

# A new surgical approach for the management of severe postpartum hemorrhage due to uterine atony: preliminary results in 27 cases

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## Summary

**Purpose of investigation:** To demonstrate a new suturing technique that effectively reduces severe postpartum hemorrhage secondary to uterine atony. **Materials and Methods:** The study consisted of 27 patients with persistent postpartum bleeding due to uterine atony which was unresponsive to medical treatment. The patients were treated with  $\infty$  compression sutures that passed through entire uterine wall on which the placenta was located and were knotted within uterine cavity. Demographic properties, complications, operative results are demonstrated. **Results:** Uterine bleeding was controlled in 26 of 27 cases (%96.3). Total abdominal hysterectomy was performed in only one patient who had persistent incision site bleeding and disseminated intravascular coagulation. **Conclusion:** Uterine atony is an emergency and early intervention is necessary. As indicated by the preliminary results, the new technique effectively stopped bleeding in 96.3% of cases; no other techniques were carried out additionally. The technique is promising with properties as easy applicability, safety, and absence of major complications. A larger study is needed for further comparison of operative results.

**Key words:** Postpartum Hemorrhage; New Surgical Approach;  $\infty$  Compression suture.

## Introduction

Postpartum hemorrhage (PPH) still remains to be one of the most serious health problems related to maternal mortality worldwide, accounting for 25–30% of all maternal deaths [1]. PPH complicates up to 18% of all deliveries [1]. In addition, 64.7% of severe maternal morbidity is the result of obstetric hemorrhage most of which is the result of uterine atony (UA) [2].

Management of UA begins with intravenous and urinary catheterization. Uterine massage, uterotonic agents with bimanual uterine compression, volume replacement (crystalloid or if needed blood products) should be maintained in order to prevent coagulopathy. Besides uterine tamponade, compression sutures and in selected cases embolization or hypogastric artery ligation is applied. Hysterectomy is the last opportunity in order to supply homeostasis. Due to recent advances in effective medical and surgical interventions, need for emergent hysterectomy is highly decreased. In a report, emergent per partum hysterectomy incidence was reported as 0.2–0.5% [3].

Uterine compression sutures are successful in avoiding hysterectomy in 82% of these women [4]. Of the several different techniques noted in the literature, the B-Lynch suture, which was first reported in 1997, has gained the most popularity, with a number of subsequent publications attesting to its efficacy [5]. Although compression

sutures are highly efficient in the management of uterine atony, persistent bleeding still remains as a fear for obstetricians.

In Literature, new methods and investigations are being reported and continued in the management of uterine atony. Several concerns about the current compression sutures have been raised since they may lead to occlusion of the uterine cavity and blood entrapment. As the other is relatively new, data on the safety and efficacy of the new uterine compression suture techniques and efficacy are limited [6].

In this paper, the authors describe another simple variation of uterine compression suture technique ( $\infty$  suture) that is applied over placental bed by transmural suturing of the uterine wall on which the placenta was located for which the preliminary results appear to be effective and safe.

## Materials and Methods

The present study is a retrospective review of cases at Necmettin Erbakan University Meram Faculty of Medicine, Obstetrics Department between January 2010 and March 2013. This study was approved by the Institutional Review Board of Necmettin Erbakan University Meram Faculty of Medicine.

Meram Medical Faculty serves as a referral hospital in a geographic area which has four million inner lands. The mean birth rate regarding last five years is 2,915 per year. Besides, it is the re-

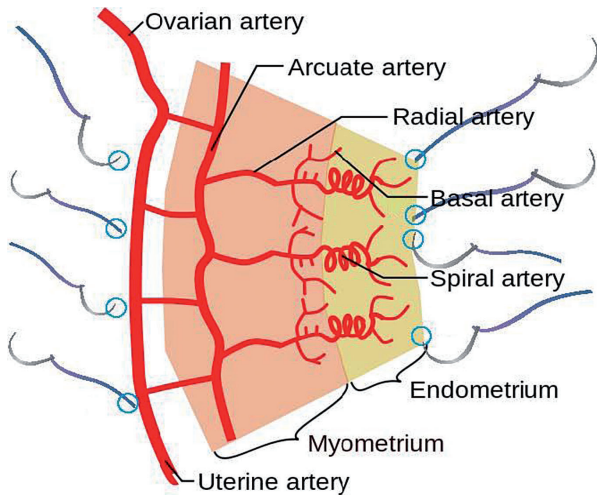


Figure 1. — The schematic demonstration of the initial hypothesis of the operative technique.

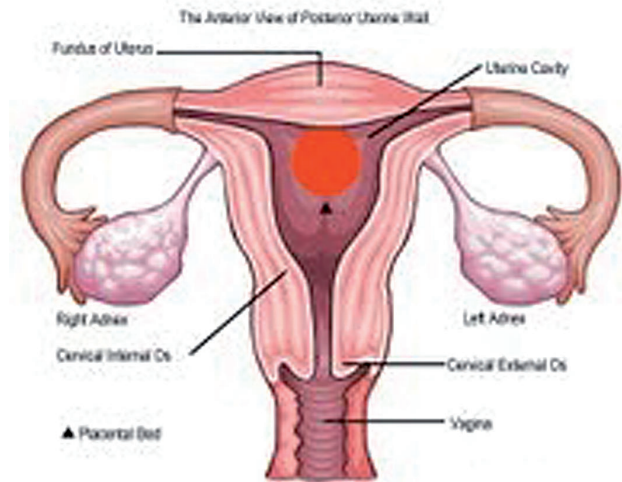


Figure 2. — The location of the placenta on which the suturing would be applied is outlined.

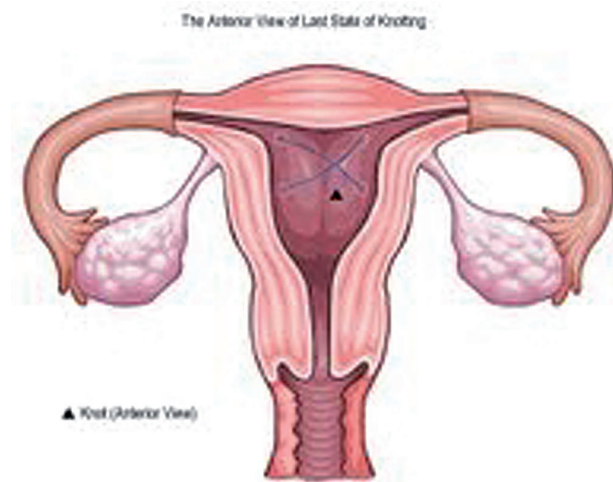


Figure 3. — The anterior view of the last state of knotting.

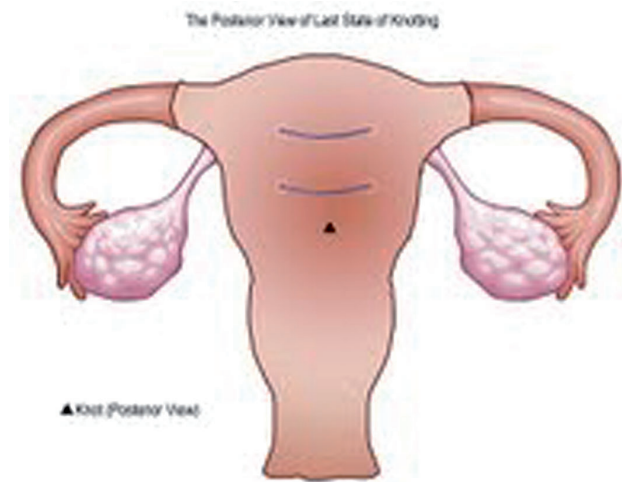


Figure 4. — The posterior view of the last state of knotting.

ferral center of the complicated obstetrical cases. The demographic data: age, parity, gravidity, and gestational week were all recorded. The comorbidities with UA were also recorded.

In this report, the preliminary operative results of 27 cases with UA who were treated with transmural suturing of the uterine wall on which placenta was located were demonstrated.

The new surgical approach was carried out by the same operator (AA) in all cases. The technique was applied through pfannenstiell incision site. Laparotomy was performed through pfannenstiell incision for the patients who had UA after normal spontaneous delivery. Uterus was taken out of abdominal cavity.

Unless disseminated intravascular coagulopathy developed, bleeding occurred only from placental side, thus the placental side was the targeted area of the suturing technique. The placental detachment site was palpated and the interior uterus was tamponed from uterine incision site in order to visualize the bleeding placental area on which the suturing technique would be applied.

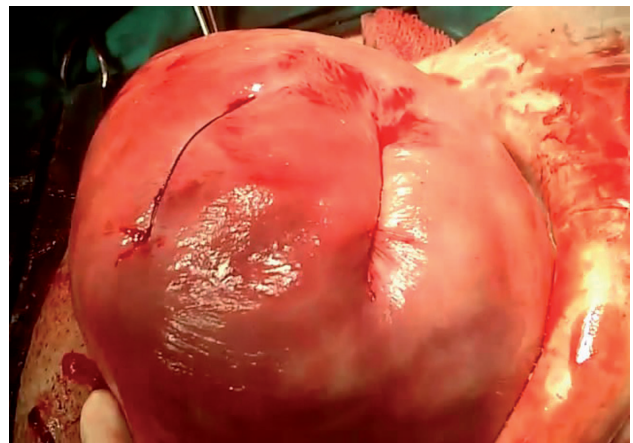


Figure 5. — Photograph of the posterior view of the last state of knotting.



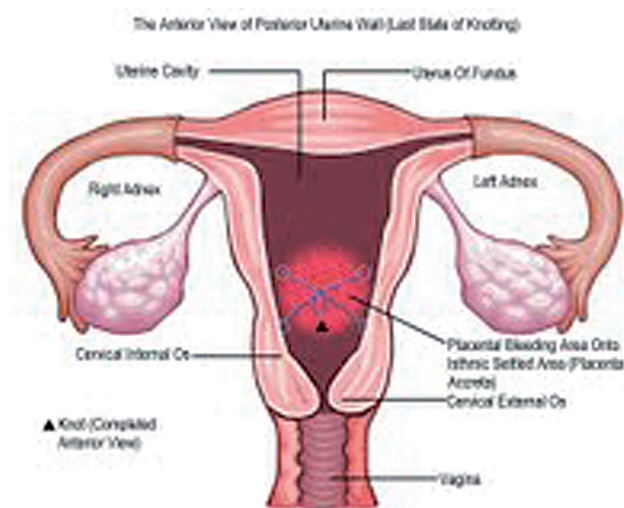


Figure 6. — The anterior view of the last state of knotting in case with placenta previa.

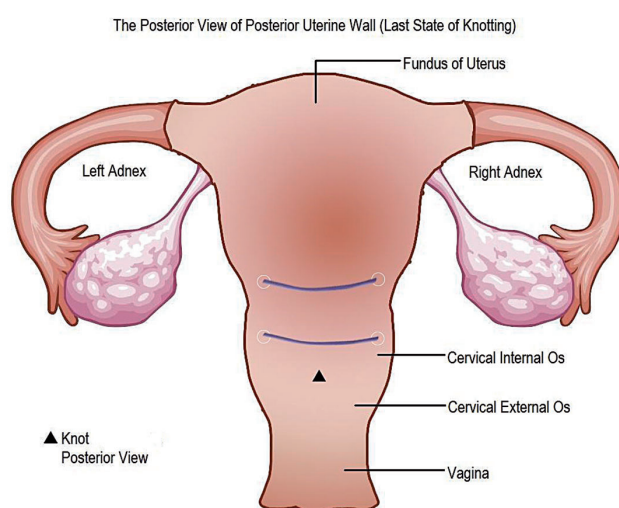


Figure 7. — The posterior view of the last state of knotting in case with placenta previa.

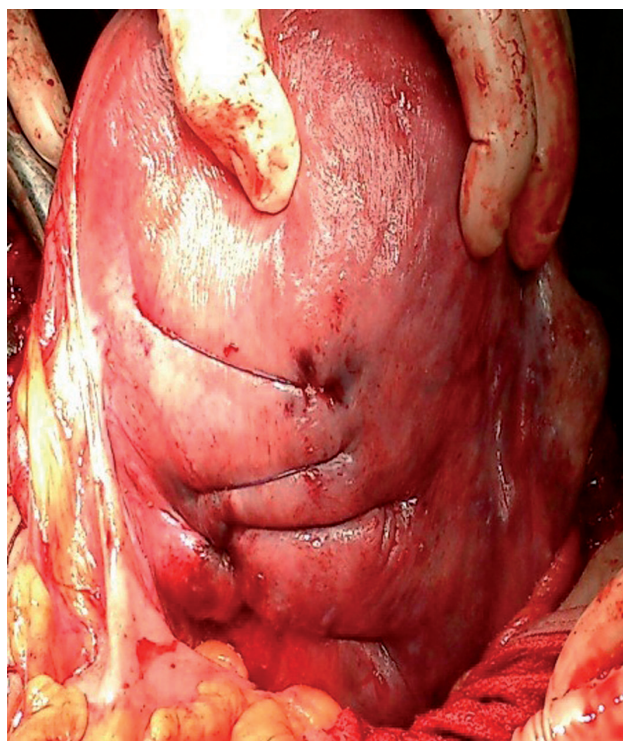


Figure 8. — Two repeats of technique in a case with placenta previa, posterior view.



Figure 9. — Multiple repeats of technique in a case with anteriorly located placenta.

The suturing of entire uterine wall objected to block the circulation within arcuate, radial, basal and spiral arteries, especially the anastomoses among these. This was the initial hypothesis of the study (Figure 1).

Placental detachment region (Figure 2) was outlined and inspected by low segment uterine incision. No. 1 sized 50 mm long semicircular needle was used and the needle was inserted from interior uterine cavity and passed through entire uterine

wall (endometrium, myometrium, and serosa) towards serosa (first exit). The needle was then inserted from serosal surface just three to four cm lateral to first exit towards uterine cavity (first entry). After that, needle was inserted for the third time three to four cm cross downwards from first entry inside uterine cavity towards serosal surface (second exit). On the next step, the needle on the serosal surface was inserted from three to four cm lateral to second exit just parallel to the first suture towards uterine cavity (second entry). By the help of these moves, both ends of the suture were kept ready within uterine cavity to be tied. The end of suture at first exit and the other on second entry were tightened correspondingly in balance and tied (Figure 3-4-5). To prevent loosening suture was tied twice. At the same time, uterine wall being sutured was approximated manually from serosal site. Same procedure was repeated for each repeats of suture. When needed, two or more sutures were applied on placental area and bleeding was observed from incision site. In cases of placenta previa, following the appropriate reduction of bladder, the technique was applied on each bleeding areas all around cervix (Figures 6-7). Sutured areas could be observed for persistent bleeding intraoperatively and sutures could be repeated (Figures 8-9).

The patients were observed for 60 minutes in intensive care unit postoperatively. The transfused blood products were recorded. The intraoperative and postoperative complications, the duration of hospital stay were all recorded. The study results were analyzed by SPSS version 13 and reported as mean  $\pm$  standard deviation.

## Results

Eighteen of 27 patients (66.6%) had UA after caesarean section and nine (33.3%) had UA after vaginal delivery. All cases received antibiotic prophylaxis. Mean age of cases was  $28.5 \pm 2.3$  (21-33) years, mean gravidity was 3.2 (1-5), and mean parity was 2.7 (1-6). Twelve of 27 patients (44.5%) were primiparous and 15 of 27 (55.5%) patients were multiparous. Mean gestational week was  $35.5 \pm 2.1$  (32-39) weeks. Eleven of 27 (32.6%) cases had placenta previa coexisting with uterine atony.

Total abdominal hysterectomy was performed in only one patient who had persistent bleeding and disseminated intravascular coagulation. This patient was urgently referred to the present clinic for UA developed after cesarean delivery. At admission, patient hemoglobin level was four g/dl. It was learned that Bakri postpartum balloon had been inflated at an outside center. Since patient's bleeding had continued, laparotomy was planned. The new technique was applied; afterwards bilateral internal iliac artery ligation was achieved. Due to continuation of bleeding, total abdominal hysterectomy was performed. Two patients had wound infection postoperatively. Two patients remained vaginal bleeding (five pads/day), but these patients did not require additional transfusion; the remaining patients had insignificant vaginal bleeding.

Twenty-seven patients were operated by new suture technique. Bleeding was controlled in 26 patients (96.2%). Total abdominal hysterectomy was performed in only one patient who had persistent bleeding and disseminated intravascular coagulation.

The sutures were repeated in necessary cases, and the mean suture number/case was  $2.3 \pm 1.1$  (1-5). The mean blood loss in the series during operations was  $1,650 \pm 950$  cc (600-5,000). Four patients (14.8%) did not require blood transfusion postoperatively; on the other hand mean transfusion rate in the series was four units (2-15). Mean operation time was  $75 \pm 10$  minutes (60-100 minutes). Routine controls on 40<sup>th</sup> day were normal.

## Discussion

UA is one of the most important obstetric emergencies that cause maternal mortality and morbidity. It may occur in cases even without risk factors (elderly maternity, history of cesarian section, history of postpartum hemorrhage, multiple pregnancy, polyhydramnios, prolonged labor, and tired uterus). Mortality and morbidity decrease with early intervention [2].

Options for the management of postpartum hemorrhage resulting from uterine atony include uterotonics, selective devascularization by suture ligation or angiographic embolization, uterine compression sutures, intrauterine packing, and hysterectomy. All of these therapies are objected to diminish blood loss, preserve fertility, and avoid life-threatening complications.

When conservative medical treatments fail to control hemorrhage, surgical options are considered. Hysterectomy is one of these surgical approaches for the management of uterine atony, but is a radical option and is not appropriate for patients who desire further fertility. Regarding this fact, in recent years compression sutures have been introduced into literature for the management of UA. Initially in 1997, B-Lynch *et al.* applied a surgical approach in five cases and reported successful management of hemorrhage [5]. Afterwards several modified techniques were reported [7-11]. In severe and persistent hemorrhage, Lynch compression suture together with balloon tamponade was defined [12].

All of these techniques puncture the uterine walls. Most of them directly define the suturing of the anterior and posterior uterine walls, which result in obliterated uterine cavity. The reported complications of these sutures were reported as such as pyometrium, uterine synechiae, uterine necrosis, partial ischemic necrosis and, in a few of the procedures, the sutures slid off at the uterine fundus [13-19]. Multiple square sutures described by Cho *et al.* that target placental area in severe postpartum hemorrhage were found to be efficient and safe. In some cases, moderate to severe adhesions were reported, and those adhesions were reported to be resected by hysteroscopic approaches [7].

The present authors' new technique is a compression suture but targets the placental bed. (The suture passes through entire uterine wall on which the placenta is located and the suture is placed on the bleeding part of uterine cavity). It can be predicted that the technique may have some complications, but similar to other compression sutures, it is predicted to be free of great vessel and ureter injury.

In the literature, Wohlmuth *et al.* in their series achieved blood stoppage in 85% of 22 cases [20]. Mostfa *et al.* described a needle suture that compresses the uterus in a different way without opening the uterine cavity and reported success in 12 patients out of 13 [21]. In the present series, the authors have succeeded homeostasis in 26 cases (96.2%).

In 1991 Cho *et al.* described interrupted circular suture (one cm frequently) around of the bleeding lower uterine segment with zero chromic suture [22]. They described a suturing technique which was placed on serosal face of uterus.

Druzin described four cases in which bleeding stopped by hard buffering of lower uterine segment [23]. In literature, it is also reported that Bakri balloon application stopped active hemorrhage in cases with placenta previa without any need for hysterectomy [24, 25].



In a study in which 70 cases with postpartum hemorrhage were investigated, it was reported that hemorrhage was controlled in 75% of cases by balloon and Lynch suture, and in 24% of cases hysterectomy was carried out. Sixteen percent of cases suffered from organ dysfunction, and one patient died. Though promising developments are reported in the management of postpartum hemorrhage, it retains its importance and severity [26].

Later on, in 2000 Cho *et al.* reported square sutures at cesarean delivery that approximated anterior and posterior walls of the uterus in order to compress the bleeding site of the uterus. They have also reported that their technique was applicable in cases with placenta previa [7].

The present technique offers suturing of entire thickness of the uterine wall on which placenta had been located, beginning from endometrial cavity towards serosa, placing the knot of suture within endometrial cavity. By this way, the uterine cavity is not totally collapsed and this may be an advantage in the future for preventing complications related to compression suture techniques. Similarly, the present technique also provides alternative for cases with placenta previa, which in turn is another advantage in cesarean deliveries. By the present method, bleeding areas can be observed intraoperatively and repeated sutures can be applied.

The present authors can predict that their technique may lead to complications, but they believe in that a few  $\infty$  sutures applied only on to the placental bed without interfering other sites on endometrial cavity (uterine cavity is not totally collapsed) is an advantage to prevent complications and it also provides to detect the cessation of hemorrhage during operation. The suturing of entire uterine wall objected to block the circulation within arcuate, radial, basal, and spiral arteries spiral, especially the anastomoses of these. The suturing of entire wall and the placement of the knot within the cavity objected to decrease the uterine volume, thus to help uterine contraction.

In cases with fundal localization of placenta, in order not to traumatize the adjacent tissue, the needle was straightened and protruded towards uterine fundus by the guidance of finger tip. The needle was inserted from uterine cavity, traversed entire uterine layers and reinserted from serosal site towards uterine cavity, thus all these maneuvers achieved the suturing of uterine fundus which remains as a closed area. It might be much easier to suture with 80-mm sized needle, but it would also be more traumatic, so the present authors preferred to use 50-mm sized needle. Since, atonic uterus is soft, 50-mm sized needle is appropriate in each case even when placenta was located on fundus. No other interventions such as Lynch suture, ligation of uterine, and hypogastric arteries other than this method were applied in this series.

## Conclusion

The present new technique is a placental side compression suture rather than a uterine compression suture, thus

preventing obliteration of uterine cavity. The authors believe in that intervention only on placental bed without interfering other sites on endometrial cavity (uterine cavity is not totally compressed) is an advantage to prevent complications. However, this theory should be supported by further studies with further studies that included larger case series.

The authors succeeded to control uterine bleeding in 26 cases out of 27 (96.2%), thus it may be offered as an alternative approach in the management of uterine atony.

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