MEDİKAL TEDAVİYE YANITSIZ OBSTETRİK KANAMALI OLGULARDA SIRALI UTERİN ARTER DEVASKÜLARİZASYON SONUÇLARI

Stepwise Uterine Artery Ligation Results In Patients With Postpartum Bleeding Unresponsive To Medical Treatment

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ÖZET

Amaç: Sezaryen ameliyatlarinda karsilasilan ve kontrol edilemeyen kanamalari yonetmede proksimal ve distal uterin arter ligasyonun terapotik etkinligini tanimlamak

Dizayn: Retrospective study.

Gereç ve Yöntem: Sezaryen ile dogum yapan ve peroperatif kontrol altina alinamayan kanama ile karsilasilan 65 kadin incelendi.Bu hastalarin tedavisinde proksimal uterin arter ligasyonu ,distal uterin arter ligasyonu ya da hem proksimal hem de uterin arter ligasyonu altta yatan nedenlere gore uygulandi.Bunlara ragmen kanamanin persiste ettigi olgulara bilateral hipogastrik arter ligasyonu ve kanama halen devam ediyorsa histerektomi uygulandi.

Sonuçlar: 61 hastanin kanamasi yalnizca uterin arter ligasyonu ile(proksimal uterin arter ligasyonu,distal uterin arter ligasyonu ya da distal/proksimal uterin arter ligasyonu) kontrol altina alindi.4 akreta tanili hastaya uterin arter ligasyonuna ek olarak hipogastrik arter ligasyonu ve histerektomi operasyonu uygulandi .Distal uterin arter ligasyonu cogunlukla uterin atoni nedenli kanamalarda etkin iken ,proksimal uterin arter ligasyonu ya da distal ve proksimal uterin arter ligasyonu plasenta previa ya da akreta nedenli kanamalarda tedavi saglamistir.32 akreta tanili hastanin 24 tanesine hem proksimal uterin arter ligasyonu hem distal uterin arter ligasyonu ,4 tanesine proximal uterin arter ligasyonu, 4 tanesine de histerektomi uygulanmistir.

Tartışma: Sezaryen sirasinda karsilasilan kontrol altina alinamayan kanamalarda uterin arter ligasyon teknigi basarili,emniyetli ve hayat kurtarici bir islemdir.Ozellikle plasenta akreta ya da previa gibi uterusu korumanin cok guc oldugu vakalarda bulgularimiz proksimal arter ligasyonunun yararli oldugunu göstermistir.

Anahtar kelimeler: *Uterin arter Ligasyonu; Proksimal uterin arter Ligasyonu; Distal uterin arter Ligasyonu; Obstetrik kanama; Plasenta akreta; Uterin atoni*

ABSTRACT

Objective: To describe the therapeutical efficiency of proximal and distal uterine artery ligations performed to treat uncontrolled bleeding encountered during cesarean section operations.

Design: Retrospective study.

Materials and Method: 65 parturient women delivered by cesarean section. An uncontrolled peroperative bleedings were encountered. Uterine artery ligations were performed proximally , distally or both segments depending on the etiology. In cases where the bleeding could not be controlled, hypogastric artery ligations ; and if persistent, a hysterectomy was performed.

Results: 61 patients were treated with uterine artery ligations (proximal uterine artery ligation, distal uterine artery ligation or distal/proximal uterine artery ligation). An additional hypogastric artery ligation was required in 4 accreta cases where a hysterectomy was needed, as well. While distal uterine artery ligations could treat most atony cases, proximal uterine artery or distal/proximal uterine artery ligation were effective in treating bleeding due to placenta accreta and/or previa. Of 32 accreta cases; 24 were treated with distal/proximal uterine artery ligation; 4 with proximal uterine artery ligation, only; and in 4, a hysterectomy was performed.

Discussion: Uterine artery ligation techniques are successful, safe and life saving interventions for treating uncontrolled bleeding during cesarean section. Especially in conditions where uterus preservation is considered to be difficult due to placenta accreta and/or previa, our findings show that proximal uterine artery ligation can provide an added benefit for the patient.

Keywords: *Uterine artery ligation,; proximal uterine artery ligation; distal uterine artery ligation; obstetrical bleeding;placenta accreta;uterine atony*

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Geliş tarihi/Received: 01.12.2018
Kabul tarihi/Accepted: 18.01.2019
DOI: 10.16919/bozoktip.491115

Bozok Tıp Derg 2019;9(3):32-8
Bozok Med J 2019;9(3):32-8

INTRODUCTION

Peripartum-postpartum bleeding is one of the most common causes of obstetrical morbidity and mortality in developing countries. Fourteen million cases of postpartum hemorrhage (PPH) occur worldwide each year, with a case mortality rate of %1; this, representing a total of 140000 women, and from another perspective one maternal death every 4 minutes [1]. The upper limit for normal bleeding for vaginal deliveries is accepted as 500ml and for cesarean sections, as 1000ml [2].

In cases where PPH can not be managed expectantly or medically, a surgical intervention is usually required. This surgical intervention is a UAL; uterine artery embolization; external compression sutures (B-Lynch, Hayman, Cho); bilateral Hypogastric Artery Ligation; and finally, hysterectomy [3]. Following the first report of the use of uterine artery ligation to control bleeding by Waters, many authors reported the effective use of this modality with failure rates within 0 to 20% [4]. It has been proposed that in cases of uncontrolled bleeding, UAL may be an appropriate alternative where the uterine vessels have lost their inherent capability of constriction [5].

The main objective of this study is to define the additional therapeutical benefit of proximal UAL, as well as that of distal UAL and distal/proximal UAL to medical measures and hypogastric artery ligations, in treating uncontrolled bleeding during cesarean section while circumventing the need to perform a hysterectomy.

MATERIALS AND METHOD

This study is a retrospective study of 65 cesarean sections (among 6776 day time cesarean section cases) who delivered at the Istanbul Suleymaniye Maternity Hospital in the 48 months period, (2006-2009).During this time if an uncontrolled excessive bleeding was encountered during day-time surgery or a patient having been diagnosed as one of uterine atony, placenta previa or placenta previa/accreta was referred to our clinic , this cases were regularly referred to one of 4 specific surgeons for the uterine artery ligation algorithm to be carried out. Cases with iatrogenic uterine injuries, preoperative preeclampsia related coagulopathies, pregnancies with premature ruptured membranes who needed to be treated with surgical hemostatic techniques or any patients who were not operated by any one of the 4 consultants were not included in the study.

The patients were systematically treated with a proximal UAL, distal UAL or a distal/proximal UAL during the operation.

The study was approved by the Hospital ethics committee and informed consent forms of all our cesaerean sections operations were revised accordingly to include approval of the patients for the distal UAL, proximal UAL and distal/proximal UAL, if necessary. Excessive bleeding was defined as bleeding exceeding 1000ml which is regularly reported in the patient files, taking the number of blood soaked drapes/gauzes used and blood aspirated into account.

Stepwise approach to cases of atony in our hospital included: Massage manually; 40 Units of Oxytocin in 1000ml IV fluid; methyl ergonovine maleate 0,2mg im (unless the patient is hypertensive); and misoprostol 400 microgram, rectally. If the patients had responded to one these measures they were not included in our study..In cases where these former measures had not been able to control the bleeding, surgical measures took the turn. In cases where placental insertion abnormalities and/or placenta previa was present, surgical intervention was initially used to control the bleeding without conservative measures. Uterine artery ligations were carried on two segments: the proximal and the distal. In atony related hemorrhages; first the distal and if the bleeding persisted, the proximal segment was ligated as well. In lower segment hemorrhages; the first step was proximal and if this was not enough, the distal segment was ligated, as well. (No:1) Absorbable suture material was used for uterine artery ligations. The technique for distal segment uterine artery ligation (dUAL): While the uterus is kept under traction towards the counter and cephalic directions, a window is created through the broad ligament to expose the distal uterine (ascending) vascular pedicle, and a transverse suture is passed through the myometrium anterior to posterior or posterior to anterior directions, just below the level of the transverse ceasarean incision, while preserving

the bladder and the rectum and the suture tied over the distal (ascending) uterine vascular pedicle. The technique for proximal uterine artery ligation (pUAL): A window is created through the broad ligament in a similar way. At the base of this window the ureter is defined and freed laterally and downwards, towards the tunnel. Having mobilized and secured the bladder, a suture is passed obliquely through the myometrium in the anterior to posterior direction at just about the level of the insertion of the sacrouterine ligaments, about 6-7 cm below the level of the cesarean incision, medial to the ureteric tunnel, to encompass the main branch of the uterine artery and proximal to its forking to give the cervicovaginal and rectovaginal branches, hence to be able to better control lower segment hemorrhages. In all cases where excessive bleeding could not be controlled by these measures, bilateral hypogastric artery ligation (HAL) or in even further persistence of the hemorrhage, a hysterectomy was eventually performed. Postoperative follow up findings were noted. All 4 hysterectomy specimens were confirmed as placenta invasion abnormalities(placenta accreta).

RESULTS

Of 6776 cesarean deliveries performed at day time within the time period 2006-2009, 65 patients (65/6776; 1%) had suffered perioperative bleeding which did not respond to any of the conservative or regular medical measures and were treated with an additional surgical intervention. Table 1 summarizes the basic characteristics of the patients included in this study.

Table 1: Demographic data of the patient group:

Gestational age	36,96±3,77	23,3-42,1
Maternal Age	29,4±4,6	18-37
Parity	1,24±1,09	0-5
Gravidity	2,7±1,4	1-7
Abortus	1,8±1,5	0-5
Number of previous caesarean sections	0,5±0,7	0-2
Birth Weight (gm)	2932,1±907,2	640-4130
Preoperative Hematocrit	35±3,5	28,3-41,2

Of the patients who encountered uncontrolled excessive bleeding during cesarean section, the presumed etiologies were: 32 placenta accreta, 14 were placenta previa, and 19 had uterine atony.

The flowchart and the summary for the therapeutical vessel ligations performed to control bleeding were as in (Tables 2,3). In summary, of 19 uterine atonies: none which had responded to conservative measures; 12 was controlled with only dUAL; and in 7 an extra proximal UAL was required to control the bleeding; none required hypogastric artery ligations or hysterectomy; uterine preservation was 100% successful. Of (32 / 14) placenta previa and/or accreta cases, respectively; (28/10) responded to proximal UAL only; (4,0) responded to an additional distal UAL and in 4 placenta accreta cases, Hypogastric Artery Ligation was carried out by which the bleeding could not be controlled and hysterectomy was performed for all 4 of these cases. Uterine preservation was 100% for placenta previa and 0% for the placenta accreta cases. The differential hematological findings due to operation were similar in the 3 groups (Table 4).

Only the hospitalization time for the hypogastric artery ligation/hysterectomy group was longer than the other 2 groups. Of 2 patients who had distal/proximal UAL+Hypogastric Artery Ligation+Hysterectomy with a diagnosis of placenta accreta: one patient was interned in the Intensive Care Unit for 7 days and eventually passed away due to DIC and multiple organ failure; one other patient went through a stage of acute renal failure postoperatively and recovered after receiving hemodialysis for 2 months. No complications were observed due to distal UAL or proximal UAL. Only one surgical complication of bladder injury was observed in a case where a hysterectomy was required. In the long term followup only 34 of the patients whose uteruses were preserved were contacted. 10 of these women were not wishing for another baby. Of the 24 rest 4 had successfully completed gestations within the postoperative 12-30 months.

Table 2: Flowchart summary of the surgical interventions and clinical outcomes

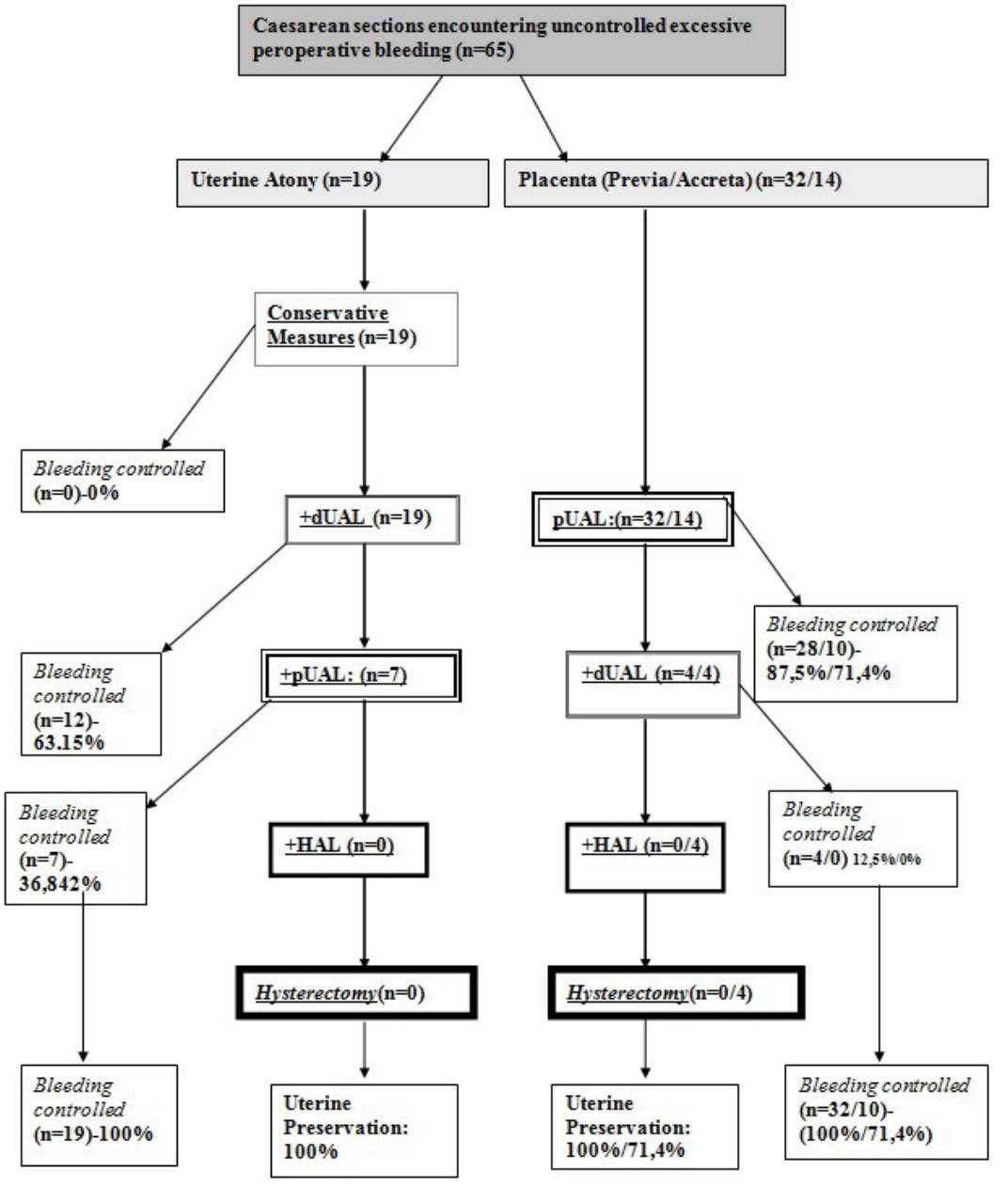

Table 3: Interventions used to control bleeding in the 3 hemorrhagic etiology groups during cesarean section:

Peroperative presumed Cause for Bleeding	(n)	Vessel Ligation Performed				
		dUAL	pUAL	dpUAL	HAL	Hysterectomy
Previa group	14	0	10	4	0	0
Accreta group	32	0	18	14	4	4
Atony group	19	12	7	3	0	0

Table 4: Comparison of the clinical outcome for different surgical

		N	Mean±Std.Dev.	95% Confidence Interval for Mean
Hematocrit drop*	**dUAL**	12	7±5,5	1,2-12,7
	pUAL	35	9,2±4,4	6,6-11,7
	dpUAL	14	7±2,2	4,9-9
	HAL/Hyst	4	9,5±4,5	6,0-12,8
	Total	***65***	*8,1±4,2*	***6,4-9,8***
Postop platelet count$^{\alpha}$	**dUAL**	12	194333,3±70950	119876-268790
	pUAL	35	169427,8±62914	138141-200714
	dpUAL	14	223428,6±49749	177418-269438
	HAL/Hyst	4	162000	118000-197000
	Total	***68***	***186441,9±63893***	***163005-209878***
Hospitalization Time	**dUAL**	12	2,3±0,2	1,8-2,9
	pUAL	35	3,3±1,9	2,4-4,3
	dpUAL	14	3,1±1,6	1,9-4,3
	HAL/Hyst$^{\beta}$	4	5±1,6	3,5-6,4
	Total	***68***	***3,1±1,7***	***2,5-3,7***

*,α,: no significant difference among different treatment modalities
β: the hospitalization for the HAL/Hys group was significantly longer than the other groups

DISCUSSION

Excessive hemorrhage during ceasarean section is basically defined as blood loss exceeding 1000ml and massive hemorrhage over 2500ml based on the judgment in our case, of the amount by regarding the blood in the suction bottle and soaked swabs/ linens [6]. In our study we prefer to use the term 'uncontrolled bleeding' because the point when we decided additional surgical intervention was necessary was either at the first scene following cesarean delivery or at the point when the cesarean incision was closed and bleeding persisted after all effort were made to ensure bleeding control.

About 73% of maternal mortality caused by bleeding in the peripartum period have been found to be 'preventable' retrospectively [7,8]. Interestingly, the mortality rate is much higher for emergency cesarean section related hemorrhages than elective ones (41% vs 17,3% of the 3,7:1000 mortality) [9]. This may explain our favorable outcome because all our cesarean sections were nonemergency cases and the surgical vessel ligation procedures were performed by 4 specific surgeons.

Common causes for peroperative hemorrhage are uterine atony, abnormal placentation, infection and iatrogenic uterine injuries. In our study, we analyzed cases with uterine atony, placenta previa and placental invasion abnormalities, namely placenta accreta. The initial approaches can include medications to increase uterine tonus, antifibrinolytics, thrombogenic medications (FVII) and mechanical massage. If these measures have failed to control the bleeding, invasive radiology or surgical approaches are immediately in order. Organ (uterine/ovarian) preservation aversing the choice of hysterectomy should be the priority provided that application of the bleeding control technique is timely and safe enough. The conservative surgical approaches may be uterine compression sutures, uterine/pelvic vessel ligations and (total/subtotal) hysterectomy. In cases where abnormal placentation, coagulopathy, hemodynamic abnormalities or active intraabdominal bleeding are observed; surgery should be the first choice. For the uterine atonies who were not successfully treated with medical measures, the next conservative surgical option should be the uterine compression sutures

[10]. About 50-60% percent of these patients respond favorably; however, for the rest, intrauterine balloon or vessel ligation techniques should be used [11]. For the sandwich technique comprised of the combination of uterine compression sutures and the intrauterine balloon the success rate is (95%) in groups mostly comprised of uterine atony cases [12]. In cases where these measures fail, the next alternative is vessel ligation techniques. Having lost precious time and blood in the meantime, the additional ligation of the uterine vessels has been reported to be gravely associated with the complication of uterine necrosis. Vessels ligated are the uterine vessels and the ovarian vessels. Massive ligation of the uterine vascular pedicle has been described by Waters and O'Leary which included a suture passed through the lateral border of the uterus and through the avascular segment of the broad ligament between the uterine vascular pedicle and rhe ınfundibulopelvic ligament [4,13]. This technique does not require the opening of the broad ligament or identification of the uterine vessels or the ureter. The technical variation, requiring the opening of the broad ligament to visualize the uterine vessels or the ureter is actually made for hemorrhages due to lateral or lower tears of the myometrium, being iatrogenic or not. In our study, we opened the broad ligament window in all the cases, and in cases where we ligated the proximal uterine artery segment or the lower uterine artery segment just above and medial to the ureter proximal to the cervicovaginal and rectovaginal branching , the ureter was dissected until into the ureteric tunnel. Tsirulnikov et al., in 1979, defined the triple vessel ligation technique, which involved the ligation of the distal uterine artery, the round ligament artery and the uteroovarian ligament ligations, with a success rate of 100% in a group of parturients with uterine inertia [14]. Abdrabbo et al. then defined the technique of stepwise uterine artery devascularization as being 100% successful, namely without major morbidity, mortality or having the need for hysterectomy. The stepwise technique is comprised of the orderly treatment steps of bilateral distal uterine artery ligations (dUAL) as O'Leary; followed by bilateral proximal uterine artery ligations (pUAL) as described in our technique; if still persistent, followed by ligation of the ovarian vessels (infundibulopelvic ligaments). In the original publication, the treatment has been shown to be effective for hemorrhages due to uterine inertia [15]. This stepwise technique has been reported to cause ovarian failure by Sentilhes et al. [16]. Conservative surgical measures may fail mainly if the bleeding is too brisk, a systemic coagulopathy has developed or is already present or if a lower segment bleeding not controlled because the cervicovaginal/ rectovaginal branches of the uterine artery are bleeding. Bilateral hypogastric artery ligations can be attempted which is may be technically challenging with complication rates of 3-5% and not a very assuring success rate of 50% preventing hysterectomy [17]. In our group, all the patients who were treated with hypogastric artery ligations when distal/proximal UAL was not enough to control the hemorrhage, also had to have a hysterectomy. Hence, if distal/proximal UAL was not enough hypogastric artery ligation did not add any benefit but complication risks [18]. The risk at this point is being too late to make a decision to perform a hysterectomy which in itself has significant rate of complications (bladder injury: 4%; ureteral injury:4%) and high rates of morbidity [19,20] Our study underlines the significance and the benefit of considering bilateral ligation of the proximal uterine artery branch right after the bilateral distal branch ligation, contrary the Abdrabbo technique of stepwise ligations where proximal UAL is not a step or the stepwise approach proposed by Morel et al. where proximal branch ligation is addressed but suggested as the last step, by when, even more time and blood will have been lost [21,15] Studies about vessel ligations to treat intractable hemorrhages can not possibly be randomized in emergency hemorrhagic patient groups; and control cases are not possible to be assigned. What we have in the literature are case/group studies or systematic observation studies as scientific evidence. Our study's limitation is being a retrospective study as the patients are diagnosed with postpartum hemorrhages who can not be randomised . Besides defining the significance of proximal UAL as a second choice to distal UAL in the treatment of intractable preoperative bleeding, the optimism of our results should also draw attention to the essence of preoperative risk assessment for a peroperative hemorrhage before a cesarean section to make available the specific surgical/anesthesiology

team, surgical equipment, blood components and central vessel lines. It would be interesting to study the fertility outcome and closely survey endometrial functions and perform doppler studies of the uteruses in the distal/proximal uterine artery ligation group, which are subjects of further studies.

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