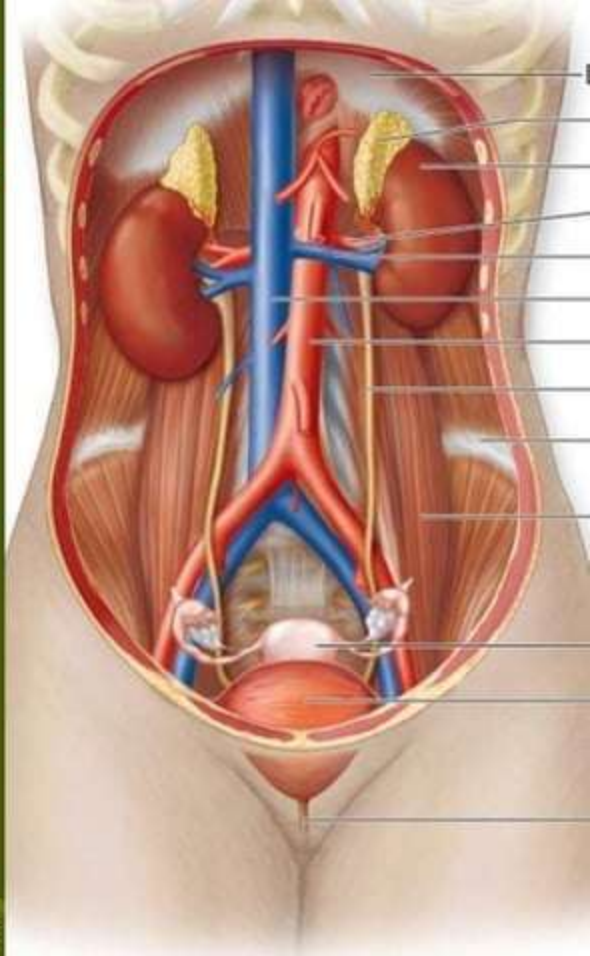
OPERATIVE INJURIES TO THE URETER



LEARNING OBJECTIVES

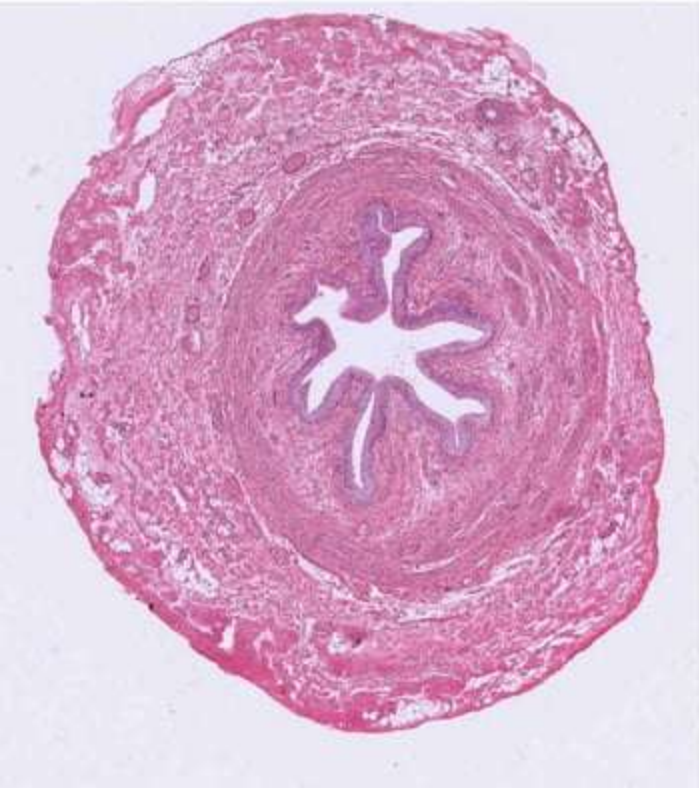
Learner will be able to understand:

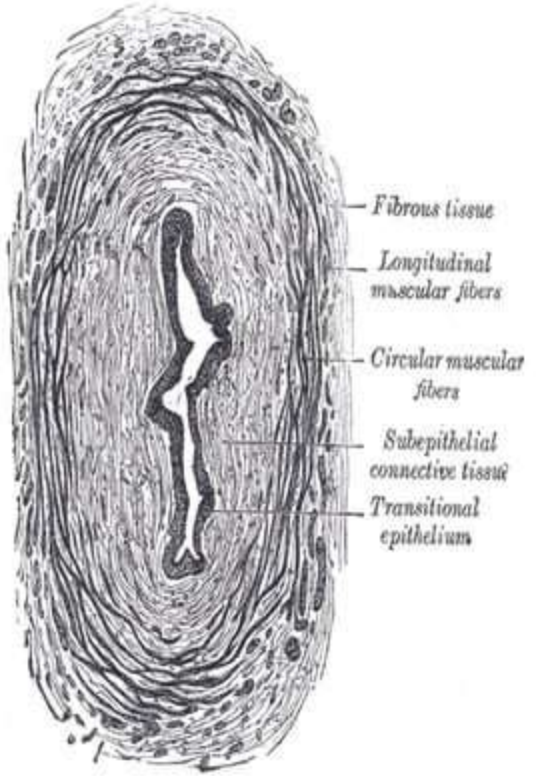
- ✓ The functional anatomy of the ureter & why the ureter is very prone to injury
- ✓ The general principles of prevention & management of ureteric injury
- ✓ The high risk procedures of ureteric injuries
- ✓ Diagnosis & Treatment of ureteric injuries

FUNCTIONAL ANATOMY OF URETER

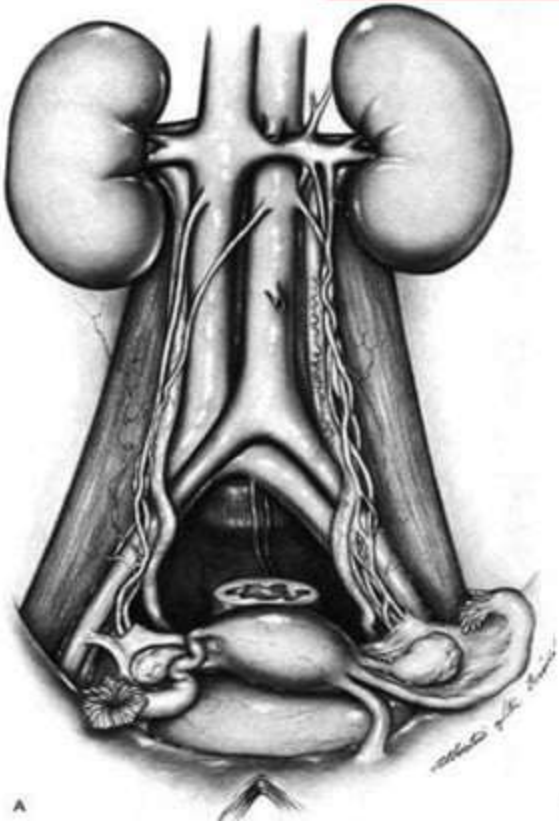
25-30 cm. length
- Abdominal-> 12-15cm.
- Pelvic-> 12-15cm.

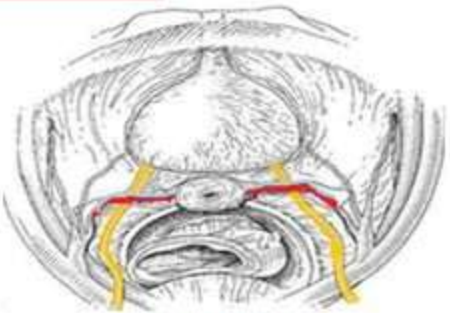
Cross section of ureter

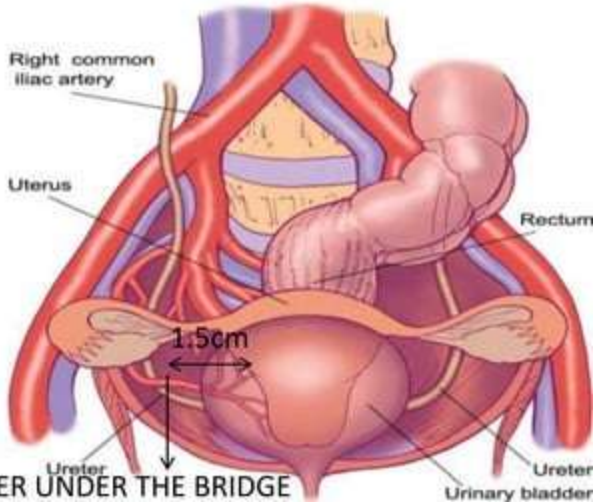




Course of ureter

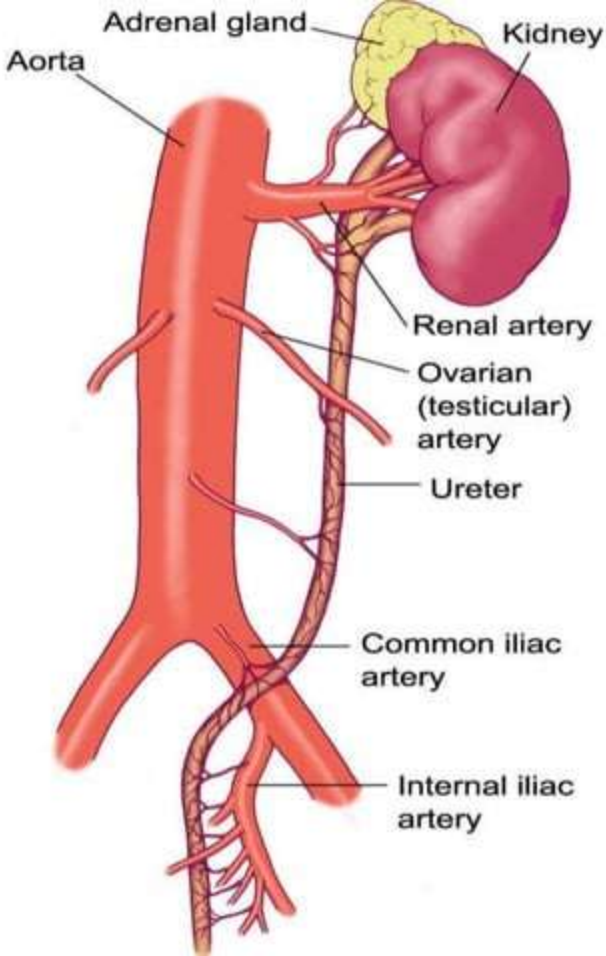






WATER UNDER THE BRIDGE

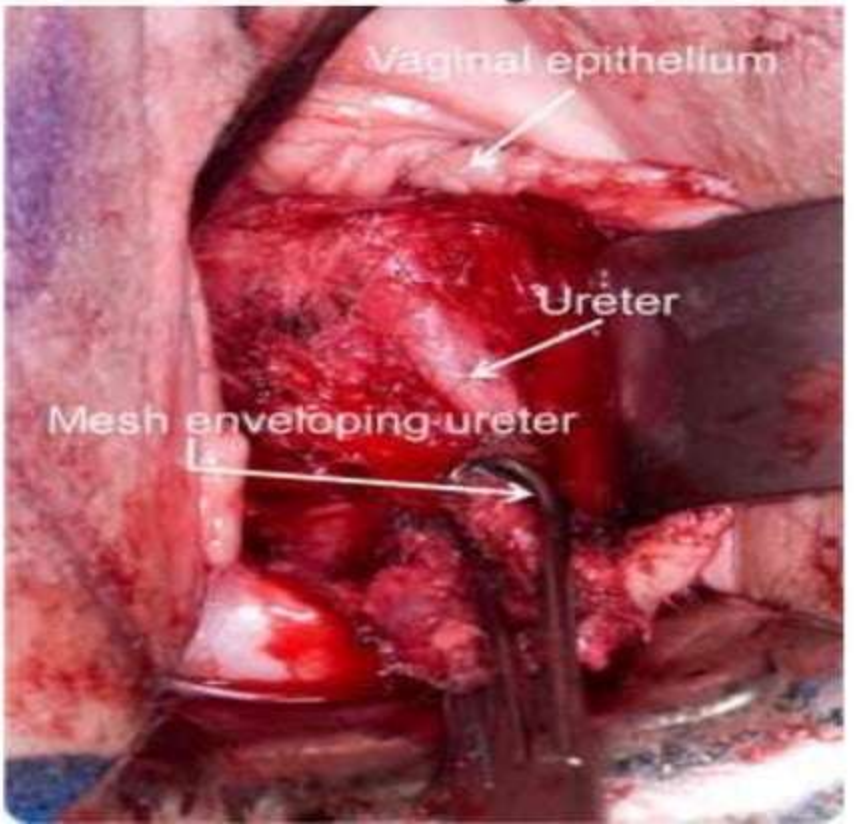
BLOOD SUPPLY TO URETER



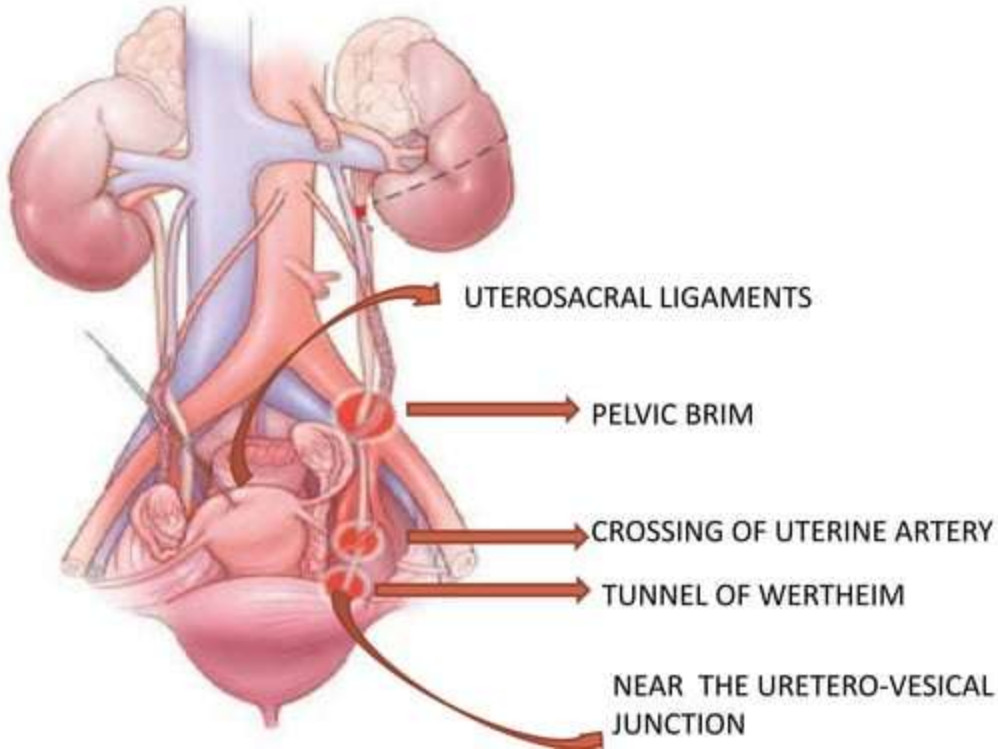
Identification of ureter

- Anatomy & relations of the ureter
- Peristalsis
- Palpation – SNAP feeling

URETERIC INJURIES



COMMON SITES OF INJURY



RISK FACTORS

- Enlarged uterus
- Previous Pelvic surgeries
- Pelvic adhesions
- Endometriosis
- Ovarian neoplasm
- Distorted Anatomy/congenital malformations
- Massive Intraperitoneal Haemorrhage

TYPES OF INJURIES

Ligation with suture

Crushing

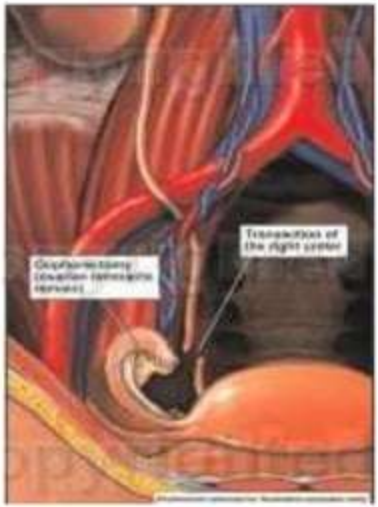
Transection(complete or partial)

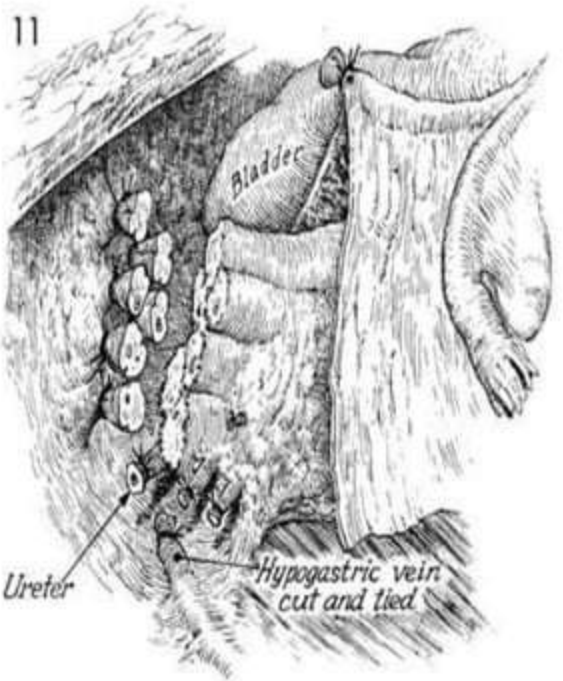
Angulation(kinking)

Diathermy related injuries

Resection

Ischemia




11
Bladder
Ureter
Hypogastric vein cut and tied

High risk procedures for ureteric injuries

RISK OF URETERIC INJURY IN OBSTETRIC AND GYNAECOLOGICAL PROCEDURES

OBSTETRIC

Emergency caesarean section	**0.027–0.09 %**
Caesarean hysterectomy	**0.5–8.0 %**

GYNAECOLOGICAL

Abdominal hysterectomy	**0.04–3.0%**
Vaginal hysterectomy	**0.02–0.47%**
Subtotal hysterectomy	**0.03%**
Wertheim's hysterectomy	**1–30%**
Urogynaecology Burch colposuspension	**0.09–3.3%**
Laparoscopy Adnexectomy	**2.9%**
Laparoscopically assisted vaginal hysterectomy	**1.39–6.0%**

(Royal College Of Obstetricians & Gynaecologist 2004;6:203–208)

ABDOMINAL HYSTERECTOMY

High risk area:

Lateral to uterosacral ligaments, uterine artery crossing, tunnel of Wertheim, termination into bladder.

High risk situation :

Lower uterine segment or cervical fibroid protruding into broad ligament,

Bleeding from pedicles especially at vaginal corners.

Lower uterine segment or cervical fibroid protruding into broad ligament:

Ureter may be anterior, lateral or posterior

Myomectomy first (by an incision adjacent to uterus or cervix).

bleeding from the pedicles or the vaginal angles:

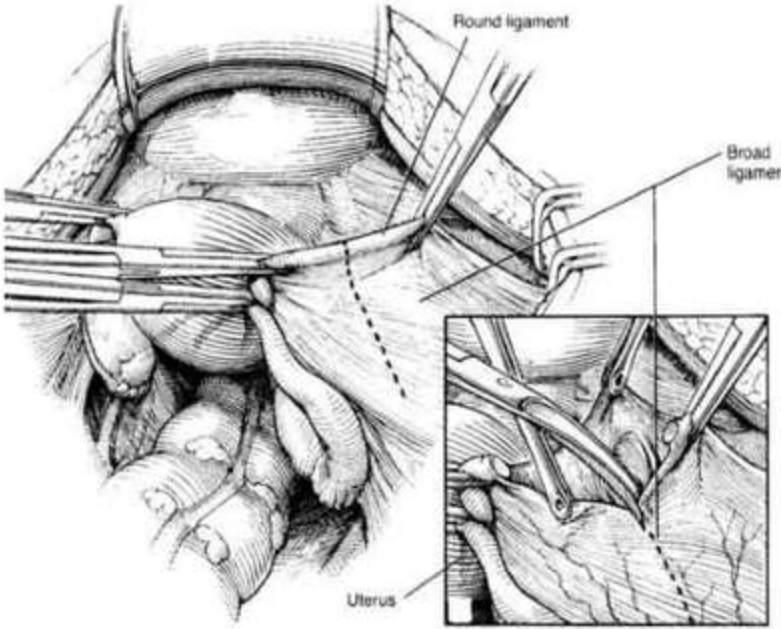
Superficial 3-0 suture

Intrafascial hysterectomy

Decreases chances of ureteral injury but increases blood loss.(not used now a days)

IF THERE IS ANY DOUBT :

Just trace the ureter before clamping by retroperitoneal dissection



Complex Adnexectomy

High risk area:

Ureter between the Pelvic brim & Tunnel of Wertheim.

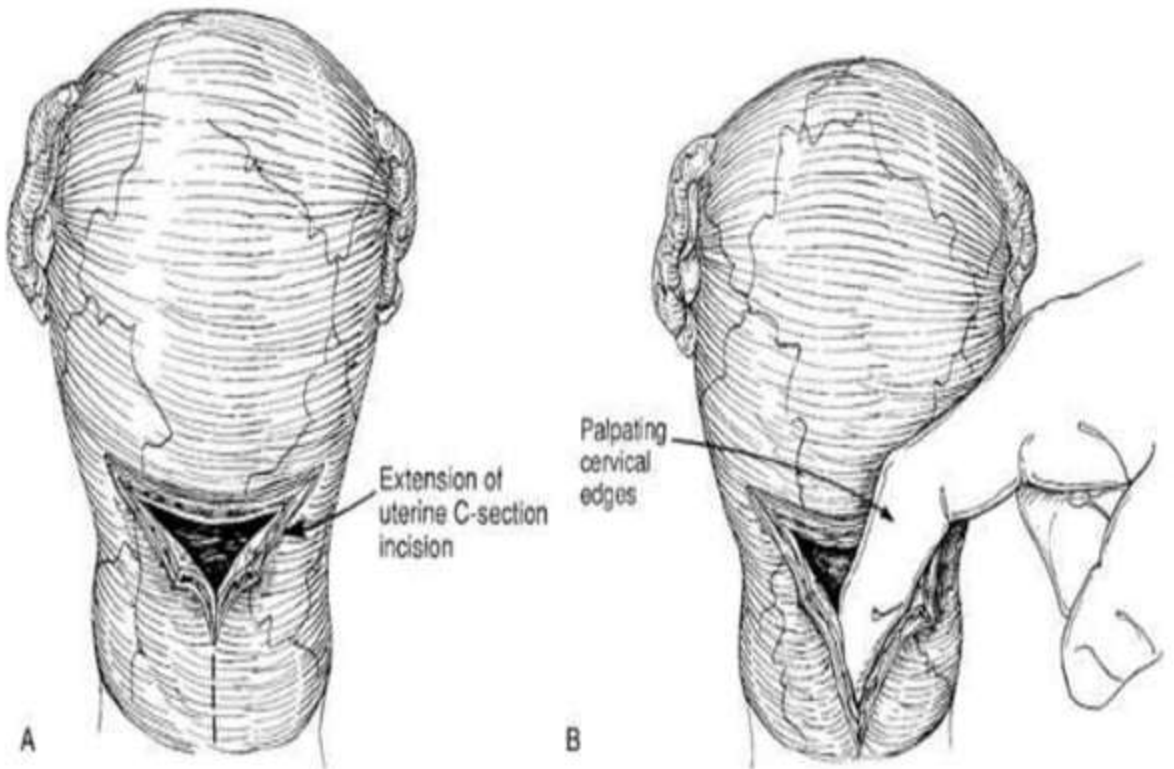
Retroperitoneal approach

Caesarean hysterectomy

- Bloody environment
- Distorted anatomy

Many prefer sub total hysterectomy to avoid ureteric injury

If not extend the incision downwards for easy placement of forefinger into endocervical canal & upper vagina.


Extension of
uterine C-section
incision
A
Palpating
cervical
edges
B

Vaginal hysterectomy

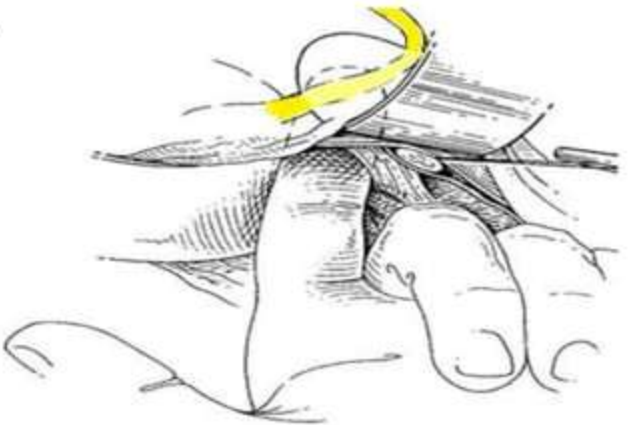
Ureteric injury is relatively uncommon

Traction on the cervix pulls the uterus farther from the ureter.

Injury is more common during culdoplasty.

Methods to minimize injury:

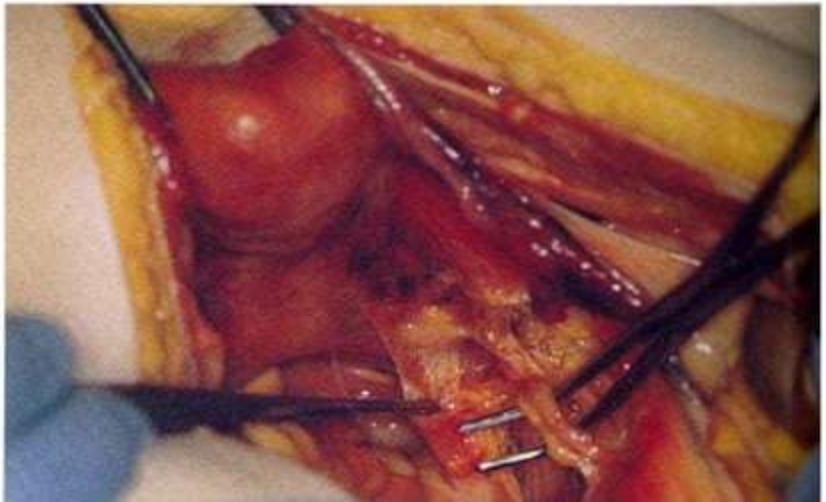
- ❑ Palpate the ureter



- Develop adequate vesico vaginal space
- Clamp, cut & ligate only small bits of paracervical & parametrial tissue adjacent to the uterus
- In anterior colporraphy while plicating the bladder do not start suture too laterally or too deeply to prevent needle injury

- Place an Allis clamp on the vaginal cuff over the Uterosacral ligaments & pull upward to make it taut.

With finger inside palpate the uterosacral ligaments & ureter.



Laparoscopy associated ureteral injuries

Thermal injury to ureter is more common

More likely to be diagnosed 2-5 days after surgery

High risk area:

- Where Uterine vessels are stapled or electro coagulated
- Where the infundibulopelvic ligament is transected(pelvic brim)
- At the uterosacral ligaments.

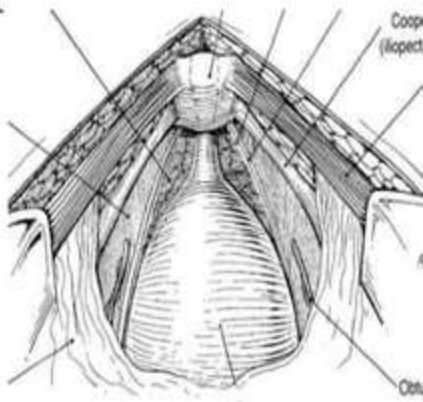
Methods to minimize injury:

- Always locate the ureter
- If ureter not visualised retroperitoneal dissection should be done
- Cauterize or laser with extreme caution near the ureter (clips & sutures are better choices)
- One should always know the area covered by cautery(usually 5 mm.)

Operation for Stress incontinence

Marshall-marchetti-krantz(mmk) procedure:

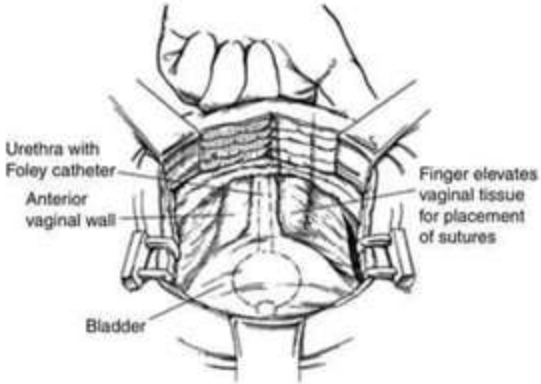
During excessive dissection of Space of Retzius.
If bladder is excessively mobilised

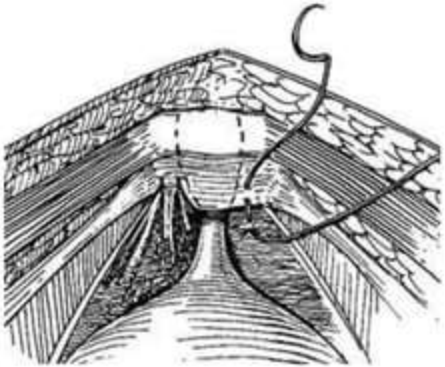


Burch colposuspension procedure:

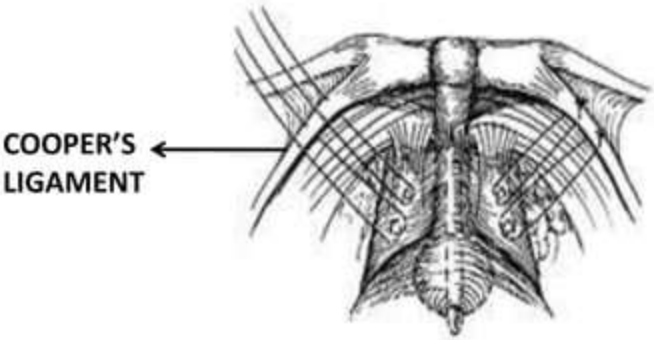
During high elevation suture.
If paravaginal defect repair is done in addition

marshall-marchetti-krantz(mmk) procedure





Burch colposuspension procedure



Methods to minimize injury

- Dissection through the space of Retzius should be under direct visualization & as close to symphysis pubis as possible

- Lateral paravaginal tissue dissection should be as minimum as possible.

- Marked lateral mobilization of bladder must be avoided.

- Urethrovesical junction should not be elevated so high.

Radical pelvic surgery

- The more radical the surgery more likely the injury of the ureter
- Adhesions due to multiple radiation exposure places ureter at high risk

Preventive strategies to reduce the risk of ureteric injuries

- Appropriate operative approach(thorough case study)
- Adequate exposure
- Avoid blind clamping of blood vessels
- Direct visualisation
- Mobilise bladder away from operative site
- Short diathermy applications

DIAGNOSING URETERAL INJURY

Dr.HIGGINS STATEMENT:

'The Venial sin is the injury to the ureter;

The Mortal sin is failure of recognition'.

Unfortunately only 1/3rd of the ureteric injuries are diagnosed intraoperatively

Intraoperative:

- ❑Directly visualised
- ❑Extravasation of urine
- ❑Proximal ureter may be dilated if obstructed distally
- ❑DYE TEST: PhenazopyridineHCl(pyridium)/indigo carmine/methylene blue dye injected intravenously(~5ml)- Extravasation within 3-5min.

Some surgeons prefer intraoperative cystoscopy after complicated gynaecological surgery

POST OPERATIVE:

SYMPTOMS: Unilateral cramping, flank pain,

Unusual delay of return of bowel function,

Abdominal distension,

Haematuria, anuria,

Watery vaginal discharge,

SIGNS: Unexplained pyrexia, illeus/peritonitis

Ascites,

Frank urine in drain or vagina or abdominal incision site,

Retroperitoneal urinoma.

INVESTIGATIONS:

- Leukocytosis
- Rise in serum creatinine
- IVP
- Renal ultrasound- hydronephrosis
- C.T.Scan
- Cystoscopy

Ureterovaginal, vesicovaginal or urethrovaginal fistula may be formed during gyne operations.

TEST TO DIFFERENTIATE:

Bladder filled with 200cc NS+3cc methylene blue-if vagina stained blue-vesicovaginal fistula. If not

I.V. Indigo carmine dye 5cc.-If vagina stained blue-ureterovaginal fistula.

URETERIC REPAIR

PRINCIPLES OF URETERIC REPAIR

- Meticulous ureteric dissection preserving ureteric sheath with its blood supply
- Tension free anastomosis by ureteric mobilisation
- Use minimal amount of fine absorbable suture
- Use peritoneum/omentum to surround the anastomosis

PRINCIPLES OF URETERIC REPAIR (cont....)

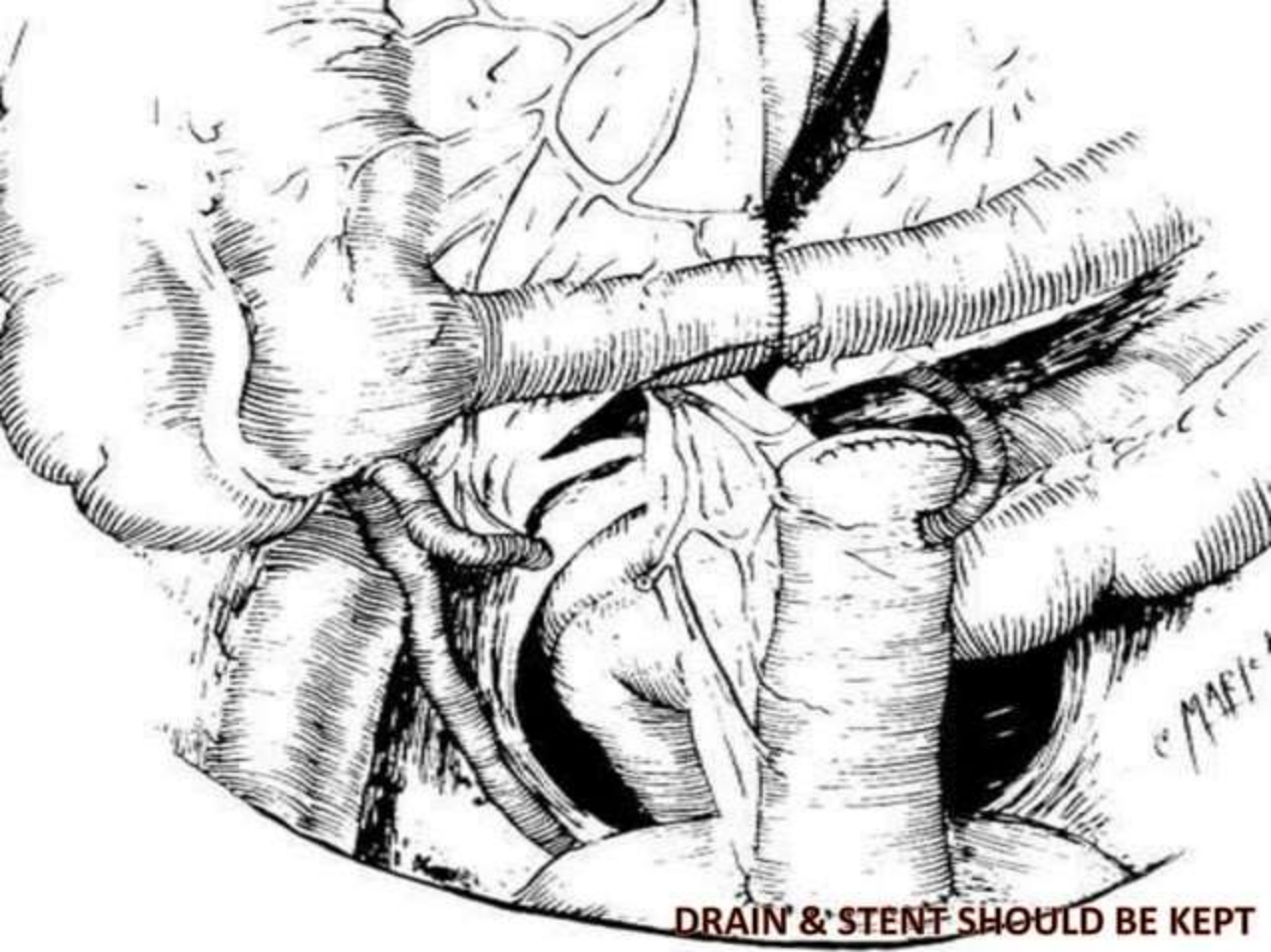
- A close suction drain to prevent urinary accumulation
- Stent the anastomotic site with urethral catheter
- Consider the proximal diversion-

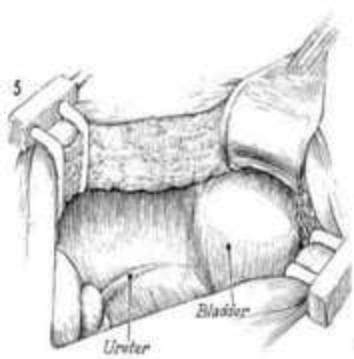
Percutaneous Nephrostomy
(if defect is large/complete transection/ureter lies in bed of inflammation/sepsis/abscess)

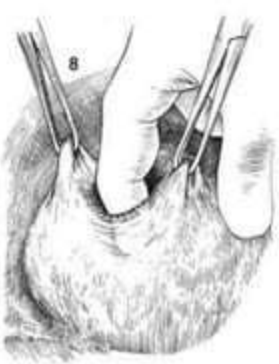
MANAGEMENT

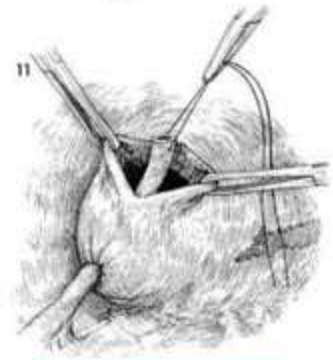
Depends upon:

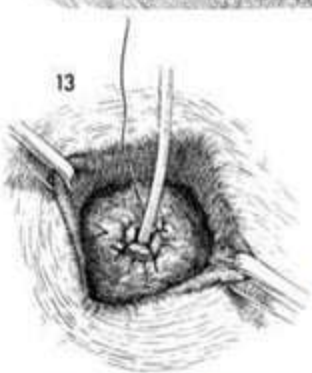
- Timing of diagnosis
- Type of injury
- Length of injury
- Location of injury
- Extent of causative operation
- Condition of woman

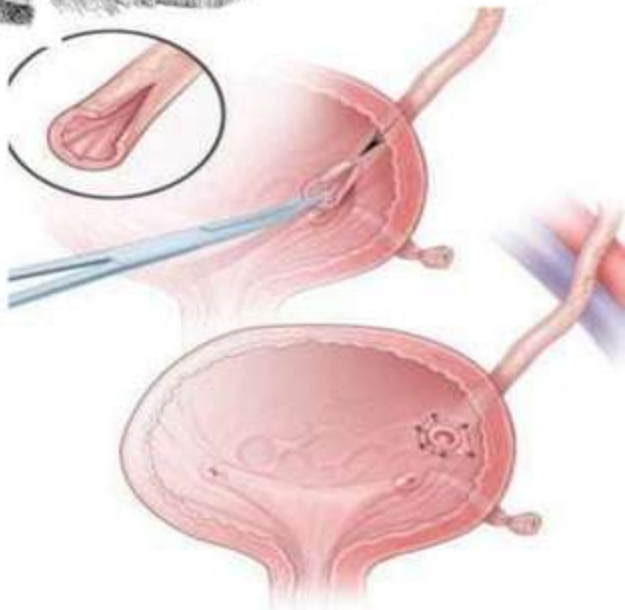

DRAIN & STENT SHOULD BE KEPT











URETROSTOMY

> URETEROILEO CYSTOSTOMY

> AUTO TRANSPLANTATION

> NEPHRECTOMY

If the ureteric injury goes unrecognised

POSSIBLE SEQUELAE:

- When injury is minimal – Spontaneous resolution & healing
- When complete obstruction – Hydronephrosis & gradual loss of renal function
- In transection–Urinoma/Urinary ascites/necrosis
- Fistula formation
- Stenosis

If diagnosed postoperatively

If the diagnosis of ureteric injury is delayed repair should not be delayed Unless there is:

- ❑ Sepsis
- ❑ Extensive hematoma
- ❑ Abscess formation
- ❑ Hemodynamic instability

In these cases **percutaneous nephrostomy tube/ stent** should be inserted & when resolves then definitive surgery to be done.

MEDICOLEGAL considerations

Ureteric injuries are the most common cause of litigation in gynaecological surgeries.

Lord Denning's proposal in the Court of Appeal that: 'In a professional man, an error of judgement is not necessarily negligent'

To prevent litigation any difficulty encountered should be properly documented & explained.

High index of suspicion should be kept in mind.

When removal of cervix is difficult, subtotal hysterectomy may be appropriate.

Any suspicion of ureteric injury should be investigated and managed.

Post op patients should have followup in both urology & gyanecology consultants.


UKOHN AYT