



Efficacy of tourniquet application in reducing intraoperative blood loss in cesarean hysterectomy for placenta accreta

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Abstract

This study was conducted in a tertiary university hospital between January 2009 and October 2015, including selected fifty five pregnant women diagnosed to have placenta accreta by ultrasonography and color doppler with history of previous cesarean section. These cases were planned for elective cesarean hysterectomy. A thirty five cases underwent cesarean section followed by total or subtotal abdominal hysterectomy with the placenta *In situ* in routine way (group A). In the other twenty cases, after delivery of the fetus through high transverse incision in lower segment away from placental invasion, a 16 or 18 Folly's catheter tourniquet strap the lower uterine segment immediately, so that the uterine blood supply could be blocked effectively, thus minimizing uterine bleeding, hysterectomy was performed with placenta *In situ* (group B). Abdomen closed after achieving complete homeostasis. Cesarean hysterectomy was done under general anesthesia in all fifty five cases. Results revealed that the average operative time taken was 90.5 ± 5.6 min among group A, 80.3 ± 4.3 min among group B ($p < 0.001$). Average blood loss was 2515.65 ± 150.96 ml in group A and 1620.47 ± 80.88 ml in group B ($p < 0.001$). Average requirement of blood transfusion was 5.45 ± 2.2 units for the group A and 3.1 ± 0.8 units for group B ($p < 0.001$) urinary bladder injury seven cases in group A and one case in group B, while only two cases ureteric injury in group A and nil in group B. According to placental type in group A, seven cases accrete, seventeen cases increta and eleven cases percreta, in group B three cases accrete, ten cases increta, thirteen cases percreta. Twelve cases total hysterectomy in group A and twenty three subtotal hysterectomy. In group B, seven cases total hysterectomy and thirteen cases subtotal hysterectomy. Duration of hospital stay was 5 ± 4.83 days in group A and 3.08 ± 0.76 days in group B ($p < 0.001$). Regarding postoperative complications, internal bleeding and 2nd laprotomy one case in group A while nil in group B, respiratory care unit admission five cases in group A and three cases in group B. Deep venous thrombosis two cases in group A while nil in group B. One case uterovascular fistula and one case maternal mortality in group A while nil in group B. Six neonates died as a result respiratory distress syndrome in group A and tow in group B. At six weeks postpartum both mother and baby did well in follow up in both groups. In conclusion, This technique is an effective and safe intervention for controlling and minimizing the intra-operative blood loss and surgical complications due to obstruction of operative field by bleeding in cesarean hysterectomy for abnormal adherent placenta. It may be offered as a preliminary step to prevent massive bleeding and allow time for blood transfusion and further procedures.

Keywords: Placenta accreta, Tourniquet, Cesarean hysterectomy.

Introduction

Placenta accreta is a severe pregnancy complication and is currently the most common indication for per-partum hysterectomy. Main risk factor for placenta accreta is a previous cesarean delivery particularly when accompanied with a coexisting placenta previa. Once a rare occurrence, placenta accreta is becoming an increasingly common complication of pregnancy, mainly due to the increasing rate of cesarean delivery over the past 50 years (Committee on Obstetric Practice,

2002). Several risk factors for placenta accrete, increasing numbers of prior cesarean deliveries exponentially increase the risk of placenta accrete although the exact pathogenesis of placenta accreta is unknown (Garmi and Salim, 2012). A proposed hypothesis includes a mal development of decidua, excessive trophoblastic invasion, or a combination of both (Garmi *et al.*, 2011). In general, the recommended management of suspected placenta accreta is a planned caesarean

followed by hysterectomy with the placenta *In situ* (Figure 1).

Since attempts at removal of the placenta may result in severe bleeding endangering the patient's

life; however, surgical management of placenta accreta may be individualized according to institutional protocol for maternal hemorrhage management.

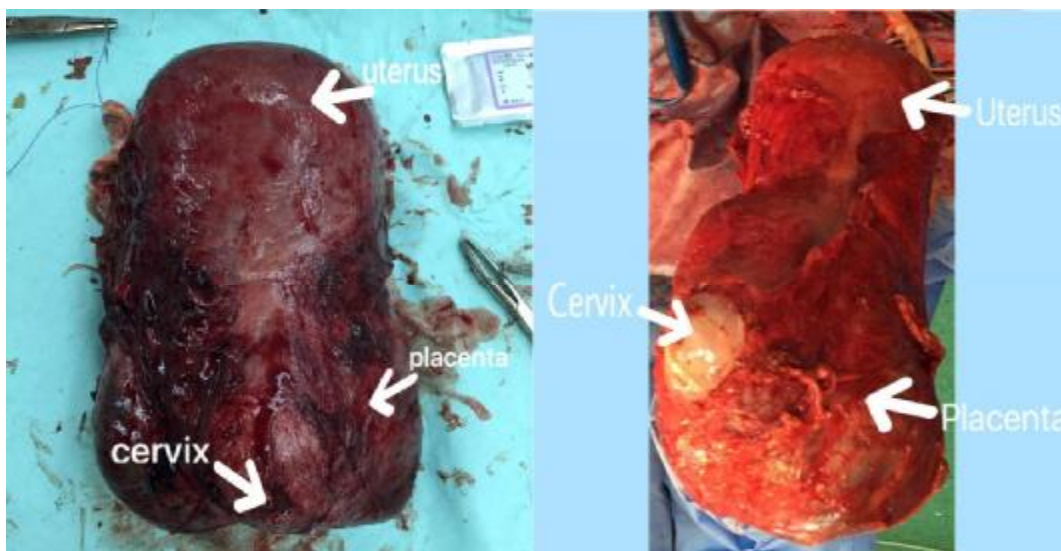


Figure (1): Specimen of uterus with placenta accreta *In-situ*

The major complications of cesarean hysterectomy are excess blood loss and urinary tract damage during operation (Tangcharoensilp, 2012). Various precautions and techniques to reduce blood loss maybe incorporated which include hypotensive anaesthesia, hemostatic sutures in placental bed and myometrium, stepwise devascularisation of uterus including uterine artery ligation, ovarian artery ligation, internal iliac artery ligation and embolization (Sankhwar *et al.*, 2014). However, all these previous techniques need time, special skills and sometime ask for calling, so the aim of this study was to evaluate the tourniquet method as an intervention, and its role in minimizing intra-operative hemorrhage and comparing retrospectively. Tourniquet has well established role in vascular surgeries, myomectomies. We used Folly's catheter 16-18 size tourniquet application in placenta accreta cases and got promising results to minimize intra-operative hemorrhage.

Reported incidence of placenta accreta is nearly 10% in cases of placenta praevia and rises up to 40% in women who have an anterior placenta and ≥ 2 previous caesarean deliveries (Committee on Obstetric Practice, 2002); actually the incidence of placenta accreta vary widely ranging from 1 in 540 to 1 in 93,000 deliveries (Clark *et al.*, 1985; Finberg *et al.*, 1992; Hoffman-Tretin *et al.*, 1992; Nelson, 1994; Hull *et al.*, 1999). The incidence of placenta accreta has increased & seems to parallel the increasing cesarean delivery rate (The American

college of Obstetrician and Gynecologist, 2012). Gravid hysterectomy is associated with an incidence of maternal mortality of up to 7%, with a 90% incidence of transfusion, 28% incidence of postoperative transfusion, and a 5% incidence of ureteral injuries or fistula formation (O'Brien, *et al.*, 1996).

The aim of this study was to assess the effect of tourniquet application on intra operative blood loss in placenta accreta cases undergoing cesarean hysterectomy.

Materials and Methods

This study was conducted in a Tertiary University Hospital (Al-Imamain Al-Kadhmain Medical City, Iraq, Baghdad) between January 2009 to October 2015. During that period, fifty five patients who had placenta accreta met the inclusion criteria were involved in the study after approval of the Hospital Ethics Committee. Fifty five subjects with prior cesarean section and ultrasonography (USG) doppler diagnosed placenta accreta were chosen after critical evaluation with a detailed history and physical examination. USG findings of placental lacunae, absence of the retro placental clear zone and interruption of posterior bladder wall-uterine interface on the gray-scale and color doppler findings of blood vessels crossing the tissue-interface disruption sites were presumed to be diagnostic of placenta accreta. Patients were randomly allocated into group A and group B. Preoperatively, routine investigations

including hemoglobin (Hb), urinalysis, blood group, viral markers, liver function tests, kidney function tests, bleeding time, clotting time and platelets were done. The subjects were planned for cesarean hysterectomy under general anesthesia after their written informed consent. Adequate blood was arranged pre-operatively. Surgery was performed by a team of trained and competent obstetricians, urologists and vascular surgeons. The thirty five cases underwent cesarean section followed by total or subtotal abdominal hysterectomy with the placenta *In situ* in routine way (group A). In the other twenty cases (group B) abdomen was opened through Pfannenstiell incision Utero-vesical fold of peritoneum was

opened and bladder pushed down gently as low as possible and if morbidly adherent, separation by urologist done. A high transverse incision in lower segment away from placental invasion done, through which the fetus was delivered. Cord was clamped and baby handed over to the pediatrician. The placenta was left *In situ*, before applying lower tourniquet, we should close the incised uterine wound from cesarean section by suturing quickly only to approximate the incision or use sponge clamp to pull up lower lip of incised wound for tourniquet can apply below easily. The tourniquet should be applied to reach at the level of insertion of utero-sacral ligaments or lower (Figure 2).

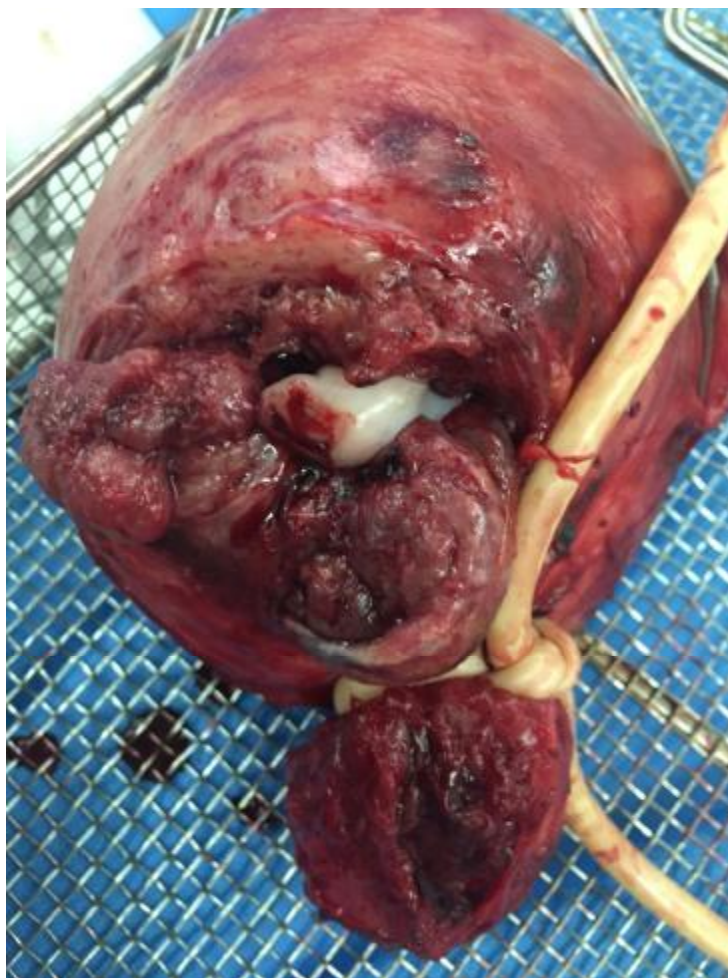


Figure (2): Specimen of uterus with placenta increta *In-situ* and tourniquet tied over the lower pole of uterus.

When tourniquet was already applied, uterine bleeding would be almost completely controlled. So obstetrician can begin to perform hysterectomy in nearly elective situation, waiting for help and/or adequate resuscitation to improve the patient's circulation. Abdominal drain was put. Abdomen was closed after achieving complete homeostasis,

instruments and sponges were counted. The amount of blood loss was calculated by counting and weighing the sponges used, weighing the clots that were removed and the blood collected in the graduated suction jar. Cesarean hysterectomy was done under general anesthesia in all fifty five cases.

Results and Discussion

The present study shows the mechanical tourniquet can be used safely in cases of cesarean hysterectomy and it not interfere with the surgical procedures.

Group B cases (20) had cesarean hysterectomy using this approach, the mean operative time was recorded to be 80.3±4.3 min and the intra operative blood loss was 1620.47±80.88 ml and required transfusion of 3.1±0.8 units of blood depending upon intra operative blood loss (Table 1). Three study group patients required admission to RCU in post-operative period (Table 2). Mean hospital stay was 3.08±0.76 days (Table 1) with no major maternal complications (Table 2). Among the 35 group A had cesarean hysterectomy for placenta accreta, the mean operative time was recorded to be 90.5±5.6min (Table 1). The intraoperative blood loss was 2515.65±150.96ml (Table 1). Each patient required 5.45±2.2 units of blood transfusions (Table 1). As shown in (Table 1) there are no statistically significant differences between pre and post-operative hemoglobin (Hb) levels in both groups. However, as regard to the blood loss and transfusion, statistical significant differences were found between both groups (Table 1). Six cases admitted to RCU in group A while three in group B. One case uterovsical fistula and two cases of uretral injury in group A while nil

in group B, seven cases of urinary bladder injury in group A while one only in group B (Table 2). Maternal mortality was not recorded in group B versus one case of maternal death occurred in group A after bilateral internal iliac ligation due to uncontrolled internal bleeding (Table 2). No significant differences were observed between group A and group B as regards to the postoperative complications such as fever and postoperative wound infection in both groups (Table 2). Six neonates died as a result RDS in group A and tow in group B (Table 2). Deep venous thrombosis two cases in group A while nil in group B, the results show a striking difference with respect to mean operative time ($p<0.001$), average intra operative blood loss ($p<0.001$), need for blood transfusion ($p<0.001$) and duration of hospital stay ($p<0.001$). All these parameters were significantly lesser in group B as compared with group A. At six weeks postpartum, both mother and baby did well in follow up in both groups.

According to placental type, in group A, seven cases accrete, seventeen cases increta and eleven cases percreta, in group B three cases accrete, ten cases increta, thirteen cases percreta (Table 3). Twelve cases total hysterectomy in group A and twenty three subtotal hysterectomy. In group B, seven cases total hysterectomy and thirteen cases subtotal hysterectomy (Table 3).

Table (1): Comparative comprehensive analysis between both groups by unpaired ttest

Parameters	Group A	Group B	P value
	(n=35) Mean ±SD	(n=20) Mean ±SD	
Age (yr)	27.3±2.6	26.5±1.35	0.207
Parity	4.2±3.38	5.1±3.62	0.358
GA (wk)	36.4±5.97	37.2±0.5	0.554
CS history (times)	3.5±0.95	3.0±0.75	0.651
Vaginal bleeding history (times)	3.0±2.2	2.0±1.8	0.090
Preoperative Hb (g/dl)	9.8±2.4	10.6±3.2	0.298
Postoperative Hb (g/dl)	9.1±1.1	9.0±2.3	0.828
Blood loss (ml)	2515.65±150.96	1620.47±80.88	< 0.001
Blood transfusion (unit)	5.45±2.2	3.1±0.8	< 0.001
Duration of surgery (min)	90.5±5.6	80.3±4.3	< 0.001
Duration of hospital stay(days)	5±4.83	3.08±0.76	< 0.001

Yr=year, Hb = hemoglobin, CS=cesarean section, wk=week, ml= milliliter, min=minute

Note: *p < 0.05 = significant

Table (2): maternal and neonatal morbidities and mortalities in both groups by Fisher's exact test

		Group A (n=35) No. (%)	Group B (n=20) No. (%)	P value
Internal bleeding	Present	1 (2.9)	0 (0.0)	1.000
	Absent	34 (97.1)	20 (100)	
2 nd laparotomy within 24 hrs	Present	1 (2.9)	0 (0.0)	1.000
	Absent	34 (97.1)	20 (100)	
Admission to RCU	Present	6 (17.1)	3 (15.0)	1.000
	Absent	29 (82.9)	17 (85.0)	
Pyrexia	Present	10 (28.6)	7 (35.0)	0.763
	Absent	25 (71.4)	13 (65.0)	
Wound infection	Present	5 (14.3)	5 (25.0)	0.469
	Absent	30 (85.7)	15 (75.0)	
DVT	Present	2 (5.7)	0 (10.0)	0.529
	Absent	33 (94.3)	20 (90.0)	
Fistula	Present	1 (2.9)	0 (0.0)	1.000
	Absent	34 (97.1)	20 (100)	
Maternal mortality	Present	1 (2.9)	0 (0.0)	1.000
	Absent	34 (97.1)	20 (100)	
Neonatal mortality	Present	6 (17.1)	2 (10.0)	0.696
	Absent	29 (82.9)	18 (90.0)	
Ureteric injury	Present	2 (5.7)	0 (0.0)	0.529
	Absent	33 (94.3)	20 (100)	
Bladder injury	Present	7 (20.0)	1 (5.0)	0.234
	Absent	28 (80.0)	19 (95.0)	

DVT: deep venous thrombosis, RCU: respiratory care unit

Table (3): Comparison of types of placenta accrete and type of hysterectomy between both groups by Chi square test

Parameter		Group A (n=35) No. (%)	Group B (n=20) No. (%)	P value
Types of placenta	Placenta accrete	7 (20.0)	3 (15.0)	0.891
	Placenta increta	17 (48.6)	10 (50.0)	
	Placenta percreta	11 (31.4)	7 (35.0)	
Type of hysterectomy	Total hysterectomy	12 (34.3)	7 (35.0)	1.000
	Subtotal hysterectomy	23 (65.7)	13 (65.0)	

In this study, the tourniquet uterine vessels ligation technique in cesarean hysterectomy can dramatically reduce blood loss from gravid uterus during operation. This technique is popular in gynecological practice especially during myomectomy and recommended by many gynecologists (Farrell, 2002).

Tourniquet can preserve life and it has been recommended by various authorities worldwide in gynecological practice and recommended as it is simple, inexpensive and quick procedure and the procedure can be performed by surgeon with average surgical skills at unit of limited resources (Al-Shabibi *et al.*, 2010). This assistant technique is superior to cesarean hysterectomy by standard method because obstetricians can perform

operation in situation that no active and heavy blood loss as in standard method that not use this assistant technique. So, they can carefully operate and have adequate time to plan for effective operation. In addition, tourniquet is simple equipment, cheap, always available in most hospitals, no trauma to the applied organ and removable although completely applied; so it is easy, safe, and suitable for gravid uterus. Almost every obstetrician can use this assistant technique. After application of tourniquet, uterine bleeding was temporarily stopped. Cesarean hysterectomy will change from emergent to nearly elective procedure. Maternal mortality and morbidity are significant in cases of morbidly adherent placenta despite optimal planning, transfusion

management, and surgical care. This assistant technique decreases both maternal mortality & morbidity also can effectively control severe hemorrhage from placental site at lower uterine segment in case of uncontrolled hemorrhage placenta previa, after placental removal in cesarean section especially in case of associated abnormally adhered placentation (Knight and UKOSS, 2007) and also can be used for temporary stop bleeding from gravid uterus in almost causes. So anesthesiologist will have time for fluid and/ or blood replacement to improve condition of the unstable patients and to make correct decision especially in critical time. We can conclude that this technique of tourniquet application might be helpful in desperate obstetric emergencies. This may be yet another way to reduce blood loss and a step forward towards decreasing maternal mortality.

Conclusion

Using tourniquet application technique in planned cesarean hysterectomy operations for morbidly adherent placenta is an effective step to minimize blood loss intra-operatively and thus in reducing the complications of massive blood transfusion and reducing operative time and postoperative hospital stay. The tourniquet uterine vessels ligation technique is innovation that changes cesarean hysterectomy from emergent, high-risk operation to nearly elective and safe procedure by effective control blood loss before and during operation. So, when compare to cesarean hysterectomy by standard method, the operative results are much better especially in reduction of blood loss during operation.

Recommendations

A tourniquet application technique is highly recommended in cases of cesarean hysterectomy operations for morbidly adherent placenta as it helps to reduce significantly intraoperative blood loss, blood transfusion, operative time and postoperative hospital stay.

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