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Research Article

Urinary Tract Injuries Following Obstetric Operations: A Retrospective Study in Iraqi Tertiary Care Center

Amenah Fadhil[1], Wassan Nori[1]*, Ban Hadi Hameed[1], Saad Dakhil Farhan Daraji[2]
[1]*Department of Obstetrics and Gynecology, College of Medicine, Mustansiriyah University, Baghdad, Iraq;*
[2]*Department of Surgery, College of Medicine, University of Baghdad, Baghdad, Iraq*
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Abstract

Background: Urinary tract injuries (UIn) are commonly reported after obstetrical and gynecological operations. They contribute to higher morbidity rates, longer hospital stays, and lower patient life quality. ***Objective***: To identify risk factors and predictors of UIn, as well as the best therapeutic techniques for preventing further harm and improving patient outcomes. ***Methods***: A retrospective analysis examined UIn cases from obstetrical and gynecological procedures conducted at Yarmouk Hospital during 2021-2023. The records included information about the patients' demographics, operative data (surgery type, after diagnosis of UIn, and injury type, size, and confirmation), repair data (suture used, how many layers, and the use of suprapubic catheter), and post-operative complications (admission to intensive care, sepsis, renal failure, and maternal death). ***Results***: 51.6% of the cases were between 30 and 40 years old. Cesarean hysterectomy was performed in 54.84% of instances, with 66.13% being diagnosed intraoperatively without the requirement for IVU, which was employed in just 30.65%. Bladder injuries account for 80.65% of all cases, with 48% of them measuring 3–5 cm. Injuries were healed in 77.4% of cases using two two-layer methods and Vicryle sutures. Most patients (69.35%) had a suprapubic catheter. 93.5% of cases had no serious problems. ***Conclusions***: Early diagnosis during surgery, as well as a two-layer repair using Vicryle sutures and a suprapubic catheterization, are critical for reducing morbidity, enhancing recovery, and improving healthcare in high-risk settings.

Keywords: Cesarian section, Hysterectomy, Risk factors, Suprapubic catheter, Urinary tract injury.

إصابات المسالك البولية بعد عمليات الولادة: دراسة استعادية في مركز عراقي للرعاية الثالثية

الخلاصة

الخلفية: يتم الإبلاغ عن إصابات المسالك البولية (UIn) بشكل شائع بعد عمليات التوليد وأمراض النساء. وهي تساهم في ارتفاع معدلات المراضة، والإقامة الأطول في المستشفى، وانخفاض جودة حياة المريض. **الهدف**: تحديد عوامل الخطر والتنبؤ ب UIn ، بالإضافة إلى أفضل التقنيات العلاجية لمنع المزيد من الضرر وتحسين نتائج المرضى. **الطرق**: فحص تحليل بأثر رجعي حالات UIn من إجراءات التوليد وأمراض النساء التي أجريت في مستشفى اليرموك خلال الفترة 2021-2023. تضمنت السجلات معلومات حول خواص المرضى، والبيانات الجراحية (نوع الجراحة، بعد تشخيص UIn، ونوع الإصابة وحجمها وتأكيدها)، وبيانات التداخل الجراحي (الخيط المستخدم، وعدد الطبقات، واستخدام القسطرة فوق العانة)، ومضاعفات ما بعد الجراحة (المكوث في العناية المركزة، والإنتان، والفشل الكلوي، ووفاة الأمهات). **النتائج**: 51.6٪ من الحالات كانت تتراوح أعمارهم بين 30 و 40 عاما. تم إجراء استئصال الرحم القيصري في 54.84٪ من الحالات، مع تشخيص 66.13٪ أثناء الجراحة دون الحاجة إلى IVU، والذي تم استخدامه في 30.65٪ فقط. تمثل إصابات المثانة 80.65٪ من جميع الحالات، مع 48٪ منها بقياس 3-5 سم. تم التئام الإصابات في 77.4٪ من الحالات باستخدام طريقتين من طبقتين وخيوط فيكريل. معظم المرضى (69.35٪) لديهم قسطرة فوق العانة. 93.5٪ من الحالات لم تكن لديها مشاكل خطيرة. **الاستنتاجات**: يعد التشخيص المبكر أثناء الجراحة، بالإضافة إلى الإصلاح المكون من طبقتين باستخدام خيوط الفيكريل والقسطرة فوق العانة، أمرا بالغ الأهمية لتقليل المراضة وتعزيز الشفاء وتحسين الرعاية الصحية في الأماكن عالية الخطورة.

* ***Corresponding author***: Wassan Nori, Department of Obstetrics and Gynecology, College of Medicine, Mustansiriyah University, Baghdad, Iraq; Email: dr.wassan76@uomustansiriyah.edu.iq
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INTRODUCTION

Urinary tract injuries (UIn) impose notable risks in obstetrics and gynecology procedures due to the close anatomical proximity between the urinary and genital systems. Despite advancements in surgical technique, bladder and urethral injuries still raise clinical concerns [1]. The reported incidents of UIn vary between 0.36-0.5% and 1.7-5.13% for gynecological and obstetrical operations, respectively [2]. According to some reports, the incidence of UIn can escalate up to 30% due to the global increase in cesarean section rates (C-sections) and their associated consequences, such as pelvic adhesion and morbidly attached placenta. Researchers have linked UIn to significant morbidity, including fistulae formation, infections, renal impairment, and prolonged hospitalization [4,5]. Additionally, more than 50% of them may require reopening surgeries, which have a major impact on the patient's quality of life [6,7]. Despite early studies addressing the causes, risk factors, and therapeutic approach for UIn, their findings remain inconsistent,

potentially due to regional variation, patient demographics, available resources, and institutional protocols [8-10]. The current study examined the criteria, intraoperative findings, post-operative management, and outcomes for Iraqi women undergoing obstetric and gynecological procedures who presented with urinary injuries. Our aim was to create population-based data to define a risk factor for UIn, formulate an effective prevention strategy, and improve a multimodal approach for a better patient outcome.

METHODS

Study design and setting

From June 2021 to July 2023, an observational study retrospectively monitored cases of iatrogenic urinary tract injury (UIn) during emergency obstetrical surgeries performed at AL Yarmouk Teaching Hospital's Department of Obstetrics and Gynecology.

Inclusion criteria

All recorded cases with complete data were included, with no age or BMI restrictions. UIn was diagnosed clinically by direct vision or imaging tests, such as IVP or cystography [5,11].

Exclusion criteria

Cases that had missing data and those that had malignancies.

Ethical consideration

The ethical committee of Mustansiriyah University, Baghdad/Iraq, issued the approval for the study protocol. All the methods used in the study followed Helsinki's declaration with respect to patients' anonymity and privacy.

Sampling and outcome measurements

During the review period, 62 cases of documented UIn were evaluated and extracted from the hospital's medical records. The data collected included demographic data (age, parity, and BMI), operative data (surgery type, when the diagnosis of UIn was made, how the injury was confirmed, injury type, and size), repair data (what sutures were used, how many layers, and the use of the suprapubic catheter inserted), and treatment protocol (for minor UIn, repair by absorbable suture and urinary catheterization for 10–14 days). Major injuries were treated with primary repair, implantation, and DJ ureteric catheters. Post-operative complications include ICU hospitalization, sepsis, renal failure, and maternal death.

Statistical analysis

The data was evaluated using SPSS version 25.0, and descriptive statistics were performed to summarize the patient's demographics and clinical characteristics. The chi-squared test compared categorical variables. A prism graph was used to illustrate data. A *p*-value of less than 0.05 was judged significant for all.

RESULTS

Table 1 describes the study demographic criteria. The main age group was between 30 and 40 years, accounting for 51.61% of the participants; between 20 and 30 years, 19.35%, and more than 40 years, 17.74%.

Table 1: Demographic characteristics of the patients (n=62)

Parameters	categories	n(%)	*p*-value
Age (years)	15-20	1(1.61)	0.9
	>20-30	12(19.35)	
	>30-40	32(51.61)	
	>40-50	11(17.74)	
	>50	6(9.68)	
Gravida	1-3	11(17.74)	<0.001
	4-5	37(59.68)	
	>5	14(22.58)	
BMI	18-24.9	15(24.2)	0.08
	25-29.9	28(45.2)	
	>30	19(30.6)	

The gravida distribution showed that 45.2% of the participants had a body mass index [BMI] of 25-29.9. Age, gravidity, and BMI did not significantly influence the risk of injury, with $p>0.05$. Regarding the type of surgery, 54.84% of all cases of renal injuries involve cesarean and hysterectomy, with cesarean accounting for 25.8% and hysterectomy accounting for 19.35%. The statistical significance of this surgery type with injury risk was demonstrated by a *p*-value of 0.001 (Figure 1).

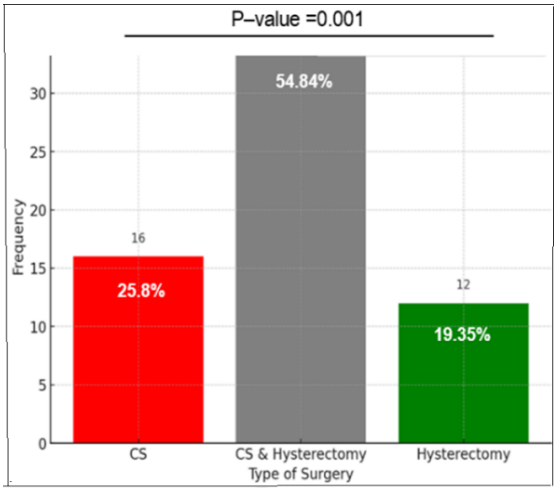

Figure 1: Type of surgeries where injury was caused

Table 2 presents the main operative details; most cases, 41 (66.13%; $p=0.01$), underwent intraoperative diagnosis of the injury. Images used to diagnose injuries didn't play a big part; out of 62 cases, 41 were clinically diagnosed without imaging. The next most common imaging method was an IVU, which was used in 30.65% of cases, and the last was a cystogram, which was used in 3.23% of cases ($p<0.001$) (Figure 2).

Table 2: Operative details of the participants (n=62)

Parameters	Categories	n(%)	*p*-value
Time of diagnosing injury	Post-op	21(33.88)	0.011
	Intra op	41(66.13)	
Type of injury	Bladder	50(80.65)	0.00001
	Bladder and ureter	11(17.74)	
	Bladder and 2 ureters	1(1.61)	
Size of injury (cm)	<3	16(15.8)	0.042
	3-5	30(48.39)	
	>5	16(15.8)	
Type of repair	1 layer	8(12.9)	<0.01
	2 layers	42(67.74)	
	Ureters and DJ	12(19.35)	
Type of suture	Vicryl	48(77.42)	<0.0001
	Catgut	9(14.52)	
	PDS	5(8.06)	
Suprapubic catheter	With	43(69.35)	0.002
	Without	19(30.65)	
Adverse outcome	None	58(93.55)	<0.00001
	ICU admission	3(4.84)	
	Sepsis	1(1.6)	
	Maternal death	0(0)	
	Renal failure	0(0)	

The bladder accounts for 80.65% of all injuries, followed by the bladder and ureter at 17.74%, and the bladder with two ureters at 1.61%. The site of injury showed a high statistical difference with injury risk; *p*=0.00001.

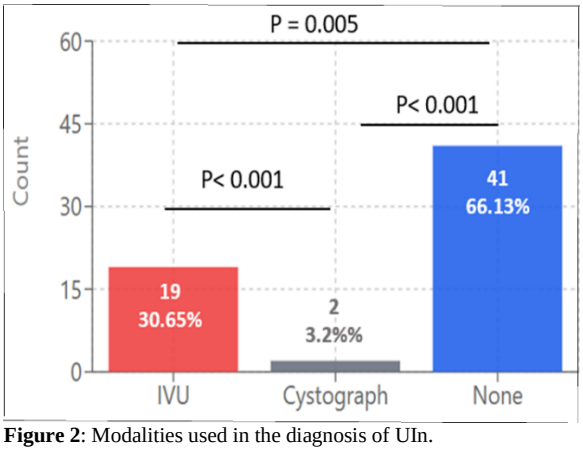

Figure 2: Modalities used in the diagnosis of UIn.

The results showed that 48.39% of cases had an injury size of 3-5 cm, and 15.8% had an injury size of less than 3 cm or more than 5 cm; the injury size was significant among cases, with a *p*-value of 0.042. The type of repair was significant among cases, with a p-value of less than 0.01. We used two layers of suturing at 67.74%, ureters, and DJ at 19.35%, whereas one layer was 12.9%. Vicryl was the most common suture used, 77.42% *p*<0.0001, followed by catgut at 14.52% and PDS at 8.06%. Most operated cases, at 69.35% (*p*=0.002), had suprapubic catheters, while 30.65% did not have any catheters. There was no reported complication in 93.5% of the cases, nor was there maternal or fetal death. 4.8% of the cases reported adverse complications, including ICU admission, and 1.6% reported maternal sepsis.

DISCUSSION

The analysis showed that only gravida was linked with a higher risk of urinary injury, and neither maternal age nor BMI was significant. The prevalence of cesarean hysterectomy was significantly higher among the cases. Most injuries were diagnosed intraoperatively, and those who were diagnosed later were shown mainly via IVP. The bladder was the most common site of injury, and the size ranged from 3 to 5 cm. The injuries were mostly repaired in two layers via vicryl sutures, and the patients were mainly discharged to the ward with a suprapubic catheter. An Indian study, examining 27 cases referred to a tertiary center, revealed a UIn incidence of 0.05%. In line with our findings, the most common maternal age range was 20–34 years old, primarily among multiparous women (92.61%), with the bladder being the most frequently diagnosed site [81.5%]. Emergency C-section for cephalopelvic disproportion was linked with the highest risk of injury (81.5%), while cesarean hysterectomy accounted for only 8.33% of the cases. Their analysis identified the history of adhesion and previous C-sections as the most frequently reported cases involving injury. Urologists handled 37% of their cases, while experienced obstetricians handled 29%. 15% of their cases needed ICU admission [12]. An Egyptian study examined 170 cases with UIn; with an incidence of UIn of 0.82%, the mean maternal age was 33.5±6.6 years, and 94% were at obstetrical operation. C-sections for placenta previa and reported C-sections had the highest odds with a high incidence [54%] and 34%, respectively; they discussed that distorted pelvic anatomy was a predominant risk factor. Current results indicate that 98% of cases with a bladder injury and 90.6% of cases with frequently injured sites received the diagnosis intraoperatively. They reported using DJ stents in 12 cases vs. 14 in our study. ¼ of their cases needed ICU admission [13]. In an African case series, 19 cases were recruited, and they scored an overall UIn incidence of 0.02%. The mean age was 28.9 years, and 84% were multiparous women. The most common cause, accounting for 76% of the cases, was an emergency c-section. The presence of adhesion and the history of an earlier scar served as a predisposing factor for internal bleeding. 89.5% of the cases involved bladder injuries, with intraoperative recognition occurring in 52.6% of cases, while postoperative recognition occurred in 26%. 21% of cases reported admission to the ICU and sepsis. A consultant managed 42% of the cases, and they postulated that early recognition and repair will improve patient outcomes [14]. Salman *et al*. conducted a study on 82 cases, with a mean age of 35 years, 97% of them reporting scars, and 76% reporting adhesion. The injury was recognized in 97% of the cases intraoperatively by clinical evidence (65%); it was without the need for imaging. The bladder was injured in 60% of the cases and was repaired by two layers sutured in 82% of them. Cases that were diagnosed postoperatively underwent cystography in 42.68%. In the current study, cystography was performed only in 3.2% [15]. The role of cystography in evaluating bladder injury is controversial. Some surgeons recommend doing it after bladder repair to document success before the removal of the catheter. Others disagree, claiming that it will increase the risk of infection, especially if bladder breach is an issue

[16,17]. 67.74% of the currently included cases were repaired by 2-layer sutures, which aligns with the Jensen *et al*. meta-analysis that discussed that two layers followed by urinary catheterization were the most adopted approach for bladder injuries [18]. Vicryl was used in more than 75% of the cases. These sutures offer a balance between foreign body effects and durability, making them ideal for delicate procedures [19,20]. A similar approach was adopted by surgeons in hypospadias surgery repair; they confirmed that Vicryl had longer tensile strength compared to other sutures [21]. In the current study, 69.35% of cases had a suprapubic catheter inserted, which aids in bladder decompression without putting too much pressure. By bypassing the urethra, it minimizes the strain on new stitches, facilitating bladder healing. Another advantage is reducing urinary tract infection risk, decreasing pain and discomfort, and enhancing patient mobility during recovery [22-24].

Study limitations

Being a single-center study is one limitation; the referral nature of the case may impose selection bias [25]. Moreover, the follow-up was not extended. After the patients were discharged, the majority did not return, leading us to assume that their outcomes were uneventful. However, we cannot confirm the absence of undesirable side effects [26,27].

Study strength

The study was conducted in a tertiary center that receives referrals from many hospitals, ensuring patient population diversity and enhancing the generalization of our results. The study had excellent sampling power. Expert urology surgeons run on all included cases, so potential bias associated with surgical technique and experience is minimized. All operative and post-operative details were meticulously collected, thus allowing a thorough examination of the outcome. The role of the suprapubic catheter was addressed for the first time in improving patient outcomes.

Conclusion

The recorded cases of bladder injuries happened during cesarean hysterectomy procedures, which pose the greatest risk. Using the Vicryl in two layers approach for early intraoperative diagnosis and repair, combined with suprapubic catheterization, produces excellent results and decreases post-operative problems. This study emphasizes the importance of surgical technique and early diagnosis for improved patient outcomes and lower post-operative morbidity.

Conflict of interests

No conflict of interest was declared by the authors.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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