

Urological Surgical Injuries in Gynecology and Obstetrics. 10-Year Review

Jesús Eduardo Prior-Rosas^{1*}, Héctor Bizueto-Rosas², Evelin Yolitzí Hernández-Olvera³, Cintia Liliana Torres-González⁴ and Andrés Sánchez-Mercader¹

¹General Surgery Resident, Dr. Darío Fernández Fierro General Hospital, Mexico

²General and Vascular Surgeon, Dr. Darío Fernández Fierro General Hospital, Mexico

³Resident of Epidemiology, Dirección General de Epidemiología, México

⁴Urologist, Dr. Darío Fernández Fierro General Hospital, Mexico

*Corresponding author: Jesús Eduardo Prior-Rosas, Department of General Surgery, Dr. Darío Fernández Fierro Hospital, ISSSTE, Mexico

ARTICLE INFO

Received: 📅 January 17, 2024

Published: 📅 February 06, 2024

Citation: Jesús Eduardo Prior-Rosas, Héctor Bizueto-Rosas, Evelin Yolitzí Hernández-Olvera, Cintia Liliana Torres-González and Andrés Sánchez-Mercader. Urological Surgical Injuries in Gynecology and Obstetrics. 10-Year Review. Biomed J Sci & Tech Res 54(4)-2024. BJSTR. MS.ID.008586.

ABSTRACT

Introduction: Urinary tract injuries are rare but when presented are among the most serious complications of pelvic surgery it can cause significant morbidity for the patient and is a leading cause of litigation in many countries. The incidence in low resource settings is not well documented.

Objective: Determinate the prevalence of urinary tract injury, associated with gynecologic and obstetric surgery.

Methods: A descriptive and ambispective analytical study was carried out to determine the prevalence of urinary tract injury, associated with gynecological and obstetric surgery, it was diagnosticated intraoperative or during the postoperative. The results were analyzed with the statistical program SPSS-27.0.

Results: During the period from 2013 to 2023, a total of 27 injuries to the urinary tract occurred, of which 19 were to the bladder (73.07%), 6 ureteral injuries (22%) and 2 injuries that involved both the bladder and ureters (7.69%). Bladder injuries in cases of abdominal hysterectomies were 3.08% (21/680), and ureteral injuries were 1.17% (8/680).

Conclusion: The precaution and knowledge of anatomy is of utmost importance to minimize the risk of these structures; early recognition and their repair has a positive prognosis in the morbidity of patients.

Keywords: Urologic Injury; Gynecologic Surgery; Diagnosis; Timely Repair

Abbreviations: HT: Hysterectomy; TAH: Total Abdominal Hysterectomy; SO: Salpingooferectomy; VH: Vaginal Hysterectomy

Introduction

Iatrogenic urinary tract injuries are a rare complication (0.5-1.0%); the majority (75%) occur in gynecological surgery [1,2]. In several studies it has been reported mainly at the ureteral level; 1 injury per 1000 hysterectomies 13.9 per 1000 laparoscopic hysterectomies: 0.4 per 1000 total hysterectomies and 0.2 per 1000 vaginal hysterectomies [3]. The ureter is the anatomical structure with the highest risk during these procedures, due to its relationship and proximity to the gynecological structures (rectosigmoid junction and

the uterine-cervical junction), in addition to the anatomical variants [4,5]. The ureter in its distal portion is where it is most frequently injured in pelvic surgeries. Iatrogenic injuries affect the upper, middle, and lower thirds of the ureters in 2%, 7%, and 91% of cases, respectively. These injuries occur in any of the approaches for hysterectomy, whether abdominal 0.3%, vaginal 0.04% or laparoscopic 0.3% [6,7]. The incidence of bladder injury varies depending on the procedure; Wong et al. reported an incidence of 0.24% in laparoscopic surgery in benign pathology; Other studies report an incidence of 0.44% in cesarean sections and 1.54% during hysterectomies for benign pathol-

ogy [8,9]. Lower urinary tract injuries including bladder injuries are associated with increased morbidity; This includes the formation of fistulas, infections, hydronephrosis and kidney injury, combined with a 60% percentage of reinterventions, with an increase in hospital stay and affecting quality of life [6,10,11].

Endometriosis, pelvic inflammatory diseases, pelvic adhesions, intraoperative bleeding, large adnexal tumors, and oncological surgery can modify the anatomy, causing additional technical difficulties [2,5]. The main mechanisms of ureteral and bladder injury include contusion, devascularization, laceration, ligation of structures, partial clamping (clips), or transection [12,13]. The ureter in the middle of its length crosses the pelvis; The most frequent sites of injury are at the level of the infundibulo-pelvic ligament where the ureters are located parallel to the ovarian vessels; These structures may be modified by adhesions, or large adnexal tumors [12]. The most common site of ureteral injury is located at the level of the uterine artery, which passes medially and below the ureter at 1 cm [6]. The other site of injury is located on the anterior fornix of the vagina where the ureter becomes medial and anterior before entering the bladder, in the ureteral canal of the cardinal ligament; In cases of strongly adherent placenta and closure of lateral uterine incisions, injury to the ureter may occur [12]. During a hysterectomy, several steps have been proposed to minimize and avoid the risk of ureteral injury; The first step is to identify the ureter at the edge of the pelvis (retro-transperitoneal) and follow its caudal course over the lateral part of the pelvic wall where it disappears below the uterine artery through the broad ligament. This decreases the risk of injury when the pelvic infundibulum ligament is ligated [13]. The second step is performed by incising the round ligament, the anterior leaf of the broad ligament and the bladder and vaginal peritoneum, causing the ureter to move in an inferior and lateral direction of the uterine artery at the level of the cervix [12].

The third step is the dissection of the uterine arteries before ligating them, which displace the ureter inferiorly and laterally [3,12]. Sometimes, ureteral injuries are not diagnosed in the immediate postoperative period, due to nonspecific symptoms attributed to the normal recovery process [11]. The factors that raise suspicion of ureteral injury intraoperatively are: urine leakage into the surgical field; To detect this injury, the ureter must be explored as it travels through the pelvis [1]. Ureteral injuries are diagnosed in most cases between postoperative days 2 and 7; in some cases up to 1 month after surgery. [8, 12]. One third of ureter injuries are diagnosed intraopera-

tively; The rest of the lesions are diagnosed postoperatively, in which the clinical manifestations include fever, peritonitis, paralytic ileus, urinoma, abscess, hematuria, leakage of urine through the vagina, or through drains [1,10]. Early diagnosis of injuries is a priority because it allows early repair with a better prognosis since it minimizes long-term morbidity [5,9,14].

Materials and Methods

From December 2013 to November 2023, an ambispective, descriptive and analytical study was carried out in the clinical archive of the Dr. Darío Fernández Fierro General Hospital of the Institute of Security and Social Services for State Workers, of the surgeries performed by the service. of Gynecology and Obstetrics of this unit (cesarean sections, abdominal and vaginal hysterectomies), to determine the prevalence of urinary tract injuries in patients undergoing emergency or scheduled surgery. The statistical analysis was performed with SPSS-27 to perform the univariate analysis of the variables of interest, describing cumulative incidence and prevalence of injuries, relative and absolute frequencies of the categorical variables and measures of central tendency for the quantitative variables according to the data distribution. The study was carried out strictly in accordance with the Ethical principles of patient confidentiality.

Results

During the 10 years included in the study period, a total of 5,675 surgical procedures were performed by the gynecology and obstetrics service, of which 4,924 cesarean sections, 751 hysterectomies (680 abdominal and 71 vaginal); and a total of 27 iatrogenic injuries to the urinary tract were identified, with a cumulative incidence of 4.8 injuries per 1,000 procedures. There were 19 bladder injuries (70.4%), 5 ureteral injuries (18.5%), and 3 injuries that involved both the bladder and ureters (11.1%). In 3.3% (25/751) of hysterectomies, urinary tract injury occurred. The main indication for hysterectomy was uterine myomatosis, followed by malignant pathology in 14.8% (4 of 27), infectious 7.4% (2 of 27), uterine prolapse in 7.4% (2/27) and obstetric hemorrhage 3.7% (1/27). 27) (Table 1). 92.6% (25 of 27) of urinary tract injuries occurred during a hysterectomy with 88% (22/25) being more frequent in the abdominal approach, of which in 36.4% (8/22) unilateral or bilateral salpingo-oophorectomy was performed simultaneously; In vaginal hysterectomies, lesions occurred in 12% (3/25) with a ratio of 7.3:1 (Table 2).

Table 1: Type of surgical procedure performed according to the initial diagnosis.

Surgical Procedure								
Inicial diagnosis	Exeresis	%	Hysterectomy	%	Miomectomy	%	Total	%
Miomatosis	-	-	16	59.3	1	3.7	17	63
Malignant	1	3.7	4	14.8	-	-	5	18.5
Infection	-	-	2	7.4	-	-	2	7.4
Uterine prolapse	-	-	2	7.4	-	-	2	7.4
Obstetric hemorrhage	-	-	1	3.7	-	-	1	3.7
Total	1	3.7	25	92.6	1	3.7	27	100

Table 2: Injured structure and type of procedure.

Injured Structured								
Surgical procedure	Bladder	%	Ureter	%	Both structures	%	Total	%
TAH+SO	8	29.6	2	7.4	2	7.4	12	44.4
TAH	6	22.2	3	11.1	1	3.7	10	37
VH	3	11.1	-	-	-	-	3	11.1
Exéresis	1	3.7	-	-	-	-	1	3.7
Myomectomy	1	3.7	-	-	-	-	1	3.7
Total	19	70.4	5	18.5	3	11.1	27	100

Note: HT: Hysterectomy; TAH: Abdominal Hysterectomy; SO: Salpingooferectomy; VH: Vaginal Hysterectomy

In TAH, 63.6% (14/22) had urinary bladder injury; 22.7% (5/22) of ureters and in 13.6% (3/22) injury of both structures. In VH, 100% (3/3) of the injuries were to the bladder. The rest of the urinary tract injuries occurred during myomectomies and adnexal surgery, which presented anatomical alterations due to adhesions, previous surgeries or large pelvic tumors. In 74.1% (20/27) of the lesions studied were diagnosed intraoperatively and 25.9% (7/27) in the postoperative period, of these, 57% (4/7) were diagnosed in the first 72 hours and 42.8% (3/7) corresponded to ureteral injuries, which were diagnosed after 72 hours due to low clinical suspicion. Regarding bladder injuries, 84.2% (16/19) of the injuries were identified intraoperatively, while 15.8% (3/19) were identified postoperatively within the first 48 hours (Table 3). 55% (11/20) of primary injury repairs were per-

formed by urology; 25% (5/20) for general surgery and 20% (4/20) for gynecology. 71.4% (5/7) of late injuries were repaired by the urology service (Table 4). 50% (11/22) of the bladder injuries (early and late; 7 bladder and 2 mixed) were repaired by urology. Of 22 bladder repairs, the repair technique was reported in 72.7% (16/22), consisting in 75% (12/22) of two planes with 2(0) polyglactin 910 suture, in 18.8% (3/16) in three planes and 6.3% (1/16) in one plane; A Foley catheter was placed for 2 to 3 weeks in the bladder lesions, after the injury. 94.4% (17/18) of bladder repairs that were diagnosed intraoperatively progressed satisfactorily. Of those in which there was complete information in the file, it was estimated that the length of the bladder lesions had a median of 4 cm [IQR: 1.25] and the most frequent location was the bladder dome 42.3% (6/14).

Table 3: Injury identification and timing.

Injury Identification						
Injury structure	Early (<24 horas)	%	Late	%	Total	%
Bladder	16	59.3	3	11.1	19	70.4
Ureter	2	7.4	3	11.1	5	18.5
Both structures	2	7.4	1	3.7	3	11.1
Total	20	74.1	7	25.9	27	100

Table 4: Speciality that performs primary repair and injured structure.

Injury structure	Speciality that performs primary repair							
	Urology	%	General surgery	%	Gynecology	%	Total	%
Bladder	7	35	5	25	4	20	16	80
Ureter	2	10	-	-	-	-	2	10
Both structures	2	10	-	-	-	-	2	10
Total	11	55	5	25	4	20	20	100

Postoperatively diagnosed bladder injuries accounted for 18.2% (4/22); The repair was performed in two planes with 2(0) polyglactin 910 without requiring reintervention in any patient. One patient had an injury to the right iliac vein, performing the venorrhaphy with 4(0) monofilament polypropylene suture, progressing satisfactorily. Two patients with bladder injury also had ureteral injury, diagnosed intraoperatively; one patient with complete bilateral transection; Cystorrhaphy was performed in two planes with ureteral reimplantation with the Linch-Gregoir technique and placement of a double J catheter; In the other patient, with a bladder injury and complete section of the right ureter, ureteral reimplantation was performed. A patient with a late diagnosis of a mixed lesion (bladder and ureteral) underwent bladder closure in two planes and was reoperated three days later for bilateral ureteral pexia, performing bilateral ureteral reimplantation with the Linch-Gregoir technique. At three months he developed a vesico-vaginal fistula which was repaired with the O'Connor technique and discharged without complications. 100% of early and late ureteral injuries were surgically repaired by urology. The ureteral injuries that were diagnosed intraoperatively corresponded to 25% (2 of 5 ureteral and 3 mixed) of the injuries with early diagnosis, which were repaired by the urology service. None of these patients required surgical reintervention after the removal of the catheters. Of the postoperative diagnostic ureter injuries, one case was a left ureter injury that was reimplanted with the Boari Flap technique that was accompanied by intestinal perforation. Another case was a complete section of the right ureter with Linch-Gregoir reimplantation with subsequent placement of a double J catheter. The third case corresponds to ureteral pexia, from which release was performed. No patient in this study had a double J catheter placed prior to their surgical procedure.

Discussion

In 0.5 to 1%, injuries to the urinary tract inevitably occur in abdominal, vaginal or laparoscopic gynecological surgery [15] and may go unnoticed due to their insidious presentation [1,15,16]. In our study, it was found that abdominal hysterectomy was the gynecological surgical procedure in which urinary injuries occurred the most (3.3%), in contrast to some international reports in which urinary tract injuries are more frequent in urinary tract surgery. minimal invasion [3,16], predominating the lesion of the left ureter due to its proximity to the cervix [2,17,18]. In two patients it was probably due

to the presence of massive bleeding that even required ligation of the hypogastric arteries. It is sometimes difficult to detect a ureteral injury, so even if it is suspected, intravenous diuretics must be administered to try to locate the ureter through its peristalsis, dilation or urine output [18].

We must keep in mind that unlike bladder injuries, which the majority are diagnosed intraoperatively, ureteral injuries are diagnosed, as we said before, late, 10 to 14 days [19], since the delay in diagnosis is said to be which decreases 1-year survival, compared to patients without the presence of lesion, 91.7 vs 99.7% respectively [21]. We are well above international reports regarding the incidence of urinary tract injuries in hysterectomies, perhaps because it is a teaching hospital; However, it should be noted that the fact that it is a teaching hospital does not mean that these procedures are carried out by doctors in training, but rather it should be like in other countries, that the surgeries are performed by the responsible doctors with assistance from the resident doctor. On the other hand, there is the factor of overconfidence and anatomical alterations or variants. Accidents are due to lack of experience or overconfidence, as the American College of Surgeons once mentioned.

Not only does the anatomical disposition of the distal left ureter predispose to its injury, it should also be recognized that, almost finishing the surgery at this stage, the surgeon becomes overconfident. We can consider that bladder repair in two planes has a good evolution and is safe; only one bladder injury that was diagnosed late developed a vesico-vaginal fistula which was subsequently repaired. To avoid surgical times, we can take into consideration, according to the literature, that in some cases ureteral injuries can be treated non-invasively with the placement of a double J catheter; however, the majority of them will require a formal repair such as reimplantation. Ureteral [18]. The decision to use a double J catheter prior to surgery must be individualized; its routine use is still controversial. It should be considered, above all, in adnexal or intestinal oncological pathology. Even so, we are not exempt from causing an injury with the placement of a double J catheter, as demonstrated in a report of a series of 3000 patients, with a slight increase in the incidence of injury with a catheter than without a catheter (1.20 vs 1.09%). again, probably due to the overconfidence factor [19]. On the other hand, the use of cystoscopy to detect urinary tract lesions is not completely standardized; There are reports where, despite the existence of blad-

der or ureteral lesions, cystoscopy has failed to diagnose them [20]. It is reported that the detection rate is low (1.6 per 1000 surgeries) with the routine use of cystoscopy and 0.7 without the use of cystoscopy; Cystoscopy is not so harmless because its complications include bleeding or injury to the ureter per se, so the risk-benefit of performing it routinely must be assessed; However, there is the other side of the coin, detect it in time [21]. It must be suspected and always closely monitor the urinary volume, as well as its characteristics, during a surgical procedure [22-24].

Conclusion

Urinary tract injuries are rare (1%); in gynecological surgeries, however, they can be fatal. Knowledge of anatomy is of utmost importance to minimize damage to these structures. Early diagnosis and its repair influence the morbidity and mortality of patients.

Conflict of Interest

Authors declare no conflict interest.

References

- Nawaz FH, Khan ZE, Rizvi J (2007) Urinary tract injuries during obstetrics and gynaecological surgical procedures at the Aga Khan University Hospital Karachi, Pakistan: A 20-year review. *Urologia Internationalis* 78(2): 106-111.
- Chung D, Briggs J, Turney BW, Tapping CR (2017) Management of iatrogenic ureteric injury with retrograde ureteric stenting: an analysis of factors affecting technical success and long-term outcome. *Acta radiologica (Stockholm, Sweden : 1987)* 58(2): 170-175.
- Härkki-Sirén P (1998) Urinary Tract Injuries After Hysterectomy. *Obstet Gynecol* 92(1): 113-118.
- Rahoui M, Ouanes Y, Chaker K, Mourad Dali K, Bibi M, et al. (2022) Functional outcomes of surgical treatment of ureteral injury following gynecological and obstetrical surgery. *Annals of medicine and surgery* 79: 104067.
- Raassen TJIP, Ngongo CJ, Mahendeka MM (2018) Diagnosis and management of 365 ureteric injuries following obstetric and gynecologic surgery in resource-limited settings. *International urogynecology journal* 29(9): 1303-1309.
- Baboudjian M, Long Depaquit T, Gondran-Tellier B, Lechevallier E, Boissier R (2023) Reparaciones quirúrgicas de las lesiones ureterales. *EMC* 55(1): 1-15.
- Brummer THI, Jalkanen J, Fraser J, Heikkinen AM, Kauko M, et al. (2011) FINHYST, a prospective study of 5279 hysterectomies: complications and their risk factors. *Human Reproduction* 26(7): 1741-1751.
- Jensen AS, Heinemeier IIK, Schroll JB, Rudnicki M (2023) Iatrogenic bladder injury following gynecologic and obstetric surgery: A systematic review and meta-analysis. *Acta obstetrica et gynecologica Scandinavica* 102(12): 1608-1617.
- Rao D, Yu H, Zhu H, Duan P (2012) The diagnosis and treatment of iatrogenic ureteral and bladder injury caused by traditional gynaecology and obstetrics operation. *Archives of gynecology and obstetrics* 285(3): 763-765.
- Khatra RA, Chand A, Thapa S, Khadka S, Thapa M (2021) Ureteric injuries after hysterectomy in a tertiary care center of Nepal: A descriptive cross-sectional study. *Journal of the Nepal Medical Association* 59(239): 622-625.
- Ade-Ojo IP, Tijani O (2021) A review on the etiology, prevention, and management of ureteral injuries during obstetric and gynecologic surgeries. Vol. 13, *International Journal of Women's Health* 13: 895-902.
- Jacob GP, Vilos GA, Al Turki F, Bhangav G, Abu-Rafea B, et al. (2020) Ureteric Injury During Gynaecological Surgery - Lessons from 20 Cases in Canada. *Facts, views Vis ObGyn* 12(1): 31-42.
- Smith AP, Bazinet A, Liberman D (2019) Iatrogenic ureteral injury after gynecological surgery. *Canadian Urological Association Journal. Canadian Urological Association* 13(6 Suppl4): S51-S55.
- Vorobe V, Beloborodov V, Golub I, Frolov A, Kelchevskaya E, et al. (2021) Urinary System Iatrogenic Injuries: Problem Review. Vol. 105, *Urologia Internationalis* 105(5-6): 460-469.
- Lobato JL, Andía D, Garay G, López-Valverde M (2011) Lesiones del tracto urinario en cirugía ginecológica. *Clin Invest Gin Obst* 38(3): 100-103.
- Ozdemir E, Ozturk U, Celen S, Sucak A, Gunel M, et al. (2011) Urinary complications of gynecologic surgery: iatrogenic urinary tract system injuries in obstetrics and gynecology operations. *Clinical and experimental obstetrics & gynecology* 38(3): 217-220.20.
- Tan-Kim J, Menefee SA, Reinsch CS, O'Day CH, Bebchuk J, et al. (2015) Laparoscopic Hysterectomy and Urinary Tract Injury: Experience in a Health Maintenance Organization. *Journal of minimally invasive gynecology* 22(7): 1278-1286.
- El-Tabey NA, Ali-El-Dein B, Shaaban AA, El-Kappany HA, Mokhtar AA, et al. (2006) Urological trauma after gynecological and obstetric surgeries. *Scandinavian journal of urology and nephrology* 40(3): 225-231.
- Watterson JD, Mahoney JE, Futter NG, Gaffield J (1998) Iatrogenic ureteric injuries: approaches to etiology and management. *Canadian journal of surgery* 41(5): 379-382.
- Wei G, Harley F, O'Callaghan M, Adshead J, Hennessey D, et al. (2023) Systematic review of urological injury during caesarean section and hysterectomy. *International urogynecology journal* 34(2): 371-389.
- Blackwell RH, Kirshenbaum EJ, Shah AS, Kuo PC, Gupta GN, et al. (2018) Complications of Recognized and Unrecognized Iatrogenic Ureteral Injury at Time of Hysterectomy: A Population Based Analysis. *The Journal of urology* 199(6): 1540-1545.
- Chou MT, Wang CJ, Lien RC (2009) Prophylactic ureteral catheterization in gynecologic surgery: a 12-year randomized trial in a community hospital. *International urogynecology journal and pelvic floor dysfunction* 20(6): 689-693.
- Teeluckdhar B, Gilmour D, Flowerdew G (2015) Urinary Tract Injury at Benign Gynecologic Surgery and the Role of Cystoscopy: A Systematic Review and Meta-analysis. *Obstetrics and gynecology* 126(6): 1161-1169.
- Mamik MM, Antosh D, White DE, Myers EM, Abernethy M, et al. (2014) Risk factors for lower urinary tract injury at the time of hysterectomy for benign reasons. *International urogynecology journal* 25(8): 1031-1036.

ISSN: 2574-1241

DOI: 10.26717/BJSTR.2024.54.008586

Jesús Eduardo Prior-Rosas. Biomed J Sci & Tech Res



This work is licensed under Creative Commons Attribution 4.0 License

Submission Link: <https://biomedres.us/submit-manuscript.php>



Assets of Publishing with us

- Global archiving of articles
- Immediate, unrestricted online access
- Rigorous Peer Review Process
- Authors Retain Copyrights
- Unique DOI for all articles

<https://biomedres.us/>