

## Original Article

# Incidence of Urinary Tract Injuries and Infections Associated with Gynecological Surgeries

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## Abstract

**Objective:** To determine the incidence of urinary tract injuries associated with gynecological surgeries and their management.

**Methodology:** In this retrospective study, data of all the women admitted and went through any gynecological surgery during the period of four years from January 2017 to December 2020 was included. Detailed history, clinical examination along with information regarding demographic characteristics were ascertain from the record. The record was reviewed retrospectively for disease caused for obstetric and gynecologic surgery, success rate, failure rate of the surgery and treatment strategy for the complication were noted.

**Results:** A total of 46 (2.92%) women were found to have urinary tract injury among 1578 gynecological surgeries performed. The mean age of these women was  $35.61 \pm 8.45$ , ranging from 23 years to 26 years. There were 423 (26.81%) open surgeries, 237 (15.01%) were laparoscopic surgeries, and 918 (58.17%) were cesarian sections. Among open surgeries most common surgery was transabdominal hysterectomy 197 (46.57%) followed by vaginal hysterectomy 152 (35.93%). Bladder injury was found to be most common 14 (46.67%) among surgeries of Myoma of uterus followed by 10 (33.33%) ceasarian section. Ureter injuries were most commonly found in surgeries of cervical cancer. All the patients with bladder injury were managed with primary repair. Most of the patients 3 (30%) with ureter injury were managed with Immediate Ureteral Stent Indwelling.

**Conclusions:** Although the urinary tract injuries are uncommon, but a significant morbidity is associated with these injuries. Bladder injuries were more common than ureteric injuries, but they cause less morbidity because of their early diagnosis and repair.

**Keywords:** urinary tract injuries, Gynecological surgeries, bladder injury, ureteric injury

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## Introduction

Complication risk is always associated with every surgical procedure, with an increasing chance based upon unsafe medical care. These complications may be incidents or adverse events related to surgery. Any undesirable and involuntary event that affects the patient, or unintentional damage due to intervention can be termed as complication. Surgical complications have great importance due to their clinical, legal and public health point of view and burden of cost on health system.<sup>1</sup>

In obstetric and gynaecological surgeries, urological injuries including damage to ureter and urinary bladder, are very common. The main cause of this might be the anatomical proximity of urogenital system. Its incidence is quite high and about 75% of the iatrogenic urinary tract injuries are due to gynecological surgeries. Urinary tract injuries are estimated to occur in 0.2 to 1% of all pelvic operations and gynecological procedures. Although the incidence appears to be small but due to large number of gynecologic surgeries performed, it complicates quite a few gynecologic surgeries. The urological complications are associated with a significant amount

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of morbidity, because it can be associated with longer operative times, greater blood loss, longer hospital stay and some time it requires second surgery.<sup>2,3</sup>

Urinary tract injury has a significant chance of occurrence during gynecologic surgery. There are many reasons of this like anatomic proximity, adhesions, distorted tissue planes due to cancer, endometriosis and use of new technologies for improved visualization, tissue dissection, and hemostasis. Similarly, surgeon experience is also a strong contributor for urinary tract injury during surgery, its risk increases with less experience of surgeon's surgical experience.<sup>4</sup>

Due to the anatomic proximity of the genital and urinary systems of females, any surgical intervention has a probable risk of injury to these systems. The injuries occurring to the ureteral or bladder due to overlooked conditions may cause high morbidity in women undergoing gynecologic surgery. The advancement in gynecologic and obstetric techniques does not affect this risk. The factors associated with these injuries may include excessive blood loss requiring more frequent blood transfusions, and longer hospitalization. The factors that may increase the risk of urologic injury in gynecologic operations include prolonged surgery, presence of active infection during operation, a large uterus, endometriosis, previous history of pelvic operation, gynecologic malignancies and myoma of the uterus.<sup>5,6</sup>

The urinary tract has close anatomical and embryologic relationship with genital tract, which increases the risk of urological injury during gynecological surgery. About 75% of all urinary tract injuries occur during gynecological surgeries. Most (26-95%) of the injuries remained unrecognized at the time of the surgery and are usually diagnosed in the postoperative period. In gynecology, this is one of the leading causes of litigation due to the complication itself or failure of injury recognition. There are severe consequences of unrecognized injury, which increase surgical morbidity, need of reoperation, often with a poorer outcome, fistulas and even silent loss of renal function.<sup>7,8</sup>

The topic of surgical complications is widely studied worldwide, but this is not the case locally in our population. Incidences of these injuries have decreased due to increased knowledge of these injuries and advancements in surgical techniques. Hence, periodic analysis of these iatrogenic injuries will give information about their changing trends, incidence in various surgeries, the time of diagnosis, their management, and

overall morbidity caused by them. So, this study has been planned to find out the burden of urological complications and their association with the type of gynecological surgery in our setup.

## Methodology

In this retrospective study, data of all the women admitted and went through any gynecological surgery in the Department of Obstetrics and Gynecology, Aziz Fatima Medical and Dental College Faisalabad, were included. This study was time based and data of a period of four years from January 2017 to December 2020 was included. In this time period total number of gynecological surgeries performed were 1578 and among these surgeries 46 women reported to have urinary tract injuries. Approval of the study was taken from the hospital ethical committee. Female patients of age ranging from 25 years to 55 years were included in the study. Data of the women going through obstetric surgery due to pregnancy complications, laparoscopic tubal ligation and thermal balloon ablation were excluded from the study. The sample size was time bound, and all the women who underwent any gynecological surgery and fulfilling inclusion criteria were included in the study.

Detailed history, clinical examination along with information regarding demographic characteristics were ascertain from the record. In this retrospective study, record was reviewed retrospectively for disease caused for obstetric and gynecologic surgery, success rate, failure rate of the surgery and treatment strategy for the complication. The urological complications were noted in terms of laceration, transection, rupture or ligation of genitourinary tract during the surgery, leakage of contrast media out of urinary tract after surgery requiring surgical or interventional treatment and hydronephrosis. The success of first repair was considered as successful treatment.

All the data was entered in SPSS v 25 for analysis. Descriptive statistics were used to calculate mean and standard deviation for quantitative data and frequency and percentages for qualitative data. Independent sample t-test and chi-square tests were used to analyze quantitative data and qualitative data. P-value  $\leq 0.05$  was taken as significant.

## Results

In this retrospective study a total of 46 (2.92%) women were found to have urinary tract injury among 1578

gynecological surgeries performed. The mean age of these women was  $35.61 \pm 8.45$ , ranging from 23 years to 26 years. The distribution of the surgeries performed showed that 423 (26.81%) were open surgeries, 237 (15.01%) were laparoscopic surgeries, and 918 (58.17%) were cesarean sections in our study period. Among open surgeries most common surgery was transabdominal hysterectomy 197 (46.57%) followed by vaginal hysterectomy 152 (35.93%). In laparoscopic surgeries, laparoscopic assisted vaginal hysterectomy was the most common surgery followed by 68 (28.69%) total laparoscopic hysterectomy surgeries as elaborated in table I.

| <b>Surgical Procedures</b>                         | <b>No.</b> | <b>%</b> |
|--|------------|----------|
| <b>Open Surgery</b>                                |            |          |
| Vaginal Hysterectomy                               | 152        | 35.93%   |
| Myomectomy   | 56         | 13.24%   |
| Transabdominal Hysterectomy                        | 197        | 46.57%   |
| Radical Abdominal Hysterectomy                     | 18         | 4.26%    |
| Total  | 423        | 100.00%  |
| <b>Laparoscopic Surgery</b>                        |            |          |
| Laparoscopic assisted vaginal hysterectomy         | 116        | 48.95%   |
| Laparoscopic assisted radical vaginal hysterectomy | 6          | 2.53%    |
| Total laparoscopic hysterectomy                    | 68         | 28.69%   |
| Other laparoscopic hysterectomy                    | 47         | 19.83%   |
| Total  | 237        | 100.00%  |
| <b>Cesarean Section</b>                            |            |          |
| Total Cesarean Section                             | 918        | 100.00%  |

Bladder injury was found to be most common 14 (46.67%) among surgeries of Myoma of uterus followed by 10 (33.33%) cesarian section. Ureter injuries were most commonly found in surgeries of cervical cancer 4 (40%) followed by surgeries of myoma of uterus 2 (20%) and endometrial cancer 2 (20%). The incidence of vesicovaginal fistula was highest 2(66.67%) in ovarian cancer surgeries. Similarly, ureterovaginal fistulas were found in patients having surgeries of myoma of uterus and uterine prolapse. In one patient of endometrial cancer got renal injury as elaborated in detail in table II.

All the patients with bladder injury were managed with primary repair. Most of the patients 3 (30%) with ureter injury were managed with Immediate Ureteral Stent Indwelling, and Immediate End-to-end anastomosis 2 (20%) followed by Delayed End-to-end anastomosis 2 (20.0%). All the Vesicovaginal Fistulas were managed through transvaginal repair and Ureterovaginal Fistulas were accomplished by ureteral Stent Indwelling 1(50%)

and End-to-end anastomosis 1(50%). The renal injury was managed by primary repair as shown in table III.

**Table II: Distribution of Urinary tract injuries associated with gynecological surgeries.**

| <b>Surgeries performed</b>    | <b>No.</b> | <b>%</b> |
|-------------------------------|------------|----------|
| <b>Bladder Injury</b>         |            |          |
| Myoma of Uterus               | 14         | 46.67%   |
| Cesarian section              | 10         | 33.33%   |
| Adenomyosis                   | 2          | 6.67%    |
| Cervical Cancer               | 1          | 3.33%    |
| Uterine Prolapse              | 1          | 3.33%    |
| Other                         | 2          | 6.67%    |
| Total                         | 30         | 100.00%  |
| <b>Ureter Injury</b>          |            |          |
| Cervical Cancer               | 4          | 40.0%    |
| Myoma of Uterus               | 2          | 20.0%    |
| Endometrial Cancer            | 2          | 20.0%    |
| Endometriosis                 | 1          | 10.0%    |
| Ovarian Cancer                | 1          | 10.0%    |
| Total                         | 10         | 100.0%   |
| <b>Vesicovaginal Fistula</b>  |            |          |
| Ovarian Cancer                | 2          | 66.67%   |
| Myoma of Uterus               | 1          | 33.33%   |
| Total                         | 3          | 100.00%  |
| <b>Ureterovaginal Fistula</b> |            |          |
| Myoma of Uterus               | 1          | 50.0%    |
| Uterine Prolapse              | 1          | 50.0%    |
| Total                         | 2          | 100.0%   |
| <b>Renal Injury</b>           |            |          |
| Endometrial Cancer            | 1          | 100.0%   |

**Table III: Distribution of management of urinary tract injuries**

| <b>Urinary Tract Injury Management</b> | <b>No</b> | <b>%</b> |
|--|-----------|----------|
| <b>Bladder Injury</b>                  |           |          |
| Primary Repair                         | 30        | 100.0%   |
| <b>Ureter Injury</b>                   |           |          |
| Immediate Ureteral Stent Indwelling    | 3         | 30.0%    |
| Immediate End-to-end anastomosis       | 2         | 20.0%    |
| immediate ureteroneocystostomy         | 1         | 10.0%    |
| Delayed Ureteral Stent Indwelling      | 1         | 10.0%    |
| Delayed End-to-end anastomosis         | 2         | 20.0%    |
| Delayed ureteroneocystostomy           | 1         | 10.0%    |
| Total                                  | 10        | 100.0%   |
| <b>Vesicovaginal Fistula</b>           |           |          |
| Transvaginal repair                    | 3         | 100.00%  |
| <b>Ureterovaginal Fistula</b>          |           |          |
| Ureteral Stent Indwelling              | 1         | 50.0%    |
| End-to-end anastomosis                 | 1         | 50.0%    |
| Total                                  | 2         | 100.0%   |
| <b>Kidney injury</b>                   |           |          |
| Primary Repair                         | 1         | 100.00%  |

## Discussion

Gynecological surgeries are very common, and complications associated with these surgeries are also frequent because of the anatomical proximity of the female reproductive system and urogenital systems. In fact, gynecological surgeries are mostly the reason of iatrogenic urinary tract injuries. There are several risk factors that significantly enhance the chance of urinary tract injury after gynecological surgery. These factors include previous pelvic surgery, gynecological malignancy, endometriosis, abnormalities of ureter, pelvic radiation, and presence of adhesion. The most common urinary tract injury during gynecological surgery is urinary bladder injury, which is usually recognized and repaired immediately without increasing the chance of complications. However, ureteral injuries happening to distal one third of the ureter are usually not recognized immediately, which can result in severe consequences, even it has the potential to be life threatening or permanent damage to kidney.<sup>9,10</sup>

In this present retrospective study, a total of 46 (2.92%) women were found to have urinary tract injury among 1578 gynecological surgeries performed. The mean age of these women was  $35.61 \pm 8.45$ , ranging from 23 years to 26 years. The distribution of the surgeries performed showed that 423 (26.81%) were open surgeries, 237 (15.01%) were laparoscopic surgeries, and 918 (58.17%) were cesarean sections in our study period. These results are in accordance with previous studies in which the incidence of urinary tract injuries have been reported from 0.8% to 2.5%.<sup>11</sup>

Significant morbidity is associated with urinary tract injury, especially when diagnosis is delayed. This injury can lead to a significant personal suffering like depression, anxiety, difficulties in interpersonal relationships, poor quality of life and even loss of employment etc. Urinary tract injury is not so common but higher number of gynecological surgeries and cesarean sections make it a quite considerable complication. Its incidence has variation with respect to health care facilities and surgeon experience. It ranges from 0.3% to 1% of all gynecological operations and cesarean sections. Its major portion (74%) occurs during surgeries of benign diseases.<sup>12,13</sup>

In this study, bladder injury was found to be most common 14 (46.67%) among surgeries of Myoma of uterus followed by 10 (33.33%) cesarean section. Ureter injuries were most commonly found in surgeries of cervical cancer 4 (40%) followed by surgeries of myoma of uterus 2 (20%) and endometrial cancer 2 (20%). The

incidence of vesicovaginal fistula was highest 2(66.67%) in ovarian cancer surgeries. Similarly, ureterovaginal fistulas were found in patients having surgeries of myoma of uterus and uterine prolapse. In one patient of endometrial cancer, got renal injury. Previous studies like study by Lee et al, also support that most common injury during gynecological surgeries was bladder injury followed by ureter injuries.<sup>7,14</sup>

These findings suggest that the bladder is the most common site of urinary tract injury during pelvic surgery. The observed high incidence of bladder injury may be because such injuries are easier to detect than injuries occurring at other sites. In gynecology, urinary tract injury is most common cause of litigation and about 10% of the claims are due to this injury. The urinary tract injury increases the chance of litigation to 91-fold as compared to other complications associated with hysterectomy. Its occurrence and sequelae can lead to severe health outcomes as well as difficulty in interpersonal relationships making the quality of life poorer.<sup>15,16</sup>

Hemostatic suturing is the time when most of the injuries occur during the gynecological surgeries, especially when bleeding is excessive and blind clamps are applied to stop the bleeding. Despite the close anatomical association between the female reproductive organs and the ureter, injury to the ureter is relatively uncommon. But still these injuries occur as the ureters run close to the field of dissection and availability of limited surgical space.<sup>17</sup>

In this present study all the patients with urinary tract injuries were managed with standard procedures like the patients with bladder injury were managed with primary repair. Most of the patients with ureter injury were managed with Immediate Ureteral Stent Indwelling 3 (30%), and Immediate End-to-end anastomosis 2 (20%) followed by Delayed End-to-end anastomosis 2 (20.0%). All the Vesicovaginal Fistulas were managed through transvaginal repair and Ureterovaginal Fistulas were accomplished by ureteral Stent Indwelling 1(50%) and End-to-end anastomosis 1(50%). The renal injury was managed by primary repair.

There is always an associated risk of injury to adjacent structures in all surgical procedures. A significant risk of lower urinary tract injury has been reported with every gynecological procedure. That is why preoperative counseling has a vital part of taking informed consent and disclosure of potential surgical risks. The data on rates of gynecological surgeries will help surgeons to identify the burden and incidence of lower urinary tract

injuries during hysterectomy, vaginal and cesarean deliveries.<sup>18</sup>

Urinary tract injury is one of the inevitable risks associated with gynecology surgery, even though its incidence is quite low. There are some risk factors that do exist in most of the cases, and their preoperative identification can help in proper planning and management of the case and preoperative patient counselling regarding the risk. The incidence of urinary tract injury can be reduced with cystoscopy, therefore training of gynecologists with this procedure can improve the results which will be beneficial for patient and cost effective. Any injury in the patients with normal anatomy is difficult to justify especially when there is a failure of recognition during the operation.<sup>19,20</sup> There are some factors which can help in positive culture for learning and reduction in patient morbidity in the future. These factors include familiarization of risk factors, intraoperative investigations and safe individual and collective practice. To reduce rate of urinary tract injuries during gynecologic and obstetric operations, a sound knowledge of anatomy and use of correct surgical techniques are required. Overlooked injuries may lead to organ losses with high morbidity. Early diagnosis and treatment may eliminate complications secondary to urinary tract injuries.

## Conclusion

Although the urinary tract injuries are uncommon, but a significant morbidity is associated with these injuries. Bladder injuries were more common than ureteric injuries, but they cause less morbidity because of their early diagnosis and repair. The rate of ureteral injuries was very less in comparison to bladder injuries, but they caused high morbidity. Urological complications can be life threatening and their early diagnosis and intervention is essential to prevent these complications.

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