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Selective pelvic arterial embolization in the management of obstetric hemorrhage

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Abstract

Objective: Retrospective evaluation of pelvic arterial embolization for the treatment of severe post-partum hemorrhage.
Methods: Data were collected, from our departmental clinical records, on all patients with life-threatening post-partum hemorrhage managed with arterial embolization between January 2001 and December 2003.
Results: During the period analyzed, there were 29,119 deliveries in our institution. Of these, 27 patients underwent pelvic arterial embolization to control severe hemorrhaging despite conservative management. Of the 27 patients, 22 (81.5%) had a vaginal delivery and 5 had a caesarean section. The major indication for embolization was uterine atony (15 women). Disseminated intravascular coagulation developed in 20 cases (74.1%).

There were eight cases (29.6%) who underwent hysterectomy, seven of them pre-embolization.

The most frequent vessel embolized was the uterine artery (13 cases; 38.3%). One patient (3.7%) presented complications related to the procedure. The success rate was 96.3%.
Conclusion: Pelvic arterial embolization is a good therapeutic choice for severe post-partum hemorrhage refractory to conservative treatment measures.

Keywords: Post-partum hemorrhage; Pelvic arterial embolization; Obstetric hysterectomy

1. Introduction

The definition of obstetric hemorrhage varies. In general, this implies excessive blood loss of 500 mL or more in a vaginal delivery and at least 1000 mL following a caesarean section [1]. It is clinically difficult to define the amount of blood lost based on visual examination and, hence, post-partum hemorrhage can also be defined as a 10% change in hematocrit between admission and the post-partum period, or if a transfusion had been considered clinically necessary [2,3].

Depending on the country under consideration, post-partum hemorrhage is the third, the second, or even the first cause of maternal mortality, and represents around 11% of the total maternal deaths [4,5]. It is also a main cause of morbidity, including severe anemia, blood transfusion requirements, acquired coagulation disorders, renal failure, shock, and in severe cases, Sheehan's syndrome [5,6]. The most common cause of post-partum bleeding is uterine atony which occurs in 1 of every 20 deliveries [7]. Other causes are genital tract tears, hematomas, retained placental tissue, uterine inversion, acquired or inherited coagulation irregularities, and abnormal placentation such as placenta previa and accreta. Disorders of placentation are increasing in frequency because of the rising number of caesarean deliveries (elective as well as non-elective) and uterine scars. Post-partum hemorrhage incidence varies between 1 and 11% [4,8]. Initial management using such measures as uterotonic drugs can resolve most cases. In the cases of failure of conservative measures, the therapeutic alternatives include: bilateral ligature of the hypogastric arteries or of the arteries of the uterus, B-Lynch suture, and intra-uterine

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balloon dilatation [9,10]. In refractory cases, obstetric hysterectomy may be performed, but this surgical option leads to considerable maternal morbidity and mortality [11], leaves the patient infertile, and does not always result in effective hemostasis [6]. The disadvantages of surgical treatment also include low success rates for hypogastric artery ligation (<50%) due to abundant collateral blood supply of the uterus [12], the need for general anesthesia, and surgical complications including infection, bleeding, and injury to the ureter [13]. Pelvic arterial embolization is an alternative method with a low rate of complications, compared to the morbidity associated with surgical interventions. The rate of success is as high as 90%, and with the added advantage of preserving fertility [8,14,15]. The objective of the present study was to determine the effectiveness of pelvic embolization in the management of post-partum hemorrhage.

2. Materials and methods

Between January 2001 and December 2003, there were 29,119 deliveries in the Obstetrics and Gynecology Service of La Paz Hospital (Madrid, Spain). Of these, 315 had post-partum hemorrhages, and which represents 1.1% of the deliveries. Post-partum hemorrhage was considered following the clinical suspicion of a higher-than-normal bleeding confirmed by a decrease of >10% in the laboratory analysis of the hematocrit. There were 27 patients (0.09%) with severe post-partum hemorrhage who were referred to the Radiology Service for emergency pelvic angiography and embolization.

Clinical data were collected from medical records. The clinical, biochemical, and hematological data were recovered together with data on age, number of pregnancies, parity, mode of delivery and its complications, gestational age, etiology of the bleeding, clotting function and indication, and volume of blood transfused (number of bags of packed red cells, number of bags of fresh frozen plasma).

Conservative management consisted of prevention of hypovolemic shock with intravenous administration of crystalloid or colloid substances, treatment of coagulation disorders with transfusion of specific blood products, and management of uterine atony with fundal massage, uterine packing and the administration of uterotonic drugs (intravenous oxytocin, methyl-ergonovin, prostaglandin E2 analogue, and misoprostol).

Surgical interventions included inspection of the vagina, cervix, and perineum in order to locate and repair lower genital tract tears; manual exploration of the uterine cavity seeking evidence of retained products of conception; perforation or rupture; uterine or hypogastric artery ligation; hysterectomy.

Patients were stabilized and referred to the Radiology Service for an angiogram and embolization in case of active hemorrhage following the medical treatment, or degradation of hemodynamic status, or decrease in hemoglobin concentrations despite transfusion, or the possibility of developing clotting disorders. Catheterization via the femoral artery and flush aortography were performed before selective embolization.

There were 25 patients with active bleeding at angiography. Embolization was induced in 27 cases using coils and polyvinyl alcohol particles. Post-embolization angiography was performed to confirm that the occlusion of the vessels was complete.

3. Results

The mean age of the women was 29.9 years (SD: 5.6); 21 women (77.8%) were primiparas, and 6 (22.2%) were multiparas. There was one multiple pregnancy.

Full-term infants had been delivered by 26 women (96.3%); 22 (81.5%) had a vaginal delivery and in 11 of which forceps were used (50%). Caesarean section was employed in five women (18.5%). Overall mean birth weight was 3340 g (range: 2210–4330).

The major indication for embolization was uterine atony in 15 women (55.5%) and which was associated with genital tract tears in 4 cases. Other causes were: isolated genital tract lacerations in nine cases (33.3%); retained fragments of placenta in two cases (7.4%); amniotic fluid embolism with cardio-respiratory arrest, uterine atony and disseminated intravascular coagulation in one case (3.7%).

In all patients, the lower genital tract was inspected for lacerations needing repair. All patients needed uterotonic drugs (oxytocin in 100%, prostaglandin E2 analogue in 63.3%, methylergonovin in 53.3%, and misoprostol 33.3% of cases).

Surgical procedures pre-embolization included obstetric hysterectomy in seven cases. Hysterectomy was considered necessary in one case following the failure of the embolization to control the hemorrhage.

There were 26 patients (96.3%) who required transfusion pre-embolization and 17 cases (63%) required more blood products following the procedure. Disseminated intravascular coagulation was observed in 20 cases (74.1%). These data are summarized in Table 1.

Embolization was performed on 34 arteries. The procedure was carried-out bilaterally in eight patients (cases 5, 10, 13, 23, 24, 25, 26, and 27). The most frequent vessel embolized was the uterine artery in 13 cases (38.3%). Other vessels were pudendal artery in eight cases (23.6%); hypogastric artery in six cases (17.7%); obturator artery in three cases (8.8%); vaginal artery in two cases (5.8%), cervical artery in one case (2.9%), and deep femoral artery in one case (2.9%). These data are summarized in Table 2.

Angiography showed no extravasation in two women (7.4%). Nevertheless, bilateral embolization of uterine arteries was carried-out in these patients because the etiology of the bleeding was related to uterine atony.

In all patients, control arteriography post-embolization was performed to document overall hemostasis and to