Conservative Management of Postpartum Uterine Atony with Intrauterine Balloon Tamponade

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ABSTRACT

Objective: Uterine atony is one of the serious complications of labour. Hysterectomy is mostly required in acute cases. Conservative management with intrauterine balloon insertion alone or in combination with B-Lynch suture might be an alternative. We report a case series from a referral hospital.

Material and Method: This was a retrospective analysis of 30 postpartum uterine atony cases refractory to uterotonic treatment and managed with intrauterine balloon tamponade with or without B-Lynch suture.

Results: Thirty cases managed with intrauterine Bakri balloon tamponade (BBT) with or without B-Lynch compression suture. Our success rate was 86 %. Median estimated blood loss was 1850 ml, intraoperative median hemoglobin was 6.6 mg/dl, median amount of blood transfused was four units, median operation duration was 70 minutes, median volume infused into balloon was 250 ml, balloon was in place for a median duration of 30 hours. In 4 cases Bakri balloon tamponade with or without B-Lynch compression sutures failed to stop hemorrhage and hysterectomy required. In one patient Asherman’s syndrome and infertility developed. In cases which BBT was successful PI values of bilateral uterine artery doppler was similar to control group. There wasn’t maternal mortality.

Conclusion: Balloon tamponade of uterus with or without compression sutures is an effective, quick, simple and fertility preserving technique in the management of postpartum uterine atony bleeding. It further provides time for more complicated interventions in case of failure to control hemorrhage.

Keywords: Uterine Atony, Bakri Balloon, Intrauterine Balloon Tamponade, B-Lynch Suture.

ÖZET

Postpartum Uterin Atonide İntraüterine Balon Tamponad ile Konservatif Yaklaşımda


Anahtar Sözcükler: Uterin Atoni, Bakri Balon, İntraüterine Balon Tamponadı, B-Lynch Sütürr
medical treatment and managed with Bakri balloon tamponade alone or in combination with B-Lynch compression suture (sandwich method) successfully.

MATERIAL AND METHOD

All postpartum uterine atony cases managed in our clinic between December 2011 and December 2015 were reviewed retrospectively. For this study, the approval was obtained from Firat University Faculty of Medicine Non-Interventional Research Ethics Committee. Cases managed with intrauterine Bakri balloon insertion with or without sandwich method were evaluated. Data was retrieved about age, gravidity, 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, duration of time Bakri balloon remained in uterus, complication rate and analysed.

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 (8). Uterine atony cases refractory to uterine massage and medical treatment with uterotonicics were managed with intrauterine Bakri balloon insertion alone or in combination with B-Lynch uterine compression suture (sandwich method). B-Lynch sutures were done as described by B-Lynch in 1997 (9). Bakri balloon (Cook Medical, Bloomington, US) was inserted to the uterus as previously described (10). Following balloon placement in the uterus during c-section, distal end of the balloon shaft was advanced to the vagina through the cervix and pulled out of the vagina by an assistant. Balloon was infused with sterile saline with 50 ml increments. In cases of persistent bleeding, balloon was removed, B-Lynch compression suture was placed and balloon was reinserted and infused with saline, again with 50 ml increments (9, 11). By cases when this approach was not able to stop the bleeding, we administered hysterectomy. Because of the massive bleeding bilateral internal iliac artery ligation wasn’t 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 (12). Second generation cephalosporins were used for antibiotic prophylaxis. In the first postoperative 24-hour, urine output, arterial blood pressure (mmHg), heart rate (/min) and fever (°C) were measured hourly. Balanced fluids were administered and 10 units of oxytocin was added to each 500 ml fluid, and 0.2 mg methylergonovine maleate was administered i.m. twice daily. Gauze bandages used for bleeding control was weighed after the operation and the drained blood in the aspirator were evaluated in order to estimate the amount of intraoperative hemorrhage. In the first 24-hour postoperative period, the amount of blood collect-
ed in the drainage bag from the Bakri balloon and the weight of pads placed in the perineum were measured. All cases were recalled between 2-4 years after birth. Menstrual irregularities of the cases and pregnancy were investigated. If they were pregnant again the fate of their pregnancy was questioned. Bilateral uterine artery doppler ultrasonography (usg) examination was examined in patients and compared with control group. As a control group to compare uterine artery doppler usg results 30 multiparous woman without a uterine or ovarian pathology were randomly selected.

Uterine artery doppler evaluation: Usg was performed with transvaginal usg (voluson E6 GE Healthcare Technologies, Milwaukee, WI, USA) in the position of lithotomy in the follicular phase. From the sagital position of the uterus where the cervical canal was seen, the probe was slowly turned to the lateral and the flow of the right and left uterine arteries was determined by color flow doppler from internal cervical os. Pulse wave doppler sampling interval was automatically measured in a range of 2 mm, insertion angle 30 degrees. Right and left uterine artery PI values were measured.

Descriptive statistics were used to analyse the data. Median and mean values were presented for the variables analysed. For the statistical analysis of the data, definitive statistics was carried out with SPSS 21.0 (SPSS Inc. IL, USA). Mann-Whitney U test was used in the comparison between the groups. Values of p <0.05 were considered significant.

RESULTS

Demographic characteristics of the cases were presented in (Table 1). In 22 cases intrauterine Bakri balloon was administered alone and in the remaining eight cases, Bakri balloon tamponade and B-Lynch compression suture (sandwich method) was concurrently used. 26 of the cases (86%) were delivered by C-section and the remaining four (14%) had normal vaginal birth. Median estimated blood loss was 1850 ml (range 1100-3100 ml), median blood needed for transfusion was 4 units (range 0-8 units), (Table 1).

Table 1. Demographic and clinical characteristics of the patients.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Median values</th>
<th>Range</th>
<th>Mean values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>32</td>
<td>20-43</td>
<td>31.2</td>
</tr>
<tr>
<td>Gravida, n</td>
<td>2</td>
<td>1-5</td>
<td>2.1</td>
</tr>
<tr>
<td>Parity, n</td>
<td>1</td>
<td>0-4</td>
<td>1.1</td>
</tr>
<tr>
<td>Gestational week at birth (n)</td>
<td>37</td>
<td>30-41</td>
<td>35.5</td>
</tr>
<tr>
<td>Delivery by C-section (%)</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest Hb value</td>
<td>6.6</td>
<td>5-9.7</td>
<td>6.7</td>
</tr>
<tr>
<td>Estimated blood loss (ml)</td>
<td>1850</td>
<td>1100-3100</td>
<td>1973</td>
</tr>
<tr>
<td>Blood needed for transfusion (units)</td>
<td>4</td>
<td>0-8</td>
<td>4</td>
</tr>
<tr>
<td>Volume infused into the balloon (ml)</td>
<td>250</td>
<td>80-500</td>
<td>271</td>
</tr>
<tr>
<td>Duration of time balloon remained in the uterus (hours)</td>
<td>30</td>
<td>12-36</td>
<td>31.8</td>
</tr>
<tr>
<td>Procedure duration (minutes)</td>
<td>70</td>
<td>20-120</td>
<td>66.6</td>
</tr>
<tr>
<td>Hospitalization duration (days)</td>
<td>3.5</td>
<td>2-7</td>
<td>3.6</td>
</tr>
</tbody>
</table>
The main risk factors for uterine atony were induction of labor (33 %), advanced maternal age (20 %), MgSO₄ treatment (20 %), preeclampsia (16%) and unprogressive labor (16 %) in our cases. Risk factors existent in our cases for postpartum uterine atony are given in (Table 2). Postpartum follow-up results were shown in (Table 3).

Table 2. Risk factors for uterine atony in patients included in the study.

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction of labour</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>Advanced maternal age</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>MgSO₄ treatment</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Obstructed labour</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Polyhydramnios</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Placenta previa</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ablatio placenta</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Median operation time was 70 minutes (range 20-120 minutes), the median volume infused into the balloon was 250 ml (range 80-500 ml), the balloon was in place for a median duration of 30 hours (range 12-36 hours). Bakri balloon tamponade with or without uterine sandwich method were successful in 26 cases of 30 (86 %). In 22 cases (74 %) only Bakri balloon, in 8 cases (26 %) Bakri balloon was applied together with B-Lynch compression sutures. Whereas totally 4 cases (13%), 2 cases in Bakri balloon tamponade and 2 cases in sandwich method applied failed to stop postpartum atony hemorrhage. Peripartum hysterectomy was needed in four cases. In one case disseminated intravascular coagulopathy occurred due to massive bleeding and in one case bladder injury occurred during hysterectomy. There wasn’t any mortality.

In 8 of 26 patients which fertility was preserved, pregnancy occurred during follow up 1-3 years and pregnancies were terminated as term healthy live births. Amenorrhrea and infertility developed in a case where the sandwich method was applied and the balloon was inflated with 350 ml. In Hysteroscopic examination there was a severe Asherman’s syndrome in that patient. In other cases which sandwich method applied the balloon was inflated at a pressure of 200 ml or less. 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. While 25 cases didn’t have any severe complaint about menstrual disorders, only one case had a complaint of amenorrhrea which sandwich method was applied (Table 3).

Comparison of uterine artery doppler results: PI values of right uterine artery in atony group was 3.52±0.83, while 3.38 ± 0.87 in the control group (p=0.47). PI values of left uterine artery in atony group was (3.54±0.84), while (3.24 ± 0.93) in the control group (p:0.227). There was no significant difference between the two groups in the flow measurements of the doppler usg (p>0.05).

**DISCUSSION**

We found the success rate of BBT as 86% in the management of postpartum uterine atony in fertility preserving management option. This ratio is compatible with the 70-100% rates reported in the literature (6, 10, 11, 19, 20). Since it is a retrospective case series and the absence of a control group are the limitations of our study.

Recently, intrauterine balloon insertion was suggested to be included in the treatment protocol for PPH (13-15). In Hong Kong, intrauterine balloon tamponade for the management of massive postpartum hemorrhage is in use as part of obstetric training (16). Various balloons such as condom, Sengstaken-Blakemore tube, Foley, Rusch or Bakri catheter are in use for uterine tamponade (17). Bakri balloon is specially designed to be inserted into the uterine cavity which is infused with liquid up to 500 ml and effective in controlling acute PPH refractory to medical treatment. The lumen at the center of the catheter provides the drainage of blood which enables the detection of ongoing bleeding (10). 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 (18).

In the literature, case series were reported describing the effectiveness of uterine balloon tamponade with various balloon types in acute postpartum hemorrhage unresponsive to medical treatment (16). Success rates in preventing hysterectomy were between 70-100 %. In some reports analysing only uterine atony cases, 100 % success rate was presented (19). Similarly, 80-100 % success rates were reported in case series which combined the uterine compression sutures with Bakri balloon tamponade for the treatment of uterine atony (6, 7, 10, 11, 20). UBT might be combined with other conservative techniques like external uterine compression sutures or endouterine square hemostatic sutures. Bakri balloon is probably the least invasive conservative management modality for acute postpartum hemorrhage and convenient for both transvaginal and transabdominal insertion, immediately reduces bleeding and decreases the need for more aggressive procedures such as hysterectomy (21). Therefore, uterine balloon tamponade is recommended as the first step in the
management of postpartum hemorrhage (22–24). We performed BBT as the first step in 22 cases of 30 cases of uterine atony who did not respond to medical treatment in our clinic. Two of these cases required emergency hysterectomy. Sandwich method was applied to 8 cases. In two of these cases there was a failure and hysterectomy was required.

Uterine compression sutures and intrauterine balloon tamponade are defined as fertility preserving management options in PPH and both of those techniques were suggested to be combined in order to apply pressure on the surface of myometrium both internally (Bakri balloon) and externally (B-Lynch suture) (8, 9, 11, 25-27). Yoong et al. (20) similarly suggested that sandwich technique is a simple and quick surgical technique that can be used especially for the treatment of atonic postpartum hemorrhage in infiltrating placenta previa. Vitthala et al. (6) reported the success rate of sandwich method as 100 % in vaginal delivery and 57 % in cesarean section birth. This method fails mostly in abnormal placentation cases such as placenta previa and placenta accrete. In our series, we used Bakri balloon together with B-Lynch compression suture in eight cases. In 2 of these cases this method failed and hysterectomy was required. In 1 case Asherman’s syndrome developed which resulted in amenorrhea and infertility. In this case the balloon inflation volume was 350 ml. When B-Lynch sutures and BBT applied together, that inflated volume may cause more ischemia in endometrium and myometrium which leads to Asherman’s syndrome. The other balloon inflation volumes that we applied during sandwich method were 200 ml or less.

There wasn’t any gynecological and obstetric problems in these cases. Nelson et al. (11) reported that when the sandwich method was applied in cases where the B-Lynch procedure was inadequate, infusion of 100 ml of Bakri balloon was effective in stopping the bleeding in all cases. Diemert et al. (28) reported a success rate of 85 % in 7 cases of Sandwich method. Our success rate in the sandwich method was 75 %.

The effects of B-Lynch sutures on fertility are controversial. 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 (29-35). We did not find any complaints about menstrual irregularity, endometriosis or preterm labor in which we performed the Sandwich method successfully too. We did not encounter any complications in 25 cases of uterine preservation such as pyometra or uterine necrosis in our cases, which we followed up in 1-4 years. Asherman’s syndrome developed in only one case.

In conclusion, Bakri balloon tamponade alone or in combination with B-Lynch compression suture is an effective method to control bleeding in the management of acute postpartum uterine atony refractory to medical treatment. This technique is also invaluable in providing time to prepare for further surgical interventions or transportation to another clinic in critical cases. Nevertheless, in such life-threatening situations, various treatment modalities should be used in a stepwise approach but depending on the different stages of emergency.

REFERENCES


