Document Control

Title **Guideline for Initial Investigation and Management of Iatrogenic Ureteric Injury**			
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CONTENTS

1. Purpose

1.1. The purpose of this document is to detail the process for investigation and initial management of suspected iatrogenic ureteric injury.

1.2. The guideline applies to gynaecological surgeons/colorectal and general surgeons/urologists/radiologists.

1.3. Implementation of this guideline will ensure that:

- A standard approach is followed which will reduce delays in the initial management and streamline initial treatment.

2. Definitions

2.1. APR – Abdominoperineal Resection

2.2. AKI – Acute Kidney Injury

2.3. IVP – Intravenous Pyelogram

2.4. PCN – Percutaneous Nephrostomy

2.5. RPG – Retrograde Pyelogram

3. Responsibilities

Role of the Gynaecologist/Surgeon

3.1. The gynaecologist/surgeon is responsible for:

- To have a low threshold for referring patients with suspected ureteric injury to the oncall urologist at NDDH (available 24 hours a day) for further investigations and management.
- To be aware of the possibility of ureteric injury when performing operations (see Appendix1) and consent patients appropriately.
- To discuss cases beforehand with the urologist on a case by case basis according to need.

Role of Urologist

3.2. The urologist is responsible for:

- Assisting when called to theatre intraoperatively and dealing with the situation as appropriate.
- For patients being referred post operatively, acting promptly on referral, assessing patient on the same day, and liaising with radiology to request the most appropriate radiological investigation.

- In case of a confirmed grade 3 ureteric injury or higher (See appendix 2), to liaise with tertiary centre as soon as possible, to discuss the most appropriate plan with them and refer patient immediately for reconstructive surgery, when such a therapeutic window exists (generally one week from injury).
- To perform cystoscopy and RPG and attempt at stenting in case of incomplete injuries, both in cases of intraoperative or delayed diagnosis.
- To arrange temporising measures such as nephrostomy, with radiologist, when stenting fails or where this is felt to be clinically appropriate.
- To refer patients to tertiary centre for delayed reconstruction after initial management with PCN/stent as appropriate.
- In case of injury during endoscopic surgery in the ureter, to recognise and manage this as per clinical need. In most cases, this will be by inserting a JJ stent.

Role of radiologist

3.3. The radiologist is responsible for:

- Approving and performing the most appropriate radiological investigation expeditiously.
- Perform PCN as clinically appropriate.
- Draining a urinoma percutaneously if this is clinically required.

4. Background

4.1. Iatrogenic trauma is the most common cause of ureteric injury. Injuries can occur during open, laparoscopic and endoscopic procedures and in some cases, can have severe consequences. The distal third of the ureter is predominantly involved.

Procedures causing iatrogenic ureteric trauma

4.2. Gynaecological surgery is the most common cause, with procedures like abdominal, vaginal hysterectomy, salpingo-oophorectomy and urogynaecological procedures. Colorectal procedures like APR and sigmoid colectomy and urologic operations especially endoscopic can also cause ureteric injury.

Mechanisms of injury

4.3. Injury can result from ligation, kinking with a suture, partial or complete transaction, avulsion, thermal injury or crush and devascularisation. Endoscopic ureteric injury can range from minor mucosal injury to perforation to the extremely rare avulsion.

Risk factors

4.4. Risk factors include conditions that alter normal anatomy such as advanced malignancy, prior surgery or irradiation, diverticulitis, endometriosis, large uterus, anatomic abnormalities, and major haemorrhage. Most iatrogenic injuries have no identifiable risk factors.

5. Diagnosis

Intraoperative

5.1. Absence of haematuria does not rule out ureteric injury and direct ureteral visualisation should be performed if injury is suspected intraoperatively. RPG is the most sensitive test and should be performed in most cases. Intravenous or intraureteric injection of indigo carmine or methylene blue can aid identification and location of injury if RPG is not possible. Intraoperative single shot IVP cannot reliably exclude ureteric injury and should not be used solely for this purpose.

Delayed

5.2. The diagnosis is typically delayed. Patient presents with flank pain, haematuria, urinary incontinence, vaginal or drain urinary drainage, worsening renal failure or even a urinoma. Blood tests may show an AKI with raised creatinine due to absorption of intraperitoneal creatinine.

6. Management

Intraoperative management

6.1. Acutely diagnosed injuries require immediate surgical intervention. Intact ureters should be primarily managed with ureteral stenting. Ligation injuries can be managed with de-ligation and stent placement, depending on the degree of ureteric damage. Partial transections can be repaired primarily over a stent. In cases of devascularisation form extensive skeletonising or thermal injury, the unhealthy segment should be excised and it is prudent to leave a stent. For injuries distal to the iliac vessels (pelvic brim), ureteral reimplantation is the method of choice. In damage control settings, when immediate repair is not possible at the time of laparotomy, ureteral ligation and subsequent PCN can be performed.

Imaging

6.2. CT Urogram should be performed as soon as the diagnosis is suspected. Hydronephrosis, delayed pyelogram, contrast extravasation with lack of contrast in distal ureter are suggestive of ureteric injury. Other signs include a urinoma from the extravasated urine. If bladder trauma is also suspected, a CT cystogram can be considered. Ultrasound adds very little to the diagnosis and a normal ultrasound cannot rule out a ureteric injury.

Cystoscopy and Retrograde Pyelography

6.3. Retrograde pyelogram is a sensitive and specific test for the presence, location and degree of ureteric injury. This can be performed intraoperatively, as well as in most cases where post-operative imaging suggests a ureteric injury. This allows direct examination of the bladder and contrast study of both ureters. In case of incomplete injury, a ureteric stent placement should be attempted, as this ensures canalisation and may reduce risk of later stricture.

Nephrostomy

6.4. If stent placement is unsuccessful, then consideration should be given to performing a percutaneous nephrostomy with later repair at tertiary centre

Referral

6.5. Patients should be discussed on the telephone with tertiary centre as soon as possible, as there is a narrow therapeutic window in the immediate post-operative period, when reconstructive surgery can be undertaken. For patients presenting later, the only option may be to temporise with a nephrostomy and delayed reconstruction.

7. Prevention

Stent placement

7.1. Prevention is based on visual identification of ureters and careful intraoperative dissection. Prophylactic stent insertion assists visualisation and palpation, and can be used in complicated cases, to facilitate dissection. It can also help to identify a ureteric injury when it does occur. However routine stenting is usually not cost effective and may not decrease the rate of injury, as it may alter the course of the ureter and reduce flexibility.

Intraoperative technique

7.2. Intraoperative haemorrhage is a significant risk factor for ureteric injury and should never be treated with blind cautery or suturing. Instead direct pressure and exposure of bleeding vessels allows visualisation and precise suturing.

8. Monitoring Compliance with and the Effectiveness of the Guideline

8.1. Iatrogenic ureteric injuries will be recorded as complications and serious injuries should be reported as incidents, as per Trust's incident reporting policy. Adherence to the policy can be audited and reported through specialty and divisional governance process.

9. References

- EAU Guidelines on Urological Trauma 2020
- Urotrauma AUA guideline 2014, amended 2017, 2020
- EAU Guidelines on Iatrogenic Trauma 2012
- Diagnosis and management of ureteric injury: an evidence-based analysis BJUI 2004

10. Appendices

- **Appendix 1**

Incidence of ureteric injury during various procedures

Procedure	**Percentage**
Gynaecological	
Vaginal Hysterectomy	0.02-0.5
Abdominal Hysterectomy	0.03-0.2
Laparoscopic Hysterectomy	0.2-6.0
Urogynaecological (anti incontinence/prolapse)	1.7-3.0
Colorectal	0.15-10
Urological	
Mucosal abrasion	0.3-4.1
Ureteral Perforation	0.2-2.0
Intussusception/Avulsion	0-0.3

- **Appendix 2**

AAST organ injury severity scale for ureteric trauma.

Grade	Description of injury

1	Haematoma
2	Laceration <50% of circumference
3	Laceration >50% of circumference
4	Complete tear <2 cm of devascularisation
5	Complete tear >2 cm of devascularisation