

Intraoperative damage to the urinary bladder during cesarean section - review of literature.

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Introduction

The last years have brought a significant increase in the number of births by caesarean section, and as a result there is expected to be an increasing number of patients with adhesions in the pelvis minor on a more frequent basis. Intrauterine adhesions are the most significant risk factors of damage to the bladder. The incidence of damage to the bladder during the caesarean is relatively small. However, it is extremely important to anticipate the possibility of this complication, its intraoperative diagnosis and implementation of appropriate treatment when they occur.

Introduction

Damage to the urinary tract, which is a complication of caesarean section, is rarely described in the literature. However, the caesarean section is now the most frequently performed obstetric surgery in the world, and their number increases every year. Taking this into account, the obstetricians and their patients should be aware of the potential complications associated with carrying out this procedure.

Over the last century, the reduced rates of morbidity and mortality of mothers during caesarean section are noticeable, but a growing number of urological complications are expected to be seen. The most common urological complication of caesarean section is the damage of the urinary bladder [1].

Incidence of bladder damage after cesarean section ranges from 0.08 to 0.94% [2-8]. The data on injuries of the urinary bladder during caesarean section, however, are divergent because the available work uses inconsistent definitions of damage and do not specify the severity of damage.

Although bladder damage during cesarean delivery is rare, obstetricians should be aware of the need to inform pregnant women about all the possible complications associated with this operation before giving conscious consent for the caesarean section. The potential consequences of damage to the bladder are connected with the extension of the duration of operation, longer hospitalization, the need to keep Foley cathete longer in the urinary bladder, the increase of infections and post-operative complications in the urinary tract, such as vesico-vaginal fistula.

The possibility of this type of complication should be also expected and it is necessary to point out that the most important thing is to establish the diagnosis even during the caesarean section.

In this paper, the following aspects are discussed: the risk factors, diagnosis and treatment of damage to the bladder during caesarean section.

How to avoid damage?

The contemporary methods of cesarean section are mainly modification of the operation performed by Pfannenstiel method, which is the method described at the turn of the 19th and 20th centuries. This procedure is usually not a single surgical technique, and in many centers there are well-established kinds of this surgical technique. In order to minimize the damage of the urinary bladder, it is necessary to analyze different surgical techniques.

In analyzing how to perform caesarean section and its impact on the traumatism of the urinary bladder, it should be stated that the way to open the abdominal wall (modification of Pfannenstiel method, or longitudinal midline cut) does not change the probability of damage [8]. About 28, 0-46,6% of damage to the bladder occurs during the opening of the peritoneum [7,8,9]. In the studies of some authors, bladder injuries, which occur during the opening of the peritoneal dominate during the first cesarean section (46.6%), while the subsequent cesarean section predisposes to injuries in the opening of vesico-uterine fistula (32.0- 60.0%) [2, 7,8,9].

Opening the peritoneum using the "sharp" method (*Pfannenstiel* method), compared to the opening with the "blunt" method (*Joel-Cohen* and *Misgav-Ladach* methods) seems to be the safer method, especially if it is the subsequent cesarean section [7].

The operation of reaching the uterus consists of opening of the vesicouterine wave and sliding the bladder downwards - as in the *Pfannenstiel* and *Joel-Cohen* methods, suggested by Kerr. Sliding the bladder reduces the risk of injury particularly in the repeated cesarean section. The risk of bladder injury can be minimized by opening wave of at least about 1-2 cm above the top edge of the bladder and the bladder should slide sharply, not with the use of gauzes. Reaching the uterus without sliding the bladder, as in the - *Misgav Ladach* method and its modifications, seems to be safe mostly at first incision. Special attention should be paid to this stage of the operation, because about 23.8, % of damage in case of women who give birth for first time and up to 60.0% of injuries in case of the next cesarean section is formed at that moment [2, 7, 8, 9]. Approximately 14.3% of injuries occur at the time of opening the uterus (in the following caesarean section, this value rises up to 40%) [8].

The moment of damage to the urinary bladder	First-time caesarean section	Repeated Caesarean Section
Opening of the peritoneum	35,7 - 46,6%	35,7 - 46,6%
Opening of vesico-uterine fistula	23.8-50.0%	32.0-60.0%
The opening of the uterus and the fetus extraction	14.3-28.6%	35,7 - 46,6%
Suturing the uterus muscle	10%	10%

Table I. Time of creating damage to the bladder [7,8,9].

In most cases, the uterus is opened laterally with a scalpel in the lower section on a length of about 2 cm, and then it is extended bluntly or sharply with fingers. There were no differences found in the incidence of fractures of the uterus in the published studies or the anticipated loss of blood or ease of extraction of the fetus [26, 30]. Unfortunately, in these studies, no reference was made to the urinary bladder damage [30]. The method of transverse opening of the uterus transverse muscle is safer compared to the infrequently used uterine incision in the midline in the lower section (*De Lee and Cornell methods*) [13].

Sometimes, there is a need to widen the incision of the uterus in order to extract the fetus. Although no comparative studies were found of a way to extend the incision, it appears that in order to reduce the risk of injury to the bladder, extension of the slit, cephalad to the patient should be performed.

The integral part of the cesarean by the Pfannestiel method is suturing the vesicovaginal fistula. The distant consequence of such a technique is the greater chance of adhesions in the lower segment of the uterus, which may lead to difficulties in the subsequent cesarian section and damage the bladder. [7, 8,14,15,17]. Therefore, what seems intentional is reperitonealization of the peritoneum as in the *Joel-Cohen* and *Misgav Ladach* methods.

The available studies found no significant differences in the impact of suturing vesicovaginal fistula on the formation of bladder injury [15].

On the other hand, however, there are studies that have shown beneficial effects on reperitonealization in reducing formation of adhesions [31, 32].

The probability of bladder damage increases with the times of performing the caesarean

section. According to many authors, subsequent cesarean section causes approximately 4-5 fold increase in the risk of damage to the bladder [2,7, 8].

The main reason for damage to the bladder, in case of incisions, is imperial peritoneal adhesions.

The adhesions in the peritoneal cavity in combination with another cesarean increase the risk of damage to the bladder ten-fold [8]. The probability of adhesions grows with subsequent caesarean section.

Number of Cesarean sections	The risk of adhesions in the peritoneal cavity
2	21.6-24.0%
3	32.3-42.9%
next	42.2-47.9%

Table II The percentage of adhesions in the abdominal cavity depending on the times of caesarean section [19,20, 21]

The most frequently diagnosed adhesions are the adhesions of abdominal wall, bladder, uterus and systems with parietal peritoneum. The pathogenesis of adhesion formation is a complex process in which fibrin, clotting factors and inflammatory cells repair the peritoneum [20,22,23]. The risk factors include adhesions: individual predisposition, the presence of blood in the abdominal cavity, tissue ischemia, infection, excessive use of instruments or touching organs [20, 22]. Separation of the scarred tissues should be carried out using the sharp method. In the case of suspected massive adhesions, the peritoneal cavity should be opened higher than usual. A scar of the lower part of the uterus mobilizes sharply and broadly separates the posterior wall of the bladder [11].

Among the documented risk factors of damage to the bladder are, for instance: abdomen surgeries, the lower section of the uterus fibroids or endometriosis. [7,11]

Most of the publications indicate that the total number of defects of the bladder is greater in elective caesarean sections than in case of emergencies. This is due to elective cuts being attributed to patients after cesarean as well as elderly female patients [7,8]. It should be remembered, however, that a Caesarean section, due to emergency indications, can cause

haste, especially in case of less experienced operators, which may favor the occurrence of complications. [11,24].

The period of delivery is also important in the occurrence of certain risks of damage to the urinary bladder. The risk of damage to the bladder increases four-fold in the second stage of labor, compared to the 1st period of birth. [8.12].

The reason for this growth risk is complex. Oppression of the leading part of the fetus changes the local blood supply to the bladder wall by increasing its traumatism, and moreover it is often difficult to draw the stretched line between the lower segment of the uterus and bladder. The advance of the leading part of the fetus in the birth canal hinders its extraction, promotes damage to the lower part of the uterus, which often coexists with damage to the bladder - according to some authors it is an independent risk factor, which increases the risk of damage two-fold [8]. Thus, there are to be expected clinical situations where there is a greater risk of damage to the uterus such as: PROM, under-development of the lower section in a premature birth, the abnormal orientation and position of the fetus, placenta previa, placenta accreta and ingrown will foster injury of the bladder [11, 28]. Fetal weight (more than 4000g) proved to be an independent factor increasing the risk of injury to the bladder by 2.85 times. This may be due to the need for larger incisions of the uterus [8].

Failed attempt of natural birth after cesarean section is also associated with a higher probability of bladder damage compared to elective incision, but should not be discouraged to patients attempting a natural birth [25]. There are no studies comparing the effect of suturing the uterus after cesarean section for the risk of bladder injury in the next operation. However, there are studies which suggest that the double-layer suturing of the uterus muscle reduces the risk of adhesions by seven times [35].

How to recognize the damage?

The bladder consists of the peak of the bladder, which passes the midline umbilical ligament, stem (front and back wall) bladder connecting the peak to the bottom of the bladder called a triangle formed by the mouth of the ureter and the beginning of the urethra.

The top of the bladder is usually damaged during caesarean section (48, 0-76, 2%), followed by the core (21, 8- 52.0%) the remaining cases concern the triangle bladder and ureters (3-8%). [2,7,8,9,10,11]. According to the statistics, the first caesarean sections are dominated by damage to the top of the bladder (76.2%) in the subsequent caesarean sections, the

number of injuries to the shaft and triangle bladder [7,8]is increased.

The place of damage to the bladder	First-time caesarean section	Repeated Caesarean Section
Top	51.0-76.2%	48,0 - 53,3%
Stem	21.8 - 24%	46.7 - 52.0%
Triangle	0-3.0%	3,0 - 8%

Table III Location of the damage to the urinary bladder. [8,9]

Identification and immediate repair of damage during surgery reduces the risk of having to perform further operations as well as possible complications. Most of the injuries are recognized during surgery, during extraction of the fetus and suturing the uterus muscle (about 62%), during the inspection of the peritoneum (about 33%), when closing the fascia (about 12%) [2, 26]. Visual inspection is the most reliable method of assessing the integrity of the bladder. The intraoperative symptoms which indicate bladder injury are the presence of urine outside the bladder, visualization of Foley catheter in the surgical field and visible wound or mucous membrane of the bladder [8, 11, 25].

Continuity of the bladder wall can be checked by providing it with light by the Foley methylene blue catheter, or 0.9% NaCl. Departure of fluid into the peritoneal cavity allows identification of the damage and its location. If there is a suspected damage in the area of a triangle bladder, the possibility of damage to the ureters should be considered. In order to determine the damage, 40 mg indigo carmine or 25 mg of a 10% solution of sodium fluorescein can be given intravenously. Assessment of the extent of damage to the triangle of the bladder and ureters escape is beyond the competence of the obstetrician and requires consultation of the urologist. [10,11,25]

How to repair damage?

If there has been damage to the bladder, it is necessary to have it repaired during the same operation. Unrecognized damage and failure to implement treatment lead to the development of complications and requires re-operation [2, 7, 8, 10]. Damage around the top of the bladder with less than 2 mm does not require repair or catheterization. Injury of this type can be, for example, under pinning- it is then necessary for the thread to be removed from the wall of the bladder, and no further treatment is necessary. In the event of damage up to 2 cm, a single layer of sutures with delayed absorption (usually with a thickness of 3-0) should be put on the wound.

The damage extending more than 2 cm is provided with two layers of continuous sutures with delayed absorption. Firstly, the mucosa of the urinary bladder is sutured (3-0 absorbable suture); the second film layer comprises submucosa and muscularis (3-0 absorbable suture). Non-absorbable sutures should not be used because of the greater likelihood of urolithiasis, granulation scars and recurrent urinary tract infections [10, 11, 24]. As mentioned above, damage in the area of a triangle of the urinary bladder can coexist with damage to the urethra and ureters; repair of this damage requires a lot of experience, thus, the help the urologist is needed [10,27]. The tightness of suture is usually checked in the cases of complex trauma area of a triangle or the plasticity of ureters giving the blue methylene solution.

Some centers routinely perform and recommend a cystoscopy after repair surgery - especially the rear wall and the bladder triangle tract, which is often accompanied by rupture of the uterus towards the cervix. [9] Foley Cathete remains usually for 5-14 days taking care of its patency. Sometimes it is appropriate to assume ureteral catheters and drainage of the peritoneal cavity. Most of the centers during the time of maintaining Foley catheter use the antibiotic prophylaxis according to anti-biogram with urine culture from a sample taken directly from the Foley catheter [2,7,8,11]. However, there is no clear evidence of the need for such a procedure. However, it seems that the antibiotics need to be individually adjusted according to the clinical situation [30]. Damage to the urinary bladder heals well, if it is fitted immediately after damage. The most common postoperative complication is urinary tract infection and urinary incontinence [7,8,10].

Damage to the bladder rarely remains undiagnosed during caesarean section.

There are also many signs of the postoperative period, which suggest damage to the

bladder. These symptoms may include hematuria, oliguria, abdominal pain, intestinal obstruction, ascites, peritonitis and septicemia.

Cystography or computed tomography with cystography is used for the purpose of diagnosis of the initially unrecognized damage. In diagnostically obscure situations a method of exploratory laparotomy [10,29] should also be taken into account.

Summary

As a result of the global increase in the number of deliveries completed by cesarean section and the increase in the number of patients who have had (at least one) cesarean section, who become pregnant again - the risk of damage to the bladder when performing the most common obstetric operation is real. The key role is a proper risk assessment before and during the operation and the immediate recognition of this complication. Doing the right thing at the time of surgery and in the postoperative period can reduce the impact of the distant results of these most common urological complications of cesarean section.



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