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ORIGINAL ARTICLE

The Effect of Cystodistension During Cesarean Section for Preventing Urinary Bladder Injuries in Patients with Placenta Previa

Abdelrazik Elsayed Abdelrazik[1], Walid Mohamed Elnagar[1], Khadijah Issa Mohammed Algarmadi[2*], Ahlam Ahmed Basha[1]
[1]Obstetrics and Gynecology Department, Faculty of Medicine, Zagazig University,Zagazig, Egypt
[2]Obstetrics and Gynecology Department, Faculty of Medicine, El-Mergib University, Libya
Corresponding author:
Khadijah Issa Mohammed Algarmadi
Email:
katyessa07@gmail.com
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ABSTRACT
Background: Adhesions from prior procedures greatly enhance the risk of bladder damage during emergency cesarean sections. One technique to minimize bladder injuries during cesarean sections is cystodistension or bladder retro-fill, which inflates the bladder to improve its visualization and facilitate dissection. This study aimed to assess the safety and effectiveness of cystodistension in preventing bladder injuries among women diagnosed with placenta previa.
Methods: This randomized control trial study was conducted on 70 patients with placenta previa diagnosed by ultrasound and Doppler who attended to outpatient clinics and maternity Hospital of Zagazig University Hospital. Women randomly allocated into two groups: Group A: 35 cases of inflated urinary bladders before cesarean section. Group B: 35 cases of non-inflated urinary bladders before cesarean section. All patients were subjected to full detailed history taking, laboratory investigations, full clinical examination including Obstetric ultrasound and Doppler.
Results: showed a significantly shorter dissection time, with a mean of 4.6 minutes compared to 5.8 minutes in Group B. Furthermore, hospitalization duration was notably shorter in Group A, with a median of 1 day versus 3 days in Group B. Additionally, urinary catheter retention was significantly reduced in Group A, with 97.1% of patients having the catheter removed within 12 hours, compared to 62.9% in Group B.
Conclusions: Women presenting with placenta previa had reduced risk of bladder injuries, shorter dissection time, shorter duration of hospitalization and shorter duration of retention of urinary catheter as a result of cystodistension during cesarean section for placenta previa.
Keywords: Placenta Previa; Cesarean Section; Effectiveness; Safety; Inflated urinary bladders.

INTRODUCTION
When placental tissue covers the internal cervical os during pregnancy, it is referred to as placenta previa[1]. There are three types of placenta previa: partial, incomplete, and complete. A placenta that totally covered the internal cervical os and had a placental margin more than two centimeters from the os was referred to as complete placenta previa. Partial placenta previa, which covered the os but had a margin within 2 cm of the os, and incomplete placenta previa (marginal), whose margin was next to the internal os[2]. About 1 in 200 pregnancies result in placenta previa [3]. Since the incidence of cesarean deliveries has climbed tenfold[4].

It is uncertain what causes placenta previa. One theory is that regions of the upper uterine cavity with poor vascularized decidua due to prior surgery or multiparity encourage trophoblast

implantation in or unidirectional development toward the lower uterine cavity. Another theory is that the placenta is more likely to cover or intrude on the cervical os if its surface area is exceptionally big, as it is in multiple gestation[5].

Advanced maternal age, multiparity, smoking, cocaine usage, previous suction and curettage, assisted reproductive technology, history of cesarean sections, and previous placenta previa are risk factors that are associated with placenta previa[6]. According to reports, the chance of recurrence in subsequent pregnancies is between 4 and 8%[1].

Maternal death, cesarean hysterectomy, and severe bleeding are among the many negative consequences linked to placenta previa. Placenta accrete is more likely to occur in pregnant women who have had a previous cesarean section and present with placenta previa[7].

Transabdominal ultrasonography is usually used to diagnose abnormal placentation. Additionally, color Doppler ultrasound tests aid in the identification of anomalous placentation[4].

Concerning gestational age at delivery, no official guidelines address the issue of the optimal timing in placenta previa, but common practice is to conduct delivery between 36- and 37-weeks' gestation. According to RCOG, elective delivery by caesarean section in asymptomatic women is not recommended before 38 weeks of gestation for placenta previa or before 36–37 weeks of gestation for suspected placenta accrete. With the diagnosis of placenta previa, the patient is scheduled for elective delivery at 36 to 37 weeks via cesarean section. However, some patients with placenta previa present with complications and require urgent cesarean sections at an earlier gestational age [8]

Regional anesthesia is considered safe and associated with lower risks of hemorrhage than general anesthesia for caesarean delivery in women with placenta previa or a low-lying placenta. Women with anterior placenta previa or a low-lying placenta should be advised that it may be necessary to convert to general anesthesia if required and asked to consent [9].

One uncommon but significant side effect of caesarean sections (C-sections) is urinary bladder damage. The number of women who have numerous C-sections has increased as a result of the declining trend of vaginal birth following C-section. Adhesions between the bladder and uterus may form following a cesarean delivery, making it challenging to identify and dissect the bladder flap during the subsequent surgical delivery[10].

Aim of the work:

The purpose of this study was to evaluate the efficacy and safety of cystodistension in preventing bladder injury in women with placenta previa.

METHODS

Seventy individuals with placenta previa diagnosed by ultrasound and Doppler who visited Zagazig University Hospital's maternity hospital and outpatient clinics between May 2024 and November 2024 were the subjects of this randomized clinical trials investigation. The study was authorized by the Zagazig Faculty of Medicine's local research ethical commission (also known as the Institutional Research Board, or "IRB") and was given the IRB number [359/13-May-2024]. Every participant provided written informed consent, and at every stage of the study, confidentiality and individual privacy were upheld. The study complies with the World Medical Association's 1975 Helsinki Declaration, which establishes ethical standards for studies involving human participants.

Our study included women who had undergone at least one cesarean section in the past, were scheduled for an elective cesarean section, had a viable fetus at least 36 weeks gestation, and had been identified with placenta previa by Doppler

and US. Prior to skin incision. Exclusion criteria were patient who are hemodynamically unstable before skin incision (admitted with severe bleeding, operated as an emergency, coagulation defect, hemoglobin <9), micturition problems (dysuria, frequency, urgency, urinary retention, incontinence),patient with previous history of bladder injury, evidence of placental invasion of uterine serosa (placenta percreta) at time of surgery.

Using a computer-generated table of random numbers with allocation concealment, participants were randomized 1:1 to the two groups. A closed, opaque envelope with a serial number was used for allocation concealment. Prior to recruitment, participation counseling was conducted. Allocation cannot be altered once it has been completed. Group A: 35 incidences of bladder enlargement prior to cesarean delivery. Group B: 35 cases of bladders that were not inflated prior to cesarean sections.

Every woman had her whole medical history taken, including her name, age, socioeconomic position, place of residence, occupation, and any unique medically significant habits, like smoking. A history of prior uterine surgery (myomectomy, dilatation, and curettage), antepartum bleeding in prior pregnancies and its nature (abruption or placenta previa), postpartum hemorrhage, any problems in prior deliveries, and a history of adherent or placenta previa. Evaluation of the fundal level, presentation, position, uterine tenderness, uterine tone, presence or absence of uterine contraction or painful scar, and auscultation of the fetal heart sound (FHS) are all included in the general examination. Laboratory tests include blood group and Rh type, standard transabdominal ultrasound examination, liver function test (liver transaminase level, serum albumin level), kidney function test (serum creatinine and blood urea nitrogen), and complete blood picture (hemoglobin level, hematocrits, platelets count).

Intervention:

All of the women were catheterized and given spinal anesthetic prior to the procedure. Theatre staff nurses received training to enable them to execute catheterizations in an aseptic manner. The nurse cleaned the woman's urethral meatus and perineum from front to back using sterile gauze pieces moistened in sterile water kept in sponge holders. While the surgeon inflated the bulb with 10cc of distilled water, a nurse placed the catheter and held it well beyond the bulb. Her legs were straightened, her tubes raised, and she was draped with sterile blankets. After the drainage was finished, the catheter was connected to the urine bag and a drape was fastened to the thigh in front of the urinary port end. The process of cystodistension was carried out aseptically. The primary surgeon looked for bladder distension between adhesions in the pelvis. Group A filled a 50cc bladder wash syringe four times with 200cc of regular saline dyed with methylene blue **(Figure 1,2).**

Our study's key outcome measures included the time it took for study groups to dissect their bladders and intraoperative bladder damage. Secondary outcomes include the location of the bladder injury, length of hospital stay, and length of catheter retention.

Statistical analysis:

Microsoft Excel software is used to code, enter, and analyze data gathered over time, basic clinical examinations, laboratory tests, and outcome measurements. For analysis, the data were subsequently loaded into the Statistical Package for the Social Sciences (SPSS version 20.0) program. In accordance with the data type, qualitative variables were represented by numbers and percentages, while quantitative variables were represented by means ± standard deviations. The Chi square test (X2) was utilized to determine whether the differences were significant. correlation by

Pearson's or Spearman's, and differences between quantitative independent groups using t test or Mann Whitney. For significant results, the P value was set at less than 0.05, and for very significant results, it was less than 0.001.

RESULTS

Seventy women were divided into two groups at random: Group A; Consisting of 35 women, their mean age was 28.9±6.2 years, with ages ranging from 18 to 38. The mean body mass index of the patients was 24.9±3.5, with a range of 19–31. Group B;Consisting of 35 women, their mean age was 27.1±6.0 years, with ages ranging from 18 to 38. The mean body mass index of the patients was 24.1±2.9, with a range of 19.8 to 29. Age per year and BMI did not significantly differ across groups (p>0.05). No significant statistical differences were reported in obstetric history of both groups, (as regarding number of Parity). No significant statistical differences were found in type of placenta previa or Gestational age in both groups, p>0.05(Table1).

Time to dissect bladder of studied group:In group A;Time to dissect bladder ranged from 3-9 min with a mean of 4.6±1.6. **In group B**;The average time to dissect the bladder was 5.8±1.9 minutes, with a range of 3–10 minutes. Demonstrated that group A (inflated bladders before to cesarean surgery) had a much shorter time to dissect their bladders than group B (non-inflated bladders prior to cesarean cut), p<0.05 as shown in Table 2.

Table 3 showed that group A had a reduced incidence of bladder injuries (2.9%) compared to group B (17.1%). Inflated bladders before to cesarean sections minimize the incidence of bladder injuries by 83%, as indicated by the relative risk of injuries of 0.17. The statistical significance of the difference is p>0.05. In all cases, bladder injuries occurred in the bladder dome.

Duration of hospitalization of studied groups: In group A; duration of hospitalization ranged from 1-4 days with a median of one day. **In group B**; The median length of hospitalization was three days, with a range of one to five days. Group A (inflated bladders before to cesarean surgery) had a significantly shorter hospital stay than group B (non-inflated bladders prior to cesarean section), p<0.05 (Table 4). Regarding the length of time that the urine catheter was retained, there was a notable difference between the two groups. Nearly all patients (97.1%) in group A removed their catheters within 12 hours, whereas 62.9% in group B (p<0.05).

Table (1): Demographic characters Age per years, body mass index of studied groups:

Parameters		Group A n.35		Group B n.35		t-test	p-value
Age per years Range Mean ±SD		18-38 28.9±6.2		18-38 27.1±6.0		1.21	0.23
body mass index (kg/m^2) Range Mean ±SD		19-31 24.9±3.5		19.8-29 24.1±2.9		1.11	0.27
		n.	**%**	**n.**	**%**	**χ2**	**p-value**
Parity	p1	9	25.7	9	25.7	0.136	0.987
	p2	9	25.7	8	22.9		
	p3	11	31.4	11	31.4		
	p4	6	17.1	7	20.0		

Type of placenta previa	**Complete**	14(40.0)	15(42.9)	0.59	0.808
	Incomplete	21(60.0)	20(57.1)		
Gestational Age (weeks)	**Range** **Mean ±SD**	37-38 37.5±0.7	37-39 37.4±0.65	**t**	**p-value**
				0.176	0.81

t:student't test
Data are expressed as number, percent or mean ± standard deviation (SD), P value ≥ 0.05: no significant
χ2:Chisquare test, t:student't tes P value ≥ 0.05: no significant

Table (2): Primary outcome (time to dissect bladder of studied groups:

Parameter	Group A n.35	Group B n.35	t-test	p-value
Time to dissect bladder(min) **Range** **Mean ±SD**	3-9 4.6±1.6	3-10 5.8±1.9	2.96	0.004*

t:student't test
Data are expressed as number, percent or mean ± standard deviation (SD), Range
*** P value < 0.05: significant**

Table (3): Incidence of bladder injuries of studied group:

Parameter	Group A n.35 n(%)	Group B n.35 n(%)	fp-value
bladder injuries **yes** **No**	1(2.9) 34(97.1)	6(17.1) 29(82.9)	0.106
bladder injuries site dome	1(2.9)	6(17.1)	0.106

f:Fisher exact test
Data are expressed as number, percent P value ≥ 0.05: no significant

Table (4): secondary outcome "duration of hospitalization, duration of retention of catheter "of studied groups:

Parameter	Group A n.35	Group B n.35	u-test	p-value
duration of hospitalization (days) **Median (Range)**	1(1-4)	3(1-5)	4.69	0.0001*
duration of retention of catheter **12 Hours** **24 Hours** **21 days**	34(97.1) 0 1(2.9)	22(62.9) 7(20) 6(17.1)	13.14	0.001*

Mann-Whitney U, data expressed as median ,Range or number and percent
**** P value < 0.05: significant***

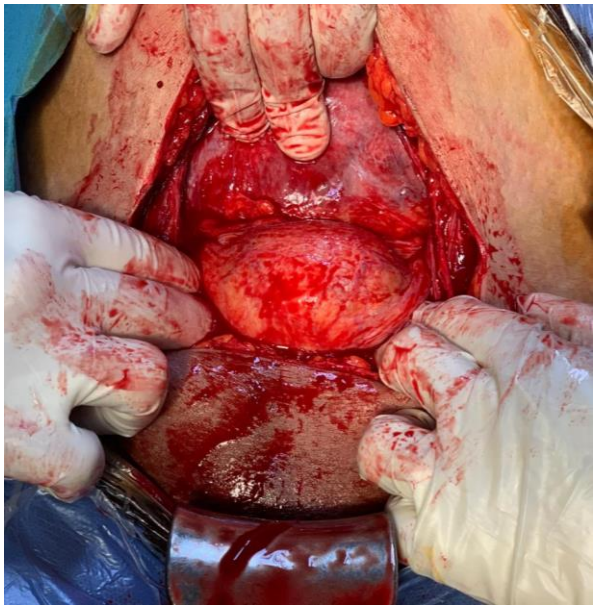

Figure 1: Group A; Inflated bladder

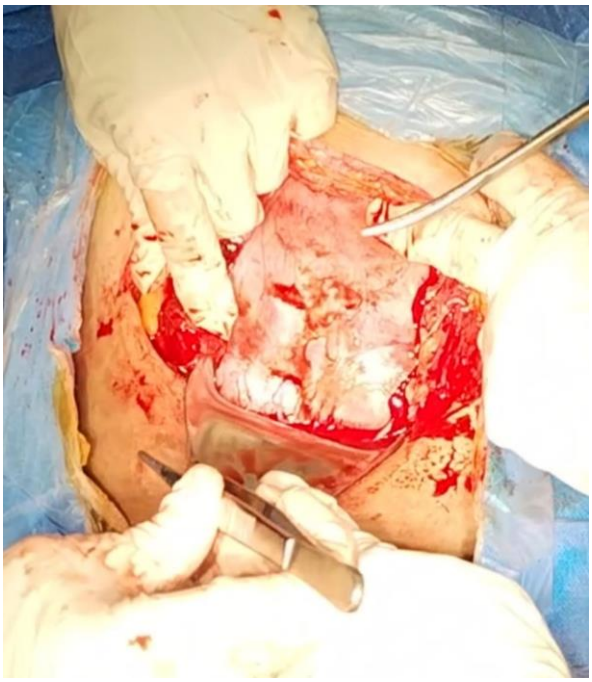

Figure 2: Group B; Non-inflated bladder

DISCUSSION

Our findings confirmed that cystodistension significantly reduced the risk of bladder injuries, dissection time, hospital stay, and urinary catheter retention. The incidence of bladder injuries in Group A was 2.9%, compared to 17.1% in Group B. The relative risk of bladder injuries was 0.17, indicating an 83% reduction in risk with bladder inflation.

This aligns with *Özcan et al.* [11], who found fewer bladder injuries in patients with inflated bladders (21.9%) compared to non-inflated ones (32.4%), However, the difference (p = 0.339) was not statistically significant. In a similar vein, *Celik et al.* [12]demonstrated the utility of saline bladder filling in surgeries for placenta accreta, reporting a bladder injury rate of 4.5% in the saline-filled

group versus 31.5% in the control group, despite of no statistically significant difference. These results suggest that while cystodistension may not entirely eliminate the risk of injury, it provides considerable protection by enhancing visualization and facilitating surgical dissection.

Abd El-Gaber et al. [13]provided additional evidence, showing that deflated bladders resulted in significantly higher injury rates (13.1%) compared to inflated bladders (5.2%, p = 0.001). Likewise, *Kuznetsova et al.* [14]found a significant reduction in bladder injuries in their inflated bladder group, with injuries occurring in only one patient compared to six in the non-inflated group (p < .05). *O'Hanlan*[15]corroborated these findings in laparoscopic gynecological surgeries, reporting complete prevention of bladder injuries with CO2 cystoinsufflation.

Our study also supports findings by *Saaqib et al.* [10], who reported that cystodistention improved bladder margin identification and reduced the risk of urological complications, including blood loss and bladder injuries. This consistency across studies highlights the efficacy of cystodistension as a preventive measure in high-risk obstetric surgeries.

Another study done by *Naseeb et al.* [16], who investigated the role of bladder inflation in reducing urinary bladder injuries during surgery. According to the study, 12.2% of women in Group B (without bladder inflation) and 5.5% of women in Group A (with bladder inflation) suffered bladder injuries. Group A and Group B had efficacy rates of 94.5% and 87.8%, respectively. These findings demonstrated a significant association between bladder inflation and a lower incidence of bladder injuries, with a p-value of (0.0320).

However, the benefits of cystodistension were less apparent in cesarean hysterectomy for placenta accrete *Matsubara,* [17]*; Özcan et al.,* [11] they attributed this to poor visualization caused by increased vascularity and excessive bleeding in these cases, which hinder effective bladder flap creation. Furthermore, bladder adhesions strongly attached to the anterior uterine wall may lead to injuries despite successful cystodistension[18].

Intentional bladder filling enhances the surgeon's ability to define the bladder's contour, facilitating safe dissection[11].When there are strong adhesions between the bladder and the lower uterine region, where separation could normally cause harm, this method is especially helpful.

Our study also demonstrated significantly shorter dissection time in the inflated bladder group (Group A), with a mean of 4.6 minutes compared to 5.8 minutes in the non-inflated group (Group B). This result aligns with previous studies that have demonstrated the benefits of bladder filling for improved visibility and easier dissection during [11,13,16,17]. This can be attributed to enhanced lower uterine segment visibility, which facilitates accurate incision planning and lessens hemorrhage. Because of the placenta's close closeness to the cervix, placenta previa is linked to a higher risk of bleeding, and cystodistension compresses blood vessels in the lower uterine segment, reducing intraoperative blood loss.

The findings of our study are in agreement with *Kuznetsova et al.* [14]who highlighted that bladder filling techniques can improve surgical outcomes, particularly in complex surgeries involving placenta accreta, by reducing complications related to bladder injury and facilitating easier identification of pelvic structures.

In contrary to our findings, *Saaqib et al.* [10]found no discernible variation in the groups' mean operating times, with a prolonged time in the cystodistension group. This variation may be due to differences in clinical setups and the efficiency of performing cystodistension.

Moreover, our study revealed that Group A had a significantly shorter

duration of hospitalization (median of 1 day) compared to Group B (median of 3 days). Additionally, the duration of urinary catheter retention was significantly shorter in Group A, with 97.1% of patients having the catheter removed within 12 hours, compared to 62.9% in Group B. This result aligns with previous studies by *Abd El-Gaber et al.* [13]*; Naseeb et al.* [16]*; Özcan et al.* [11]. This could be due to reduced bladder injury rates, faster recovery times, and minimized blood loss, which collectively expedite postoperative recovery and discharge.Additionally, cystodistension may lower the risk of urinary tract infections (UTIs) by preventing bladder injuries, which are a known risk factor for UTIs.

CONCLUSION

According to the study's findings, women who presented with placenta previa had a lower chance of bladder injuries, a shorter dissection time, a shorter hospital stay, and a shorter urinary catheter retention period due to cystodistension during the cesarean section for placenta previa.

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