

## Original Research

# Urologic Complications following Gynecologic Surgery in a Sub-Saharan West African Country

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## Abstract

**Background:** Urological trauma is a dreaded complication of gynecological or obstetrical surgery and its incidence is poorly documented in resource limited settings can cause a major health problem. The objective of this study is to determine the clinical, therapeutic and evolutionary aspects of iatrogenic urological lesions in a low- and middle-income country (LMIC). **Methods:** A retrospective, descriptive study conducted for 5 years at the obstetrics and gynecology department of the university hospital of Cocody. It concerned all gynecological surgery performed in the department. All Urinary Tract Injuries (UTI) during surgery were recorded. UTI occurring outside this scenario were excluded. The socio-demographic features, clinical data, intraoperative UTI features, and treatment outcome parameters were studied. Statistical analysis was carried out using Epi Info 3.5.1 2008 software. **Results:** We recorded 46 cases of UTI (4.0%) including bladder (n = 33 or 71.7%), ureter (n = 8 or 17.4%) and both bladder and ureteral lesions (n = 5 or 10.9%). The average age of patients was 29 years. The UTI were suspected during the initial surgery by hematuria (52.2%), or intraoperative visualization (23.07%). Postoperative diagnosis of UTI was made in patients presenting with signs of peritonitis (3.84%). The UTI were immediately repaired (96.16%) by simple suturing of bladder or cystorraphy (84.64%), ureter: or ureterorraphy (4.3%), ureterostomy (4.3%) and removal of ureteral strictures (4.3%). Postoperative complications (15.36%) included urogenital fistulae (50%), urinary tract infection (25%) and acute peritonitis (25%). The average length of stay in the urology department was 45 ± 5 days. No maternal deaths were reported. **Conclusions:** Urologic complications associated with gynecologic procedures are sometimes unavoidable but can be reduced by complying with standard surgical guidelines. Bladder trauma were the most common iatrogenic lesions, however ureteral injuries are feared because of their more complex treatment. Treatment strategies should be dependent on location and length of injury, and surgical possibilities.

**Keywords:** gynecological surgery; iatrogenic urological injury; surgical management; ureter; ureteral reconstruction; ureteral strictures

## 1. Introduction

The appearance of Urinary Tract Injuries (UTI) is a major problem in obstetrics and gynecologic surgery. The bladder is the most frequently injured organ [1,2]. Postoperative complications are not intentional but directly result from surgery or the surgeon's expertise. The occurrence of these accidents can be avoided when surgical standards and guidelines are properly implemented. These intraoperative complications may be subject to legal proceedings [1,3]. UTI occurrence is primarily related to the close anatomical proximity between the pelvic genital organs and urinary tract. UTI are not insignificant and occur in 0.2%–1% of all gynecologic pelvic surgeries, with higher risks reported in cases of severe endometriosis and locally advanced cervical cancers [4]. UTI mostly occur in the lower ureter (51%), and less frequently in the upper (30%) and middle (19%) portions [5]. These iatrogenic lesions can also include the pelvic portion of the urethra, a habitual threat of any pelvic surgery [3–6]. Iatrogenic lesions include either ligation or kinking by a ligature, clamp-

ing, division, devascularization, or diathermy-related injury. However, the commonest injury mechanism is complete or partial ureter transection [5,6]. The severity of these injuries lies in the potential repercussions on the upper urinary tract [2,3]. Due to the continuous increase in the rate of cesarean deliveries, the incidence of urologic complications will potentially be higher [3]. Uterine arteries cross the pelvic portion of the ureter, with an increased risk of iatrogenic injury during hysterectomies, ranging from 1% during laparoscopic approach for benign disease, to 10.7% during open surgery for cervical malignancy. The exact frequency of UTI remains difficult to assess in our practice, as they are not reported [2]. The initial mechanism mainly results from obstetrical surgery and incidentally gynecological surgery [1–3,7]. Iatrogenic urological complications from gynecological surgery can be prevented and reduced by complying with standard surgical procedures. In cervical malignancy management, the primary prevention approach focuses on preventing disease before it develops (*i.e.*, prophylactic treatment); secondary prevention



attempts to detect the disease as early as possible (*i.e.*, early detection); and tertiary prevention is directed at managing a present disease (*i.e.*, treatment) [8–11]. The treatment of these malignant lesions requires individualization of the components of the urinary tract in order to avoid any traumatic lesions. The purpose of this study is to discuss current literature regarding clinical and management data for UTI during gynecology surgery in low- and middle-income countries (LMIC).

## 2. Material and Methods

This was a retrospective descriptive study concerning all the patients with iatrogenic urinary tract injuries (UTI) managed in the context of emergency or scheduled surgery in the obstetrics and gynecology department, and urology division of Cocody (Côte d'Ivoire) Teaching Hospital during 5 years from January 2016 to December 31, 2020. We included cases of ureteral injuries in which information on clinical observation, imaging (abdomino-pelvic ultrasound) and operative reports were available. We also included all cases of iatrogenic urinary tract injuries (UTI) recorded (intra or postoperatively) during or after initial gynecological surgery. All traumatic urinary tract injuries (UTI) occurring outside of a surgical procedure, were excluded. Variables studied were socio-demographic features, time to diagnosis, the causative event, intraoperative UTI features (topography and characteristics of the lesions), the method of lesion repair and outcome of repair. Ureteral reconstruction was performed by urologists either during the initial operation or during re-operation. Statistical analysis required the use of Epi Info 3.5.1 2008 software (centers for disease control and prevention (CDC), Atlanta, GA, USA). Qualitative variables were expressed in terms of proportion while quantitative variables consisted of measuring the mean with standard deviation (SD), median and ranges. Ethics approval was granted by the Ethics Committee of the Department of Surgery, University Teaching Hospital Cocody. We obtained informed consent to review medical records of all previously admitted patients. Names and identities were protected and anonymous.

## 3. Results

### 3.1 Results Socio-Demographic Data

We recorded 14,017 surgical procedures, of which 12,872 were obstetric (91.8%) and 1145 gynecological (8.2%). We found 46 cases of iatrogenic Urinary Tract Injuries (4.0%), including 33 bladder lesions (71.7%), 8 cases of ureteral damage (17.4%) and 5 mixed bladder and ureteral injuries (10.9%). The average age of patients was 29 years [15–40 years], with the most common age group between 26 and 30 years (26.93%). Socio-demographic data are summarized in Table 1.

**Table 1. Socio-demographic data.**

Variables	n = 46	%
Age (years)		
• 15–20	5	10.9
• 21–30	15	32.6
• >31	26	56.5
Parity		
• Primiparous	16	34.8
• Pauciparous	6	13.0
• Multiparous	24	52.2
Previous abdominal surgery		
• Yes	29	63.0
• No	17	37.0

**Table 2. Patients' preoperative diagnosis.**

Data	n = 46	%
Malignant lesion	28	60.9
• Cervical cancer	23	50.0
• Ovarian cancer	3	6.5
• Endometrial cancer	2	4.3
Benign pathology	18	39.1
• Uterine myoma	12	26.1
• Endometriosis	4	8.7
• Ovarian	2	4.3
Pelvic adhesions	46	100.0
• Filmy	18	39.1
• Dense	28	60.9

### 3.2 Clinical Data and Urinary Tract Injury Features and Management

Among the causative events, hysterectomy was the first procedure which resulted in iatrogenic ureteral injury (n = 31 or 67.4%). These hysterectomies were performed by open abdominal route in 87.0% cases. The lesion was suspected intraoperatively by hematuria (52.2%), or visual recognition (23.07%). The type of ureteral injury was, respectively, ligation (n = 8 or 17.4%), and complete ureteric transection in 25% cases. Intravenous urography (IVU) or computed tomography (CT) scan were not performed but six patients had pelvicalyceal dilatation or ureterohydronephrosis on ultrasound. In the postoperative period, the modes of presentation were leakage of urine into the peritoneum (3), anuria or oliguria (3), flank or lumbar pain (5). See Tables 2,3.

### 3.3 Urinary Tract Injuries Treatment

The UTI were immediately repaired when discovered (96.16%). Management included a simple bladder injury suture (78.4%), end-to-end simple ureteric terminal part traumatic lesions suture or ureterorrhaphy (4.3%), ureteral reconstruction including ureteroneocystostomy, end-to-end ureteroureterostomy (4.3%) or ureteric ligation removal (4.3%).

**Table 3. Surgical management data.**

Data	n	%
Surgical approach	N = 46	
• Transverse suprapubic open laparotomy	33	72.4
• Mid-line sub-umbilical open laparotomy	7	12.8
• Vaginal surgery	4	8.7
• Laparoscopy	2	6.0
Surgical method carried out at open laparotomy	N = 40	
• Simple total hysterectomy	7	17.5
• Radical hysterectomy	22	55.0
• Myomectomy	8	20.0
• Adnexal surgery	3	7.5
Type of abdominal surgery through laparoscopy	N = 2	
• Total hysterectomy	1	50.0
• Adhesiolysis	0	0.0
• Adnexal surgery	1	50.0
Vaginal surgery	N = 4	
• Total hysterectomy	1	3.9
• Pelvic organ prolapse surgery	3	4.8
Urinary tract injuries	N = 46	
• Bladder	33	71.7
• Ureteral (ligation and transection)	8	17.4
• Bladder and ureteral trauma	5	10.9
Time diagnosed	N = 46	
• During initial surgery	40	87.0
• Postoperatively	6	13.0
Repair of UTI		
• Simple bladder suture	36	78.4
• End to end ureteric simple suture	2	4.3
• Uretero-vesical reimplantation	4	8.7
• Ureteric reconstruction	2	4.3
• Removal of ureteric strictures	2	4.3

### 3.4 Postoperative Outcome

Follow-up was marked by the presence of postoperative complications in 15.36% including urogenital fistulae (50%), urinary tract infections (25%) and peritonitis (25%). Vesicovaginal fistulae were repaired after three months with a total hospital stay of 50 days. The average inpatient duration in the urology department was  $45 \pm 5$  days. There were no cases of maternal death reported.

## 4. Discussion

During our study period of five years, 46 cases of iatrogenic urinary tract injury were recorded, giving a frequency of nine cases per year. These complications occur during gynecological surgeries, although most of them were seen from obstetrics and gynecological surgical procedures [12], due to the close anatomical proximity between the urinary and female genital organs [2]. Urinary tract injuries (UTI) from pelvic surgery are not desirable and represent a challenge to the managing surgical teams [12–14]. They can lead to legal proceedings involving the practitioners and health care institutions [13], or signifi-

cant morbidity and mortality [1]. Post-operative complications may also significantly affect the surgeon's career or daily work of a surgical unit. Urological trauma during pelvic surgery in women is rarely described with an incidence that varies between 0.4 and 2.5% of gynecologic surgical procedures [14]. In our practice, studies on this issue are scarce because these lesions are not properly registered or are treated by other managing teams [2,12,15–17]. Nevertheless, analysis of postoperative complications is important in helping the surgeon audit his practice, understand why things went wrong and devise means of avoiding such complications in future patients. The need for proper documentation has long been recognized and this has led to the design of grading systems for postoperative complications [18,19]. The grading systems provide for uniform and standardized documentation across units in different locations and objective comparisons of practices can be made. In LMIC, lack of guidelines and supervision of health providers' medical activities make it difficult to evaluate clinical practice. This is one of the reasons why we undertook this study, and showed that UTI are mostly recognized intraoperatively or sometimes discovered late in patients with ages ranging from 15 to 40 years as described in literature [2,17,20]. In this study, these abnormal lesions we recorded in multiparous women as is widely found by many others authors [16,17,20–22]. The population profile corresponded to the socio-demographic data of LMIC where pregnancies are generally precocious, numerous and close [2,12,17,22]. Pelvic adhesions due to previous surgery make surgical access to the abdominal wall and pelvic organs difficult. During radical surgery for malignant pelvic tumor management, cleavage of the peritoneum between the bladder and the uterus is sometimes associated with a risk for traumatic bladder injuries [3,7,13]. Iatrogenic traumatic lesions were mostly discovered intraoperatively (96.20%) contrary to Western literature data [1,3–7]. The incidence of intraoperative ureteral iatrogenic injuries was lower in this study (7.50%) compared to other authors [23–27]. An earlier diagnosis guaranteed a better prognosis as it allows early management. Most iatrogenic ureteric injuries (IUI) occur during gynecological procedures (52%–82%) and require intraoperative identification to avoid significant consequences [19,20,23,24]. Ureteral trauma must be suspected in the postoperative period when facing upper urinary tract obstruction, urinary fistula, or sepsis [23–27]. Postoperative diagnosis of UTI can be a great challenge in our LMIC because clinical manifestations are often not specific and paraclinical exams very expensive or unavailable [17,20,28]. Computed Tomography Urography (CTU) is considered the gold standard for diagnosis [15–17,20,29]. Retrograde or anterograde pyelography are also sensitive radiographic tests for UTI diagnosis, while also allowing simultaneous stenting procedures [25]. These various diagnostic possibilities are unavailable in our country due to their high cost. Most urethral injuries were diagnosed late

with a predominant delay of 10 days postoperatively [2,23–26]. Despite the clinical importance of ureteral lesion management, the quantity of scientific work reported about this topic is relatively low [23–26]. Controversy remains about ureteral repair strategy regarding surgical or conservative approaches, particularly urological endoscopic or interventional radiology procedures, or both [26]. During the postoperative period, the most important diagnostic data was the red color of urine in the urinary bag as was reported in half of our study population (46.15%). But these lesions can be suspected by the sudden onset of violent lumbar pain with radiating to the pelvis, fever and persistently red urine. Cancer procedures were scheduled surgical interventions done by more experienced doctors, but are involved in 32.6% of UTI in this study. Bladder lesions were significant (80%) at its posterior wall. This is a common site of iatrogenic urinary lesions due to its close anatomical proximity with the anterior uterine wall. The ureteric iatrogenic lesions were usually located in the sub-ligamentary portion of the ureter [30–32]. Most bladder injuries should be immediately repaired during initial surgery. A simple bladder suture is generally effective associated with drainage of the Retzius space for large lesions [2,31–33]. However, traumatic lesions can be repaired without drainage with good postoperative outcomes [17,20,21]. The management of ureteral traumatic injuries included either end-to-end simple stitch, ureterostomy, or removal of abnormal ligation stitch. Ureteric reconstruction (reimplantation with anti-reflux system) or ureteral stenting (also known as double J stent) placement are specific efficient approaches. Due to an increase in endoscopic procedures for kidney and ureteral stones treatment, radiation therapy and pelvic surgery, ureteral strictures are more frequently observed. Short proximal and distal strictures can be reconstructed using the renal pelvis or urinary bladder. New techniques are needed for reconstruction of long strictures as well as those located in the middle ureter [32–34]. In open reconstruction, some new techniques to reconstruct full-length ureter defects using bladder flaps or intestinal on-lay techniques have been described. In addition, laparoscopic and robotic reconstruction methods as well as single site procedures demonstrated feasibility [33,34]. Some authors associated uretero-vesical reimplantation with the previous procedures [8]; while others performed a total nephrectomy [5,8]. Future targets focus on the development of artificial transplants by tissue engineering for ureteral reconstruction [33,34]. Novel open and minimally invasive techniques for reconstruction of full-length and middle ureter strictures demonstrated feasibility in the past year. To date, artificial transplants remain experimental [33,34]. All these surgical techniques require resources that are not available in poor countries. It is therefore important to emphasize prevention, by acquiring and perfecting skills and respecting classic surgical guidelines. A study on the Laparoscopic Approach to Cervical Cancer (LACC) Trial on patterns of care

and surgery-related morbidity in early-stage cervical cancer highlighted that in referral centers the shift from minimally invasive to open radical hysterectomy does not influence 90-day surgery-related morbidity [35]. This could be an option in the management of cervical cancer which must be implemented in our countries through acquisition of this technology. The results of this study show reasonable outcomes, but current results are significantly compromised by short-term follow-up. The average hospital stay time was very long. This means additional expenses for the patient and her family. No cases of death were recorded during this study, which corroborated data in the literature [5,8,17,20,21].

Limitations of this study are mainly based on its retrospective feature as all cases were not recorded and some clinical medical records could not be exploited. The main results are the not insignificant incidence of lesions, and immediate therapeutic possibilities that could be done by a gynecologist or urologist. Postoperative complications were mainly vesicovaginal fistulae leading to a long hospital stay. It was difficult to show the possibility of UTI occurrence in daily practice, and the clinical and psychological repercussions in patients. The possibility of legal proceedings is more and more frequent nowadays. This study shows the value of following procedures in pelvic surgery particularly in LMIC where therapeutic possibilities are sometimes unavailable and the population poor. It was an appropriate way to instill better reporting of cases of urinary complications in order to learn from them and improve future management of patients.

## 5. Conclusions

Urologic complications associated with gynecologic and obstetric procedures are preventable if the procedures are performed by trained and experienced surgeons in the appropriate settings. Detection and appropriate treatment are necessary. When complications arise, they should be identified early and promptly corrected by a strategy that depends on the location and size of iatrogenic injury.

## Availability of Data and Materials

The data that support the findings of this study are available from corresponding author but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Dehi Boston Mian *et al.*

## Author Contributions

Authors RK, AY, SA and FA have contributed in extraction and drafting of the manuscript. Authors DBM, VA and RK have made the analysis of data. DBM, KNG and SB have contributed to the final statistical analysis, manuscript



revision, design and revision. Authors DBM, VA, AY, SA and FA have contributed to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work. We confirm that all authors have read and agreed to the final version and are accountable for what is published. All authors contributed to editorial changes in the manuscript.

## Ethics Approval and Consent to Participate

We have obtained the approval of the National Committee of Ethics of Health and Life (N°387334-CI/2021) of the Felix Houphouët Boigny University for the publication of this manuscript.

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## Conflict of Interest

The authors declare no conflict of interest.

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