

# Uterine sparing techniques in placenta accreta

## Abstract

Placenta Accreta (PA) is a major challenge facing obstetricians nowadays owing to increased incidence of PA parallel to increased Caesarean Section rates. Although the age of patients with PA getting younger and fertility preservation is required, there is no definite planned management method widely accepted except for hysterectomy. Uterine sparing techniques were developed to prevent poor sequelae of hysterectomy but neither one methods proved to be superior to the other nor got wide acceptance by obstetricians and hysterectomy remains the most popular and accepted method for PA management as it minimize maternal morbidity and mortality. The aim of this review is to put the light on Uterine Sparing techniques aiming to preserve future fertility and, minimizing the poor sequelae of hysterectomy.

**Keywords:** Placenta accreta, Conservative management, Uterine sparing, Techniques

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## Introduction

Placenta accreta become the most serious problems during third stage of delivery and some obstetricians call it "Obstetricians Nightmare".<sup>1</sup> PA leads to massive intractable hemorrhage with loss of about 3-5 liters of blood, disseminated intravascular coagulopathy, adult respiratory distress syndrome, massive blood transfusion, electrolyte imbalance, and renal failure.<sup>2</sup>

Although hysterectomy in this situation is a life saving procedure but it has major complications like injury to the ureters, bladder, bowel, or neurovascular structures, and permanent loss of fertility with its psychological insult. Placenta accreta accounts for (38%) of peripartum hysterectomy.<sup>3</sup> Maternal mortality may occur despite adequate planning, disciplinary management and transfusion management.<sup>4</sup> As fertility preservation is required in many cases due to their young age and uterine preservation is directly related to psychology, femininity and self esteem of female, obstetricians developed many conservative approaches in management of PA.<sup>5</sup>

## Incidence of placenta accreta

The incidence of accrete syndromes has increased remarkably, in direct relationship to the increasing cesarean delivery rate. The incidence of placenta accreta was estimated in the 1980s to be 1 in 2500 deliveries; in 2012 the American College of Obstetricians and Gynecologists stated the incidence to be as high as 1 in 533 deliveries. Currently, the rate is higher.<sup>3,6</sup>

## Diagnosis of placenta accreta

Antenatal diagnosis of placenta accreta is crucial for the best management as multidisciplinary planning minimize potential maternal and neonatal morbidity and mortality. Diagnosis is usually made by ultrasonography and sometimes completed by magnetic resonance imaging (MRI).

**Ultrasonography:** Grayscale transvaginal or transabdominal ultrasonography could be used with a sensitivity of 77-87%, specificity of 96-98%, a positive predictive value of 65-93%, and a negative predictive value of 98%.<sup>7,8</sup>

The ultrasonographic features suggestive of placenta accreta include multiple irregular placental lacunae with a "moth-eaten" or "Swiss cheese" appearance of placenta, thinning of the myometrium

overlying the placenta, loss of the retroplacental clear space, invasion of the placenta into the bladder, increased vascularity of the uterine serosa-bladder interface, and turbulent blood flow through the lacunae on Doppler velocimetry.<sup>7,9</sup>

**Magnetic Resonance Imaging:** MRI is required when there are insufficient ultrasound findings or a suspicion of a posterior placenta accreta, with or without placenta previa, so MRI is considered an adjunctive method to ultrasonography and adds little to its accuracy. In 2005 a prospective study done on 300 cases showed that MRI was able to determine the anatomy of the invasion and its relation to the regional anastomotic vascular system plus detection of parametrial invasion and possible ureteral involvement.<sup>10</sup>

The American College of Radiology guidance advocated the safety of MRI practices but stated that intravenous gadolinium should be avoided during pregnancy and should be used only if absolutely essential.<sup>11</sup>

## Timing and Place of delivery

Scheduled preterm delivery is necessary and justified by many obstetricians to avoid serious adverse maternal consequences of emergency cesarean delivery.<sup>12</sup> It is advised to be in tertiary care hospitals for disciplinary team management and possibility of ICU need.<sup>13,14</sup> The American College of Obstetricians and Gynecologists (2012b) recommends individualization of the time of delivery. Many studies advocate elective delivery without fetal lung maturity testing after 34 completed weeks.<sup>15</sup> Recently surveys indicate that most obstetricians do not deliver PA patients until 36 weeks or later.<sup>16,17</sup> At Tanta University Hospital, we generally schedule delivery after 36 completed weeks and at full competency to manage them in non elective situations.

## Management of placenta accrete

### Caesarean hysterectomy

The only recommended management of placenta accreta is planned cesarean hysterectomy with the placenta left *in situ* because removal of the placenta is associated with significant hemorrhagic morbidity. However, this approach might not be considered first-line treatment for women who have a strong desire for future fertility.<sup>18,19</sup>

## Uterine sparing approaches in management of placenta accreta

These are techniques developed to preserve uterus and future fertility which is crucially linked to societal status and self-esteem:

**Conservative management:** It is the expectant management by leaving placenta *in situ* for spontaneous resorption and autolysis. It consumes cutting cord close to the placenta and closure of uterus over placenta followed with or without methotrexate treatment.<sup>20</sup> The role of adjuvant methotrexate in cases of conservative management is uncertain. No large studies have compared methotrexate with no methotrexate in the treatment of placenta accreta, and at the present time, there are no convincing data for or against the use of Methotrexate in cases of placenta accrete.<sup>21</sup> Follow up is made by  $\beta$ -HCG level and Ultrasound or MRI.<sup>22</sup> The time required for spontaneous resolution ranges from 4 weeks to 12 months,<sup>23</sup> with a mean 6 months.<sup>24-26</sup>

Conservative method require aggressive antibiotic therapy to combat infection and many adjuvant approaches to minimize bleeding like oxytocin, compression sutures, or intervention radiology methods like embolization.<sup>27</sup>

Although some cases succeeded and placenta was expelled spontaneously, the great majority had hysterectomy either promptly or later on due to hemorrhage or infection. Infectious complications of conservative method include septic shock, sepsis, infection, endometritis, wound infection, peritonitis, pyelonephritis, vesicouterine fistula and uterine necrosis.<sup>25</sup> Other rare morbidities like choriocarcinoma and uterocutaneous fistula were also reported.<sup>28</sup>

Sentilhes et al.<sup>23</sup> reviewed 167 cases of PA in a retrospective study performed in France between 1993 and 2007 and included 40 university hospitals and found that 78% of patients preserved the uterus with resolution occurred at a median of 13.5 weeks with a range of 4 to 60 weeks postpartum. Additional procedures were required in majority (65%) of cases, including pelvic artery embolization, hypogastric artery ligation, and uterine compression sutures. Postpartum hemorrhage occurred in (51%) and (22%) of those patients required subsequent hysterectomy. Ten patients suffered severe morbidity, including septic shock, vesicouterine fistula, and uterine necrosis.<sup>23</sup>

Pather et al reviewed conservative management of 57 cases of placenta percreta that were diagnosed by antenatal imaging. They showed that many patients (60%) required further surgery (40% as emergent hysterectomy) and morbidities occurred in about 42% of patients including sepsis, DIC, hemorrhage, pulmonary embolism, fistula and AV malformation.<sup>29</sup>

Hysteroscopic resection of conservatively managed placenta accreta was described to hasten resolution or treat delayed bleeding and/or pelvic pain.<sup>30,31</sup> Potential advantages of using a hysteroscopic approach include the ability to confirm absence of cleavage plane, visualize tissues during resection, and reduce risk of adhesion formation.<sup>32</sup>

**Intervention radiology methods:** In these methods either Balloon-tipped catheters are placed in a retrograde fashion through the femoral arteries immediately before surgery and be inflated during the dissection in attempt to decrease the morbidity associated with placenta accrete or intervention radiologist is preoperatively place a femoral catheter with selective embolization of the uterine vessels at the time of delivery.<sup>33,34</sup>

Current evidence is insufficient to make a firm recommendation on the use of balloon catheter occlusion or embolization to reduce blood loss and improve surgical outcome. Despite initial enthusiasm

about the utility of balloon catheter occlusion, available data are unclear regarding its efficacy.<sup>35</sup> In addition, some studies have reported an increased risk of vessel thrombosis/dissection, insertion site hematoma, abscess, necrosis, and pseudoaneurysms.<sup>36</sup>

**Local resection of placental implantation site:** Placenta accreta and placenta increta can be safely and successfully treated, in some well-selected cases, by resection of the placental implantation site and repair of uterine defect. This method provides immediate therapy, reduces blood loss and preserves fertility. Local resection seems to be associated with fewer complications within 24 hours postoperatively compared with hysterectomy or leaving the placenta *in situ*.<sup>37</sup>

The Triple-P procedure involves perioperative placental localization and delivery of the fetus via transverse uterine incision above the upper border of the placenta; pelvic devascularization; and placental non-separation with myometrial excision and reconstruction of the uterine wall. It is considered a safe and effective alternative to conservative management or peripartum hysterectomy.<sup>38</sup>

The authors of Triple-P procedure reported remarkably low blood loss, ranging from 800 to 1500 mL per patient. A follow up cohort study by the same group showed reduction in estimated blood loss, the need for delayed hysterectomy, and length of hospital stay when compared to leaving the placenta *in situ* plus arterial occlusion [39]. The potential benefit of Triple-P procedure may be minimizing the surgical dissection necessary to do adequate hemostasis while removing all or most of the placenta. The authors state that Triple-P procedure is also beneficial in case of lateral extension of placenta percreta into the broad ligaments, or deep infiltration into the cervix or the ureters.<sup>40</sup>

## Systematic pelvic devascularization

### Uterine Artery Ligation (UAL)

Uterine artery ligation is crucial step for success of uterine preservation in many patients, with a total success rate of 78.9%. The first reports of bilateral UAL were published by Waters<sup>41</sup> in 1952 and O'Leary in 1966.<sup>42</sup>

The reported success rate varies from 80% to 96%.<sup>43</sup>

A new study done at Assiut University Hospitals (Egypt) comparing bilateral uterine artery ligation versus a new compression suture of lower uterine segment with shorter operative time and less blood loss in group of bilateral uterine artery ligation.<sup>44</sup> Another new study done at Tanta University Hospitals (Egypt) which reported 100% success of double uterine artery ligation in management of PA.<sup>45</sup>

### Uterine and ovarian arteries ligation

Salvat et al.<sup>46</sup> stated that stepwise procedure with progressive ligation of the uterine and ovarian arteries is a good solution with 100% success compared to bilateral ligation of the hypogastrics which provided success in only 66% of cases. Gungor et al.<sup>47</sup> reported a 100% success rate for a stepwise procedure with progressive ligation of the uterine and ovarian arteries and the authors recommended uterine artery ligation and high ligation of ovarian artery to be first applied instead of implementing internal iliac ligation first, because ligation of internal iliac arteries is less effective and technically more difficult to carry out.

### Internal Iliac artery ligation

Bilateral internal iliac artery ligation (IIAL) was the first choice in 23 cases and the procedure failed in 11 cases, so in our study the success rate was 52%.<sup>47</sup> Boynukalin et al.<sup>48</sup> conducted a study

On a total of 26 cases required hypogastric artery ligation due to intractable postpartum hemorrhage including uterine atony, placental abruption, uterine rupture, and placenta accreta. Hemorrhage was effectively controlled in 20 of 26 cases (76.9%) and hysterectomy was avoided. Iliac vein injury occurred in one patient (3.8%) as an operative complication. 48 reported effectiveness of IIAL in avoiding hysterectomy in up to 50% of cases. Joshi et al.<sup>49</sup> told about 88 therapeutic IIAL for postpartum hemorrhage and 33 of 84 women failed to arrest hemorrhage. They concluded that bilateral ligation of the internal iliac arteries does not result in complete blockage of blood supply to the female pelvic organs but contributes to significant decrease in blood loss. They concluded also that IIAL is useful in the treatment and prevention of postpartum hemorrhage from any cause. Early resort to IIAL effectively prevents hysterectomy in women with atonic PPH.<sup>49</sup>

Kelekci et al.<sup>50</sup> performed bilateral ligation of the 2 hypogastric arteries and utero-ovarian anastomosis branches were also ligated. The clamped cord was released and hydrodissection was performed by heated saline at 37°C. If placenta was not sufficiently dissected from the uterus, placental curettage or excision was performed. After hemostasis is secured, a balloon of 3-ways 20F Foley catheter was inflated by 80cc saline and placed into the intrauterine cavity and they reported success in 11 cases with preservation of their uteri.<sup>50</sup>

Many authors advocate its routine ligation in placenta accreta.<sup>51</sup> Others reported no value for its ligation.<sup>52</sup> On the other hand some authors reported severe complications such as gluteal necrosis, bladder necrosis, uterine gangrene and occasionally leg ischemia if external iliac artery is ligated by mistake.<sup>53-56</sup>

## Compression suture

The principle is mainly the compression of the uterine body, and is basically the same for all types of compression sutures. The main differences being the figure at which the suture is applied, the numbers of longitudinal and/or transverse sutures used, and whether or not the uterine cavity is penetrated. The success rate for uterine compression sutures ranging from 68% to 100% with an overall success rate of 92%.<sup>57</sup>

### a. Vertical sutures

Hwu et al.<sup>58</sup> conducted a study on fourteen women with placenta praevia (including one who also had placenta accreta) undergoing caesarean section had massive bleeding after removal of the placenta. In order to preserve the uterus, two parallel vertical compression sutures were placed in the lower segment to compress the anterior and posterior walls of the lower uterine segment. The haemorrhage from the lower segment stopped immediately after the knots were tightened. All women later resumed normal menstrual flow with no apparent complications. This parallel vertical compression suturing technique is simple, easy and effective for controlling bleeding in women with placenta praevia or accreta. The authors suggest that this technique should be tried first before other more complex procedures are undertaken.<sup>58</sup>

Makino et al.<sup>59</sup> also tried compression sutures as 'double vertical compression sutures' because it has dual actions: haemostatic compression of the bleeding surface and reduced uterine blood flow.<sup>59</sup>

### b. Transverse B-Lynch sutures

Transverse B-Lynch sutures are also effective in controlling bleeding from placenta accreta cases. The new modification of B Lynch by making horizontal sutures passed in a vascular area in

the broad ligament make more tension around and pressure in the lower segment so the technique easily applied to placenta previa and accrete.<sup>60</sup>

## c. Other sutures

- i. **Cho suture** which is a haemostatic multiple square suture to approximate the anterior and posterior uterine wall.<sup>61</sup>
- ii. **Hayman suture** which involved two vertical apposition sutures together with two transverse horizontal cervico-isthmic sutures.<sup>62</sup> Pereira suture was reported in 2005, which consisted of longitudinal and transverse sutures applied with superficial intramyometrial bites only.<sup>63</sup>
- iii. **Bhal suture** which entailed two sutures instead of one, with the knots tied in the anterior-inferior margin of the lower uterine segment, without any difference in the compression effects compared to the original B-Lynch suture.<sup>64</sup>
- iv. **El Shazly suture** consists of continuous 8 compression suture with anterior and posterior bites. They resorted to this suture after failure of uterine artery ligation to stop bleeding in placenta accreta cases.<sup>44</sup>
- v. **Modified suture:** An observational study was conducted in China, among patients with placenta previa centralis (with or without placenta accreta). During surgery, a Foley catheter balloon containing 60-120 mL of water was used to compress the hemorrhage site and an absorbable suture was placed around the lower uterus segment to provide extra pressure on the balloon.<sup>65</sup>

## Stepwise procedures

### I. One step procedures

First developed by Placios et al.<sup>66</sup> and include pfanesteil incision ligature of newly formed vessels then dissection of posterior bladder wall, hysterotomy is done above placental margin, the entire placenta and invaded myometrium are removed in one surgical piece. In this way, uterine reconstruction is performed using healthy tissues.<sup>66</sup>

The uterine hemostasis is performed with a pair of square stitches following the technique. With the aim of preventing hematometra, a Hegar's bougy dilator no.10 is placed in the uterine cervix, which will move towards one of the sides. In this manner the application of a square stitch is easier, and the potential for accidental closure of the internal cervical os is minimized. Then repair of uterus in two layers. It is somewhat difficult to apply in all cases, time consuming and there are reports of intrauterine synechia following this procedure.<sup>66</sup>

### II. Two step procedure

Include leaving placenta *in situ* plus methotrxate injection at the operative time and follow up by weekly  $\beta$ -HCG level and MRI. The second step is delayed hysterectomy (Interval hysterectomy) after 6 weeks conservation with minimal blood loss. It had the complications of both conservative treatment and hysterectomy so it is not recommended.<sup>24,67</sup> Afia et al.<sup>68</sup> conducted a study to determine the outcome of interval hysterectomy compared to immediate caesarean hysterectomy. They found less blood loss, less visceral injuries, and better dissection in the group of delayed hysterectomy.<sup>68</sup>

### III. Shehata's simple procedures

It includes three simple procedures without major vessels ligations, the first step was double ligation of uterine artery on both sides before

and after placental removal, the second step was suturing the placental bed by two quadruple sutures and the third step was triple way Foley's catheter insertion through the cervix and inflation to 50 cc saline to compress lower segment and drain bleeding.<sup>45</sup>

## Conclusion

Conservative treatment in management of placenta accreta had changed greatly from the conventional leaving placenta in situ which had a lot of complications to uterine sparing techniques that have less operative time and lesser complications. These techniques are based on either resection of placental endometrial implantation site or compression sutures with pelvic devascularization or combination of both. Adjuvant procedures as Foley's catheter insertion or methotrexate administration may be required. Uterine sparing techniques are getting world wide acceptance and applicability. Researches on these techniques are going up every day till become standardized in management of placenta accreta.

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## Conflicts of interest

None.

## References

- Praveen Mohan, Sukhwinder Bajwa, Satish Sharma, et al. Placenta percreta – an obstetrician's nightmare. *Sri Lanka Journal of Obstetrics and Gynecology*. 2010;32(2):39–40.
- Frances E Likis, Nila A Sathe, et al. Management of Postpartum Hemorrhage. Comparative Effectiveness Reviews, No. 151. Agency for Healthcare Research and Quality, Rockville (MD) USA. 2015.
- American College of Obstetricians and Gynecologists. Placenta accreta. Committee Opinion No. 529. 2012
- Jolley JA, Nageotte MP, Wing DA, et al. Management of placenta accreta: a survey of Maternal–Fetal Medicine practitioners. *J Matern Fetal Neonatal Med*. 2012;25(6):756–760.
- Provansal M, Courbiere B, Agostini A, et al. Fertility and obstetric outcome after conservative management of placenta accreta. *Int J Gynaecol Obstet*. 2010;109(2):147–150.
- F Gary Cunningham, Kenneth J Leveno, Steven L Bloom, et al. (2014) *William's Obstetrics*. (24th edn). 2010;pp.806.
- Warshak CR, Eskander R, Hull AD, et al. Accuracy of ultra sonography and magnetic resonance imaging in the diagnosis of placenta accreta. *Obstet Gynecol*. 2006;108(3 Pt 1):573–581.
- Comstock CH, Love JJ Jr, Bronsteen RA, et al. Sonographic detection of placenta accreta in the second and third trimesters of pregnancy. *Am J Obstet Gynecol*. 2004;190(4):1135–1140.
- Comstock CH. Antenatal diagnosis of placenta accreta: a review. *Ultrasound Obstet Gynecol*. 2005;26(1):89–96.
- Palacios Jaraquemada JM, Bruno CH. Magnetic resonance imaging in 300 cases of placenta accreta: surgical correlation of new findings. *Acta Obstet Gynecol Scand*. 2005;84(8):716–724.
- Kanal E, Barkovich AJ, Bell C, et al. ACR guidance document for safe MR practices: 2007. ACR Blue Ribbon Panel on MR Safety. *American Journal of Roentgenology*. 2007;188(6):1447–1474.
- Warshak CR, Ramos GA, Eskander R, et al. Effect of Predelivery Diagnosis in 99 Consecutive Cases of Placenta Accreta. *Obstet Gynecol*. 2010;115(1):65–69.
- Eller AG, Bennett MA, Sharshiner M, et al. Maternal Morbidity in Cases of Placenta Accreta Managed by a Multidisciplinary Care Team Compared With Standard Obstetric Care. *Obstet Gynecol*. 2011;117(2 Part 1):331–337.
- Walker MG, Allen L, Windrim RC, et al. Multidisciplinary Management of Invasive Placenta Previa. *J Obstet Gynaecol Can*. 2013;35(5):417–425.
- Robinson CJ, Villers MS, Johnson DD, et al. Timing of elective repeat cesarean delivery at term and neonatal outcomes: a cost analysis. *Am J Obstet Gynecol*. 2010;202(6):632.e1–632.e6.
- Esakoff TF, Handler SJ, Granados JM, et al. PAMUS: Placenta accreta management across the United States. *J Matern Fetal Neonatal Med*. 2012;25(6):761–765.
- Wright JD, Silver RM, Bonanno C, et al. Practice patterns and knowledge of obstetricians and gynecologists regarding placenta accreta. *J Matern Fetal Neonatal Med*. 2013;26(16):1602–1609.
- Eller AG, Porter TF, Soisson P, et al. Optimal management strategies for placenta accreta. *BJOG*. 2009;116(5):648–654.
- Placenta accreta. Committee Opinion No. 529. American College of Obstetricians and Gynecologists. *Obstet Gynecol*. 2012.
- Tan CH, Tay KH, Sheah K, et al. Perioperative endovascular internal iliac artery occlusion balloon placement in management of placenta accreta. *AJR Am J Roentgenol*. 2007;189(5):1158–1163.
- Timmermans S, van Hof AC, Duvekot JJ. Conservative management of abnormally invasive placentation. *Obstet Gynecol Surv*. 2007;62(8):529–539.
- Courbiere B, Bretelle F, Porcu G, et al. Conservative treatment of placenta accreta. *J Gynecol Obstet Biol Reprod (Paris)*. 2003;32(6):549–554.
- Sentilhes L, Ambroselli C, Kayem G, et al. Maternal outcome after conservative treatment of placenta accreta. *Obstet Gynecol*. 2010;115(3):526–534.
- Kayem G, Davy C, Goffinet F, et al. Conservative versus extirpative management in cases of placenta accreta. *Obstet Gynecol*. 2004;104(3):531–536.
- Clausen C, Lonn L, Langhoff–Roos J. Management of placenta percreta: a review of published cases. *Acta Obstet Gynecol Scand*. 2014;93(2):138–143.
- Roulot A, Barranger E, Morel O, et al. Two– and three–dimensional power Doppler ultrasound in the follow–up of placenta accreta treated conservatively. *J Gynecol Obstet Biol Reprod (Paris)*. 2015;44(2):176–183.
- Fox KA, Shamshirsaz A, Carusi D, et al. Conservative management of morbidly adherent placenta: Expert Review. *Am J Obstet Gynecol*. 2015;213(6):755–760.
- Kim TH, Lee HH, Kwak JJ. Conservative management of abnormally invasive placenta: choriocarcinoma with uterine arteriovenous fistula from remnant invasive placenta. *Acta Obstet Gynecol Scand*. 2013;92(8):989–990.
- Pather S, Strockyj S, Richards A, et al. Maternal outcome after conservative management of placenta percreta at caesarea section: a report of three cases and a review of the literature. *Aust N Z J Obstet Gynaecol*. 2014;54(1):84–87.
- Legendre G, Zoulovits FJ, et al. Conservative management of placenta accreta: hysteroscopic resection of retained tissues. *J Minim Invasive Gynecol*. 2014;21(5):910–913.
- Hequet D, Morel O, Soyer P, et al. Delayed hysteroscopic resection of retained tissues and uterine conservation after conservative treatment for placenta accreta. *Aust NZ Obstet Gynaecol*. 2013;53(6):580–583.

32. Rein DT, Schmidt T, Hess AP, et al. Hysteroscopic management of residual trophoblastic tissue is superior to ultrasound-guided curettage. *J Minim Invasive Gynecol*. 2011;18(6):774–778.
33. Dilauro MD, Dason S, Athreya S. Prophylactic balloon occlusion of internal iliac arteries in women with placenta accreta: Literature review and analysis. *Clin Radiol*. 2012;67(6):515–520.
34. D'Souza DL, Kingdom JC, Amsalem H, et al. Conservative Management of Invasive Placenta Using Combined Prophylactic Internal Iliac Artery Balloon Occlusion and Immediate Postoperative Uterine Artery Embolization. *Can Assoc Radiol J*. 2015;66(2):179–184.
35. Butt K, Gagnon A, Delisle MF. Failure of methotrexate and internal iliac balloon catheterization to manage placenta percreta. *Obstetrics Gynecology*. 2002;99(2):981–982.
36. Bishop S, Butler K, Monaghan S, et al. Multiple complications following the use of prophylactic internal iliac artery balloon catheterisation in a patient with placenta percreta. *Int J Obstet Anesth*. 2011;20(1):70–73.
37. Pliskow S, Dai X, Kohner A, et al. J Conservative surgical management of placenta accreta: a report of 3 cases. *J Reprod Med*. 2009;54(10):636–638.
38. Chandrharan E, Rao S, Belli AM, Arulkumaran S The Triple-P procedure as a conservative surgical alternative to peripartum hysterectomy for placenta percreta. *International Journal of Gynecology and Obstetrics*. 2012;117(2):191–194.
39. Teixidor Vinas M, Belli A, Arulkumaran S, et al. Prevention of postpartum haemorrhage and hysterectomy in patients with Morbidly Adherent Placenta: A cohort study comparing outcomes before and after introduction of the Triple-P procedure. *Ultrasound Obstet Gynecol*. 2015;46(3):350–355.
40. Chandrharan E. Should the Triple-P procedure be used as an alternative to peripartum hysterectomy in the surgical treatment of placenta percreta? *Women's health*. 2012;8(4):351–353.
41. Waters EG. Surgical management of postpartum hemorrhage with particular reference to ligation of uterine arteries. *AJOG*. 1952;64(5):1143–1148.
42. O'Leary JL, O'Leary JA. Uterine artery ligation in the control of intractable postpartum hemorrhage. *AJOG*. 1966;94(7):920–924.
43. AbdRabbo SA. Stepwise uterine devascularization: a novel technique for management of uncontrolled postpartum hemorrhage with preservation of the uterus. *AJOG*. 1994;171(3):694–700.
44. Sherif El Shazly, Ahmed Badee, Mohammed Ali. The use of multiple 8 compression suturing as a novel procedure to preserve fertility in patients with placenta accreta: case series. *Aust N Z J Obstet Gynaecol*. 2012;52(4):395–399.
45. Ayman Shehata, Naglaa Hussein, Ahmed El-Halwagy, et al. Could Simple Procedures Minimize Hysterectomy in Management of Placenta Accreta? *Indian Journal of Obstetrics and Gynaecology Research*. 2015;2(4):213–217.
46. Salvat J, Schmidt MH, Guilbert M, et al. Vascular ligation for severe obstetrical hemorrhage: review of the literature. *J Gynecol Obstet Biol Reprod (Paris)*. 2002;31(7):629–639.
47. Gungor T, Simsek A, Ozdemir AO, et al. Surgical treatment of intractable postpartum hemorrhage and changing trends in modern obstetric perspective. *Arch Gynecol Obstet*. 2009;280(3):351–355.
48. Boynukalin FK, Boyar H, Gormus H, et al. Bilateral hypogastric artery ligation in emergency setting for intractable postpartum hemorrhage: a secondary care center experience. *Clin Exp Obstet Gynecol*. 2013;40(1):85–88.
49. Joshi VM, Otiv SR, Majumder R, et al. Internal iliac artery ligation for arresting postpartum hemorrhage. *BJOG*. 2007;114(3):356–361.
50. S Kelekci, Emre Ekmekci, Serpil Aydogmus, et al. A Comprehensive Surgical Procedure in Conservative Management of Placenta Accreta: A Case Series. *Medicine (Baltimore)*. 2015;94(7):e529.
51. Ahmed Shabana, Muhammad Fawzy, Waleed Refaie. Conservative management of placenta percreta: a stepwise approach. *Arch Gynecol Obstet*. 2015;291(5):993–998.
52. Iwata A1, Murayama Y, Itakura A, et al. Limitations of internal iliac artery ligation for the reduction of intraoperative hemorrhage during cesarean hysterectomy in cases of placenta previa accreta. *J Obstet Gynaecol Res*. 2010;36(2):254–259.
53. Palacios-Jaraquemada JM. Buttock Necrosis and Paraplegia after Bilateral Internal Iliac Artery Embolization for Postpartum Hemorrhage. *Obstet Gynecol*. 2012;120(5):1210.
54. Poujade O, Ceccaldi PF, Davitian C, et al. Uterine necrosis following pelvic arterial embolization for post-partum hemorrhage: review of the literature. *Eur J Obstet Gynecol Reprod Biol*. 2013;170(2):309–314.
55. Maassen MS, Lambers MD, Tutein Nolthenius RP, et al. Complications and failure of uterine artery embolisation for intractable postpartum haemorrhage. *BJOG*. 2009;116(1):55–61.
56. Al-Thunyan A, Al-Meshal O, Al-Hussaini H, et al. Buttock necrosis and paraplegia after bilateral internal iliac artery embolization for postpartum hemorrhage. *Obstet Gynecol*. 2012;120(2 Pt 2):468–70.
57. Doumouchtsis SK, Papageorghiou AT, Arulkumaran S. Systematic review of conservative management of postpartum hemorrhage: what to do when medical treatment fails. *Obstet Gynecol Surv*. 2007; 62(8):540–547.
58. Hwu YM, Chen CP, Chen HS, et al. Parallel vertical compression sutures: a technique to control bleeding from placenta praevia or accreta during caesarean section. *BJOG*. 2005;112(10):1420–1423.
59. Makino S, Tanaka T, Yorifuji T, et al. Double vertical compression sutures: A novel conservative approach to managing post-partum hemorrhage due to placenta praevia and atonic bleeding. *Aust N Z J Obstet Gynaecol*. 2012;52(3):290–292.
60. Elsayed DA. New Modified Cross B– Lynch Versus Classic B Lynch in Controlling Postpartum Hemorrhage. *International Journal of Science and Research*. 2015;4(5):600–606.
61. Cho JH, Jun HS, Lee CN. Haemostatic suturing technique for uterine bleeding during cesarean delivery. *Obstet Gynecol*. 2000;96(1):129–131.
62. Hayman RG, Arulkumaran S, Steer PJ. Uterine compression sutures: surgical management of postpartum hemorrhage. *Obstet Gynecol*. 2002;99(3):502–506.
63. Pereira A, Nunes F, Pedroso S, et al. Compressive uterine sutures to treat postpartum bleeding secondary to uterine atony. *Obstet Gynecol*. 2005;106(3):569–572.
64. Bhal K, Bhal N, Mulik V, et al. The uterine compression suture—a valuable approach to control major haemorrhage at lower segment caesarean section. *J Obstet Gynaecol*. 2005;25(1):10–14.
65. Zhu L, Zhang Z, Wang H, et al. A modified suture technique for hemorrhage during cesarean delivery complicated by complete placenta previa. *Int J Gynaecol Obstet*. 2015;129(1):26–29.
66. Palacios-Jaraquemada. *Postpartum hemorrhage*. (2nd edn). Chapter. 2004;31.pp.263–271.
67. Fay EE, Norquist B, Jolley J, et al. Conservative Management of Invasive Placentation: Two Cases with Different Surgical Approaches. *AJP Rep*. 2016;6(2):e212–e215.
68. Ansar A, Malik T, Shuja S, et al. Hysterectomy as a management option for morbidly adherent placenta. *J Coll Physicians Surg Pak*. 2014;24(5):318–322.