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Case Report

# Subsequent pregnancy following B-Lynch suture, bilateral ligation of uterine arteries, utero-ovarian arteries and internal iliac arteries due to uterine atony – A case report

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ABSTRACT

*Introduction:* Postpartum hemorrhage is currently the leading cause of death of birthing mothers in Poland. Uterine atony remains one of its major causes. Treatment of uterine retraction failure consists of application of B-Lynch suture, O-Leary uterine artery ligation, utero-ovarian arteries ligation and internal iliac arteries ligation.

*Aim:* The aim of this work was to present a case of a patient, in whom conservative surgical treatment for uterine atony allowed preserving fertility and subsequent pregnancy.

*Case study:* The authors report a case of a patient, in whom after cesarean delivery a postpartum hemorrhage was diagnosed during the fourth stage of labor due to uterine atony. After unsuccessful pharmacological attempts and performing dilation and curettage procedure, a decision about surgical treatment was made. During relaparotomy B-Lynch suture was applied and bilateral ligation of uterine arteries, its ovarian branches and internal iliac arteries was performed. After 19 months the patient was diagnosed with early pregnancy. During subsequent weeks uncomplicated course of pregnancy with normal fetal development was observed.

*Results and discussion:* Implementation of conservative surgical treatment in the course of postpartum hemorrhage allowed preserving fertility and subsequent pregnancy. The authors have analyzed the available literature on the conservative surgical treatment in postpartum hemorrhage.

*Conclusions:* In a group of selected patients with postpartum hemorrhage a risk of conservative surgical treatment, that gives the chance to preserve fertility, can be taken. This is of particular importance in women with further procreative plans.

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## 1. Introduction

Postpartum hemorrhage is defined by absolute blood loss of more than 500 mL/day following vaginal delivery and more than 1000 mL/day following a cesarean section. Excessive blood loss during the fourth stage of labor is currently the leading cause of death of birthing mothers in Poland.[17] Uterine atony, together with abnormal placental implantation, intrapartum birth canal injuries and coagulation disorders, remains one of the major causes of postpartum hemorrhage.[26] It is a postpartum complication that results from failure of the uterus to retract,[4] which leads to a significant blood loss and is a direct threat to the life of the mother.

Risk factors for uterine atony include above all: factors associated with uterine overdistention (multiple pregnancy, polyhydramnios, fetal macrosomia), labor related factors (prolonged labor, oxytocin augmentation of labor, retained placenta or placental fragments, cesarean delivery), use of uterine relaxants (magnesium sulfate, beta-agonists, nifedipine), as well as previous history of postpartum hemorrhages, obesity, age above 35 years, intrauterine infections.[11,17]

The primary function of the uterus is to provide the appropriate conditions for fetal development, which is associated with rich vascularity. The main arterial trunks include paired uterine arteries which are branches of the internal iliac arteries and ovarian arteries which most frequently arise directly from the abdominal aorta. Unusual connection between two vessels include arterio-arterial anastomoses between the ovarian and tubal branches of uterine arteries within the mesovarium and mesosalpinx. Such extensive vascularity provides a rich blood supply during pregnancy and early puerperium. In full-term pregnancy, uterine blood flow increases by about 30–50 times than pre-pregnant levels,[12] reaching 1000 mL/min, which constitutes 1/5 of the total cardiac output.[11] Thus, in case of atonic uterine hemorrhage, of particular importance are prompt and efficient measures that significantly increase patients chances of survival.[15]

Treatment of uterine atony involves pharmacological and surgical measures. Pharmacological treatment begins with the administration of uterotonic agents. If pharmacological measures fail to control the hemorrhage, surgical proceeding that consists of uterine compression and reduction of blood supply is indicated. Simultaneously, dynamic anti-shock measures and prevention of coagulation disorders are adopted.

The first stage of surgical intervention implemented after vaginal delivery includes uterine arteries ligation from vagina, i.e. Erwin and Chrobak's suture (possibly modified Hebisch and Huch).[17]

In case of ineffectiveness of measures taken in the first stage or in patients after cesarean delivery, invasive treatment is performed during laparotomy. It includes: application of B-Lynch suture, O'Leary uterine arteries ligation, utero-ovarian branch ligation and internal iliac arteries ligation. Internal iliac arteries ligation reduces blood flow in distal vessels by 50% with an 85% reduction of blood pressure in the arteries, which changes blood flow from arterial to venous and increases the chance of bleeding inhibition through blood clot formation.[24]

In case of ineffectiveness of the above procedures, hysterectomy as a life-saving surgery is recommended.

## 2. Aim

The aim of this work is to present a case of a patient, in whom conservative surgical treatment for uterine atony allowed preserving fertility and subsequent pregnancy.

## 3. Case study

A 29-year-old female was admitted as an emergency to the tertiary referral unit from a district hospital (first referral unit) due to persistent uterine bleeding and hypovolemic shock developing in the course of uterine atony. There was a history of a cesarean section performed 5 hours earlier in first pregnancy at ±39 weeks of gestation due to lack of progress in labor. Pregnancy history was uncomplicated, and medical history unremarkable.

On admission, the patient was in a serious condition, HR=123 beats/min, RR=90/50 mm Hg. The patient was conscious and somnolent. In addition, pale skin, soft abdomen , painless, peritoneal symptoms negative, and cesarean section wound sutured intradermally. Gynecological examination showed the tendency for the uterus to relax and symptoms of persistent uterine bleeding.

Treatment stimulating uterine contraction was implemented. Pharmacological preparations with different mechanism of action were used (Oxytocin, Nalador, Cytotec), accompanied by intense uterine massage. In parallel, radical anti-shock and antithrombotic treatment was carried out (crystalloids, colloids, RCC, FFP).

Due to ineffectiveness of the above measures, persistent bleeding and ultrasound image (wide uterine cavity filled with mixed echogenic masses), the patient was qualified for instrumental inspection of the uterine cavity. Under general anesthesia dilation and curettage was performed, evacuating approximately 800 mL of blood clots and liquid blood from the uterine cavity. The material also contained small fragments of afterbirth. After the procedure, anti-shock management was continued (RCC, FFP, Novo-Seven).

Two hours after the procedure the general condition of the patient was defined as fair. At the time of the assessment: HR=90–115 beats/min, RR=115/65 mm Hg, hourly diuresis=35 mL/min. The patient was conscious but weak. Her skin was pale and clammy. Vaginal bleeding was observed again −500 mL of fresh, not properly clotted blood with uterine atony. The patient was qualified for reoperation of the abdomen (possible ligation of uterine arteries and hysterectomy as a last resort to save the patient's life).

During relaparotomy, after uterine sutures had been removed, uterine cavity was opened and a thorough manual inspection was performed. Placental site was visualized on the anterior uterine wall, numerous bleeding sites were observed; thus, in an attempt to reduce bleeding bilateral tying and ligation of ascending branches of the uterine arteries with O'Leary technique was performed. Then, after careful suturing of the uterine wound with single sutures a typical fast absorbable B-Lynch suture was applied, forcing muscle compression. Despite these measures, combined with administration of oxytocics, pathological bleeding was

still observed. Utero-ovarian ligaments (that contain ovarian branches of uterine arteries) were ligated, limiting blood flow to the uterus from ovarian arteries. In the next stage, after dissection of retroperitoneal space, careful localization of ureters and certain vascular trunks, a bilateral ligation of anterior trunk of the internal iliac artery was performed in order to inhibit blood flow through major arteries that supply the uterus.

As a result of conducted procedures, forced compression of the uterus was obtained and the bleeding was arrested. A drain was left in the abdomen. During the subsequent postoperative hours condition of the patient was improving, uterus was shrunk, and pathological vaginal bleeding was not observed.

Making a decision on the above proceedings, possibility of failure was taken into account – necessity of hysterectomy or complications such as pyometrium, partial or total uterine necrosis, intrauterine adhesions.

During hospital stay antithrombotic prophylaxis, antibiotics and analgesics were used. On the fifth day following surgery the patient was discharged home in good general condition, with an intact uterus. After two weeks the patient returned for a follow-up. The uterus was shrunk with the size adequate for the duration of puerperium, with no clinical signs of infection, and sonographically unchanged. Abdominal wound was healing properly.

Nineteen months after hospitalization, patient visited obstetric-gynecologic outpatient clinic due to amenorrhea. In the uterine cavity a gestational sac with live embryo was demonstrated, with the size corresponding to 6–7 weeks pregnancy. Further appointments took place in 10, 13, 17, 22, 27, 31, 35, and 37 weeks gestation (a total of nine appointments), when proper development of the fetus and no pregnancy complications were observed.

The patient was admitted to maternity unit at 38 weeks gestation in order to monitor peri-delivery period. After 4 days of hospitalization, at 39 weeks gestation, the patient gave birth through a cesarean section to a full-term live baby boy, weighing 3400 g, length 56 cm, 10 Apgar score. During a cesarean section besides a few peritoneal adhesions no evident pathologies within minor pelvis and genital tract were found. The uterus had shrunk properly. Early postpartum period without complications was observed.

After four weeks of delivery, during a follow-up visit, clinical and ultrasound examination showed good condition of the reproductive organ.

## 4. Results and discussion

The authors have analyzed the available literature on the subject. In 2012 Capmas presented results of studies conducted in 175 women who underwent ligation of internal iliac arteries (85) or embolization of uterine arteries (90) due to postpartum hemorrhage. For both treatment methods prospective studies did not show any negative effect of either procedure on menses, fertility or subsequent pregnancy outcome.[5] In the study a relatively high recurrence rate of hemorrhage was however observed: 26% of cases following ligation of internal iliac arteries and 39% following embolization of uterine arteries.

In material published in 2011, Mathlouthi denied the ligation of internal iliac arteries due to postpartum hemorrhage being the cause of secondary infertility. In his studies, 34 women were examined, in whom 39 pregnancies were observed, including 30 full-term, 1 ectopic pregnancy and 8 miscarriages.[25]

In his work of 2011 Unal has analyzed cases of 58 women who underwent internal iliac arteries ligation between 1997 and 2008, as a result of severe preeclampsia with coagulopathy during postpartum hemorrhage due to uterine atony. Study patients underwent ligation of internal iliac arteries. Out of 58 patients, 30 patients wished to preserve their reproductive potential and 17 (56.7%) became pregnant within 1 year. On this basis, bilateral internal iliac artery ligation was considered a safe, effective and life-saving procedure in control of a massive postpartum hemorrhage that allows to preserve fertility. According to Unal, this should be the method of first choice in young women.[25]

Fotopoulou in his research in 2011 has analyzed publications available in medical databases (PubMed and EMBASE) regarding compression sutures applied on the uterus due to postpartum hemorrhages. The purpose of this analysis was to assess effectiveness, possibility of complications and effect on fertility. Review of the available publications demonstrated high efficacy of compression sutures applied on the uterus due to postpartum hemorrhage with low incidence of complications. Slightly higher risk of uterine ischemia was reported for concomitant internal iliac artery ligation. These studies did not confirm any negative impact on patients fertility[8].

Goojha,[9] Akoury[1] and Mahajan[13] report isolated cases of complications following uterine compression sutures (B-Lynch). These included predominantly: development of Asherman's syndrome (that could be the cause of secondary infertility), intrauterine infections, pyometrium and partial myometrial necrosis.

Pubmed database contains isolated case reports of pregnancy after simultaneous application of B-Lynch suture and bilateral internal iliac artery ligation.[2,20,21]

Both bilateral internal iliac artery ligation and uterine compression sutures seem to represent a safe method that allows to preserve reproductive potential[3,6,16,22,23]. They provide
an alternative to hysterectomy. Concomitant use of these techniques and its effect on fertility require however further studies.

## 5. Conclusions

Analysis of the above case and the available literature clearly demonstrate that in the case of ineffectiveness of pharmacological treatment for uterine atony and associated hemorrhage, a primary treatment should include surgical procedures aiming at reduction of blood flow and uterine contraction.

The use of absorbable sutures in the discussed case has on one hand allowed extemporaneous inhibition of bleeding and retraction of the uterus and on the other hand enabled

development of collateral circulation in subsequent weeks of puerperium, and with time, recanalization of previously closed vessels. Such management has thus allowed the presence and normal course of subsequent pregnancy.

In the selected group of patients, a risk of conservative surgical management that gives a chance to preserve fertility is worth taking. This is of particular significance in case of women who have further procreative plans.

## Conflict of interest

None declared.

## REFERENCES


[1] Akoury H, Sherman C. Uterine wall partial thickness necrosis following combined B-Lynch and Cho squaresutures for the treatment of primary postpartum hemorrhage. *Obstet Gynaecol Can*. 2008;30(5):421–424.

[2] Api M, Api O, Yayla M. Fertility after B-Lynchsuture and internal iliac artery ligation. *Fertil Steril*. 2005;84(2):509.

[3] Blanc J, Courbiere B, Desbriere R, Bretelle F, Boubli L, d'Ercole C, et al. Is uterine-sparing surgical management of persistent postpartum hemorrhage truly a fertility-sparing technique? *Fertil Steril*. 2011;95(8):2503–2506.

[4] Breborowicz G. *Położnictwo i Ginekologia, t. 1 [Obstetrics and Gynecology]*. Warszawa: PZWL; 2008.

[5] Capmas P, Picone O, Musset D, Frydman R, Fernandez H. Fertility and pregnancy outcome following invasive management of severe postpartum hemorrhage. *J Gynecol Obstet Biol Reprod (Paris)*. 2012;41(3):298–306.

[6] Chelli D, Boudaya F, Dimassi K, Gharbi B, Najjar I, Sfar E, et al. Internal iliac artery ligation for post-partum hemorrhage. *Gynecol Obstet Biol Reprod (Paris)*. 2010;39(1):43–49.

[8] Fotopoulou C, Dudenhausen JW. Uterine compression sutures for preserving fertility in severe postpartum haemorrhage: an overview 13 years after the first description. *J Obstet Gynaecol*. 2010;30(4):339–349.

[9] Goojha CA, Case A, Pierson R. Development of Asherman syndrome after conservative surgical management of intractable postpartum hemorrhage. *Fertil Steril*. 2010;94(3): 1098.e1–1098.e5.

[11] Drews K, Słomko Z. *Krwotoki położnicze [Obstetric Hemorrhages]*. Warszawa: PZWL; 2010.

[12] Dłużniewski M, Grzywanowska-Łaniewska I, Wielgos M. *Ciąża problem internisty i kardiologa [Pregnancy – An Issue of Internist and Cardiologist]*. Lublin: Czelej; 2012.

[13] Mahajan NN, Akoury H, Sherman C. Uterine wall partial thickness necrosis following combined B-Lynch and cho squaresutures for the treatment of primary postpartum hemorrhage. *Obstet Gynaecol Can*. 2008;30(12):1100–1101.

[15] Mathlouthi N, Ben Ayed B, Dhouib M, Chaabene K, Trabelsi K, Ayadia M, et al. Obstetrical prognosis following ligation of internal iliac arteries. *Tunis Med*. 2011;89(10):762.

[16] Ouahba J, Piketty M, Huel C, Azarian M, Feraud O, Luton D, et al. Uterine compression sutures for postpartum bleeding with uterine atony. *BJOG*. 2007;114(5):619–622.

[17] Recommendations of Polish Gynecological Society – Postpartum hemorrhage [Rekomendacje Polskiego Towarzystwa Ginekologicznego – Krwotok poporodowy] Ginekol Dyplom; 2008 (special issue):93-96.

[20] Sentilhes L, Gromez A, Marpeau L. Fertility after pelvic arterial embolization, stepwise uterine devascularization, internal iliac artery ligation, and B-Lynch suture to control postpartum hemorrhage. *Int J Gynaecol Obstet*. 2010;108(3):249.

[21] Sentilhes L, Gromez A, Trichot C, Ricbourg-Schneider A, Descamps P, Marpeau L. Fertility after B-Lynch suture and stepwise uterine devascularization. *Fertil Steril*. 2009; 91(3):934.

[22] Shahin AY, Farghaly TA, Mohamed SA, Shokry M, Abd-El-Aal DE, Youssef MA. Bilateral uterine artery ligation plus B-Lynch procedure for atonic postpartum hemorrhage with placenta accrete. *Int J Gynaecol Obstet*. 2010;108(3):187–190.

[23] Sziller I, Hupuczi P, Papp Z. Internal iliac artery ligation for severe hemorrhage in obstetric patients. *J Perinat Med*. 2007.

[24] Słomko Z, Drews K, Poreba R. *Ciecie casarskie [Cesarean Section]*. Polskie Towarzystwo Ginekologiczne; 2011.

[25] Unal O, Kars B, Buyukbayrak EE, Karsidag AY, Turan C. The effectiveness of bilateral internal iliac artery ligation for obstetric hemorrhage in three different underlying conditions and its impact on future fertility. *J Matern Fetal Neonatal Med*. 2011;24(10):1273–1276.

[26] Uszynski M. *Klasyczne i nowo poznane koagulopatie położnicze [Classic and Novel Obstetric Coagulopathies]*. Warszawa: Urban & Partner; 2003.