ORIGINAL ARTICLE

Transverse Purse String Suture for Placenta Previa in the Presence of Previous Cesarean Section, Experience in Northern Borders Saudi Arabia

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ABSTRACT

Objective: To evaluate the effectiveness of lower uterine segment transverse purse string suture in patients with placenta previa and previous cesarean section to preserve uterus.

Study Design: We conducted a descriptive cross-sectional study.

Place and Duration of Study: Maternal and Children Hospital, Arar in Northern Borders Saudi Arabia from 2016 to 2020.

Materials and Methods: We included patients with previous cesarean section and complete placenta previa where we had applied transverse purse string suture in the lower uterine segment to control hemorrhage after the failure of preliminary measures of uterotonics' usage and figure of eight sutures at the site of placental bed.

Results: Lower uterine segment purse string suture was applied in 40 patients during cesarean section after failure of preliminary measures, among them 13 patients were found to have placenta accreta spectrum including one with placenta percreta. In 37(92.5%) patients including all patients with placenta accreta spectrum except one patient with placenta percreta, hemorrhage was successfully secured, and the uterus was preserved. In three patients (7.5%) including one patient with placenta percreta, lower uterine segment transverse purse string suture failed to control hemorrhage and hysterectomy was performed.

Conclusion: Lower uterine segment transverse purse string suture is an effective intervention in controlling hemorrhage to preserve uterus in patients with placenta previa and previous cesarean section.

Key Words: *Complete Placenta Previa, Purse String Suture, Cesarean Section, Hysterectomy, Placenta Accrete.*

Introduction

Pregnant women with placenta previa and previous cesarean section denote a very high-risk group of obstetric patients for major postpartum hemorrhage and peripartum hysterectomy. In women with scarred uterus the normal placental migration fails to occur, and the differential growth of uterine areas is hindered, contributing to high incidence of placenta previa in such cases.[1-2] Moreover, it has been postulated that in a scarred uterus morbidly adherent or invasive placenta mainly results from deficiency of decidua basalis due to damage to endometrium. This secondary defect at the endometrium-myometrium interface enhances trophoblastic invasion in the area of a uterine scar. The incidence of adherent or invasive placenta in such cases ranges from 24% to 67%. With each increasing scar on the uterus, the risk of placenta previa as well as the risk of morbidly adherent or invasive placenta increases.[1,3-5]

Invasive placenta needs histopathology for its definitive diagnosis and actually this is a spectrum disorder that includes a range of abnormally adherent to deeply invasive placenta. The condition also varies in its extent, and it can be total, partial or focal. In fact, the severity of complications of this spectrum is directly proportional to the depth of placental invasion. Depending on the degree of invasiveness it can be morbidly adherent only when it invades decidua basalis and the villi adhere superficially to the myometrium, placenta increta when it penetrates into the myometrium or placenta percreta when it penetrates through myometrium to serosa where it can also invade the adjacent pelvic organs mostly the bladder.[6-7,11]

With the rising rates of cesarean section, assisted reproductive techniques and increasing maternal age, the incidence of placenta previa and placenta accrete spectrum will continue to increase in the

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Funding Source: NIL; Conflict of Interest: NIL
Received: August 29, 2021; Revised: February 24, 2021
Accepted: March 02, 2022

future.[8,9] The appropriate management of these cases imposes a major challenge to experts in obstetric care. Obstetricians managing such cases should be well aware of all the modalities for controlling intraoperative and post-operative hemorrhage including timely decision for hysterectomy in cases of life-threatening uncontrolled hemorrhage.

Traditional methods to control excessive intraoperative hemorrhage at cesarean include pelvic devascularization, balloon temponade and different types of compression sutures like B-lynch, Cho suture or square suture and vertical parallel compression sutures [12-15]. None of such techniques has effectively decreased the rate of peripartum hysterectomy in patients with previous cesarean section and placenta previa particularly placenta accreta [8]. We here present a simple and effective technique of lower uterine segment transverse purse string suture to control intraoperative blood loss in such cases. This suture serves the dual purpose of directly occluding the vessels at the bleeding site as well as enhancing the function of weak myometrial fibers of scarred lower uterine segment by compressing them. The dual function of this suture controls the hemorrhage more efficiently and consequently the uterus can be preserved even in cases of placenta accreta spectrum. Our study evaluated the effectiveness of lower uterine segment transverse purse string suture in patients with placenta previa and previous cesarean section to preserve uterus.

Materials and Methods

In Northern Borders Saudi Arabia, from September 2016 we started applying transverse purse string suture, in those cases of placenta previa where we were unable to control hemorrhage. To see the effectiveness of the technique we conducted a descriptive cross-sectional study at Maternal and Children Hospital, Arar. Arar is the capital city of Northern Borders Saudi Arabia and almost all patients with placenta previa from the other cities of Northern Borders are also referred to Maternal and Children hospital, Arar for management. Ethical approval (H-09-A-51) for the study was taken from the local ethical research committee Northern Borders Health Affairs, Ministry of Heath Saudi Arabia. Data was collected from September 2016 till November 2020. The primary outcome was peripartum hysterectomy. Data were analyzed using simple mathematical computing techniques. Data was collected from medical records of patients by the primary surgeon and his colleague obstetrician. They found forty (40) patients who had undergone this technique. The inclusion criteria were as below:

1. Diagnosed with complete placenta previa antenatally
2. History of previous cesarean section
3. Where we had applied transverse purse string suture to control hemorrhage

Exclusion criteria included:

1. Patients with complete placenta previa without previous cesarean section
2. Patients at less than 32 weeks gestation

Though transvaginal ultrasound is considered preferable for diagnosis of placenta previa but due to its unacceptability by most of our patients in third trimester we diagnosed placenta previa by trans abdominal ultrasound in the presence of full bladder, aided by color Doppler imaging for signs of morbidly adherent placenta. Four major signs looked for placental invasion on ultrasound included: vascular lacunae, loss of normal hypoechoic retroplacental zone, retroplacental myometrial thinness and placental thickness.

Elective cesarean section was planned between 36 weeks and 37 weeks of gestation unless some emergency arose. Before cesarean section patients' hemoglobin level was strictly corrected to a level above 10g/dl. All patients were counseled in detail before surgery about the implications of the diagnosed condition, excessive intraoperative hemorrhage, risk of placenta accreta, need for blood transfusion, need to stay in high dependency area postoperatively, conservative surgical interventions to control hemorrhage as well as the risk of peripartum hysterectomy in case of uncontrolled hemorrhage. Written informed consent for cesarean section and hysterectomy was taken from all patients. Four to six units of blood were cross matched before surgery. The same primary surgeon applied the transverse purse string suture during cesarean in almost all these patients.

At the time of cesarean section abdomen was opened through Pfannenstiel incision at the site of previous scar. Intra-abdominal adhesions especially

adhesions between uterus and bladder, and signs of invasion including vascular engorgement of lower uterine segment were assessed and dealt with carefully [Fig 2]. Before incision on the uterus, bladder was well retracted down away from the uterus using sharp and blunt dissection. All patients received uterotonic drugs after the delivery of baby to control hemorrhage. Oxytocin 5 IU intravenous bolus along with infusion of 20 IU Oxytocin in 500 ml normal saline solution was started routinely in all cases, later on injection Methylergometrine and injection Prostagalndin F2 alpha were also used in cases where uterine atony occurred. Placenta was removed completely by cord traction or in piece meal. If the placental tissue was found adherent at the scar site, the edges of the incision were excised along with the adherent placental tissue. Once the baby and placenta were delivered the uterus was exteriorized. Figure of eight sutures were taken in the placental bed as needed. In cases where hemorrhage could not be controlled with these preliminary measures transverse purse string suture was applied at the lower uterine segment, passing the needle as below as possible above the line of bladder reflection with Vicryl (polyglactin) number 2 mounted on a large 75 mm needle using technique as shown in figures [Fig1 & 3]. The two ends of the suture were held tight with an artery forceps. After closing the uterine incision in two layers the two ends of the purse string suture were pulled and tied together tightly. Vagina was checked for blood loss. After ensuring the effective hemostasis, uterus was interiorized. An intraperitoneal drain was left in pouch of Douglas in all cases. In case of inability to control hemorrhage despite transverse purse string suture, decision of hysterectomy was made by two consultants. The removed placenta and uterus were sent for histopathology.

Intra operatively and postoperatively blood and blood products transfusion were performed according to RCOG guidelines “Postpartum Hemorrhage, Prevention and Management” and “Blood Transfusion in Obstetrics”. Postoperatively patient was kept in high dependency unit until stabilized. Ultrasound abdomen was performed on all patients on next day after surgery to look for any collection. Where the patients remained stable and without any complication urinary catheter was removed on next day of surgery and the drain was removed after 48 hours of surgery once the drain output was less than 100ml in 24 hours. Once stabilized patient was shifted to the post-operative ward. At the time of discharge from hospital, all patients were provided with a phone number at which they could contact in case they develop any complaints like fever, excessive vaginal bleeding or discharge, or wound infection.

On discharge, from hospital each patient was called for follow up in outpatient department (OPD) within a week and then again at an interval of six weeks from the day of surgery.

Results

We applied lower uterine segment transverse purse string suture on 40 patients with complete placenta previa and previous cesarean sections. Among these, 26 patients had simple placenta previa while 13 patients had morbidly adherent or invasive placenta. Among the latter group patients with placenta accreta spectrum other than placenta percreta were analyzed in one group. The main characteristics of the study group are listed in table1. Majority of the patients have higher order cesarean sections with more than 4 cesarean sections.

In three patient's bladder injury occurred due to excessive adhesions and bladder injury was repaired by the urologist. One patient was picked with a large hematoma on ultrasound performed after 24 hours of surgery. Patient was taken to the operation theater and hysterectomy was performed. Second patient, who underwent hysterectomy in our study, had eight previous cesarean sections and uterus was removed due to excessive uncontrolled hemorrhage caused by persistent uterine atony while the third patient who ended up in hysterectomy, had placenta percreta. Among all patients with placenta accreta spectrum except placenta percreta, transverse purse string suture successfully controlled hemorrhage in this study [Table 2].

Most patients (24) had moderate major hemorrhage with blood loss between 1000-2000ml while 16 patients suffered severe major hemorrhage with a blood loss >2000ml. Almost all patients received blood transfusion intra or postoperatively or both. There were two readmissions one with fever due to urinary tract infection and one with wound dehiscence [Table 3]. No lochiometra was identified

on ultrasound performed before discharge from hospital as well as on ultrasound performed on follow-up in OPD.

By using this technique of lower uterine segment transverse purse string suture, overall, we were able to secure hemostasis and preserve uterus in 92.5% of patients with complete placenta previa and previous cesarean sections. Except placenta percreta, we successfully preserved uterus in all patients with placenta accreta using this simple technique.

Table I: Characteristics of Study Group

Characteristic	n (%)
Age 30-35 >35	13 (32.5) 27 (67.7)
Parity 1-4 >4	6 (15) 34 (85)
Number of Previous C.S 1-3 >3	10 (25) 30 (75)
Gestational age 	12 (30) 28 (70)
Type of Placenta previa Simple Placenta previa Placenta accreta spectrum other than percreta Placenta percreta	26 (65) 13 (32.5) 01 (2.5)

Table II: Primary Outcome: Peripartum Hysterectomy

Type of Placenta	Peripartum Hysterectomy n
Simple Placenta previa	02
Placenta accreta spectrum other than Percreta	0
Placenta Percreta	01
Total peripartum hysterectomies n (%)	03 (7.5)

Table III: Secondary Outcome: Complications

Complications	n (%)
Hemorrhage Moderate Major Severe Major	 24 (60) 16 (40)
Bladder Injury	3 (7.5)
Return to operation theater	1 (2.5)
Wound Dehiscence	1 (2.5)
Readmission	2 (5)

Discussion

Our study had found the technique of transverse purse string suture quite effective in controlling hemorrhage in patients with placenta previa in the

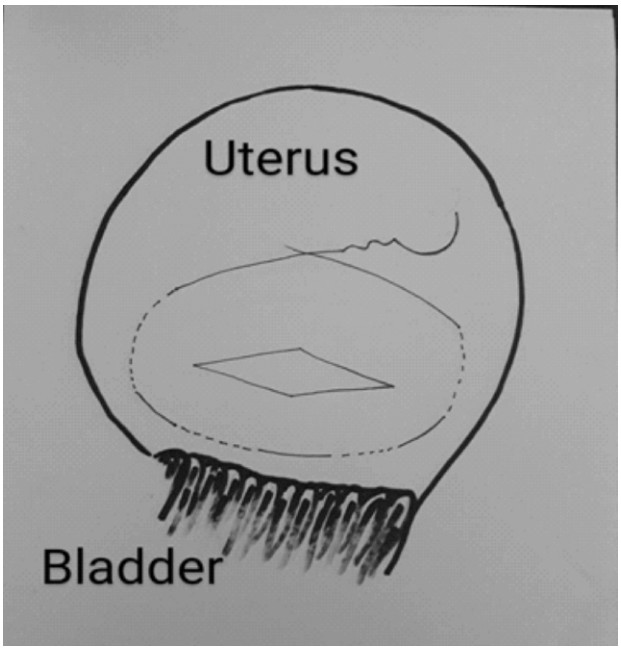

Fig. 1: Lower Uterine Segment Transverse Purse String Suture

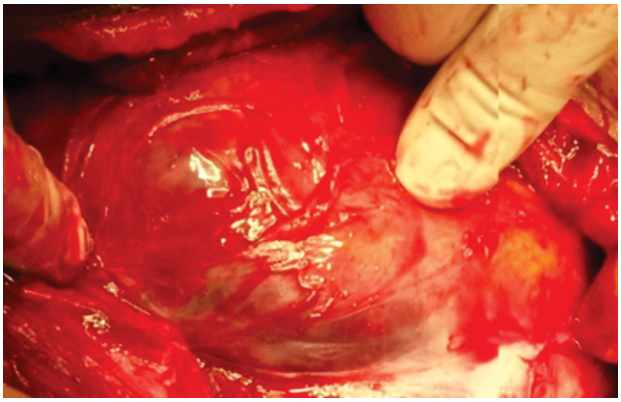

Fig. 2: Showing Bluish Bulge of Invasive Placenta

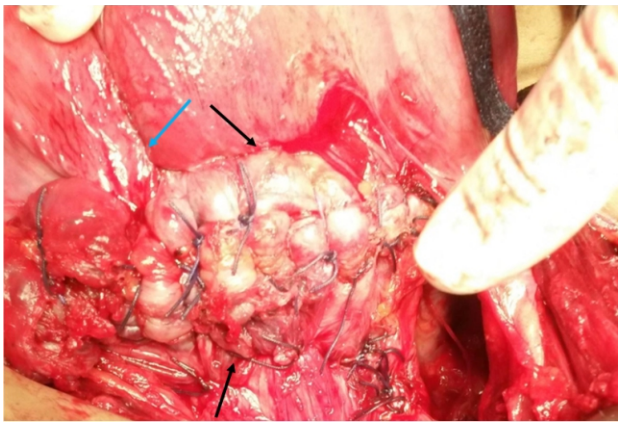

Fig. 3: Black Arrows Showing Line of Transverse Purse String Suture. Blue Arrow Showing Two Ends of Transverse Purse String Suture Tied Together

presence of previous cesarean section. Controlling hemorrhage in this high-risk group is a major challenge for even experienced obstetricians. We had preserved the uterus in 92.5% patients by using our technique in this high-risk group.

The abnormalities of placentation are grave conditions posing a major risk for peripartum hysterectomy, maternal morbidity, and mortality. Peripartum hysterectomy has its inherent risks of surgical complications, inability to conceive in the future, post-traumatic stress disorder in 64% patients and maternal mortality in 2.6% patients. Over the course of time several techniques have been demonstrated to control hemorrhage to preserve uterus in women with placenta previa, including compression sutures, balloon tamponade, pelvic devascularization and uterine artery embolization.[12-15] Our study particularly involved those women with placenta previa who had scarred uterus and it also focused on a subgroup of women with placenta accreta spectrum. Results of our study show that transverse purse string suture can effectively control hemorrhage and preserve uterus in women with complete placenta previa with or without morbid adherence, in the presence of a scarred uterus. We only had one patient with placenta percreta in our study but placenta percreta seems to be an exception, where it is safer to perform hysterectomy earlier to avoid excessive blood loss. Though the number of patients in our study is small only 40, the results seem to be very encouraging to imply this technique in women with placenta previa in the presence of a previously scarred uterus.

Uterine temponade using Bakri balloon, Sengstaken Blackmore tube or Rusch balloon is an easy technique that can be performed by an average on duty obstetrician even in a resource poor setting. The technique is very effective to control postpartum hemorrhage with a success rate reported up to 78% [14]. The efficacy of this procedure yet to be tested in the scenario of complete placenta previa and placenta accreta.

Systematic pelvic devascularization is performed by ligation of uterine artery, infundibulo- pelvic vessels and internal iliac artery. The ligation of bilateral uterine arteries is technically easy, safe and effective to reduce the uterine blood flow. Ligation of infundibulo-pelvic vessels further intends to reduce the uterine blood flow through utero-ovarian anastomosing vessels. Furthermore, ligation of bilateral internal iliac arteries, embraces a success rate of 40-80%, however by this stage the patient may have suffered significant blood loss and coagulopathy. Complexity of this procedure demanding substantial surgical skills and obligation of input from a vascular surgeon are additional hitches to this procedure. This procedure also carries the risk of injury to ureters and internal iliac veins [16,17]. Contrarily, pelvic arterial embolization carries a high median success rate of 89%, but the procedure involves an interventional radiologist and a well-equipped radiology unit. Arterial embolization is also not without risks and patients may develop post-embolization fever, vascular injury, infection, uterine and bladder ischemia.[18-20]

Several compression sutures have been devised to control hemorrhage and preserve uterus including B-Lynch suture, Cho suture or square suture, Hayman suture, vertical compression sutures and transverse compression sutures. Among these, B-Lynch suture mainly intends to control bleeding from uterine atony and the technique is more successful to cause compression of myometrial fibers of upper uterine segment to induce their contractility.[21] Cho suture technique involves placing square sutures to control bleeding from focal bleeding sites, but it may be difficult to apply such a relatively complex sequence of multiple sutures in the scenario of excessive bleeding.[22] Hayman applied a simply modified B-Lynch suture and additionally for placenta previa or accreta he suggested two transverse sutures at the level of isthmus or circular cervico-isthmic suture. This does not allow exploration of the uterine cavity and impairs the drainage of lochia.[23] On the other hand, vertical compression sutures applied for instance in the study by Mohammed and Muhammed in 2017 and later on by Raitu and Crisan in 2018 for placenta previa and accreta, showed excellent results with preservation of uterus in around 98% cases.[24-26] None of these studies involved such higher order cesarean sections as in our study where mean number of previous cesarean sections is 4. Moreover, potentially any compression suture passing through both anterior and posterior uterine walls by close opposition of the two uterine walls carries the risk of uterine syneche, adhesions,

impairment of uterine drainage and infection, ultimately resulting in problems related to menstruation and future conceptions. In our study, as the transverse purse string suture was passed only through the anterior uterine wall below the uterine incision and then tied above the uterine incision, it lacks such potential risks related to menstruation and fertility and the technique proved to be very effective by involving a large area of lower uterine segment both below and above the incision.

Our technique in this study is a modification of B-Lynch transverse compression suture demonstrated by B-Lynch C, et al in their study where they successfully secured hemostasis in cases of placenta previa.[27] In contrast, our study exclusively involved patients with scarred uterus and our technique is simpler, and thereupon can be rapidly performed even by an average on duty surgeon.

Our study has limitations of small sample size and absence of comparison group. We strongly recommend well-designed studies with larger sample size in future to look more closely at the effectiveness of this technique in such patients. We also recommend future studies to evaluate its long-term effects related to future conception and pregnancy outcome.

Conclusion

Despite the sample size being small, our results intimate the effectiveness of transverse purse string suture in a subgroup of patients very high risk for massive maternal hemorrhage who have scarred uterus inhabited with placenta previa and placenta accreta.

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CONFLICT OF INTEREST

Authors declared no conflicts of Interest.

GRANT SUPPORT AND FINANCIAL DISCLOSURE

Authors have declared no specific grant for this research from any funding agency in public, commercial or nonprofit sector.

DATA SHARING STATMENT

The data that support the findings of this study are available from the corresponding author upon request.