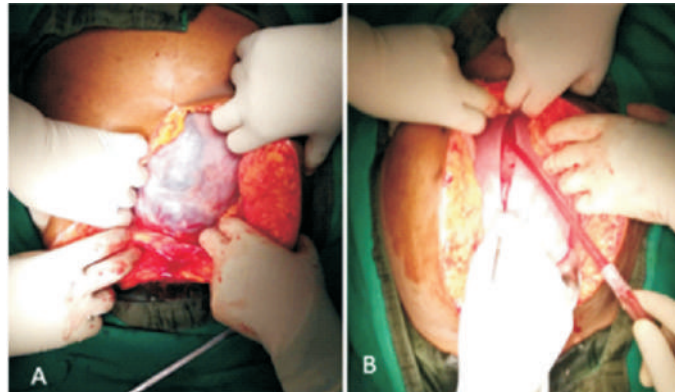
### Operative procedure :

#### Total versus supracervical hysterectomy:

In obstetrics supracervical hysterectomy may be preferred because removal of the cervix is difficult when the patient is in labor. In addition, supracervical hysterectomy may decrease total blood loss and operative time. However, total hysterectomy with removal of the cervix must be performed if cervical injury is contributing to the hemorrhage and in cases of placenta previa and PAS disorders where it is important to reach below the placenta.

#### Incision and delivery:

In planned peripartum hysterectomy, vertical skin incision is preferred. If performed in emergency conditions with Pfannenstiel incision, the latter may be converted to Maylard incision or Cherney incision for better exposure. Hysterotomy incision should avoid disruption of a known abnormally implanted anterior placenta or transection of large anterior fibroids. A high hysterotomy, trans fundal incision or classical may be preferred depending on the location of placental in PAS (Figure 1A and 1B). The lower end of the incision must be 2 cm above the placental edge.

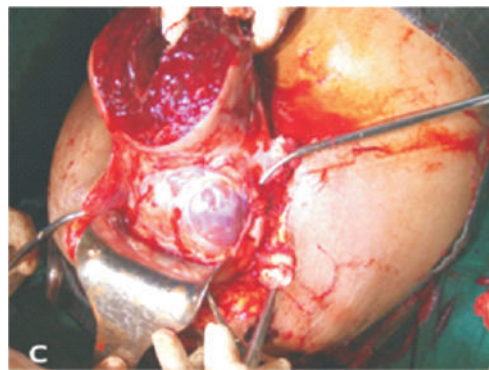


**Figure 1:** A planned peripartum hysterectomy for placenta accreta spectrum (PAS) disorder Fig 1A. Skin is opened by midline vertical incision. Classical (upper segment) caesarean section being done. Fig 1B

### Hysterectomy steps:

When patient is hemodynamically unstable priority is given to decrease the uterine blood supply.

- ☞ If facilities are available balloon catheters may be placed preoperatively in uterine artery or internal iliac artery in cases of PAS, which are inflated once the baby is extracted
- ☞ Uterus is exteriorized, compressed, and lifted to apply traction by the assistant
- ☞ Do a bilateral internal Iliac artery ligation
- ☞ Manual compression of the aorta.
- ☞ Pedicles can be rapidly clamped and cut (“clamp, cut, drop”), and sutured later after the uterine vessels are secured. Care is taken not to disturb the placenta by staying parallel or away from the lateral borders of uterus and not letting the clamps dig into the myometrium. (Figure 1 C)



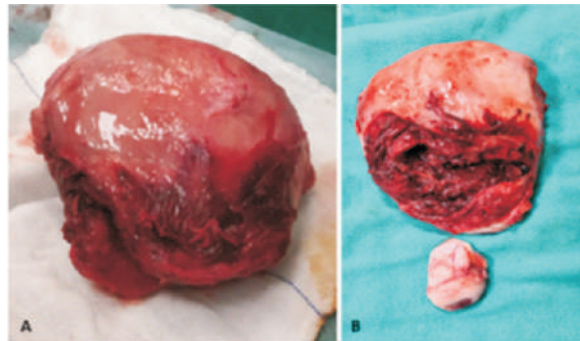
**Figure 1C.** Total hysterectomy is performed without trying to disturb the placenta

- ☞ Round ligaments and tubo-ovarian (ovaries are preserved) pedicles are doubly clamped by creating a window in the avascular space and then ligated.
- ☞ Bladder is separated by opening the UV fold.
- ☞ If the bladder is densely adherent to the scar or highly vascular, then it is better to secure the uterine blood supply before the bladder dissection by opening the para vesical spaces (lateral window approach). Remember the bladder is adherent only to the scar.
- ☞ In placental percreta, resection of a portion of the bladder may be required, but it should be done only after securing the tubo-ovarian pedicle and uterine pedicle. Sometimes if the correct plane is not identified bladder may be opened at the dome. Palpation and inspection of the posterior wall of the bladder from the inner side makes it easier to find the dissection plane between these two organs.
- ☞ The posterior leaf of the broad ligament is then opened towards the cervix, dropping the ureters inferiorly and clearing the endopelvic fascia posterior to the uterine vessels.



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- ☞ The uterine vessels are then skeletonized clamped cut and ligated.
- ☞ The ureters are to be identified by visualizing them through the peritoneum of the posterior leaf of broad ligament, or by palpation prior to the surgery. Their position should be confirmed frequently during the procedure.
- ☞ Cardinal ligaments are taken next by clamping close to the cervix with a straight clamp, after dividing the tissue medially and ligated. Supracervical hysterectomy can be performed after dissecting the upper cardinal ligaments and clamping the lateral cervical vessels. Cervical edges are then sutured. In cases of placenta previa, it is important to go beyond the placental insertion on the internal os.
- ☞ If total hysterectomy is planned, then the pouch of Douglas (POD) is examined to make sure that the rectal reflection is not abnormally high. Rectovaginal space can be dissected. Anteriorly bladder is further reflected off the entire cervix and the proximal vagina.
- ☞ Cardinal and uterosacral ligaments are clamped and cut and ligated until the base of the cervix. If the distal cervix is difficult to identify, the cervix may be transected, and external cervical os can then be palpated through the cervical canal with the help of a bend index finger.
- ☞ The cervix and uterus are removed by opening and cutting the vagina.
- ☞ Vaginal cuff is sutured.
- ☞ Sometimes the remaining cervical stump can be removed separately. Fig 2 (A & B)



**Figure 2:** Subtotal hysterectomy A. For uterine rupture in a case of previous 2 caesarean deliveries B. Rupture uterus with previous 1 caesarean delivery and injudicious use of misoprostol. Subtotal hysterectomy was performed, followed by removal of cervix separately

Bladder and ureteral integrity may be checked. Infusion of 200 mL of saline mixed with two or three drops of methylene blue is instilled through the indwelling bladder catheter. Ureters are inspected for peristalsis.

If ureteral injury is suspected 5 mL of indigo carmine can be given intravenously and observed for spill of blue colored urine into the pelvis after 10 to 15 minutes in case of injury. If ligation of ureters is suspected cystoscopy is indicated

If there is persistence of pelvic bleeding, coagulation status is to be checked, acidemia and hypocalcemia is corrected. Hemostatic agents and pelvic packing may be considered.

### Complications:

- |                |  |
|----------------|--|
| ☞ Hemorrhage   | ☞ Urinary tract injury                 |
| ☞ Coagulopathy | ☞ Paralytic ileus or bowel obstruction |
| ☞ Infection    | ☞ Pelvic or deep vein thrombosis       |
| ☞ Reoperation  | ☞ Maternal mortality                   |



### **Postoperative care:**

Women often requires care in the intensive care unit (ICU) with multi disciplinary team (MDT) approach with an experienced anesthesiologist and ICU team. The CBC and coagulation profile must be sent 2 hrs. after the replacement of blood components. Once stable, she should be managed like any other post operative case. These women are at moderate risk of postoperative thromboembolic disease. Mechanical and pharmacologic prophylaxis for deep venous thrombosis should be considered.

### **Peripartum hysterectomy in special situations:**

#### **Placenta Accreta Spectrum (PAS) disorders or morbidly adherent placenta (MAP)**

#### **Introduction**

Placenta accreta spectrum (PAS) disorders, earlier called as morbidly adherent placenta (MAP) refers to the abnormal invasion or adherence of the placenta to the myometrium and beyond. It includes the whole spectrum of placenta accreta, increta and percreta, and it may be focal, partial, or total. Over the past 4 decades, with the rising caesarean delivery rates from less than 10% to over 30%, there has been a 10-fold increase in the incidence of PAS to around 1.7-9 in 1000 maternities. More than 90% of the women with PAS have had at least one caesarean delivery before and the risk increases with the number of caesarean deliveries. PAS is often associated with placenta previa, hence also referred to as placenta-previa accreta.

#### **Risk factors for PAS**

- ★ Previous surgical scars on the uterus like caesarean delivery, surgical termination of pregnancy, dilatation and curettage, myomectomy, endometrial resection and Asherman's syndrome
- ★ Non surgical uterine scars like IVF procedure, uterine artery embolization, chemotherapy, radiation therapy, endometritis, intrauterine device, manual removal of placenta and placenta previa
- ★ Uterine anomalies like bicornuate uterus, adenomyosis and submucous fibroids

Women with these risk factors must be screened for PAS in the antenatal period with ultrasound. If PAS is suspected antenatally, delivery should be planned at an institution with appropriate expertise and facilities, including facilities for massive blood transfusion. For diagnosed cases of placenta previa accreta the surgery is planned electively anytime between 34-36 weeks electively.

#### **Pre-operative considerations**

- ★ An informed consent for classical CS followed by caesarean hysterectomy, risk of severe haemorrhage and massive blood transfusion, injury to surrounding structures, need for transfer to ICU and elective ventilation and death on table must be taken. She must be informed that the abdomen will be opened by a midline vertical incision
- ★ The surgery must be planned as the first case in the morning
- ★ Adequate arrangement of blood and blood products is done, and blood bank team is informed for timely release of blood and blood products
- ★ Operating team must have a senior anaesthetist, two senior obstetricians, neonatologist, urologist or gynae oncosurgeon or general surgeon and interventional radiologist if facility is there
- ★ Bed availability in HDU/ICU is confirmed
- ★ Placental mapping is done with ultrasound to delineate the upper edge of the placenta

The operating steps are essentially like those described under peripartum hysterectomy except following practical tips.

#### **Practical tips**

- ★ The abdomen is opened by a midline vertical incision even if the previous scar is suprapubic transverse.



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- ★ The uterine incision is given in upper uterine segment with its lower end at least 2 cm away from the placental edge.
- ★ Baby is extracted without disturbing the placenta
- ★ No oxytocic is given following delivery of placenta
- ★ Uterine incision is closed in a single layer and proceed to hysterectomy as described under peripartum hysterectomy
- ★ Bladder dissection is delayed till the uterine arteries are secured and upper part of paracervical tissue is clamped cut and ligated.
- ★ If the bladder is adherent to the previous CS scar correct plane of bladder dissection is identified by following the lateral window approach as the bladder is adherent only to the scar and not below it.
- ★ Bilateral Internal iliac artery ligation can be done once the leaves of broad ligament are opened after clamping cutting and ligation the round ligaments and tubo-ovarian pedicles of both sides.
- ★ Care is taken that the medial end of the clamp is not bounced off the surface of uterus. It stays slightly away from the lateral wall of the uterus so as not to disturb the placenta invading into the myometrium.
- ★ The surgeon needs to go below the placental insertion while removing the cervix

### Conclusion:

Peripartum hysterectomy is a lifesaving surgery. It may be a planned elective process or done in emergency. Planned peripartum hysterectomy is mostly performed for PAS disorders where abdomen is opened by vertical midline incision, classical caesarean delivery performed followed by total hysterectomy. As an emergency procedure, planning is the key. However, if abdomen has been opened by transverse incision, it may be converted to Maylard incision or Cherney incision for better exposure and subtotal or total hysterectomy should be performed. Blood and products are transfused as indicated. Postoperative care should be with MDT approach for best outcome

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Pictures courtesy Dr. Sweta Singh





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## INJURY TO BLADDER AND URETER DURING LSCS

### INJURY TO BLADDER

**Injury to bladder is not common but can happen during caesarean section as the bladder is in proximity of the lower uterine segment.** The incidence of bladder injury during caesarean section is 0.2% in a primary caesarean section and 0.6% in women undergoing previous caesarean section.<sup>1</sup> Bladder is a forgiving organ, but it is important to detect the injury and repair it at the time of primary surgery. Wherever possible involve a surgeon in repair for medicolegal safety. However simple injuries can be repaired by a obstetrician. **Hence it is important to include the risk of bladder injury in the consent for caesarean section.**

#### Risk factors predisposing to bladder injury

- ★ Prolonged labor with bladder distention.
- ★ Pregnancy with scarred uterus e.g., previous c-section, myomectomy, metroplasty, repaired uterine rupture
- ★ Intra-abdominal adhesions as in post operative cases, chronic PID, endometriosis, abdominal tuberculosis, previous puerperal sepsis etc
- ★ Morbidly adherent placenta (PAS)
- ★ Distorted local anatomy, cervical/ lower segment fibroid.
- ★ Obstructed labor
- ★ C-section done for advanced labor women that is second stage arrest with deeply engaged head
- ★ During caesarean hysterectomy

#### Applied Anatomy

The posterior wall of the bladder lies in close contact with the lower uterine segment. Usually, the dome of the bladder is injured, and the trigonal area remains well away from the site of injury. The bladder is injured either while opening the parietal peritoneum for gaining access to the peritoneal cavity or while opening uterovesical fold of peritoneum when it is adherent to previous lower segment scar.

#### Pre-operative considerations

- ★ Bladder must always be emptied before doing caesarean section by a catheter.
- ★ Whenever dense adhesions are encountered, sharp dissection of bladder under careful vision is



preferred instead of blunt dissection by mounted gauze.

- ★ In women with previous abdominal surgeries the peritoneal cavity must be entered above the previous scar preferably by blunt dissection with your fingers
- ★ In morbidly adherent placenta case, partial filling up of bladder would sometimes help in identification of bladder margins

### Diagnosis of bladder injury on table

- ★ Hematuria might occur in 95% cases.<sup>2</sup>
- ★ Foleys bulb may be visible.
- ★ Smooth bladder mucosa may be visible
- ★ Can be confirmed by distention of bladder with diluted methylene blue and visualization of leakage of methylene blue

### Classification of bladder injury

GRADE 1 – contusion, intramural hematoma/ partial thickness laceration

GRADE 2 – extra peritoneal bladder wall laceration <2cm

GRADE 3 – extra peritoneal bladder laceration >2cm or intra peritoneal <2cm laceration

GRADE 4 – intra peritoneal bladder wall lacerations >2cm

GRADE 5 – intra or extra peritoneal bladder wall laceration involving the trigone/ bladder neck

\*Grade 5 warrants calling urologist or urogynaecologist

### Step by step repair

- ★ Immediate repair is always better.
  - ★ Involve urologist if injury is near ureter.
  - ★ Give intravenous antibiotics to cover gram negative bacteria.
  - ★ Identify the extent of injury, ensure that it is limited to the dome.
  - ★ Exception to immediate repair includes some cases of placenta previa with intractable hemorrhage.
  - ★ The second surgery is usually done within 24-48 hours.
  - ★ It is important to free at least 2 cm area all around the defect in bladder wall for a tension free repair (Fig 1)
  - ★ Repair cystotomy in 2 layers, using absorbable sutures. Never use non – absorbable sutures as it might act as a nidus to bladder calculi
  - ★ Bladder injury repair is done by simple continuous suturing (Fig 2)
    - \* 1<sup>st</sup> layer includes bladder mucosa and muscularis repaired by 3-0 polyglycolic acid sutures
    - \* 2<sup>nd</sup> layer is muscularis and serosa, repaired with 2-0 polyglycolic acid sutures
- Mucosa pierced through and through and the second layer is by Lambert suture to ease out tension on first layer.
- ★ After completion of 2 layers at least 300ml saline with/without dye should be instilled through trans urethral Foleys to confirm a watertight repair.
    - \* If leakage is observed add a top up layer of imbricating sutures to attain a water tight closure.
    - \* To ensure integrity of the repair and to detect the presence of any other bladder injury, back fill the bladder with dye through the Foley's catheter.

Sometimes omentum may be trans positioned between the lower uterine segment or the vault if hysterectomy is done and the repaired site on the bladder.

- ★ American Association of Surgery for Trauma Injury Scrutiny Scale (from 1-5)

1. Bladder injury if Grade 1-2 should be managed with prolonged drainage with indwelling urethral catheter for 7-14 days

2. Injuries of Grade 3 or higher require surgical management.



**Fig 1 Sharp dissection to mobilize injured bladder off the uterus**



**Fig 2 Closure of bladder**

### Postoperative Care

- ★ Indwelling transurethral catheters are kept for at least 10-14 days depending upon the extent of injury. Silicon catheters are preferable
- ★ Continuous drainage of bladder is important for healing of the bladder wound. Hourly output measurement with a urometer is preferred
- ★ A closed suction drain must be kept at the prevesical space and pelvis for at least 5-6 days for early identification of urinary leakage.
- ★ Urine must be sent for culture and sensitivity every third day when patient is on prolonged catheterization.

### Practical tips

- ★ Remember that bladder is a forgiving organ, but prompt diagnosis and immediate repair is essential for good results
- ★ Early diagnosis and tension free 2 layered repair followed by continuous drainage of urine is of utmost importance
- ★ A watertight repair with a fine delayed absorbable stitch preferably polyglycolic acid is desirable



- ★ Placing drain in the prevesical space and pouch of Douglas for at least 5-6 days is important to detect early disruption of bladder repair is important
- ★ Prolonged catheterization for 10-14 days facilitates healing
- ★ It is important to include the risk of bladder injury in the consent for caesarean section
- ★ It is better to involve a surgeon or urologist wherever possible for a shared responsibility

### INJURY TO URETER

Ureteric injury is a rare complication of caesarean section. It is most often seen in cases with extension of uterine incision in lower uterine segment or the vagina. In case of ureteral ligation, prompt releasing of offending sutures angulating ureter and occluding the lumen should be done. Repair is indicated by a surgeon if it is partially or totally transected. It is important to identify the injury during surgery and manage to prevent morbidity associated with late diagnosis and related medicolegal complications. Incidence of ureteric Injury is approximately **0.3/1000 obstetric procedures**

#### Applied anatomy

Length of the ureter ranges between 20-30cm. It extends from the renal pelvis to ureteral orifice located at either extremity of the trigonal ureteric ridge. Its course can be divided into three anatomical zones:

**ZONE 1** : Between the renal pelvis and iliac arteries

**ZONE 2** : Between the ureteral crossover of the iliac arteries and the point where the uterine arteries cross over the ureter (water under the bridge)

**ZONE 3** : Between the uterine artery crossover of the ureter and the point where the ureter enters the urinary bladder.

Most (80%) obstetric-gynecological ureteric injuries occur below pelvic brim that is in zone 2 or 3. Zone 3 is mostly injured during c-section and Zone 2 during obstetric hysterectomy.

#### Risk factors predisposing to ureteric injuries

- ★ Extension of lower uterine segment incision leading to broad ligament hematoma
- ★ During securing a retracted uterine artery to achieve hemostasis.
- ★ During closure of tear in posterior wall of bladder while securing angles of the tear or repair of bladder injury near ureteric orifices
- ★ During oophorectomy at pelvic brim.
- ★ During obstetric hysterectomy while clamping uterine pedicle or paracervical tissues specially in women with morbidly adherent placenta
- ★ While doing adhesiolysis in women with previous surgeries.

#### Diagnosis

High index of suspicion coupled with tracing the course of ureter from the brim helps in diagnosis and repair. Direct surgical dissection and exposure of the ureter is desirable. Cystoscopy with inspection of urine coming through ureteric orifices and sometimes retrograde catheterization may be helpful.

#### Management

Principles of ureteric repair include:

- \* Mobilization of ureter preserving the adventitia



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- \* Debridement of the non-viable tissue
- \* Spatulation and a tension-free anastomosis with absorbable sutures
- \* Placement of a ureteric stent and a separate retroperitoneal drain
- \* Omental inter-position to separate the repair from associated intra-abdominal injuries or suture lines is recommended

It is important to identify ureteric injury during surgery and call in a urologist or a surgeon for assistance. Depending upon the site of injury a uretero-ureteric anastomosis, ureter reimplantation or a Psoas Hitch/ Boari Flap repair is done.

Proper documentation of the intraoperative conditions leading on to injury and the surgeons' notes must be done.

### Practical Tips to Prevent Ureteric Injury

- ★ At the pelvic brim identify the ureter before clamping infundibulo-pelvic ligament
- ★ While clamping uterine artery apply the clamp close to uterus
- ★ In case of bladder injury careful dissection of the bladder from the front of cervix must be done and care is taken while suturing the angles of the tear on dome
- ★ When ureter crosses iliac vessels, ureter is 2cm medial to the infundibulo-pelvic ligament
- ★ If there is any injury near the ureteric orifice placing JJ ureteric stents or infant feeding tube for at least 48 hours while repairing the bladder injury near to it.
- ★ Left ureter is more prone than right ureter due to dextro-rotation of gravid uterus correct dextro-rotation

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Pictures courtesy Dr. Renu Yadav



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## BOWEL INJURY IN LSCS

### Relevant anatomical points

To achieve a caesarean delivery, the surgeon must traverse through the following layers-

1. Skin
2. Subcutaneous tissue
3. Fascia overlying rectus abdominis muscle
4. The anterior abdominal fascia usually consists of 9 layers –
  - a) Composed of aponeurosis from external oblique rectus muscle
  - b) Fused layer consisting of aponeurosis of transverse abdominis and internal oblique muscles
5. After separating the rectus muscle which runs from cephalad to caudal, the surgeon enters the abdominal cavity through parietal peritoneum, keeping in mind to open the parietal peritoneum at the topmost point and notice no structure is underlying peritoneum while cutting it.
6. Uterus is encountered at this point immediately upon entry into the abdomen.
7. If the patient has an adhesive disease from prior surgeries, the surgeon may encounter adhesions involving such structures as omentum, the bowel, anterior abdominal wall, the bladder and anterior aspect of uterus, caecal injuries are most common (10%)

### Pre operative consideration

- ★ NBM for atleast 6 hours (solid food), 4 hours (Liquid diet)
- ★ Bowel preparation
- ★ Antiemetics, antianxiety medications to be given
- ★ Regional/General Anaesthesia
- ★ Trendelenberg position

### Step by step

- ★ During C- section in case of previous C-sections adhesions are encountered on omentum and bowel, etc
- ★ Adhesiolysis done.
- ★ During the procedure bowel can get injured leading to a hole or opening through which



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contents may leak into surrounding area of abdominal cavity most common site is caecum. Bowel contains feces, 50% of which comprises of dangerous E.Coli bacteria, leading to severe peritonitis and sepsis.

**Post operatively** – patient presents with

- ★ sudden severe abdominal pain that gets worse when touched or on movement.
- ★ Nausea & vomiting
- ★ Chills
- ★ Fever and tachycardia
- ★ Abdominal distention, and/ or inability to pass flatus or motion (Bloating of abdomen)
- ★ Not being able to pass urine or less than normal
- ★ Lack of appetite & feeling sick

**\*Bowel perforation should be treated as a medical emergency**

**Bowel contents in abdominal cavity**

**Peritonitis**



**Sepsis**



**Death**



### **Management**

Identify the area of perforation or bowel injury

<50% Primary Repair

>50% Resection & Anastomosis and Colostomy

Primary closure in 2 layers using 3-0 vicryl or PDS sutures is sufficient for majority of small Bowel injuries.

For Large Bowel injuries, a primary repair or colostomy followed by segmental resection is done.

- ★ The sudden decrease in uterine size following delivery may predispose to volvulus due to rapid repositioning of intra-abdominal organs.
- ★ LSCS is a risk factor for developing adhesions & small bowel obstruction with incidence of 0.5 – 2.2 per 1000.
- ★ Small serosal bowel tears can be treated with percutaneous drainage IV antibiotics. Tears may repair itself once the infection clears up.

**\*Small bowel obstruction after LSCS – Incidence = 0.1%**

**- M/c cause = post surgical adhesions/ volvulus**

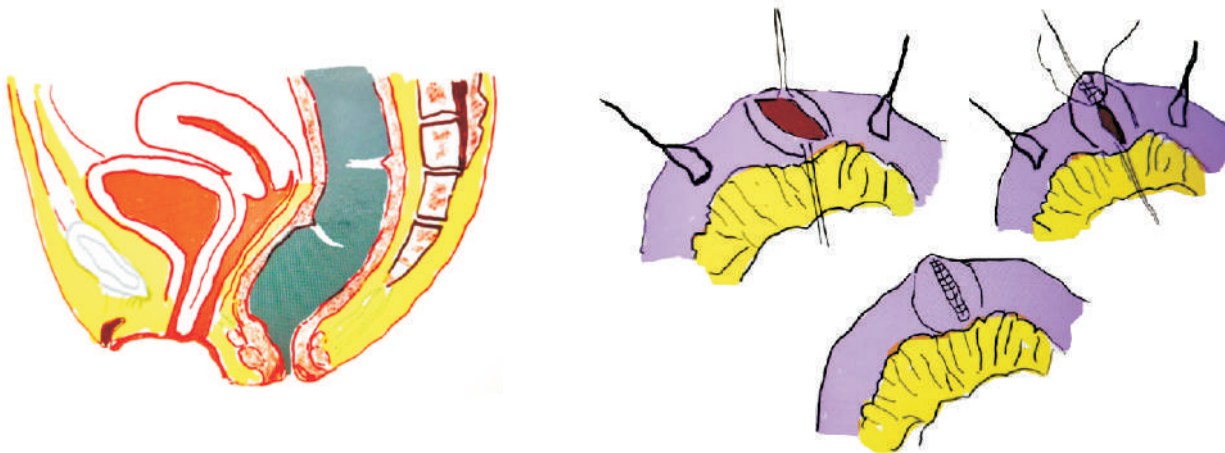
### **Ogilvie syndrome (Acute colonic pseudo obstruction) =**

It can occur post partum after LSCS, often resulting in caecal dilatation.

Incidence = 100 in 1 lakh cases.

### Do's and don'ts

1. The main approaches in the prevention of adhesions include –
  - ★ Improvement of surgical techniques
  - ★ Limitation of Intra abdominal organs trauma
  - ★ Application of adjuvant agents to reduce the formation of adhesions.
2. Delicate manipulation of tissue and meticulous hemostasis are necessary in order to avoid the presence of free blood in abdomen and prevent tissue ischaemia leading to deposition of fibrin.
3. Constant bathing of tissues with physiological saline or ringer lactate.
4. Minimally invasive surgical techniques.
5. Monofilament sutures reduce the risk of adhesions as they cause lesser tissue insult.
6. Avoiding non-closure of parietal & visceral peritoneum after C-section.
7. Avoid carrying out unnecessary large abdominal incisions and dissections, instead use small and atraumatic tools to not damage serosa.
8. Foreign bodies (such as drains) can provoke inflammatory response, hence limit its use to only when absolutely necessary.



Pictures courtesy Dr. Geetha Devi





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## INJURY TO FALLOPIAN TUBES AND OVARIES IN C-SECTION

Fallopian tubes and ovaries are rarely directly injured during C-section, but there is increased risk of injury in following cases –

- ★ Pregnancy achieved with ART
- ★ Known case of Endometriosis
- ★ Known case of Endometrioma
- ★ PID
- ★ H/o previous pelvic surgery
- ★ During adhesiolysis (if ovaries and/or fallopian tubes are adhered to the uterus)
- ★ During tubectomy
- ★ During ovarian cystectomy with LSCS
- ★ Tubo-ovarian mass in pregnancy
- ★ Koch's abdomen

### Indirect causes of fallopian tube and ovarian injuries are –

- ★ Ovarian Vein Thrombosis and Thrombus in veins supplying fallopian (due to excessive handling of tissues)
- ★ Injury to Uterine artery → Decreased supply to ovary & Fallopian tubes → Damage → leading to Secondary Infertility

### Anatomy of ovaries

They measure about 3x2x1cm

Ovaries are intra peritoneal structures and lie in ovarian fossa in lateral pelvic wall

### Relations

- ★ *Mesovarium/Anterior border* : a fold of peritoneum from posterior leaf of broad ligament is attached to the anterior border through which the ovarian vessels & nerves enter the hilum of the gland
- ★ *Posterior border* : is free and related to tubal ampulla. It is separated by the peritoneum from the ureter & internal iliac artery
- ★ *Medial surface* : related to fimbrial part of the tube
- ★ *Lateral Surface* : in contact with ovarian fossa on the lateral pelvic wall
- ★ *The ovary is attached to posterior layer of broad ligament by the mesovarium, to the lateral pelvic wall by the infundibulopelvic ligament & to the uterus by the ovarian ligament.*



### Anatomy of fallopian tubes

They are paired structures, measuring about 10cm and are situated in the medial 3/4<sup>th</sup> of the upper free margin of broad ligament.

There are 4 parts – 1) Intramural or Interstitial part 2) Isthmus 3) Ampulla 4) Infundibulum

### Blood supply

#### Fallopian tube :

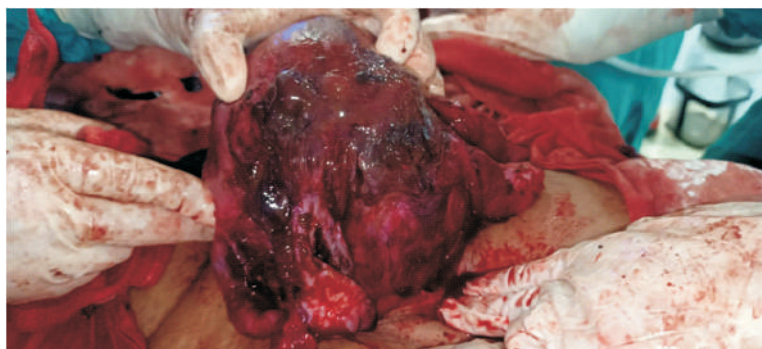
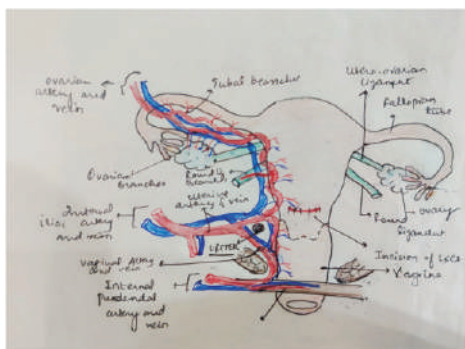
- ★ Arterial Supply – anastomosis between ovarian & tubal branches of ovarian artery and ascending branches of uterine artery
- ★ Venous Supply – Tubal branches of uterine and ovarian veins. Right ovarian vein drains directly into IVC and Left ovarian vein drains into Left Renal vein.

#### Ovaries :

- ★ Arterial Supply – Ovarian artery ( which is direct branch of Abdominal Aorta) and ovarian branches of Uterine artery
- ★ Venous supply – Uterine veins → Internal Iliac vein → IVC

### Do's and don'ts

1. Awareness regarding injury to ovaries and fallopian tubes
2. Minimal handling of the tissue during the surgery
3. Gentle handling of the tissue
4. Adhesiolysis under proper vision, with sharp dissection
5. Taking care of amount of traction and pressure during tubectomy
6. Comparing the pros and cons of additional surgeries during LSCS (like cystectomy, tubectomy, adhesiolysis)



Pictures courtesy  
Dr. Sumitra Yadav  
Dr. Vibha Moses