

Is there a role of prophylactic bilateral internal iliac artery ligation on reducing the bleeding during cesarean hysterectomy in patients with placenta percreta? A retrospective cohort study

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ABSTRACT

Objectives: Our study aims to evaluate the effect of bilateral prophylactic internal iliac artery ligation (IIAL) on bleeding in patients with placenta percreta who undergo cesarean hysterectomy (CH) with the use of blunt dissection technique.

Material and methods: This retrospective cohort study included 96 patients with placenta percreta who underwent planned CH with using the blunt dissection technique to allow better vesico-uterine dissection at the gynecology and obstetrics unit of a university hospital between the years 2017–2019. We carried out bilateral IIAL before CH in the study group (group 1) while we performed only CH in the control group (group 2).

Results: Group 1 and Group 2 consisted of 50 and 46 patients; respectively. There was no statistical difference between the two groups as regards to the mean estimated blood loss, the mean transfused blood products, the mean operation time, and the number of complications. In total, 24 patients (25%) had complications with the finding that the most common one was bladder injury (16/96, 16,66%).

Conclusions: Routine bilateral prophylactic IIAL before CH in placenta percreta cases does not have a beneficial effect on decreasing the amount of bleeding and the amount blood transfusion

Key words: blunt dissection technique; cesarean hysterectomy; internal iliac artery ligation; placenta percreta

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INTRODUCTION

Placenta percreta is an abnormal invasion of the chorionic villi in all uterine layers and sometimes throughout the bladder and rectum [1]. Approximately 5% of adhesive placental disorders are related to placenta percreta [2]. Despite modern imaging techniques and new surgical methods, placenta percreta remains an important cause of life-threatening condition [3]. Although a hysterectomy is the most preferred surgical procedure [4], bilateral internal iliac artery ligation (IIAL) technique has been performed as a life-saving modality to decrease haemorrhage in obstetrical and pelvic surgeries when other commonly used surgical methods fail [5, 6]. There are only a few studies about using bilateral IIAL during abnormally invasive placenta [7, 8] and only placenta percreta surgery [9] which are mostly

designed with a limited number of patients. Blunt dissection technique with index finger is a new surgical method to reduce bleeding in the vesico-uterine pouch and to avoid bladder injury during CH in patients with placenta percreta that invades posterior bladder wall [10].

Our study aims to evaluate the effect of bilateral prophylactic IIAL on bleeding in patients with placenta percreta who undergo CH with the use of blunt dissection technique.

MATERIAL AND METHODS

This retrospective cohort study included 96 patients with placenta percreta who underwent CH at the gynaecology and obstetrics unit of a university hospital between the years 2017–2019. A consent form was obtained from the patients before operations and an approval form was received

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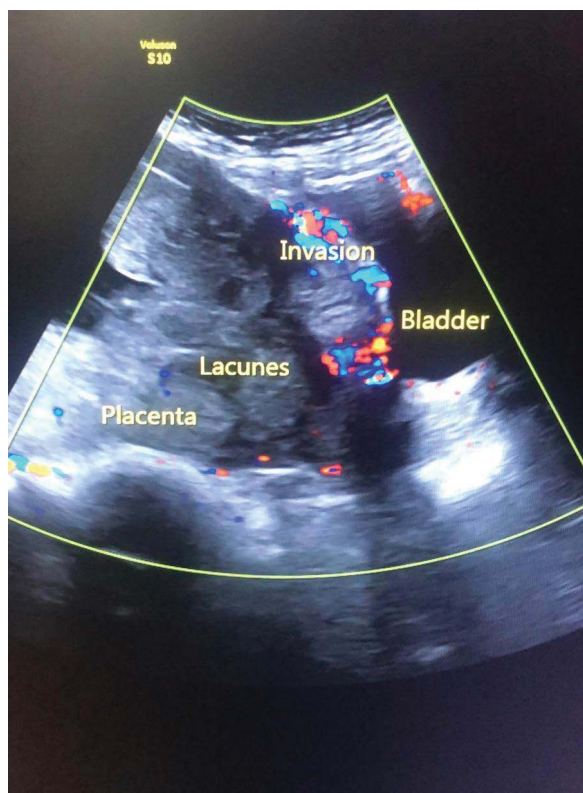


Figure 1. Doppler Ultrasonographic image of placenta percreta

from the University's Ethics Committee (Ethics Approval Number: 2019/44). We diagnosed the patients via grayscale and doppler ultrasonography (USG). Either placental lacunar zone or ambiguous vesico-uterine myometrial borderline in grayscale USG and increased vascularity between placental tissue and bladder in doppler USG were considered ultrasonographic diagnostic criteria (Fig. 1). All patients underwent planned CH with using the blunt dissection technique at various gestational weeks ranging from 34 to 37 weeks. After delivering the fetus via vertical uterine fundal incision, we filled the bladder with 300 cc saline to better determine the vascularised vesicouterine line and to provide less bleeding in all patients. Blunt dissection method was applied for all patients to make vesico-uterine dissection easier. In the first step of this method, aberrant veins between the low uterine segment and the bladder were skeletonized. In the second step, the bladder was bluntly dissected from the cervix up to the distal cervical point by using the index finger (Fig. 2). Finally, a total hysterectomy was performed. We utilized prophylactic bilateral IIAL by tying the internal iliac artery at 3 cm distal point of common iliac artery bifurcation with 2–0 silk sutures before CH in Group 1 patients (Fig. 3) and performed only CH in Group 2 patients. The same experienced surgical team who had expertise in placenta percreta surgery and were familiar with retroperitoneal anatomy. Patients with hematologic disorders, history of using an-

ticoagulant drugs and undergoing emergency CH were excluded from the study.

Post-operative complications were handled through a multi-disciplinary approach, which included a vascular surgeon and a urologist. We repaired bladder injuries by continued suturing with absorbable synthetic monofilament suture (*Monosyn*® 3/0, B-Braun) 3/0 in the mucosa and by interrupted suturing with 2–0 polyglactin 910 (*Vicryl*®; Ethicon) in the serosa and muscular layer. Neocystostomy was employed in only one patient with the ureteral injury. Internal iliac vein injuries were repaired with 5–0 polypropylene suture (*PROLENE*®; Ethicon). We estimated the blood loss by analyzing the sum of aspirated liquid (blood minus intraoperative saline usage) to the collectors, plus, the weight difference between blood-soaked surgical compress and gauze sponges from the dry ones. The final diagnosis of patients was confirmed by histopathological findings.

Statistical Analysis

Shapiro-Wilk test was used to understand whether numerical variables were distributed normally. The data that were normally distributed between the groups were analysed through student's t-test while non-normally distributed data were compared via Mann-Whitney U test. Chi-square test was used to analyse the relations between categorical variables. For statistical analyses SPSS 22.0 Windows version was used and a p-value under 0.05 was considered significant.

RESULTS

In the present study, Group 1 and Group 2 consisted of 50 and 46 patients; respectively. The mean age of the patients in the study was 32.03 ± 4.96 (range: 19–44 years). The mean body mass index (kg/m^2) was 27.34 ± 2.35 (range: 22–33). The mean parity, gravidity and gestational age (weeks) were 3.09 ± 1.44 (range: 1–8), 4.65 ± 1.80 (range: 2–11), and 35.7 ± 1.08 (range: 34–37); respectively. The comparison of maternal demographic data was shown in Table 1. There was no statistical difference between the two groups concerning age, BMI, parity, previous caesarean section, and gestational age but there was significant difference between the two groups concerning gravidity (5.04 ± 1.95 vs 4.22 ± 1.53 , $p = 0.024$). The mean intraoperative estimated blood loss was 1005.73 ± 518.34 mL (range: 400–3000). The mean amounts of transfused erythrocyte suspension and fresh frozen plasma were 2.47 ± 2.01 units (range: 0–8) and 2.17 ± 1.83 units (range: 0–8); respectively. The mean time of operation was 98.65 ± 31.23 (range: 50–200) minutes. The mean duration of hospitalization was 4.41 ± 2.15 (range: 2–16) days. The comparative data related to preoperative, intraoperative, and postoperative findings were listed in Table 2. There was no statistical difference between

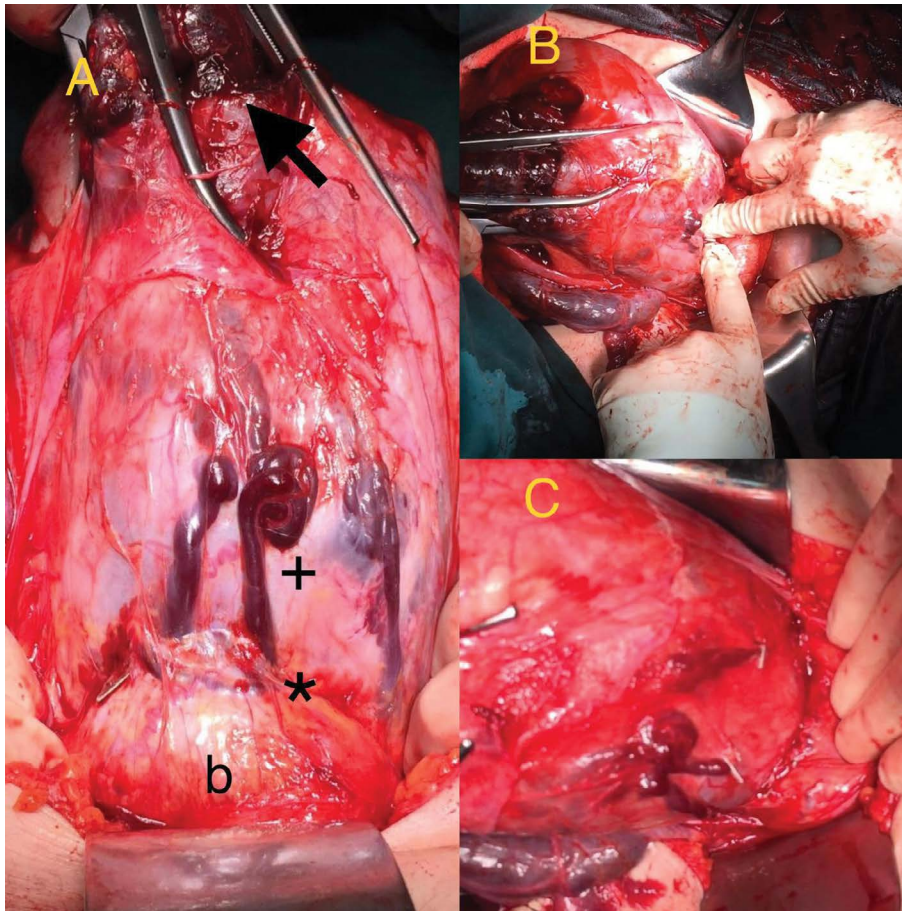


Figure 2. Utilizing blunt dissection technique; **A.** Asterisk indicates vascularised vesicouterine line. Plus sign indicates lower uterine segment; **b** indicates filled bladder with 300 mL saline, Arrow indicates lower part of fundal vertical incision; **B.** Vesicouterine dissection with index fingers; **C.** Dissected bladder from lower uterine segment

the two groups as regards to all parameters which were listed in Table 2. The mean birth weight of neonates was 2732.40 ± 320.30 (range: 2000–3500) grams. The mean Apgar scores at 1st and 5th minutes were 7.10 ± 1.17 (range: 3–9) and 8.41 ± 0.88 (range: 6–10); respectively. In total, 24 patients (25%) had complications with the finding that the most common one was bladder injury (16/96, 16.66%). The complication data concerning preoperative, intraoperative and postoperative data were shown in Table 3.

DISCUSSION

In recent years, the prevalence of patients with placenta percreta has been increasing gradually both in Turkey and throughout the world. It becomes a significant complication since it might threaten mothers' health by causing massive bleeding. In this respect, it is crucial to examine whether prophylactic IIAL might be useful in decreasing massive bleeding during placenta percreta surgery.

Our study found that using prophylactic IIAL has no statistically significant role in reducing the mean blood loss and the mean transfused blood products in placenta

percreta patients before CH with the use of blunt dissection technique. These findings are compatible with those of former studies that examine utilizing prophylactic bilateral IIAL before CH in patients with abnormally invasive placenta [7, 8] and only placenta percreta [9]. Kuhn et al. retrospectively found that bilateral IIAL in patients with placenta percreta undergoing CH did not significantly decrease the amount of blood loss in 11 patients when compared to 26 patients without bilateral IIAL [9]. The most recent prospective randomized study, which compared 29 patients with prophylactic IIAL before CH and 28 patients with only CH, suggested that this procedure has no significant impact on reducing intraoperative blood loss [7].

To the best of our knowledge, this study is the most comprehensive regarding the impact of utilizing prophylactic bilateral IIAL before CH on decreasing the amount of bleeding in patients with placenta percreta.

Bilateral IIAL has a beneficial impact on decreasing postpartum haemorrhage ranging from 40% to 100% in the literature [11]. The surgeons' ability and experience play a crucial role. The surgeon has to know retroperitoneal anatomy

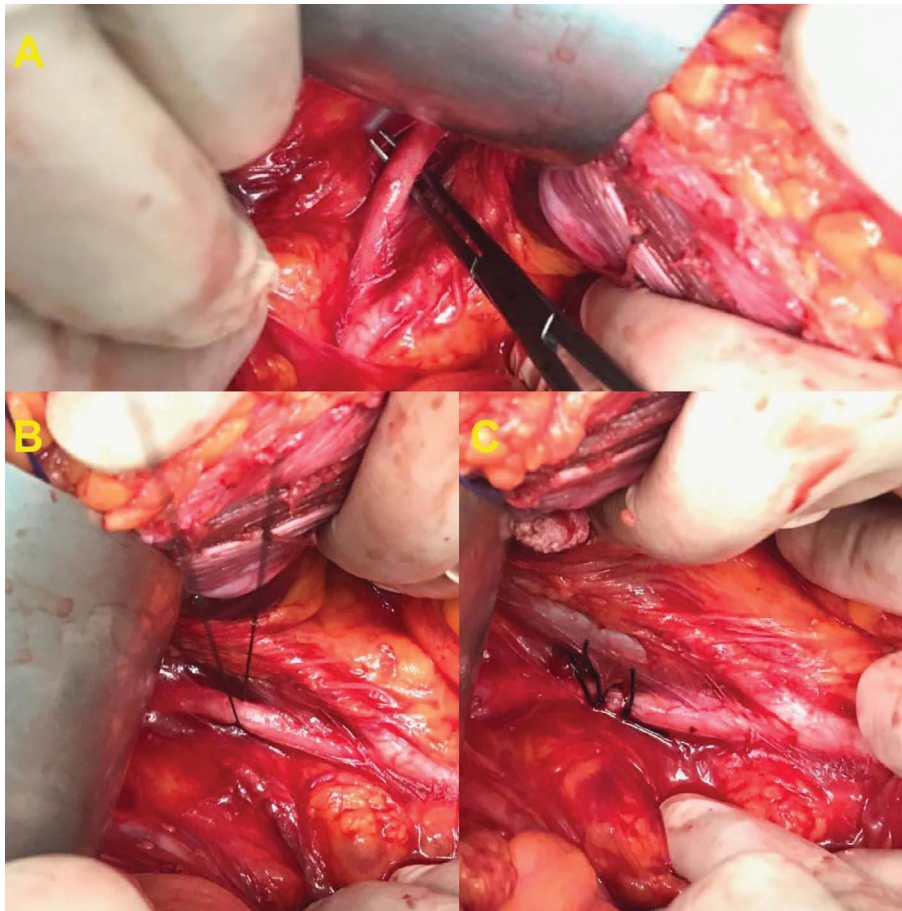


Figure 3. Intraoperative image of internal iliac artery (IIA) ligation; **A.** Dissection of IIAs sub-region with Wright surgical clamp; **B.** Holding IIA with 2-0 silk suture; **C.** Ligation of IIAL from two different points 0.5 cm apart at 3 cm distal point of common iliac artery bifurcation

Table 1. Comparison of demographical and obstetrical data

| | GROUP 1 (n = 50) | GROUP 2 (n = 46) | P |
|------------------------------|---------------------|---------------------|--------|
| Age [years] † | 32.03 ± 4.96 | 31.17 ± 4.5 | 0.105 |
| BMI [kg/m ²] † | 27.53 ± 2.68 | 27.14 ± 1.95 | 0.421 |
| Gravidity † | 5.04 ± 1.95 | 4.22 ± 1.53 | 0.024* |
| Parity † | 3.36 ± 1.63 | 2.8 ± 1.15 | 0.103 |
| Gestational age [weeks] † | 35.54 ± 1.2 | 35.87 ± 0.91 | 0.149 |
| Previous cesarean delivery † | 2.72 ± 1.01 | 2.5 ± 0.84 | 0.281 |

† mean ± SD; BMI — body mass index; *p < 0.05 value is significant

and must be familiar with potential complications including hypogastric vein injury, ureteral laceration or ligation, external iliac artery ligation, and peripheral nerve injuries [12]. The strengths of our study are the extensive sample size and having experienced surgeons both in retroperitoneal and placenta percreta surgery.

Internal iliac artery balloon occlusion can be used as an alternative to IIAL. However, this procedure is rarely em-

ployed only in health centres where experienced interventional radiologists can be found [13]. Moreover, performing an arterial catheter leads to chaotic complications including arterial pseudoaneurysms, acute lower extremity ischemia, reperfusion injury, and even arterial rupture [14–19]. The studies related to internal iliac artery balloon occlusion could not demonstrate any significant decrease in blood loss results [14, 20].

Although the bilateral IIAL procedure decreases the amount of bleeding in women's genital system, it cannot eliminate it [21]. Some studies stated that collateral circulation between internal and external iliac arteries contributes to extensive bleeding [22, 23]. Several studies demonstrated that intra-operative mean blood loss is less than the mean value reported in the literature by temporarily occluding common iliac arteries or aorta through the femoral artery [13, 24, 25]. Therefore, these procedures may have a promising potential on decreasing the amount of bleeding.

The main limitation of our study is designing in a retrospective manner. Another limitation may be the overestimation of complications due to the high referral rate to our third-degree hospital, which has the biggest obstetrical

Table 2. Comparison of preoperative, intraoperative and postoperative data

| | GROUP 1 (n: 50) | GROUP 2 (n: 46) | P |
|--|--------------------|--------------------|-------|
| Preoperative Hb [g/dL] † | 11.43 ± 1.35 | 11.51 ± 1.11 | 0.738 |
| Postoperative Hb [g/dL] † | 10.39 ± 1.35 | 9.9 ± 1.17 | 0.064 |
| Intraoperative EBL [mL] † | 993 ± 493.43 | 1019.57 ± 549.29 | 0.862 |
| Intraoperative units of RBCs transfused † | 2.14 ± 1.79 | 2.82 ± 2.18 | 0.102 |
| Intraoperative units of FFP transfused † | 1.88 ± 1.56 | 2.47 ± 2.05 | 0.151 |
| Intraoperative fibrinogens [1 gr/flacon] † | 0.2 ± 0.57 | 0.3 ± 0.73 | 0.587 |
| Maternal ICU admission ‡ | 7 (14%) | 10 (21.7%) | 0.321 |
| Operation time [minutes] † | 101.4 ± 29.95 | 95.65 ± 32.64 | 0.190 |
| Duration of hospitalization [days] † | 4.26 ± 2.11 | 4.57 ± 2.21 | 0.473 |
| The number of complication ‡ | 12 (24%) | 12 (26.1%) | 0.814 |

† mean ± SD; ‡ n (%); EBL — estimated blood loss; g/dL — gram/deciliter; ICU — intensive care unit; RBCs — red blood cells, FFP — fresh frozen plasma; Hb — haemoglobin; *p < 0.05 value is significant

Table 3. Complications data

| Complications | Group 1 (n: 50) | Group 2 (n: 46) |
|--|-----------------|-----------------|
| Intraoperative | | |
| Bladder injury ‡ | 9 (18%) | 7 (15.2%) |
| Urethral injury ‡ | 0 | 1 (2.17%) |
| Internal iliac vein injury ‡ | 2 (4%) | 0 |
| Internal iliac artery injury ‡ | 1 (2%) | 0 |
| Postoperative | | |
| Pelvic hematoma leading to re-laparotomy ‡ | 1 (2%) | 2 (4.34%) |
| Ileus‡ | 0 | 1 (2.17%) |

‡ n (%)

capacity in the southeast region of Turkey. The complications were classified as intra-operative (bladder injury, ureteral injury and vascular injury) and post-operative (ileus and post-operative hematoma) in our study.

Bladder injury was the most common complication

Bladder injury is more common in patients that have a hysterectomy due to placental invasion than those pa-

tients that have an elective hysterectomy because of various gynaecological reasons [26, 27]. In literature, the incidence of genitourinary injuries related to abnormally placental invasion is up to 29% [26, 28]. Nieto-Calvache et al. [29] demonstrated that the incidence of bladder injury in patients with abnormal placental invasion is 23%. However, this incidence was lower in our study when compared to the above-mentioned studies (16/96, %16,6). We attribute the low rate of bladder injury to the use of blunt dissection technique in all patients.

CONCLUSIONS

In conclusion, routine bilateral prophylactic IIAL before CH in placenta percreta cases does not have beneficial effect on decreasing the amount of bleeding and the amount of blood transfusion. Further prospective studies with more extended sample size are needed for more accurate outcomes.

Conflicts of interest

We declare that there are no conflicts of interest in connection with this article.

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