









Bilateral Hypogastric Artery Ligation: A Tertiary Center Experience

Bilateral hipogastrik arter ligasyonu: Tersiyer bir merkez deneyimi

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Abstract

Background: The aim of this study was to evaluate the obstetric characteristics and maternal outcomes of patients undergoing bilateral hypogastric artery ligation (BHGAL) for primary postpartum hemorrhage (PPH).

Materials and Methods: Digital records and hospital archives of patients who underwent BHGAL in the postpartum period after vaginal delivery (VD) or during or after cesarean section (C/S) in a tertiary center between May 2005 and May 2018 were reviewed retrospectively. Demographic characteristics, parity, gestational week, duration of operation, hospitalisation time, estimated blood loss, laboratory values, transfused blood volume, previous C/S history, and intensive care requirement of the patients were evaluated. The efficacy of BHGAL in controlling bleeding, indications, concomitant surgeries, and intraoperative and postoperative complications were evaluated.

Results: There were 276.008 deliveries in our hospital in the specified period. Of the patients with PPH, 41 patients underwent BHGAL after VD and 19 patients underwent BHGAL during or after C/S. In 25 of 28 patients with PPH due to atony, bleeding was controlled by BHGAL, while 3 patients underwent hysterectomy together with BHGAL. While the effectiveness of BHGAL in uterine atony was 89.2%, the success rate was 33.3% when all cases were considered. The most common cause of indication for BHGAL was atony and disseminated intravascular coagulation (DIC) was the most common complication in patients undergoing BHGAL. Iliac vein injury was detected in one patient due to the procedure itself.

Conclusions: BHGAL is more effective on controlling PPH due to atony compared to the control of other PPH causes. Most of the complications in these patients are not related to the procedure but are due to the complications of PPH. Therefore, BHGAL continues to be a life-saving method when applied by centers with adequate surgical knowledge and equipment.

Key words: Hypogastric artery ligation, Cesarean section, Vaginal delivery, Postpartum hemorrhage

Öz

Amaç: Bu çalışmanın amacı, primer postpartum kanama (PPK) nedeniyle bilateral hipogastrik arter ligasyonu (BHGAL) uygulanan hastaların obstetrik özelliklerini ve maternal sonuçlarını değerlendirmektir.

Materyal ve Metod: Mayıs 2005 ile Mayıs 2018 tarihleri arasında tersiyer bir merkezde postpartum dönemde vajinal doğum (VD) sonrası, sezaryan (C/S) esnasında ya da sonrasında PPK nedeniyle BHGAL uygulanan hastaların dijital kayıtları ve hastane arşiv dosyaları retrospektif olarak incelendi. Hastaların demografik özellikleri, parite, gestasyonel hafta, operasyon süresi, yatış süresi, tahmini kan kaybı, laboratuvar değerleri, transfüzyon yapılan kan miktarları, önceki C/S öyküsü, yoğun bakım gereksinimi gibi parametrelere bakıldı. BHGAL'nun, kanama kontrolünü sağlamadaki etkinliği, endikasyonları, beraberinde uygulanan ek cerrahileri, intraoperatif ve postoperatif komplikasyonları değerlendirildi.

Bulgular: Belirtilen sürede hastanemizde 276008 doğum olmuştur. PPK olan hastaların 41'ine VD sonrasında, 19'una ise C/S esnasında ya da C/S sonrasında BHGAL uygulandı. Atoni nedeniyle PPK olan 28 hastanın 25'inde kanama BHGAL ile kontrol altına alınırken, 3 hastaya BHGAL ile birlikte histerektomi yapıldı. BHGAL'nun uterin atonide etkinliği %89,2 iken, tüm vakalar değerlendirildiğinde ise başarıları %33,3 olarak bulundu. BHGAL en sık atoni nedeniyle uygulandığı ve BHGAL uygulanan hastalarda en sık komplikasyonun dissemine intravasküler koagülasyon (DİK) olduğu görüldü. İşlemin kendisine bağlı ise bir hastada iliak ven yaralanması tespit edildi.

Sonuç: BHGAL'in atoni nedenli PPK'daki kontrolü, diğer PPK nedenlerinin kontrolünden daha etkindir. Bu hastalarda komplikasyonların çoğu işleme bağlı olmayıp PPK'nın komplikasyonlarından kaynaklanmaktadır. Bu yüzden BHGAL, yeterli cerrahi bilgi ve donanıma sahip ellerde uygulandığında hayat kurtarıcı bir yöntem olmaya devam etmektedir.

Anahtar Kelimeler: Hipogastrik arter ligasyonu, Sezaryan, Vajinal doğum, Postpartum kanama

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Introduction

Primary postpartum hemorrhage (PPH) is defined as bleeding of more than 500 ml following vaginal delivery and more than 1000 ml following C/S within the first 24 hours postpartum period (1). PPH is the most important cause of maternal morbidity and mortality in developing countries (2). Mortality and morbidity due to PPH can be prevented to a great extent by early medical and surgical treatment. Medical treatment (uterotonics, tranexamic acid) and uterine massage should be applied first in obstetric hemorrhage that develops after VD or C/S and is life-threatening. In cases where bleeding cannot be controlled, compression sutures (square sutures, B-lynch, etc.), BHGAL, and peripartum hysterectomy as the last treatment option can be performed (3).

Fertility is also preserved in BHGAL performed to control PPH, however, the effectiveness of BHGAL in controlling PPH ranges between 42-88% (4-6). Due to the presence of vital organs in the anatomical vicinage, BHGAL procedure requires mastery of retroperitoneal anatomy (7). Serious complications including ischemia and necrosis in organs in the pelvic region and ureteral and internal iliac artery-vein injuries have been reported due to incorrect application of the procedure (8).

The aim of this study was to investigate obstetric characteristics and maternal outcomes of patients who underwent BHGAL for PPH.

Materials and Methods

This study was performed in the Gynecology and Obstetrics Clinic of Health Sciences University, Diyarbakır Gazi Yaşargil Training and Research Hospital. Ethics committee approval was obtained from Gazi Yaşargil Training and Research Hospital (Ethics committee no: 108).

Digital records and hospital archive files of pregnant women who gave birth between May 2005 and May 2018 were examined. Patients who underwent BHGAL in the postpartum period due to bleeding after VD or during or after C/S were evaluated. Patients undergoing other surgical methods but not BHGAL were excluded from the study. Patients who gave birth with VD or C/S in an external center and referred to our clinic due to bleeding and who underwent BHGAL in our clinic were excluded from the study because their previous medical and follow-up records could not be obtained.

In the presence of hemodynamic instability with one or more of tachycardia (heart rate >110 beats/min), hypotension (mean arterial pressure <60 mmHg), decrease in hemoglobin values (hemoglobin <7 g/dl), >500 ml of hemorrhagic fluid from the abdominal drain within two hours, severe oliguria or anuria findings, laparotomy was decided in conjunction with two experienced surgeons. In PPH cases who did not respond to medical treatment (60 IU oxytocin) and subsequently could not be controlled by conservative

surgical methods (uterine massage, square compression sutures, B-lynch suture) and in patients with ongoing bleeding after hysterectomy or rupture repair, BHGAL was performed after failure in bleeding control. In patients who underwent hysterectomy together with BHGAL, BHGAL was considered to be unsuccessful in bleeding control.

Surgical Technique

The peritoneum was lifted from the back of the ligament rotundum and dissected with scissors and opened about 2-3 cm. With blunt dissection, the fingers were moved parallel to the ureter and vessels and the retroperitoneum was entered. The ureter was removed from the dissection site in front of the A. iliaca communis. The capsule around the artery and vein was opened by sharp dissection. The right-angle clamp was passed from the outside to the inside 2-3 cm distal to the hypogastric artery and hypogastric artery ligation (HGAL) was performed with no: 0 silk suture. Contralateral hypogastric artery ligation (HGAL) was performed with similar technique.

Demographic characteristics, parity, gestational week, duration of operation, length of hospitalisation, estimated blood loss; laboratory values, transfused blood volume, previous C/S history, and intensive care requirement of the patients who underwent BHGAL were evaluated. Indications for BHGAL, concomitant surgeries, and intraoperative and postoperative complications were evaluated.

Statistical Analysis

All data were analyzed using Statistical Package for Social Sciences (SPSS version 16.0, Chicago, IL, USA). The distribution of the data was evaluated by Kolmogorov-Smirnov test. Descriptive statistics of continuous variables were presented with mean and standard deviation. Categorical data were expressed as number and percentages (%).

Results

209,526 VD and 66,482 C/S operations were performed within the specified time period. A total of 60 patients underwent BHGAL for PPH. 41 patients with PPH underwent BHGAL after vaginal delivery (VD), and 19 during or after C/S. 25 of these patients underwent BHGAL because of uterine atony and 3 due to atonia with placental detachment. Bleeding was controlled with BHGAL in 25 of 28 patients with PPH due to atony, whereas 3 patients underwent hysterectomy together with BHGAL. The effectiveness of BHGAL in uterine atony was 89.2% and the success rate in other indications was 33.3%. Maternal mortality was not observed in any of the patients. The demographic and laboratory characteristics of the patients undergoing BHGAL are listed in Table 1, whereas the clinical features are listed in Table 2.

Table 1. Demographic and laboratory characteristics of patients undergoing BH GAL

Characteristics	Mean ± Standard deviation	Min-Max
Age	33.1±6.2	18-44
Parity	4.4±2.4	0-11
Gestational Week	37.8±3.4	27-42
Duration of operation (min)	124.8±26.1	70-240
Hospitalisation (days)	5.5±2.1	3-12
Estimated blood loss (cc)	2013.3±933.6	800-4500
Pre-operative hemoglobin (g/dL)	10.5±1.67	5.1-14.1
Pre-operative hematocrit (g/dL)	31.3±4.82	16.2-41.1
Post-operative hemoglobin (g/dL)	7.4±1.59	2.8-10.9
Post-operative hematocrit (g/dL)	22.2±4.40	9.7-32.1
Erythrocyte suspension replacement (units)	4.6±2.6	0-13
Fresh frozen plasma replacement (units)	2.1±1.5	0-8

Table 2. Clinical characteristics of patients undergoing BH GAL

Characteristics	n	%
Previous C/S history	17/60	28.4
Patients undergoing additional surgery	45/60	75
Patients with complications	29/60	48.3
Patients requiring intensive care	57/60	95
Indications for BH GAL		
Atony	25/60	41.6
Uterine rupture	20/60	33.4
Placenta accrete	8/60	13.3
Placental detachment + atony	3/60	5
Uterine rupture + retroperitoneal hematoma	4/60	6.7
Additional Surgery		
None	15/60	25
Hysterectomy	39/60	65.4
Uterine artery ligation	4/60	6.4
Hysterectomy + Unisalpingo-oophorectomy	1/60	1.6
Unisalpingo-oophorectomy	1/60	1.6
Complications		
None	31/60	51.7
DIC	10/60	16.8
Bladder injury	6/60	10
Ureteral injury	5/60	8.4
Wound site infection	2/60	3.3
Fever	2/60	3.3
Ileus	2/60	3.3
Iliac vein injury	1/60	1.6
Pulmonary embolism	1/60	1.6

Discussion

In this study, the effectiveness of BH GAL in uterine atony was found to be 89.2% and the success rate in other indications was 33.3%. The most common indicator for BH GAL was atony and DIC was the most common complication in all patients who underwent BH GAL.

The hypogastric artery and its branches are responsible for the blood supply of organs in the pelvis. After BH GAL, arterial pressure decreases in the uterus, hemorrhage decreases and hemostasis is achieved. Studies evaluating the effectiveness of BH GAL in PPH control reported the success of the procedure between 42% and 87.9%, although the number of patients in these studies was not sufficient (4,9–12). In the present study, although the effec-

tiveness of BH GAL in atony cases was similar to the literature, it was found to be relatively low when all causes of bleeding were considered. The reason for this is that most of the indications in other studies are atonia, whereas the patients in the present study represented a large group of indications accompanying atony such as uterine rupture, placenta accreta, and placental detachment.

BH GAL for PPH is applied in the presence of atony, placenta previa, placenta accreta, placental detachment, uterine rupture, and retroperitoneal hematoma (9,12–14). The indications for BH GAL in this study were similar to those reported in the literature and although the most common indicator was atony, uterine rupture was the second most common indication for BH GAL. The reason for this may be the common occurrence of grand multiparity and advanced age pregnancies in our region.

Multiparity, maternal age of 35 and over, hypertensive diseases of pregnancy, chorioamnionitis, polyhydroamniosis, post-term pregnancy, prolonged labor, intervention delivery, labor induction, macrosomic baby, placenta retention, previous C/Ss, and placental invasion anomalies have been reported as risk factors for PPH (15–17). Good management of the third stage of labor is of paramount importance in patients with these risk factors. In case of PPH, we believe that uterine massage and medical treatment should be applied first, and in cases where bleeding cannot be controlled, BH GAL in addition to surgical treatments is a good life saving surgical option.

When the decision of surgical intervention is made, the team managing the operation should decide which surgical method should be used during surgery based on clinical conditions and their clinical experience (18). Various methods have been described in the literature (19,20). Compression sutures, uterine and hypogastric artery ligations, and hysterectomy when necessary, are recommended for surgical management (18). In this study, BH GAL was performed in patients where uterine massage, square compression sutures, and B-lynch suture during laparotomy failed to control bleeding, in patients who still had bleeding after hysterectomy or after rupture repair, and in cases of retroperitoneal bleeding or hematoma. This is because we think that the bilateral ligation of the artery may further decrease the blood supply in the pelvic region and result in better bleeding control.

The presence of the hypogastric artery in the retroperitoneum and its neighborhood to the ureter requires ureteral dissection and mastery of the retroperitoneal anatomy (7). Serious consequences such as gluteal and perineal necrosis, bladder and intestinal ischemia, ureteral injury, internal iliac vein injury, and even death have been reported due to incorrect application of the procedure (8,11). In this study, DIC, bladder injury, ureteral injury, iliac vein injury were observed in the intraoperative period, whereas complications such as fever, wound site infection, ileus and pulmonary

embolism were observed in the postoperative period. The complication rate was 48.3%. However, only one patient had complications due to the procedure itself, which was iliac vein injury. Therefore, the complication rate due to the procedure itself was 1.6%.

There are certain limitations of this study. Due to the retrospective nature of this study, data such as body mass index, diabetes mellitus and uterine pathologies (e.g. myoma uteri) could not be obtained. In addition, postoperative complications observed in this study are open to discussion since the operations were performed by different surgeons, and each surgeon's clinical experience was different. However, the decision for surgery was made by two surgeons, relatively reducing any possible bias due to the surgeon. The strength of this study is that although it is a single-center study, a very large patient cohort was included.

Conclusion

BHGAL is an effective method in the surgical treatment of PPH. The effectiveness of BHGAL in controlling PPH due to atony is superior to other causes. Although the most common indication for BHGAL in surgical management of PPH is atony, it should always be kept in mind that BHGAL can be successful in surgical management of other causes. Although the complications in these patients seem to be high, most of these complications are not related to the surgical procedure and are due to the outcomes of PPH. Therefore, BHGAL continues to be a life-saving method when applied by centers with adequate surgical knowledge and equipment.

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