

Injury to Urinary Organs during Natural Deliveries, Caesarean Sections and Peripartum Hysterectomies

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Abstract

Objective: The purpose of the study is to analyze the causes and types of injuries to the urinary organs related to past deliveries.

Material and methods: There were 34,866 deliveries at the Obstetric-Gynecological Ward, Regional Specialist Hospital in Radom between 1998 and 2016. Medical records of 11 patients with injuries to the urinary organs related to past delivery were retrospectively studied.

Results: The following injuries were found:

- ligation of the left ureter: 1 case,

- injury to the urinary bladder: 10 cases

- vesicovaginal fistula (VVF): 1 case (following injury to the urinary bladder at hysterectomy in the postpartum¬ period).

In 9 patients, the detected injuries were managed during hospitalization for labor, in 3 cases the injuries were diagnosed during the postpartum period; one patient was treated in the General Surgery Ward on 5th day following natural delivery. Another patient suffered injury to the urinary bladder during hysterectomy in the postpartum period. It was sutured up. VVF was diagnosed on 10th day after the surgery, and was successfully managed at the Urology Department.

The injuries to the urinary organs were most frequently related to hysterectomies in the peripartum and postpartum period (54.5%)

Conclusions: 1. Both peripartum and postpartum hysterectomy pose a high risk of urological complications, 15.8% in the group of discussed patients.

2. Patients at high risk of complications necessitating peripartum hysterectomy should be duly transferred to reference wards to provide multi-specialist medical care.

Keywords: Hysterectomy; Deliveries; Injury to urinary; Vesicovaginal fistula

Introduction

The urinary organs can get injured during obstetric operations performed at the time of childbirth or puerperium due to the proximity to the reproductive organs. They occur less frequently during natural labor. The risk of injury to the urinary organs is also related to previous operations or the presence of pathological lesions. Other risk factors include small experience of the operator defined as less than 10 hysterectomies performed per year [1]. If an injury to a urinary organ is detected during obstetric surgery or natural labor, it can be repaired instantly. Moreover, prompt diagnosis lowers the risk of possible complications and necessary reoperations. Injury to the wall of the urinary bladder is the most frequent urological complication related to obstetric surgeries (peripartum hysterectomies, caesarean sections and forceps delivery) and natural labor. Injuries to the urinary bladder are classified according to their location as intra- and extraperitoneal [2]. They occur at caesarean section in 0.14 - 0.31% cases [2]. Other types of bladder injuries include rupture and accidental incision of the bladder wall. In the case of placenta accereta, attached to the bladder wall, it is necessary to resect the segment with the attached placenta. Injured urinary bladder during caesarean section or caesarean section with peripartum hysterectomy can be diagnosed by Foley catheter inserted into the operating field or by urine outflow [2].

Idiopathic spontaneous rupture of the urinary bladder (SRUB) is a rare intra- or extraperitoneal pathology [3]. It often results from Sikora-Szczesniak DL (2017) Injury to Urinary Organs during Natural Deliveries, Caesarean Sections and Peripartum Hysterectomies.

complete urine retention, and is 10 times less frequent in females than males [4]. The causes of SRUB are classified as primary (acute and chronic inflammation), and secondary attenuation of the bladder wall (obstructed urinary outflow, outstretched bladder wall due to nervous problems) [3].

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Vesicovaginal fistula is a non-physiological junction between the bladder and vagina [5]. It often results from an injury to the bladder and takes the form of vesicovaginal (VVF) or vesicouterine fistula (VUF). Bladder injury related to hysterectomy is associated with the risk of developing VVF [6,7]. The classification of VVFs is based on their size into simple small size fistulas (≤ 0.5 cm) and complex, i.e. medium (0.5 to 2.5 cm) and large fistulas (≥ 2.5 cm) [8]. Postoperative VVF is presented as an early complication up to about 10 days after surgery [9]. The diagnosis of VVF is based on clinical symptoms, typically total urinary incontinence. Moreover, intravesicular administration of diluted indigo carmine or methylene blue is used to confirm the problem [10]. VVF is most frequently located at the top of the vagina and the posterior wall of the bladder [9].

The ureters are 30-cm-longtubes (the left ureter is 2-3-cm longer), 4 - 4.5 mm in diameter, descending extraperitoneally in the abdominal and pelvic section of the abdominal cavity. The size, stability and anatomical location make the ureters prone to various injuries [11]. Iatrogenic trauma to the ureters includes discontinuity lesions (incision, cut through) and non-discontinuity lesions, e.g. ureteral ligation [12]. Intraoperative injuries occur most frequently at the crossing of the ureters with ovarian vessels and the uterine artery [13]. The presence of ureteral obstruction after obstetric surgery requires urological consultation and surgical treatment by a specialist urologist.

Objective

Citation:

The article aims at a retrospective review of 11 clinical records documenting the course of labor and postpartum period complicated by injuries to the urinary organs.

Material and methods

In the period from 1998 to 2016 there were 34,866 labors, (25,371 - 72.8% by nature and 9,495 - 27.2% by caesarean section) in the Regional Specialist Hospital in Radom. Peripartum hysterectomy and hysterectomy in the puerperium were performed in 38 (0.11%) women.

The medical records of 11 women were retrospectively reviewed. Injuries to the urinary organs after natural deliveries were reported in two (18.2%) women, and in nine women after caesarean section or caesarean section with peripartum hysterectomy or hysterectomy performed in the puerperium.

The results were referred to literature reports on injuries to the urinary organs related to natural labor and obstetric surgery.

Results

The clinical material of the study includes cases of injuries to the urinary organs in

11 women. The following types of injuries were found:

- ligation of the left ureter after peripartum hysterectomy due to the ruptured uterus detected after natural delivery, intraoperatively complicated by an injury to the urinary bladder – 1 case.

- spontaneous rupture of the urinary bladder on 5th day after natural delivery – 1 case,

- injury to the urinary bladder (rupture/incision) during caesarean section - 4 cases,

- injury to the urinary bladder (rupture/incision, partial resection of the urinary bladder) during caesarean section and peripartum hysterectomy - 4 cases,

- VVS after caes arean section and hysterectomy in the puerperium – 1 case

Table 1 lists indications for obstetric surgeries during and after the delivery:

- complications to the delivery and past caesarean section that required obstetric operation during which a urinary organ got injured,

- type of obstetric surgery,
- type of injury to a urinary organ,
- management of complications,

- statistical data – percentage of complications referred to natural deliveries, caesarean sections, peripartum hysterectomies, and hysterectomies in the puerperium.

Tables 2-4 provide facts that may affect labor complications with possible consequences for the course of labor and result in caesarean section, peripartum hysterectomy or hysterectomy in the puerperium in the group of examined patients:

- Table 2: age, weight and BMI,

- Table 3: number of natural deliveries, caesarean sections and miscarriages,

- Table 4: use of packed red blood cells and frozen fresh plasma in the peri- and postoperative period.

Injuries after natural deliveries were reported in 2 (18.2%) women. In 1 case ligation of the left ureter occurred during peripartum hysterectomy with left adnexa. In another case the Fallopian tubes were removed in a 36-year old patient (after 4 caesarean sections and preinvasive cervical cancer detected).

Significant ureteral injury during obstetric and gynecological operations account for 60% of all injuries to the ureters. In the case of hysterectomy with adnexa, complications occur in 0.5 - 2.0% cases, and during caesarean section in 0.1% cases at the least [11,14]. Intraoperative ureteral injury often goes unnoticed. The risk of trauma increases due to e.g. massive bleeding that requires immediate repair at limited insight into the operating field, as well as developmental abnormalities, past surgeries, and cancers [14-16].

It is optimal to recognize this complication at the time of surgery. However, up to 75% of ureteral injuries may go unrecognized during the procedure at which the injury occurred [12]. Therefore, prompt diagnosis of injured ureter is not often made until several days have passed after obstetric-gynecological surgery, considering clinical symptoms and results of imaging examinations. Citation: Sikora-Szczesniak DL (2017) Injury to Urinary Organs during Natural Deliveries, Caesarean Sections and Peripartum Hysterectomies. Med Sur Urol 6: 195. doi:10.4172/2168-9857.1000195

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Method of pregnancy	Percentage of complications observed	Number of past caesarean sections.	Percentage of complications: out of total number of deliveries (N=34 866). Natural deliveries (N=25 371)	Surgical operations. Type and management of urological complications			
termination (N/ %)	out of total number of deliveries (N=34 866). Completed by caesarean section (N=9 495). Peripartum hysterectomy (N=38).	delivery. Indications of for caesarean section/hysterectomy		Type of operation during which injury to the urinary organs occurred.	Urological complications (injury to the ureter and urinary bladder)	Management of complications	
Natural delivery (N=2 / 18.2)	0.0029 2.6	[0]. Rupture of the uterus	0.0029 0.0039	Peripartum hysterectomy with left adnexia	Ligation of the left ureter	Relaparotomy. Removing the ligation from the uterus. Internal urecterotomy t. J-J. Drainage on 5 day after delivery and peripartum hysterectomy.	
	0.0029	[0]. Not observed	0.0029 0.0039	Not observed	Spontaneous rupturę of the urinary bladder in the puerperium	Suturing up the bladder – operation on 5 day after delivery in the General Surgerey Ward.	
Caesarean deliveries (N=4 / 36,4)	0.0029 0.010	[2]. Rupture of the uterus	0.0029	Caesarean section. Resection of the uterine fragment	Incision of the bladder	Suturing up the bladder	
0.011 0.042	0.0086 0.032	 [0]. Central placenta previa. [1]. Conditio after caesarean section. [2]. Pelvic presentation of the fetus. 	0.0086	Caesarean section	Rupture/injury to the bladder	Suturing up the bladder	
Casesarean deliveries with hysterectomy. (N=5 / 45,4) 0.014 0.053 13.2	0.0029 0.010 2.63	[0]. Pelvic presentation of the fetus. Large fetus.	0.0029	Caesarean section, postpartum hysterectomy without adnexia in 4 week after caesarean section.	Injury to the bladder at peripartum hysterectomy. VVF.	Suturing up the bladder. Fistula founfd on 10 day after peripartum hysterectomy. Foley catheter. Reoperation after 9 weeks from hysterectomy in the Urology Ward.	
	0.0057 0.021 5.26	[1]. Placenta percreta. [2]. Placenta implanted.	0.0057	Caesarean section. Peripartum hysterectomy without adnexia.	Injury to the bladder	Suturing up the bladder. Resection of the bladder fragment with implanted placenta.	
	0.0057 0.021 5.26	[2]. Central placenta previa; implanted placenta.[4]. Preinvasive cancer of the uterine cervix.	0.0057	Classic caesarean section. Peripartum hysterectomy: - without adnexia, - with oviducts	Injury/incision of the bladder	Suturing up the bladder	

Table 1: Surgical operations performed to repair urological complications after delivery (N=11).

Parameter	Mean	Range	SD
Age	35.64	30 - 43	3.80
Body weight	72.82	54 -85	8.59
ВМІ	26.39	33.20 -19.85	3.58

Table 2: Age, body weight and BMI of patients operated on for injury to the urinary organs.

To postoperatively diagnose stenosis or obstruction of the ureters, it is useful to take urography (or pyelography) often in combination with CT with a contrast agent, or MRI. These procedures are now recognized as standard in the diagnosis of this type of postoperative injuries [13]. Some authors believe that CT with a dye is more sensitive than urography which should be used only if CT cannot be taken [11].

Ureteral injury, when its continuity is maintained (in ligation or clipping of the ureter), is the simplest to treat. The repair operation consists in removing the ligature/ureteral clip. In case of doubt as to the blood supply on the ligated site, the ischemic fragment of the ureter should be resected and reconstructed in a manner dependent on the location of the injury [12,17].

Parameter	Deliveries			Miscarriages		
	Total [(%)/mean]	Natural	Caesarean section	Total	Spontaneous	Forced
Number of deliveries/miscarriages Range	41/ 1 - 6	18/ 1 - 6	23/ 1 - 5	8/ 1 - 4	7	1
Mean number of deliveries per patient	3.73					
Number (%) of patients delivering naturally	2 [(18.2)/3.5]	7	0			
Number (%) of patients delivering by caesarean section	5 [(45. 5)/3.2]	0	16 (3.2)			
Number (%) of patients delivering naturally and by caesarean section	4 [(36.3)/4.5]	11 (2.8)	7 (1.8)			
Number (%) of patients who miscarried				4 (36.4)	4 (36.4)	1 (9.1)

Table 3: Deliveries and miscarriages in the patients with injury to the urinary organs after deliveries and obstetric operations (N=11).

Group of patients operated on [N = 11]	Number (%) of patients who had blood and blood components transfused	Transfused units: red blood cell concentrate	Transfused units: FFP	Transfused units: red blood cell concentrate, FFP per 1 patient mean
Primary operations [N=7]	7 (63.6)	30	9	4.29 2.25
Reoperations (secondary) [N=2]	2 (12.5)	16	7	8 3.5
Total [N=8]	8 (72.7)	46	16	5.75 2.67
Operations without blood transfusion [N=3]	3 (27.3)			

Table 4: Provision of blood preparations in women with injuries to the urinary organs after deliveries and surgical operations.

A case of spontaneous rupture of the urinary bladder was reported on 5th day in the puerperium. The patient was operated on at the ward of General Surgery. The most frequent causes of that complication include inflammation of the crotch and vagina related to labor and vulvovaginitis [4], or it can occur as a result of the combined effect of several of these factors [3]. Bladder injury after surgical deliveries was reported in nine (81.8%) patients (in four - 36.4% at caesarean section, and in five -45.4% patients at caesarean section with obstetric hysterectomy).

The results revealed this complication in 0.094% cases among all caesarean sections. It was noted in five (13.2%) patients with obstetric hysterectomies performed on our ward (Table 1). Management is based on the type and extent of injury. A 2-10-mm-long injury can be treated conservatively, maintaining Foley catheter drainage for 7 days for the wound to heal. A 1-2-cm wound can be closed with a single layer of sutures of extended absorption. Injury longer than 2 cm is closed by 2 continuous layers of sutures of extended absorption. The urothelium mucosa should be sutured separately, the submucosal and muscular layers are covered by the second layer of sutures. Tightness can be checked by administering methylene blue solution to the bladder. Foley catheter drainage should be maintained for 7 to 14 days depending on the lesion [18,19].

Emergency peripartum hysterectomy (EPH) and postpartum hysterectomy (PH) hysterectomy consist in the total resection of the $% \left({{\left[{{E_{\rm{B}}} \right]}_{\rm{B}}} \right)$

uterus or the uterine body, usually without adnexa. PH (in the puerperium) is undertaken in the case of late hemorrhage threatening with complications or infection.

Among the risk factors of urological complications after natural deliveries and obstetric operations the most frequent was multiparity, i.e. 72.2% of women were multiparous (Table 3). Another risk factor was history of caesarean delivery, i.e. 63.6% women (Table 1), and advanced age of pregnant women, i.e. >35 yrs - 54.5% (Table 2). The fourth risk factor was pathological implantation of the placenta in 36.4% women. Placenta previa was reported in 1 woman (9.1%) (Table 1).

In the group of women with obstetric hysterectomy performed, there were 6/11 (54.5%) cases of the injuries to the urinary organs. Five women in this group were over 35 years old. Two of these patients delivered naturally: one woman - six times, the other - five times. One woman delivered by caesarean section 4-times, and two women delivered by caesarean section two times each. Another patient from this group delivered 5 times of which one was caesarean section. The pathology of placental adhesion was noted in four cases in this group. In the analyzed group, a 36-year old patient, 37 hbd., 3rd pregnancy, 2 caesarean sections, had peripartum hysterectomy due to the placenta embedded into the bladder wall; the damaged section was resected and surgically closed.

In the group of four patients with urological complications during caesarean section, two women had history of two caesarean deliveries and one delivered that way one time. The fourth patient in this group underwent caesarean section due to placenta previa.

A 42-year-old woman, 39 hbd., with the history of five deliveries, had her sixth pregnancy terminated by caesarean section due to pelvic presentation of the fetus and heavy body mass. Four weeks later, hysterectomy was performed due to hemorrhage. Unfortunately, during that operation the urinary bladder was accidentally injured, and the condition was intraoperatively repaired. On 10th day after the surgery, a 1.5-cm long VVF was diagnosed and surgically repaired nine weeks following hysterectomy at the Urological Ward. In this case, bleeding that occurred after caesarean section and ongoing puerperal infection (Endomyometritis post partum) affected later complications.

Highly difficult operations, as in the present study, require provisional blood preparations and, if necessary, transfusion of blood and blood products. Transfusion was necessary in eight women (72.7%). On average, 1 patient received 5.75 U of Red Blood Cell Concentrate, and 2.67 U of fresh frozen plasma (Table 4).

In two cases the operations were performed in other wards, the patients with the symptoms of peritonitis following spontaneous rupture of the urinary bladder in the puerperium were operated on in the Ward of General Surgery, and the patient with VVF in the Urology Ward [20].

Discussion

In the presented material, urinary tract injury was recorded in 1/950 obstetric surgeries. In most cases (54.5%) they occurred during obstetric hysterectomy, including 5 cases of bladder injury (13.2%) out of 38 cases of obstetric hysterectomies. Rajewski, in a 10-year study, reported 12.0% such injuries [21].

In our material injury to the urinary bladder was reported in 10 (90.9%) women, including 1 case of bladder rupture on 5th day after natural delivery. Bladder injury was the most common complication associated with obstetric operations. A total of 9 cases of bladder injury accounted for 0.095% of trauma to the organ during cesarean section. These injuries occurred at caesarean sections (4 cases; 0.042%), and caesarean sections with peripartum hysterectomy (5 cases; 0.053%).

In one patient after caesarean section, hysterectomy complicated by bladder injury was performed in the puerperium. The condition was subsequently complicated by VVF. This complication was observed in 0.0029% after all deliveries, and in 0.010% after caesarean sections. VVF is routinely managed by Foley catheter indwelling 6-12 weeks until granular tissue has been resorbed. Simultaneous drainage increases chances of fistula closure [20]. Surgical operation of VVF involves excision of the fistula canal and closing it with several layers of absorbable sutures [13].

Bladder injury reported in the literature occurs with the following frequency:

- 0.14-0.31% of pregnant women who undergo caesarean section [2]

- 12% of women after obstetric hysterectomy [21].

In the patient with spontaneous rupture of the urinary bladder, ruptured uterine cervix and ongoing inflammation could have caused this complication. Other authors also mention inflammation of the crotch and vagina related to labor and vulvovaginitis as the most common causes of this condition [4].

Surgery, as in the presented cases, is the treatment of choice. However, there are reports on successful treatment by catheter alone [3]. Dextrorotation of the pregnant uterus, which entails neighboring organs, is typical of full term pregnancy. Therefore, during abdominal operation, e.g. during caesarean section, the left lateral wall of the bladder as well as the left ureter are found closer to the midline [22]. More frequent occurrences of left ureteral lesions have been reported in the studies of this complication following gynecological and obstetric operations, mainly after hysterectomy with adnexa [17]. Complication of that type was also noted in the presented material. Rupture of the uterus after 6th natural delivery was reported in a 37year-old woman. The lesion ca. 18-cm-long ran along the left uterus edge, from the roof of the vagina to the midpoint of the uterus, and then rightwards across the uterine body. During peripartum hysterectomy, it was necessary to remove left adnexa due to hematoma of the left infundibulopelvic ligament.

Among caesarean sections, the incidence of ureteral injury is estimated at 0.03 to 0.1%. It is recommended to check the ureters patency at the close of each operation during which there was a risk of injury [2,15]. Among complications after hysterectomy at caesarean section or after delivery, ureteral injury was reported in 3% of women [23]. In the present analysis, 1 case of ureteral injury occurred during hysterectomy performed at caesarean section; among hysterectomies performed during caesarean section and in the puerperium it accounted for 2.6% cases.

Abnormal location of the placenta and abnormal placentation are among the most serious risk factors for considerable obstetric complications. Particularly high risk cases are placenta previa and low location of the placenta with coexisting abnormal placental implantation.

The aforementioned material revealed 45.4% pathologies led to complications during obstetric surgeries, which required hysterectomy at caesarean section, and thus created a chance of traumatic injury affecting the urinary organs.

Argentinian authors presented their own method of surgical management in the case of placenta implanted into the bladder wall as a technique sparing the uterus. It consists, inter alia, in the excision of the affected segment of the anterior wall of the uterus and the posterior wall of the bladder and suturing up the affected organs [24].

In the group of 38 women, who underwent peripartum and postpartum hysterectomy, injury to the urinary organs occurred in six (15.8%) women including bladder injury in five (13.2%) women (one case- 2.6% complicated by VVF, and one- 2.6% by ligation of the left ureter).

In the present study, transfusion was necessary in eight women (72.7%). On average, 1 patient received 5.75 U of Red Blood Cell Concentrate (RBCC), and 2.67 U of fresh frozen plasma. Other authors reported similar values of RBCC (96.0% and 84% cases required transfusions during obstetric hysterectomy) [21,23].

Intraoperative bladder injury was reported in nine (0.094%) women after caesarean deliveries. On the other hand, that complication occurred in five (13.2%) women who underwent obstetric hysterectomy performed on the ward during the period of study (Table 1). This is comparable to the incidence of that injury (12.0%) reported by other authors [21,25,26].

Among hysterectomies performed during caesarean section and in the puerperium, there was one case of ureteral injury (2.6%). Literature reports on 3% ureteral injuries after hysterectomy performed at caesarean section or after delivery [23]. Thus it is recommended to check the patency of the ureter at the close of each surgery [15].

In the analyzed material the majority of women who underwent obstetric hysterectomy suffered trauma to the urinary organs. Therefore, it is important to take precautionary measures to reduce the incidence of urinary tract injury at the time of natural delivery, surgically terminated pregnancy, also during the postpartum period, and avoid associated complications. Patients at risk of urological complications should be provided with special care. Appropriate surgical techniques should be used aside early diagnosis of the lesion, and prompt treatment should base on current and reliable data.

Conclusions

1. Hysterectomy in the peripartum and postpartum period poses high risk of urological complications. In the examined group, complications were noted in 15.8% of women operated on.

2. Patients at risk for complications likely to result in peripartum hysterectomy should be promptly send to referral departments to provide them with multi-specialist medical care.

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