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Management, Clinical Course and Treatment Outcome of Postpartum Uterine Atony

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Abstract

Objective: By reporting a case series from a referral hospital we aimed to determine the treatment options and outcomes of one of the serious complications of the labour uterine atony refractory to the medical treatment.

Material and Method: In this study, a total of 58 postpartum uterine atony cases refractory to uterotonic treatment and managed with intrauterine balloon tamponade, B-Lynch suture, internal iliac artery ligation or hysterectomy was a retrospectively analyzed.

Results: Initially, thirty two cases managed with intrauterine Bakri balloon tamponade and six B-Lynch compression sutures alone, in eight cases both procedures were done together. Eight cases managed with internal iliac artery ligation and four hysterectomies. Our success rate with intrauterine Bakri balloon tamponade, B-Lynch compression suture and internal iliac artery ligation were 84.4%, 83.3%, 75% respectively in stopping postpartum haemorrhage regarding uterine atony and the most successfull rate was obtained with the Bakri balloon tamponade in the combination with B-Lynch compression suture 87.5%. The median estimated blood loss was 2018 ml, intraoperative median hemoglobin was 5.8 mg/dl and the median amount of blood transfused was five units, the median volume infused into balloon was 285ml; balloon was in place for a median duration of 36 hours. In 6 cases Bakri balloon tamponade with or without B-Lynch compression sutures failed to stop haemorrhage and hysterectomy required. In two patients Asherman's syndrome and infertility, in two patients' amenore were developed and uterine prolapse was observed in 2 patients, one of which was uterine necrosis. No maternal mortality was observed.

Conclusion: In the management of postpartum haemorrhage regarding uterine atony balloon tamponade of uterus especially with compression sutures is the most effective, rapid, easy and fertility preserving technique. It also gives us time for more complex interventions if we cannot control the bleeding.

Keywords: Bakri balloon tamponade; B-Lynch suture; Postpartum haemorrhage; Uterine Atony

List of abbreviations: BBT: Bakri Balloon Tamponade; BMI: Body Mass Index; ICU: Intensive Care Unit; PPH: Postpartum Haemorrhage; SPSS: Statistical Package for Social Sciences

Introduction

Postpartum haemorrhage (PPH) due to uterine atony is still one of the most critical complications of labour all over the world. Uterine atony is defined as a failure of the uterus to contract after delivery, as appropriate [1]. Since uterine atony is the most common cause of PPH, in acute uterine atony cases for reducing maternal mortality effective interventions alternative to hysterectomy are needed [2]. A phased approach to achieving effective uterine contractility is an integral part of any protocol to manage postpartum haemorrhage. The initiative management of uterine atony is medical treatment with uterotonics, uterine massage and immediate blood replacement [3,4]. Surgical intervention is of vital importance when conservative methods fail or in hemodynamic instability. Conventional surgical techniques include uterine artery ligation, internal iliac artery ligation and hysterectomy [5]. These procedures require surgical expertise and hysterectomy means irreversible loss of fertility. For this reason, the effectiveness of conservative management options should be searched. As for conservative management uterine balloon insertion (internal tamponade) with or without uterine compression sutures (external tamponade) might be considered [6]. This conservative approach not only provides time for preparation more complex surgical interventions but also access to an experienced centre.

The aim of this retrospective study was to describe our experience and investigate the efficacy of different surgical management options and to determine treatment outcomes in patients with a diagnosis of postpartum uterine atony cases refractory to medical treatment in a tertiary hospital.

Methods

This retrospective study was conducted on 58 women with postpartum haemorrhage (PPH) due to uterine atony who were admitted to Department of Obstetrics and Gynecology at Kafkas University in Kars, Turkey and had any surgical intervention between June 2011 and May 2016. Data was retrieved about age, BMI, gravida, parity, gestational week, risk factors for uterine atony, type of delivery, estimated total blood loss, intraoperative hematocrit values, amount of blood transfused, inflation volume of Bakri balloon and duration of time Bakri balloon remained in uterus and complication rate.

Postpartum uterine atony was defined when PPH of approximately 500 ml occurred following vaginal birth and 1000 ml following C-section together with poor uterine contractions [7]. Uterine atony cases refractory to uterine massage and medical treatment with uterotonics were managed with intrauterine Bakri balloon insertion alone or in combination with B-Lynch uterine compression suture (sandwich method), internal iliac artery ligation and hysterectomy. B-Lynch sutures were done as described by Christopher B-Lynch in 1997 [8]. Bakri balloon (Cook Medical, Bloomington, US) was inserted to the uterus as previously described [9]. Balloon was infused with sterile saline with 50 ml increments. In cases of Bakri balloon insertion in combination with B-Lynch uterine compression suture (sandwich method), B-Lynch compression suture was placed and balloon was inserted and infused with 50 ml saline increments [8,10]. When this approach was not able to stop the bleeding, because of the massive bleeding bilateral internal iliac artery ligation was not applied in patients which hysterectomy was administered. In uterine atony cases following vaginal delivery, intrauterine Bakri balloon was placed under ultrasound guidance and infused with sterile saline [11,12]. Second generation cephalosporins were used for antibiotic prophylaxis. Balanced fluids were administered and 10 units of oxytocin were added to each 500 ml fluid, and 0.2 mg methylergonovine maleate was administered i.m. twice daily. In the first 24- hour postoperative period, the amount of blood collected in the drainage bag from the Bakri balloon and the weight of pads placed in the perineum were measured.

The medical data of each patient was obtained from the hospital records and operation notes. Eight patients were excluded from the study: three who had incomplete medical files as concerns the data necessary for the study or who were rapidly lost to follow-up and five for not filling 2 year after surgery. All cases were recalled between 2-5 years after birth. The menstrual irregularities and pregnancies of the cases were researched and the destiny of their pregnancy was questioned.

The study was approved by the local research ethics committee (80576354-050-99/51, 01/03/2017) and informed consent was obtained from all patients.

Statistical Analysis

Statistical Package for Social Sciences (SPSS) for Windows 20 (SPSS for Windows, SPSS, Chicago) was used for statistical analysis. The process involved descriptive statistics and data were presented as mean ± standard deviation, median and ratio. Non-parametric Mann-Whitney U test was used to compare the mean of the data among the groups. $P < 0.05$ was considered significant.

Results

Between June 2011 and May 2016, 58 women underwent any surgical treatment for the management of PPH due to uterine atony in our institution. In 32 cases intrauterine Bakri balloon (55.2%) and in six cases B-Lynch compression sutures (10.3%) was administered alone and in the remaining 8 cases (13.8%), Bakri balloon tamponade and B-Lynch compression suture (sandwich method) was concurrently used. Eight cases managed with internal iliac artery ligation (13.8%) and four hysterectomies (6.9%).

The mean maternal age was 30.4years (± 11.8), mean BMI was 27.2 kg/m^2 (±4.8) and the mean gestational age at delivery was 36 ± 4 weeks (±6.2). The average gravidity and parity was 3.2 (±1.8) and 1.2 (±1.1), respectively. Forty-nine of the cases (84%) were delivered by C-section and the remaining nine (16%) had normal vaginal birth. Median estimated blood loss was 2018 ml (range 1250- 3300 ml), median blood needed for transfusion was 5 units (range 2-12 units), (Table 1).

Mean operation time was ranged from 32 to120 minutes, the median volume infused into the balloon was 300 ml (range 80-500 ml), the balloon was in place for a median duration of 36 hours (range 12-48 hours).

Bakri balloon tamponade treatment was successful in 27 cases of 32 (84.4 %). In 8 cases which Bakri balloon and B-Lynch compression sutures was applied together successfully (87.5 %, only one case was failure). Whereas totally 6 cases (13%), 5 cases in Bakri balloon tamponade applied and 1 case in sandwich method applied, were failed to stop postpartum atony haemorrhage. Peripartum hysterectomy was needed in four cases. In one case disseminated intravascular coagulopathy occurred due to massive bleeding and two bladder injuries were occurred, one during the hysterectomy and while the other Bakri ballon was inserted in sandwich procedure. There wasn't any mortality.

Variable		Median value	Range	Mean values
Age (years)		31	18-42	30.4
Gravida, n		2	1-6	3.2
BMI(kg/m^2)		25	22-32	27.2
Parity, n		1	0-5	1.2
Gestational week at birth (n)		37.2	32-41	36
Delivery	C-section (%)	84		
	Vaginal (%)	16		
Estimated blood loss (ml)		2018	1250-3300	2138
Lowest Hb value		5.8	4.8-9.4	6.6
Blood needed for transfusion (units)		5	2-12	5
Procedure duration (minutes)	BBT	64	32-120	62.4
	B-Lynch	72	40-120	70
	Artery ligation	52	34-96	60
	Sandwich method	60	42-104	68
Hospitalization duration (days)	BBT	3.6	2-8	3.8
	B-Lynch	4.2	3-10	4.4
	Artery ligation	3.2	2-6	3.5
	Sandwich method	3	2-5	3.2
Volume infused into the balloon (ml)		300	80-500	285
Duration of time balloon remained in the uterus (hours)		36	12-48	32.4

Table 1: Patients' demographic and clinical characteristics

The main risk factors for uterine atony were induction of labor (22.4 %), unprogressive labor (17.2 %), fetal distress (12%), advanced maternal age (8.6%), multiple pregnancy (6.9%), Mg SO4 treatment (5.2 %) and preeclampsia (5.2%) in our cases. No risk factors were identified in two cases. Risk factors existent in our cases for postpartum uterine atony are given in Table 2.

Risk factor	N	%
Induction of labour	13	22.4
Obstructed labour	10	17.2
Fetal distress	7	12
Advanced maternal age	5	8.6
Multiple pregnancy	4	6.9
Polyhydroamnios	4	6.9
MgSO4 treatment	3	5.2
Preeclampsia	3	5.2
Placenta previa	3	5.2
Ablatio placenta	2	3.4
Grande multiparity	2	3.4

Table 2: Relation between histories of risk factors of uterine atony

In 12 of 40 patients which fertility was preserved, pregnancy occurred during follow up 2-5 years and except one which was occurred after internal iliac artery ligation all pregnancies were terminated as term healthy live births. In two cases amenorrhea and infertility developed; one in B-Lynch and other one in the sandwich method was applied in which balloon was inflated with 400 ml. There was a severe Asherman's syndrome in hysteroscopic examination of those patients. In remaining cases which sandwich method applied the balloon was inflated at a pressure of 250 ml or less. A patient underwent arterial embolization on the continuation of the bleeding following iliac artery ligation. A total of four patients required intensive unit care. In 2 cases tubal ligation was applied. Other patients reported that they did not think about pregnancy for the time being and they were using one of contraception methods. Postpartum follow-up results were shown in Table 3.

Postpartum hysterectomy was performed in 9 cases where any uterine preservative surgical procedure failed so successful rate of uterus protective surgery was 84.5%. Multiple pregnancies were the risk factors of two failed cases one in BBT and one in B-Lynch group, in failed B-Lynch case total prolapse was also occurred, in remaining two multiple pregnancies cases sandwich method was successful. Other failed cases in BBT group were grande multiparity, polyhydroamnios, ablatio placenta and advanced maternal age respectively. In totally two cases were failed in internal iliac artery ligation group, one due to obstructed labour and the other due to fetal distress. Sandwich metod was failed in a case of placenta previa (Figure 1).

Morbidity	BBT	B-Lynch	Artery ligation	hysterectomy	BBT+ B-Lynch
Bladder injury	-	-	-	1	1
Asherman's syndrome	-	1		-	1
Menstruel disorders	-	-	1	-	1
Uterine prolapse	-	2	-	-	-
DIC	-	-	1	1	-
Term pregnancy	8	2	-	-	1
Abortus	-	-	1	-	-
Arterial embolisation	-	-	1	-	-
Intensive care unit require	1	1	1	1	-
Hysterectomy applied	5	1	2	-	1

Table 3: Postpartum follow-up results of all cases

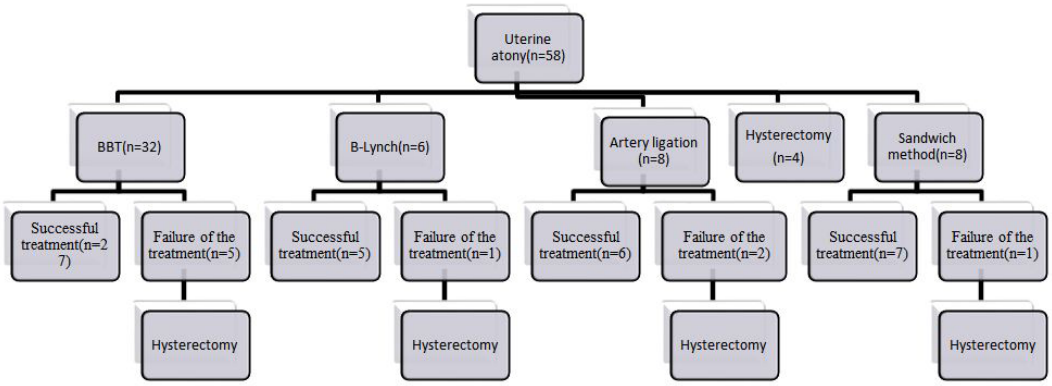

Figure 1: Flow chart for the surgical treatment

Discussion

In the management of acute postpartum uterine atony there is still no definitive answer to what the ideal surgical treatment is. According to our data in cases BBT used alone we found the success rate 84.4% and BBT in combination with B-Lynch compression suture success rate was 87.5% in the management of postpartum uterine atony as fertility preserving management options. There was a significant improvement in maternal outcomes in the form of reduced blood loss and need for ICU admissions and shorter hospitalization stay in sandwich procedure. Although our case is very small, we found that BBT or B lynch suture alone failed in multiple pregnancies in our study, but the chances of success were increased when they were put together as in the sandwich model.

Bakri balloon is specially designed to be inserted into the uterine cavity which is infused with up to 500 ml of fluid and controls acute PPH resistant to medical treatment. The lumen at the center of the catheter provides the drainage of blood which enables the detection of ongoing bleeding [9]. The mechanism of action of BBT is still not well understood. It has been speculated that the balloon acts by raising the intrauterine pressure to a greater pressure than the systemic arterial pressure [11]. Various balloons such as condom, Sengstaken-Blakemore tube, Foley, Rusch or Bakri catheter are in use for uterine tamponade [12]. Recently it has been suggested that intrauterine balloon placement should be included in the treatment protocol for PPH [13-15]. Some countries like Hong Kong, for the management of massive postpartum haemorrhage intrauterine balloon tamponade are in use as part of obstetric training [16]. Uterine balloon tamponade with diverse balloon types success rates in preventing hysterectomy were between 70-100 % in acute postpartum haemorrhage cases unresponsive to medical treatment [17]. Similarly, success rates of 80% to 100% have been reported in the case series that combine uterine compression sutures with the Bakri balloon tamponade, in the treatment of uterine atony [18]. Bakri balloon is probably the least invasive conservative management form for acute postpartum haemorrhage and is suitable for transvaginal and transabdominal insertion, decreases bleeding immediately and diminishes the need for more aggressive procedures such as hysterectomy [19]. For this reason, uterine balloon tamponade is recommended as the first step in the management of postpartum haemorrhages regarding to uterine atony [20,21].

Although Yoong *et al.* [18] suggested that sandwich technique is a simple and quick surgical technique that can be used especially for the treatment of atonic postpartum haemorrhage in infiltrating placenta previa, in our study a case which sandwich metod failed and hysterectomy required was a case of placenta previa. Vitthala *et al.* [22] reported this method fails mostly in abnormal placentation cases such as placenta previa and placenta accrete and this result overlaps with our study. Although Bakri *et al.* [9] supported filling the balloon with 250 to 500 cm3 of saline, depending on the uterine size, there is no consensus regarding the optimal volume of water to be instilled in the balloon nowadays. In sandwich method a case of Asherman's syndrome developed which resulted in amenorrhea and infertility. In this case the balloon inflation volume was 400 ml. Perhaps that inflated volume

may cause more ischemia in endometrium and myometrium which leads to Asherman's syndrome. In the remaining cases there weren't any gynecological and obstetric problems in which balloon inflation volumes that we applied during sandwich method were 250 ml or less. Nelson *et al*. [10] reported that in sandwich method applied cases when the B-Lynch procedure was insufficient infusion of 100 ml of the Bakri balloon was effective in stopping the bleeding in all cases. These suggest that it may be difficult to determine an ideal volume because the uterine size depends on various factors such as uterine tone, and it varies from individual to individual.

According to effects of B-Lynch sutures on fertility some studies didn't report any adverse effects whereas others reported adverse effects on fertility like intrauterine adhesion, abdominal adhesion, deformation of uterine fundus, endometriosis, placenta previa and preterm birth [23,24]. We found one Asherman's syndrome and two total uterine prolapse one with uterine necrosis, which we followed up within 5 years.

One of the limitations of our study is retrospective and the lack of a control group. In spite of the small number of our study it would add to the growing evidence that Bakri balloon tamponade alone or in combination with B-Lynch compression suture is an effective fertility-sparing measure for managing PPH regarding uterine atony.

Conclusion

In conclusion early, accurate, stepwise and individualized surgical treatments approaches constitute main points of the management. In the management of acute postpartum uterine atony refractory to medical treatment Bakri balloon tamponade alone or in combination with B-Lynch compression suture is an effective method to control bleeding as a fertility-sparing surgical treatment. However, depending on the different phases of the emergency in these life-threatening situations, various treatment modalities should be used with a gradual approach.

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