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Review

Outcomes of pelvic arterial embolization in the management of postpartum haemorrhage: a case series study and systematic review

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ABSTRACT

Background: Postpartum haemorrhage (PPH) is an unpredictable obstetric emergency that requires a multidisciplinary approach. Pelvic arterial embolization (PAE) is considered as a second-line treatment, although the published results have not been reviewed systematically since 2007.
Objectives: To evaluate success and complication rates of PAE to treat PPH in the study hospital between 2009 and 2015, and to perform a systematic review of the literature on the reported efficacy and safety of PAE for the management of PPH.
Search strategy: A systematic review of articles on PAE in English or Spanish was conducted using Medline and the Cochrane Library.
Selection criteria: All published articles assessing success and complication rates of PAE in cases of PPH. The search was restricted to articles published in English or Spanish between 2000 and 2015, with at least 25 cases.
Data collection and analysis: Obstetric variables, maternal haemodynamic state, pre-/postembolization management, technique-related variables, post-PAE evolution and complications were recorded in the case series study. Study characteristics, success rates and PAE-related complication rates were recorded in the systematic review.
Main results: The case series included 29 patients. The majority of these patients were primiparous, with singleton term pregnancies and spontaneous labour. Caesarean section was performed in 62.1% of patients undergoing PAE for PPH. PAE was successful in 89.6% [95% confidence interval (CI) 78.3–100] of cases. Twenty studies were included in the systematic review, providing data from 1739 patients. PAE was successful in 89.4% (95% CI 87.9–90.9) of cases. The mortality rate was 0.9%, and other major complications were uncommon (1.8%).
Conclusions: PAE was found to be a minimally invasive, highly successful and safe technique for the management of PPH. It should be considered in PPH refractory to initial treatment.

Contents

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Introduction

Postpartum haemorrhage (PPH) is a complication that occurs in 5% of deliveries and accounts for 25% of all maternal deaths worldwide [1,2]. PPH is defined as estimated blood loss ≥500 ml after vaginal delivery or ≥1000 ml after caesarean section [3]. PPH is considered to be severe when estimated blood loss exceeds 2500 ml and/or transfusion of more than five blood units is necessary and/or management of coagulopathy is necessary during the acute event [4].

In recent years, the incidence of PPH has increased in developed countries. Possible causes include changes in maternal and pregnancy characteristics (increased maternal age, maternal obesity, multiple pregnancies), and changes in obstetric clinical practice (increased rates of labour induction and caesarean delivery) [5–8].

PPH is an unpredictable emergency with high maternal morbidity and mortality rates [9]. It requires a multidisciplinary approach with early aetiologic diagnosis, immediate control of blood loss and patient stabilization. Initial management strategies include uterine massage and use of uterotonic agents. Additional procedures such as surgical repair of vaginal tears, curettage of any retained placental tissue, uterine packing, uterine balloon tamponade, and transfusion of blood products for the management of acute anaemia and/or coagulopathy may be necessary [10]. Surgical intervention is a second-line strategy for refractory cases, including pelvic artery ligation, uterine suture techniques, stepwise uterine devascularization and, ultimately, emergency hysterectomy [11]. Although these are generally straightforward procedures, they are associated with increased risk of infection, bleeding or injury of adjacent organs [12–14], and can be ineffective.

Since its introduction into clinical practice by Brown et al. in 1979 [15], pelvic arterial embolization (PAE) has become the standard second-line option to treat PPH as it is fast, minimally invasive, highly effective, safe and preserves fertility [16,17]. In a systematic review conducted by Doumouchtsis et al. in 2007 [14], PAE was found to be clinically successful in 90.7% of cases, although it did not prove to be superior when compared with other fertility-preserving and morbidity-reducing treatments for PPH (uterine balloon tamponade, uterine compression sutures and pelvic devascularization). Since 2007, an increasing number of groups have reported positive results of PAE. However, no systematic review has been conducted since the previously mentioned publication.

The aims of this study were to evaluate success and complication rates of PAE performed to treat PPH in the study hospital between 2009 and 2015, and to perform a systematic review of the literature on the reported efficacy and safety of PAE for the management of PPH.

Materials and methods

Case series of PAE for PPH

A prospective cohort observational study was undertaken in the Obstetrics and Gynaecology Unit, the Anaesthesiology and Critical Care Unit, and the Radiology Department at Hospital General Universitario Gregorio Marañón, Madrid, Spain. All women with PPH who underwent PAE in the study hospital between 1 January, 2009 and 31 March, 2015 were included. The Institutional Review Board approved the study and verbal consent was obtained from all patients.

As the study hospital is a tertiary referral centre, the study included patients who had given birth at the study hospital and patients who had been transferred from other hospitals due to refractory PPH.

PPH cases were included in an electronic database for subsequent analysis. Pre-embolization assessment involved the collection of clinical maternal and perinatal variables, including maternal age, parity, previous caesarean section, type of gestation (singleton or multiple), gestational age at delivery, induction of labour (induced or spontaneous), type of delivery (vaginal or caesarean section) and neonatal birth weight (g). Pre-embolization procedure and maternal haemodynamic state variables included were: type of PPH [primary (<24 h post partum) or secondary (between 24 h and 6 weeks after delivery)] [10,18], aetiology of PPH and/or indication for embolization, pre- and post-PAE surgical procedures (curettage, uterine balloon tamponade, bilateral uterine artery ligation, B-Lynch suture and obstetric hysterectomy), need for transfusion before and/or after PAE [mean number of red blood cell units (RBCUs) and fresh-frozen plasma units (FFPUs) per patient], and the presence of disseminated intravascular coagulation (DIC) [19].

Before embolization, patients were examined clinically and were treated for PPH according to the standard treatment protocol of the Royal College of Obstetricians and Gynaecologists [20]. Patients were managed by a multidisciplinary team comprising obstetric, anaesthesiology and radiology staff.

All PAE procedures were performed under local anaesthesia on the vascular and interventional radiology ward. An anaesthesiologist was present during all procedures. A unilateral right femoral approach was used in all cases. First, left internal iliac artery anterior division was studied via a distal aortography using a 4F or