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## RESEARCH ARTICLE

# BROAD LIGAMENT APPROACH FOR BLADDER DISSECTION TO MINIMIZE MATERNAL OBSTETRICS AND UROLOGICAL MORBIDITIES DURING CESAREAN SECTION IN PLACENTA ACCRETA IN EGYPTIAN SETTING

\*Ibrahim Saif Elnasr and Hesham Ammar

Obstetrics and Gynecology Departments, Faculty of Medicine, Menoufia University Menoufia Governorate, Egypt

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#### Abbreviations

MAP: Morbidly adherent placenta  
CS: Cesarean section  
LAVH: Laparoscopic assisted vaginal hysterectomy  
IVP: Intravenous pyelography.

\*Corresponding author: Ibrahim Saif Elnasr

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### ABSTRACT

**Background:** Urinary bladder injury is one of the most common operative morbidities of cesarean section. Bladder invasion with morbidly adherent placenta occurs rarely but can cause significant morbidity and mortality both for mother and fetus. Multiple management strategies have been mentioned in literature varying from conservative to radical approaches depending upon many factors as the degree of placental invasion. **Objectives:** this study was conducted to evaluate the efficacy and safety of lateral approach technique through the broad ligament to avoid bladder injury during cesarean section in cases with morbidly adherent placenta. **Methods:** This is a prospective observational cohort study was conducted on Obstetrics and Gynecology department at Menoufia university hospital, Menoufia governorate, Egypt where 200 women with placenta accrete and history of at least one Previous cesarean section allocated into two groups ,Group 1: included 100 patients while the bladder was dissected from the uterus by lateral approach technique and Group 2: included 100 patients while the bladder was dissected from the uterus by classical central approach . Incidence of intraoperative bladder, ureteric injury and caesarian hysterectomy were considered primary outcome measures where operative time, maternal morbidity and mortality, intraoperative blood loss, duration of hospital stay and late urological complications as genitourinary fistula were considered secondary outcome measures. The data analyzed by SPSS 22. **Results:** The overall incidence of urinary tract injury, urinary bladder injury, longer operation time , estimated blood loss, number of unit blood and plasma transfusion , Postoperative hospital stay, intensive care unit admission, Postoperative fever surgical site infection and Paralytic ileus were significantly higher in group 2 than group 1. Cesarean hysterectomy was highly significantly higher in group 2 (p- value <0.001). **Conclusion:** Lateral approach technique of bladder dissection was very effective in preventing maternal Obstetrics and urological morbidities during cesarean section in placenta accrete.

## INTRODUCTION

Morbidly adherent placenta (MAP) occurs in about 1 in 2500 deliveries in the 1980s, 1 in 535 in 2002, and 1 in 210 in 2006; this increasing number is due to the increasing rate of the last years caesarean deliveries (Stafford and Belfort, 2008). Urinary bladder injury is one of the most common operative morbidities of cesarean section. It occurs in 0.08% - 0.94% of cesarean sections. Repeated cesarean section and any type of morbidly adherent placenta (MAP) are considered the major risk factors for urinary tract injuries during cesarean delivery. (Abd *et al.*, 2019). Women with previous cesarean delivery increase incidence of bladder injury during next cesarean section by 3-folds (0.6% repeat cesarean versus 0.19% primary cesarean section) (Faranesh *et al.*, 2007). Urinary bladder injury occurs in about 15% - 43% in placenta accrete and higher in placenta percreta (Silver *et al.*, 2014). Bladder injuries during cesarean section occur at the dome of the bladder in ninety-five (95) % of cases while only 5 % occurs at

the trigon. Dissection of a bladder flap is the commonest time for bladder injury (43%), while 33% of the injuries occur at the time of peritoneal cavity opening, and 24% of the injuries occur during uterine incision or delivery of fetus (Salman *et al.*, 2017). Bladder invasion with morbidly adherent placenta occurs rarely but can cause significant morbidity and mortality both for mother and fetus. Multiple management strategies have been mentioned in literature varying from conservative to radical approaches depending upon many factors as the degree of placental invasion, other organs invasion intraoperative blood loss and the surgeon expertise (Alanwar *et al.*, 2019). The potential consequences of damage to the bladder are connected with the extension of the duration of operation, longer hospitalization time, the need to keep Foley catheter longer in the urinary bladder the increase of infections and post-operative complications in the urinary tract, such as vesico-vaginal fistula (Andrzej Korniluk *et al.*, 2017). Our study was conducted to evaluate the efficacy and safety of the new technique (lateral approach technique) through the broad

ligament to avoid or minimize urinary bladder injury during cesarean section in cases with morbidly adherent placenta.

## MATERIALS AND METHODS

This is a prospective observational cohort study was conducted on 200 women with placenta accrete. The study participants were recruited from the delivery room in the Obstetrics and Gynecology department at Menoufia university hospital, Menoufia governorate, Egypt in the period between March 2017 till June 2018. The local ethical committee at Menoufia University hospital approved the study protocol and an informed consent was obtained from all the Patients and/or their nearest relatives. The study included 200 women with placenta previa and or any type of placenta accreta and history of at least one previous cesarean section enrolled and was allocated into two groups

**Group 1 (Study group):** Included 100 patients while the urinary bladder was dissected from the uterus through lateral approach technique.

**Group 2 (Control):** Included 100 patients while the urinary bladder was dissected from the uterus through classical central approach.

We excluded women with normal sit placenta, placenta previa with No history of previous cesarean section and placenta previa posterior.

All Patients were subjected to complete history taking, Clinical Examination, preoperative laboratory investigations and detailed obstetric ultrasound with Doppler for localization of placental site and its relation to bladder wall, fetal measurements and amniotic fluid abnormalities. All cesarean sections in both groups had been done by fixed one surgeon supported by fixed assistant team in the same hospital. Under general anesthesia cesarean section with a mid-line sub umbilical incision was performed in all cases. High transverse uterine incision was performed above the level of placental origin to avoid sever bleeding. After delivery of the baby the uterus was exteriorized. The broad ligament was opened from the most lateral point just close to Rt round ligament .Or the right round ligament was clamped and ligated. The space between anterior and posterior leaflet of the broad ligament was opened easily through blunt dissection by finger then a window was created through posterior leaflet of the broad ligament .Bilateral clamping of both uterine arteries with artery clamp for temporary hemostasis .We swept the index finger of the right hand from lateral to medial pushing through pupocervical fascia to define the midline adhesions , once the bladder wall was identified we pushed it down then dissection of the dense adhesions under direct vision and finger guidance .During creation of lateral window the uterus was taken upward and to the opposite side then it was centralized upward posteriorly to give more counter traction. We preferred to push bladder entirely from one side (started with right side) so once adequate amount of dissection was done we moved easily to the opposite side to complete bladder dissection. After complete bladder dissection and exposure of whole lower uterine segment we take the decision of conservative surgery or hysterectomy according to clinical and surgical evaluation. Various conservative surgical procedures were applied as Partial resection of lower segment, B-Lynch suture and

hemostatic suture, uterine and ovarian artery ligation and internal iliac artery ligation (B-Lynch *et al.*, 1997; Cho *et al.*, 2000; Hayman *et al.*, 2002). All patients with bladder injury were admitted to our department till 14 day and discharged after reassuming of normal bladder function and all other patients were monitored at the outpatient clinic 1 week after operation to evaluate the wound and any urological complaint. Then every one month for three months to evaluate for possibilities of late urological complication as vesicovaginal fistula. Parental broad spectrum antibiotics were used for at least 48 hour following operation and replaced with oral antibiotics for about five days. Ultrasound examination was performed to all cases at day 2 and before discharge which revealed no fluid or blood accumulating in the uterine cavity in all cases. Incidence of intraoperative bladder, ureteric injury and caesarian hysterectomy were considered primary outcome measures where operative time, maternal morbidity and mortality, intraoperative blood loss, duration of hospital stay and late urological complications as genitourinary fistula were considered secondary outcome measures.

### Statistical analysis

The data collected were tabulated & analyzed by SPSS 22 (IBM Corp., Armonk, NY, USA). Quantitative data was expressed as mean  $\pm$  standard deviation (SD) and analyzed by applying student t- test or Mann-Whitney test as required. while qualitative data was expressed as frequency and percentage and analyzed by applying Chi-square test with a significance level of P value less than 0.05.

## RESULTS

**Table (1)** represents patients' characteristics. There was no significant difference between both groups regarding age, parity, body mass index, Gestational age at time of delivery, Number of cesarean deliveries and Type of placenta previa ( $p > 0.05$ ).

**Table (2)** revealed the operative data. Where Group 2 had highly significantly longer operation time and more estimated blood loss than group 1 (P-value $<0.001$ ). Also, the number of unit blood and plasma transfusion were highly significantly more in group 2 compared to group 1 (P-value $<0.001$ ). The overall incidence of urinary tract injury was significantly higher in group 2 (38 cases = 38%) than in group 1 (2 cases = 2%) with p value  $< 0.001$ . The incidence of urinary bladder injury was highly significantly higher in group 2 (35 cases = 35%) than group 1 (2 cases = 2%) with p value  $< 0.01$ , ureteric or combined vesico-ureteric injuries had been reported only in group 2 (3 case 3% and 1 case = 2.6%) respectively with no case reported in group 1 (p  $< 0.001$ ). no cases with intestinal injury were reported in both groups.

**Table (3)** Shows postoperative data where there was highly significant difference between both group as regarding postoperative hospital stay (P-value $<0.001$ ) more in group 2 and significant difference in ICU admission (P-value $<0.005$ ) more in Group 2. There was highly significant difference between both group as regarding postoperative fever (P-value $<0.001$ ) more in group 2, SSI (P-value $<0.005$ ) more in group 2 and paralytic ileus (P-value $<0.005$ ) more in group 2. There was no significant difference between both group as regarding postoperative venous thromboembolism, pelvic hematoma and genitourinary fistula (P-value $<0.001$ ).

Table 1. Patient characteristics of the studied groups

Variables	Group 1 (n=100) Mean± SD	Group 2 (n= 100) Mean± SD	Student t-test	P-value
Age (years)	33.32±4.30	33.82±4.48	1.80	0.422
Parity	3.81±1.38	4.08±1.60	1.28	0.302
BMI (Kg/m <sup>2</sup> )	30.32±5.11	30.19±5.39	0.18	0.861
Gestational age at time of delivery (week)	36.02±1.36	36.27±1.53	1.40	1.63
<b>Number of cesarean deliveries</b>	<b>NO (%)</b>	<b>NO (%)</b>	<b>Chi square test</b>	
-One CS	5 (5.0)	6 (6.0)	9.29	0.158
-Two CS	30 (30.0)	18 (18.0)		
-ThreeCS	27 (27.0)	26 (26.0)		
-Four CS	26 (26.0)	25 (25.0)		
-Five CS	10 (10.0)	16 (16.0)		
-Six CS	2 (2.0)	7 (7.0)		
-Seven CS	0	2 (2.0)		
<b>Type of placenta previa</b>				
Complete centralis	61 (61.0)	58 (58.0)	0.77	0.681
Marginalis anterior	34 (34.0)	34 (34.0)		
Lateralis	5 (5.0)	8 (8.0)		

Table 2. Operative data for the studied group

Variables	Group 1 (n=100) Mean± SD	Group 2 (n= 100) Mean± SD	Student t-test	P-value	Odd's ratio (95% CI)
Operative time (minutes)	106.90±22.89	203.95±57.10	15.78	<0.001	NA
Estimated blood loss (mL)	1379.00±307.25	2916.00±586.33	23.22	<0.001	NA
<b>Transfusion Packed RBCS (unit)</b>	<b>NO (%)</b>	<b>NO (%)</b>	<b>Chi square test</b>		
0	16 (16.0)	0	122.26	<0.001	NA
1	48 (48.0)	0			
2	24 (24.0)	18 (18.0)			
3	10 (10.0)	27 (27.0)			
4	2 (2.0)	25 (25.0)			
5	0	18 (18.0)			
6	0	12 (12.0)			
<b>Transfusion Plasma (unit):</b>					
0	79 (79.0)	8 (8.0)	110.70	<0.001	NA
1	9 (9.0)	18 (18.0)			
2	12 (12.0)	37 (37.0)			
3	0	19 (19.0)			
4	0	18 (18.0)			
<b>Organ injury:</b>					
- Bladder injury	2 (2.0)	65 (65.0)	36.11	<0.001	26.39
-ureteric injury	0	3 (3.0)	3.05	0.081	(6.133-114.502)
- combined injury	0	2 (2.0)	2.02	0.155	NA
- Small intestine injury	0	0	---	---	NA

NB: Odd's Ratio only for 2x2 tables not calculated in the presence of multiple rows.

Table 3. Post-operative data

Variables	Group 1 (n=100) No (%)	Group 2 (n= 100) No (%)	Chi square test	P-value	Odd's ratio (95% CI)
Postoperative stay in hospital (days) Mean± SD	3.36±1.57	7.29±4.96	7.55*	<0.001	-
<b>ICU admission</b>					
Present	1(1.0)	10 (10.0)	7.79	0.005	0.09 (0.01-0.72)
Absent	99 (99.0)	90 (90.0)			
<b>Postoperative complications:</b>					
Present	16 (16.0)	46 (46.0)	21.04	<0.001	0.22 (0.12-0.43)
absent	84 (84.0)	54 (54.0)			
<b>Re-operation</b>					
Fever	5 (5.0)	10 (10.0)	1.80	0.179	2.11 (0.695-6.416)
-VTE	0	1 (1.0)	1.01	0.316	NA
-SSI	6 (6.0)	25 (25.0)	13.78	<0.001	5.22 (2.037-13.386)
Paralytic ileus	5 (5.0)	10 (10.0)	1.80	0.179	2.11 (0.695-6.416)
Pelvic hematoma	0	0	---	---	---
Genitourinary fistula	0	1	1.01	0.316	NA
Maternal mortality					

\*Mann-Whitney test was used

Table 4. Intra operative surgical management of placenta previa among studied group

Variables	Group 1 (n=100) No (%)	Group 2 (n=100) No (%)	Chi square test	P-value
B-Lynch suture and haemostatic suture	10 (10.0)	3 (3.0)	4.03	0.045
Uterine and ovarian artery ligation	11 (11.0)	2 (2.0)	6.66	0.010
Combined compression suture and vascular ligation	50 (50.0)	36 (36.0)	4.00	0.046
Internal iliac artery ligation	1 (1.0)	1 (1.0)	0	1.000
Partial resection of lower segment	4 (4.0)	4 (4.0)	0	1.000
Hysterectomy	24 (24.0)	56 (56.0)	21.33	<0.001

There was no significant difference between both groups as regarding re operation and there was no maternal mortality reported in both groups.

**Table (4)** shows intra operative surgical management of placenta previa among studied group. There was no significant difference between both groups regarding internal iliac artery ligation (p- value 1.000), Partial resection of lower segment (p-value 1.000). There was significant difference between both group regarding application of B-Lynch suture and hemostatic suture more in group 1 (p- value 0.045), uterine and ovarian artery ligation more in group 1 (p- value 0.010), combined compression suture and vascular ligation more in group 1 (p-value 0.046). There was very highly significant difference between both group regarding cesarean hysterectomy more in group 2 (p- value <0.001).

## DISCUSSION

During CS for cases with placenta previa accrete with previous CS scar bladder dissection considered a major surgical challenge where surgical skills of the operating team beside massive bleeding may put surgeon in a great stress to overcome this marked blood loss in a timed manner that may increase incidence of bladder and ureteric injury in classical central approach for bladder dissection which in turn lead to increase maternal obstetrics and urological morbidities. Our team had conducted a previous study for evaluation of the safety and efficacy of novel Lateral approach technique to avoid bladder injury during total abdominal hysterectomy in cases with previous Cesarean section and concluded that novel Lateral approach was very effective in preventing bladder injury in all cases and also was very easy to be performed (Ibrahim Saif Elnasr, 2018). Due to increased incidence of CS in Egypt this lead to increased incidence of placenta accrete and associated maternal urological and obstetrical morbidities. So in this study we tried to apply this approach in cases of placenta accretes with morbidly adherent placenta and previous CS. In our study the incidence of bladder injury was markedly increased in group 2 when central approach for bladder dissection was applied (35 cases = 35%). But in group 1 when lateral approach was applied marked reduction of bladder injury was observed (2 cases = 2%) because the fibrous scar tissue related to uterus only and lateral space not affected so the bladder was easily identified and separated with fibrous tissue was cut under vision and finger guidance.

This in consistence with the study conducted by Chang *et al.* (2008) where 50 patients with vesicocervical adhesion after previous cesarean deliveries who underwent laparoscopic assisted vaginal hysterectomy (LAVH) After incorporation of the lateral intervention method into the LAVH procedures, no bladder injury occurred among any of the 50 patients (Chang *et al.*, 2008). Integrity of bladder was confirmed of all cases with methylene blue test and visual inspection which 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, gross hematuria in the Foley bag and visible wound or mucous membrane of the bladder (Cahill *et al.*, 2008). All cases with bladder injury during CS were diagnosed intra operatively and immediately repaired in two layers with 2/0 vicryl. Firstly, the mucosa of the urinary bladder is sutured then the second layer comprises submucosa and muscular layer with silicon Foleys catheter drainage for 14

days. In our study 2 cases of bladder injury in **Group 1** affect body of the bladder and in **Group 2**. 30 cases with bladder dome injury and 5 cases with body injury. There were no cases with trigon injury in both groups. This in concordance with oliphant *et al.*, (2014). In our study easy and rapid bladder dissection help in complete exposure of the whole lower uterine segment which facilitate application of B-Lynch suture and hemostatic suture, uterine and ovarian artery ligation and combined compression suture and vascular ligation in group 1 than in group 2. This in turn led to significant reduction in blood loss and performing cesarean hysterectomy with its complication in group 1. We noticed that blood loss and blood transfusion were less in group 1 this may be due to reaching a good plane for bladder dissection which was less vascular without injury to any pelvic venous plexus and also due to rapid control of bleeding from uterus after easy and rapid application of all conservative measures available. Our results consistent with the results published by Ozcan *et al.* (2018) where operative time, hospital stay and ICU admission were significantly shorter in group 1 than in group 2 which was very pleasant for the patients in minimize the total cost and early return to their usual life (Ozcan *et al.*, 2018). Postoperative fever, SSI and Paralytic ileus were reported more in group 2 and this may be due to long operation time, long hospital stay, prolonged exposure to anesthesia, intraoperative massive blood loss obscuring the surgical field and increase amount of blood products transfused. In this study 3 cases with Genitourinary fistula were reported in group 2 (2 cases with vesico vaginal fistula and 1 case with uretro vaginal fistula). These cases were discovered during postoperative follow up visits where they presented with urine leakage from the vagina. Diagnostic IVP and cystoscopy confirmed the diagnosis then these fistula were repaired with assistance of urological consultant with completely cure and no post-operative complication. According to the best of our knowledge this is the first study conducted to evaluate the safety and efficacy of novel Lateral approach to minimize urological and maternal morbidities during CS in cases with placenta accrete.

## Conclusions and Recommendations

We founded that lateral approach technique of bladder dissection was very effective in preventing bladder injury during CS with placenta accrete and also was very easy to be performed. Larger multicenter trials are warranted to enforce or refute these findings. We recommend proper training of this approach by all staff member.

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**Limitation of our study:** Small number of patient and no randomization.

**Strength of the study:** Our study is promising for applying broad ligament approach to decrease maternal obstetrical and urological complications in placenta acreta.

**Conflict of interest:** The authors declare that we have no conflict of interests. The authors alone are responsible for the content and writing of the paper.

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**Key points:** Dissection of urinary bladder is essential steps in placenta previa surgery

- Lateral approach technique of bladder dissection is very effective in preventing bladder injury during CS with placenta accrete
- This approach decrease maternal morbidities and mortality in this surgery.

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