

# Urological complications following gynaecological surgery

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## Abstract

Gynaecology surgery is the commonest cause of iatrogenic injury of the urinary tract. Rapidly evolving surgical techniques and gynaecological training involving less surgical experience compared to previous years means there is a need to proactively minimise this risk. If ureteric injury is unrecognised it can result in prolonged morbidity and potential loss of organ function. Injuries may be avoidable by pre-operative assessment, attention to risk factors and meticulous surgical technique. Counselling patients regarding potential injury is important especially if there are pre-existing risk factors. A high index of suspicion and prompt evaluation may improve immediate recognition and thereby improve prognosis. Any delay in postoperative recovery especially with flank pain should raise the suspicion of urinary tract injury and prompt diagnostic evaluation should be undertaken. Surgical repair should be done by specialists with sufficient expertise and woman should be debriefed and followed up to improve patient satisfaction and reduce litigation rates.

**Keywords** bladder injury; gynaecology; ureteric obstruction; urinary tract injury; vesico vaginal fistula

## Introduction

The close embryological and subsequent anatomical relationship between the urinary tract and the genital tract increases the potential risk of urological injury during gynaecological surgery. About 75% of urinary tract injuries occur during gynaecology surgery with 75% for a benign indication. It is estimated that 26–95% of the injuries can be unrecognised at the time, leading to diagnosis in the postoperative period. This also remains one of the leading causes of litigation in gynaecology due to the complication itself or the failure of recognition of the injury. Unrecognised injury has severe consequences leading to increased surgical morbidity, reoperations often with poorer outcome, fistulas and even silent loss of renal function.

The incidence and nature of injury varies, it is dependent on the type of surgery, the related pathology, the expertise of the

surgeon and the use of diagnostic modalities such as cystoscopy used at the time of primary surgery. Urinary tract injuries may be unavoidable in some situations, constant awareness of the possibility and recognition at the time may avoid a delayed presentation which has a poorer prognosis. This review aims to assess the overall risk of urinary tract injury in the current context with the focus on the preventative strategies as well as initial management to minimise the long term sequelae.

## Incidence

The overall incidence of urinary tract injury during a hysterectomy for benign condition is about <1%. Using visual inspection alone bladder injury is easier to recognise and more common than ureteric injury. However, the use of cystoscopy increases the detection rates of both bladder and ureteric injuries compared to visual inspection. A review by Gilmour et al. found that detection rates of ureteric injuries increased from 1.6/1000 to 6.2/1000 and bladder injuries from 2.6/1000 to 10.4/1000 with routine cystoscopy. The exact incidence may be higher as cystoscopy does not have 100% sensitivity for urinary tract injuries because urine efflux can be seen through the ureteric orifice in cases of partial ureteric obstruction or transection.

The incidence and type of injury also varies with the surgical procedure. [Table 1](#) shows the incidence of injuries in the various gynaecology operations from review of several studies published in literature. The risk of urinary tract injury seems to be least with subtotal hysterectomy and highest with radical hysterectomy. Laparoscopic procedures also have a higher incidence mainly due to the use of diathermy. Makinen et al. found a decreasing incidence of ureteric injuries from 1.1% to 0.3% over a 10 year period from 1996 to 2006 which may reflect increased surgical experience. In contrast however, a recent study by Kiran and Hilton looking at the 10 year incidence of ureteric injury in the UK from 2001 to 2010 found a higher incidence of injuries in the latter half of this period than the former with an overall incidence of 0.5%. A higher incidence was also seen in gynaecology oncological procedures due to the close proximity of the procedures to the urinary tract. Bilateral ureteric injuries are rare contributing to 5–10% of total ureteric injuries. Urethral injuries are less common and more likely associated with urogynaecological surgery. The incidence of urethral injury during stress incontinence procedure is 0.08–2.5%; however this may be underreported. A urethral tear which may be sustained during catheterisation or cystoscopy may result in a urethrovaginal fistula. Direct injuries to the kidney have so far not been reported during gynaecological surgeries.

Urogenital fistulas are relatively uncommon. In the last decade, though the number of hysterectomies undertaken in the UK has been falling, the numbers of surgically treated fistulae's remain constant suggesting a potential increase in risk of urogenital fistula. The largest retrospective cohort study by Hilton and Cromwell of 343,771 women undergoing hysterectomy, showed an overall rate of urogenital fistula to be one in 788. The highest incidence was following radical hysterectomy for cervical cancer (one in 87) and lowest for vaginal hysterectomy for prolapse (one in 3861). The incidence was one in 540 for Total Abdominal Hysterectomy (TAH) and one in 2279 for Sub Total Hysterectomy (STH) for benign indications.

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### Incidence of urinary tract injuries

	Ureter	Bladder
<b>Gynaecological procedures</b>		
Abdominal hysterectomy	1.3/1000	2.6/1000
Subtotal hysterectomy	0.6/1000	0.3/1000
Vaginal hysterectomy	0.2/1000	3.6/1000
Radical hysterectomy	3–37/1000	1.49%
<b>Urogynaecological procedures</b>		
Burch colposuspension	0.02–3.3%	0.07–3%
Tape operations for stress incontinence	2.7–3.8%	0.5%
Laparoscopic sacrocolpopexy	0–7%	0–0.8%
<b>Laparoscopic procedures</b>		
Oophorectomy	1/1000	
Total laparoscopic hysterectomy	1.6%	3.17%
Laparoscopic assisted vaginal hysterectomy (LAVH)	0.58%	2.92%
Laparoscopic subtotal hysterectomy (LASH)	0.06%	0.25%
Robotic assisted LH	1.6%	0.9%
Laparoscopic radicalH	0.01%	0.5%

**Table 1**

Vesicovaginal fistula (VVF) is one of the consequences of a bladder injury and a major reason for litigation. Duong et al. in their review of 1317 hysterectomies for benign indications found a 0.3% risk of VVF after incidental bladder injury with no difference between surgical routes. Hakkri-Siren et al. from the Finnish national patient insurance association database found an overall prevalence of VVFs as one per 1200 operations (0.08%). The incidence was slightly higher with laparoscopic hysterectomy (one per 455 cases) compared to TAH (1/958) and vaginal hysterectomy (1/5636). Likic et al. reports a VVF rate of 2.6% and ureterovaginal fistula rate of 2.4% in patients who underwent radical hysterectomy for invasive cancer of cervix.

### Risk factors

Studies have identified potential predisposing factors that may be responsible for urinary tract injury. This may be patient related, procedure related, surgeon related or a combination of the above (Box 1). However, risk factors may not be present in >50% of cases.

Patient related factors include conditions that distort pelvic anatomy, obscure tissue planes and also cause poor visualisation making the urinary tract vulnerable to injury. These include previous pelvic surgery, endometriosis, congenital urinary tract abnormalities and large pelvic mass of any origin, pelvic haemorrhage. Neumann et al. and Lafay Pillet et al. both found previous caesarean section and previous laparotomy increase the risk of bladder injuries to 4.7% and 2.1%, respectively. Retrospective review of intrafascial supra cervical hysterectomies for benign gynaecological disease by Jung et al. found the presence of endometriosis to increase ureteric injuries. Other conditions may predispose to injury by distorting anatomy and include cervical and broad ligament myomas and chronic inflammatory

### Risk factors for urinary tract injuries

- Patient related factors
  - Previous pelvic surgery
  - Pelvic inflammatory disease
  - Large pelvic mass
  - Endometriosis
  - Pelvic irradiation
  - Obesity
  - Adhesions
  - Urinary tract abnormalities
- Procedure related factors
  - Laparoscopic hysterectomy
  - Malignancy
  - Pelvic reconstructive surgery
- Surgeon related factors
  - Experience of the surgeon
  - Learning curve
  - Fatigue
- Combined factors
  - Excessive blood loss
  - Length and difficulty of operation
  - Emergency procedure

### Box 1

disease as a result of pelvic infection or diverticulitis. Though plausible, there is no data for pelvic irradiation or obesity as factors contributing to urinary tract injury.

Procedure related factors include surgery in close proximity to urinary tract which occurs due to malignancy and pelvic reconstructive surgery.

Surgeon related factors include the surgeon's learning curve especially for laparoscopic hysterectomy. There are very few studies critically examining the impact of surgical technique; however, during laparoscopic surgery Schonman et al. postulates that unconscious acceleration of movements possibly due to fatigue, can predispose ureteric injury. Retrospective review of cases of laparoscopic hysterectomy by Laffay Pillet et al. found the learning curve to have significant relationship to bladder injuries, in the first 40 procedures the bladder injury rate was 1.9% which reduced to 0.4% after 100 procedures. Emergency surgery in the presence of haemoperitoneum results in poor visualisation which increases the risk of injury. Emergency surgery done out of hours by trainees who may have insufficient experience may increase the risk of urinary tract injury.

### Pathogenesis

Figure 1 illustrates the areas where urinary tract injury is common. The ureter is vulnerable at specific points along its pelvic course, depending on the type of surgery. The distal ureter is most vulnerable with 51% of injuries occurring here, 30% in the upper third and 19% in the middle third. At the pelvic brim where it crosses the bifurcation of the common iliac artery it is likely to be at risk during oophorectomy, lymphadenectomy and internal iliac artery ligation. During hysterectomy as well as myomectomy of

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