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European Association of Urology

Guidelines

# EAU Guidelines on Iatrogenic Trauma

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**Abstract**

***Context:*** The European Association of Urology (EAU) Trauma Guidelines Panel presents an updated iatrogenic trauma section of their guidelines. Iatrogenic injuries are known complications of surgery to the urinary tract. Timely and adequate intervention is key to their management.
***Objective:*** To assess the optimal evaluation and management of iatrogenic injuries and present an update of the iatrogenic section of the EAU Trauma Guidelines.
***Evidence acquisition:*** A systematic search of the literature was conducted, consulting Medline and the Cochrane Register of Systematic reviews. No time limitations were applied, although the focus was on more recent publications.
***Evidence synthesis:*** The expert panel developed statements and recommendations. Statements were rated according to their level of evidence, and recommendations received a grade following a rating system modified from the Oxford Centre for Evidence-based Medicine. Currently, only limited high-powered studies are available addressing iatrogenic injuries. Because the reporting of complications or sequelae of interventions is now increasingly becoming a standard requirement, this situation will likely change in the future.
***Conclusions:*** This section of the trauma guidelines presents an updated overview of the treatment of iatrogenic trauma that will be incorporated in the trauma guidelines available at the EAU Web site (http://www. uroweb.org/guidelines/online-guidelines/).


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## 1. Introduction

Iatrogenic injury to the urogenital tract, although rare, is an important area for any urologist. Appropriate investigation and treatment of suspected trauma, whether in the acute or delayed setting, is critical to reduce the potential impact of subsequent complications.

Newer energy applications, surgical techniques, and equipment have created a wider range of causes of iatrogenic trauma, but treatment of these injuries has remained essentially unchanged. However, in the past 15 yr, the management of even severe renal injuries has become more conservative, which has also been suggested for intraperitoneal bladder perforation.

The EAU Trauma Panel reviewed the current English-language literature via a Medline search. Although older references were included, more emphasis was placed on newer publications. We present an overview of the most common situations likely to be encountered in clinical practice.

This review does not provide complete information on the complex management of long-term sequelae. These are often the same as for noniatrogenic causes, and detailed management plans may be found in the full EAU guidelines

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**Table 1 – Incidence and aetiology of the most common iatrogenic renal traumas during various procedures**

| Procedure | Haemorrhage | AVF | Pseudoaneurysm | Renal pelvis injury | Aortocaliceal fistula | Foreign body |
|---|---|---|---|---|---|---|
| Nephrostomy | + | + | + | + | | |
| Biopsy | + (0.5–1.5%) | | + (0.9%) | | | |
| PCNL | + | + | | + | | |
| Laparoscopic surgery (oncology) | + | | | | | |
| Open surgery (oncology) | + | | + (0.43%) | | | + |
| Transplantation | + | + | + | | + | |
| Endopyelotomy | + | | | + | | + |
| Endovascular procedure | + (1.6%) | | | | | |

AVF = arteriovenous fistula; PCNL = percutaneous nephrolithotomy.

on trauma [1]. With the exception of inadvertent injuries caused by circumcision, this paper deals only with iatrogenic trauma in the adult and not the paediatric population.

This paper concentrates on the immediate diagnosis and initial management of iatrogenic urologic trauma (IUT). A new system of nomenclature is introduced to distinguish between different organs while retaining a degree of standardisation.

## 2. Iatrogenic renal trauma

### 2.1. Introduction

Iatrogenic renal trauma (IRT) is rare but can lead to significant morbidity.

### 2.2. Incidence and aetiology

Table 1 lists the most common causes of IRT [2]. Large haematomas after biopsy (0.5–1.5%) are caused by laceration or arterial damage [3]. Renal artery and intraparenchymal pseudoaneurysms (0.9%) may be caused by percutaneous biopsy, nephrostomy, and partial nephrectomy (0.43%) [4]. In percutaneous nephrolithotomy (PCNL), haemorrhage is the most dangerous IRT. Vascular injuries may occur at any stage of the procedure, especially when punctures are too medial or directly of the renal pelvis. Other injuries include arteriovenous fistula (AVF) or tears in the pelvicaliceal system, causing extravasation and absorption of irrigation fluid.

IRT in renal transplantation is more common and includes AVF, intrarenal pseudoaneurysm, arterial dissection, and arteriocaliceal fistula. Pseudoaneurysm is a rare complication of allograft biopsy. Although the overall complication rate with biopsies in transplanted kidneys is 9% (including haematoma, AVF, macroscopic haematuria, and infection), vascular complications requiring intervention account for 0.2–2.0% [5]. Predisposing factors include hypertension, renal medullary disease, central biopsies, and numerous needle passes [6]. AVF and pseudoaneurysm can occur in 1–18% of allograft biopsies and may coexist in up to 30% of cases [7]. Extrarenal pseudoaneurysm after transplantation procedures generally occurs at the anastomosis, in association with local or haematogenous infection. Arterial dissection related to transplantation is rare and presents in the early postoperative period [8].

IRT associated with endopyelotomy is classified as major (vascular injury) or minor (urinoma) [9]. Patients undergoing cryoablation for small masses via the percutaneous or the laparoscopic approach may have minor IRT including asymptomatic perinephric haematoma and self-limited urine leakage [10]. Vascular injury is a rare complication (1.6%) of endovascular intervention, in contrast to patients with surgical injuries; the renal vessels are vulnerable mainly during oncologic procedures. Renal foreign bodies, such as retained sponges or wires during open or endourologic procedures, are uncommon.

### 2.3. Diagnosis: clinical signs and imaging

Haematuria is common after nephrostomy, but massive retroperitoneal haemorrhage is rare. If a nephrostomy catheter appears to transfix the renal pelvis, significant arterial injury is possible. The misplaced catheter should be withdrawn over a guidewire; embolisation may arrest the haemorrhage. Computed tomography (CT) can also successfully guide repositioning of the catheter into the collecting system [11]. Haemorrhage can be prevented by avoiding puncture in patients receiving anticoagulation treatment or in those with coagulopathy by carefully targeting the calices and avoiding medial puncture. Injuries to the renal pelvis are less likely to occur if the dilator is not advanced further than the calix; sheaths are handled with care, especially during advancement around the pelviureteric junction; and kinking of the guidewires is avoided [12]. After percutaneous biopsy, AVF may present with severe hypertension. Pseudoaneurysm should be suspected if the patient presents with flank pain and decreasing haematocrit, even in the absence of haematuria.

During PCNL, acute bleeding may be caused by injury to the anterior or posterior segmental arteries, or late postoperative bleeding may be caused by interlobar and lower-pole arterial lesions, AVF, and post-traumatic aneurysm [13]. Duplex ultrasound and CT angiography can be used to diagnose vascular injuries. Irrigation fluid input and output should be monitored closely to ensure early recognition of "fluid" extravasation. Intraoperative evaluation of serum electrolytes, acid-base status, oxygenation, and monitoring of airway pressure are good indicators of