Taiwanese Journal of Obstetrics & Gynecology 53 (2014) 366–371

Contents lists available at ScienceDirect

Taiwanese Journal of Obstetrics & Gynecology

journal homepage: www.tjog-online.com

Original Article

Predictive factors related to the efficacy of pelvic arterial embolization for postpartum hemorrhage: A retrospective analysis of 21 cases

Daichi Urushiyama [a], Toshiyuki Yoshizato [b,*], Shinichi Kora [c], Hideyuki Higashihara [c], Anna Sato [a], Takaaki Kubota [d], Masato Tatsumura [e], Kengo Yoshimitsu [c], Shingo Miyamoto [a]

[a] Department of Obstetrics and Gynecology, Faculty of Medicine, Fukuoka University, Fukuoka, Japan
[b] Center for Maternal, Fetal, and Neonatal Medicine, Fukuoka University Hospital, Fukuoka, Japan
[c] Department of Radiology, Faculty of Medicine, Fukuoka University, Fukuoka, Japan
[d] Department of Obstetrics and Gynecology, Fukuoka Tokushukai Hospital, Fukuoka, Japan
[e] Department of Obstetrics and Gynecology, Yamaguchi Red Cross Hospital, Yamaguchi, Japan

ARTICLE INFO

Article history:
Accepted 18 April 2013

Keywords:
disseminated intravascular coagulation
embolization
forecasting
postpartum hemorrhage
therapeutic

ABSTRACT

Objective: This retrospective study aimed to determine the predictive factors for the efficacy of pelvic arterial embolization for postpartum hemorrhage.
Materials and methods: Twenty-one patients who underwent pelvic arterial embolization for postpartum hemorrhage of >1000 mL between September 2006 and September 2011 were enrolled in this study. The patients were divided into two subgroups according to the blood loss and time from the end of pelvic arterial embolization to complete hemostasis: good-response (16 patients) and poor-response groups (5 patients). The following predictive factors were compared between the groups: (1) patient characteristics; (2) blood loss; (3) time between delivery (or onset of bleeding) and pelvic arterial embolization; (4) obstetrical disseminated intravascular coagulation score comprising clinical background, clinical signs, and laboratory data; (5) individual disseminated intravascular coagulation score; (6) shock index; and (7) laboratory data including platelet count, prothrombin time-international normalized ratio, fibrinogen, fibrin degradation products, and antithrombin-III at the time of pelvic arterial embolization.
Results: In the poor-response group, the obstetrical and individual disseminated intravascular coagulation scores and prothrombin time-international normalized ratio were higher than those in the good-response group ($p < 0.05$). Platelet count, fibrinogen, and fibrin degradation products were lower than those in the good-response group ($p < 0.05$). All obstetrical disseminated intravascular coagulation scores in the poor-response group were >9 points.
Conclusion: The efficacy of pelvic arterial embolization is related to the presence or absence of coagulation disorders. When the obstetrical disseminated intravascular coagulation score is high (>9 points), the efficacy may be poor.

Introduction

Postpartum hemorrhage (PPH) is still one of the leading causes of maternal death in developed countries [1–3]. Over the past few decades, pelvic arterial embolization (PAE) has become a reliable and safe alternative treatment method for PPH when uncontrollable hemorrhage occurs with conventional procedures such as manual and surgical compression of the uterus, local and systemic administration of uterotonic agents, and suturing of bleeding sites of the uterus and birth canal [4–6]. The success rate of PAE for PPH is high (79–95%) with complications rates from 3% to 12% [7–9]. PAE has an advantage over ligation of hypogastric and uterine arteries and hysterectomy for a variety of reasons. PAE can possibly control hemorrhage in regions that are not supplied by surgically ligated arteries or sites in which collateral circulation exists. This

* Corresponding author. Center for Maternal, Fetal, and Neonatal Medicine, Fukuoka University Hospital, 7-45-1 Nanakuma, Jonan-ku, Fukuoka 814-0180, Japan.
E-mail address: ty-obgyn@cis.fukuoka-u.ac.jp (T. Yoshizato).

http://dx.doi.org/10.1016/j.tjog.2013.04.043

Table 1
Patient characteristics.

Case	Age (y)	Parity	Medical complications	Obstetric complications	GA at delivery (wk/d)	Mode of delivery	Causes of PPH
1	36	2	–	Abruptio placentae	39/3	Transvaginal	Uterine atony
2	34	1	–	Abruptio placentae, IUFD	35/3	Hysterectomy	Uterine atony
3	31	0	–	Preeclampsia, LLP	37/2	Emergency CS	Uterine atony
4	35	3	–	Placenta previa	36/1	Elective CS	Uterine atony
5	25	1	MCTD	Abruptio placentae, IUFD	28/5	Hysterectomy	Coagulopathy
6	29	1	–	–	32/6	Emergency CS	Uterine atony
7	37	1	–	–	37/0	Elective CS	Placenta accreta
8	36	2	–	–	37/0	Elective CS	Uterine atony
9	29	1	Focal glomerulonephritis	–	34/5	Elective CS	Uterine atony
10	39	1	–	–	41/2	Transvaginal	Uterine atony
11	25	0	–	–	40/6	Transvaginal	Retained placenta
12	32	0	–	–	40/2	Transvaginal	Uterine atony
13	27	2	–	Gestational hypertension	37/4	Transvaginal	Uterine atony
14	29	1	–	–	40/4	Transvaginal	Uterine atony
15	34	2	–	–	38/1	Elective CS	Pseudo-aneurysm
16	31	0	–	Preeclampsia	40/5	Transvaginal	Uterine atony
17	37	2	–	–	39/2	Transvaginal	Undetermined
18	31	2	–	–	39/5	Transvaginal	Pseudo-aneurysm
19	37	3	–	–	39/4	Transvaginal	Retained placenta
20	33	2	–	–	40/0	Transvaginal	Undetermined
21	31	1	–	–	40/4	Transvaginal	Undetermined

CS = Cesarean section; GA = gestational age; IUFD = intrauterine fetal death; LLP = low-lying placenta; MCTD = mixed connective tissue disease; PPH = postpartum hemorrhage.

technique can also be beneficial for patients with coagulopathy in whom surgical interventions are contraindicated. Furthermore, it preserves the reproductive function of patients, including the ability to become pregnant in the future.

When treating patients with PPH, it is vital to know the efficacy of PAE in advance to determine the best strategy with which to control hemorrhage that is refractory to conventional procedures. Which patients are good candidates for PAE and under which conditions is it appropriate to intervene? To the best of our knowledge, there have been three reports regarding the predictive factors of PAE for PPH; however, the criteria for success of PAE and the indications for repeat PAE were ill-defined [7,8,10]. In this study, patients with PPH who underwent PAE in our three institutes were retrospectively reviewed. Based on well-defined criteria for hemostasis after PAE, the aim was to determine the predictive factors for the efficacy of PAE.

Materials and methods

Between September 2006 and September 2011, a total of 6772 births were recorded at Fukuoka University Hospital, Fukuoka Tokushukai Hospital, and Yamaguchi Red Cross Hospital, Fukuoka,

Table 2
DIC scoring.

(1) Clinical background	Points	(2) Clinical signs	Points	(3) Laboratory data	Points
a. **Abruptio placenta**		a. **Acute renal failure**		FDP ≥10 μg/mL	1
Uterine hypertonicity, dead fetus	5	Anuria (≤5 mL/h)	4	Platelet count ≤100,000/μL	1
Uterine hypertonicity, live fetus	4	Oliguria (>5 and ≤20 mL/h)	3	Fibrinogen ≤150 mg/dL	1
Abnormal CTG/ultrasound findings suggestive of abruption	4	b. **Acute respiratory failure (excluding amniotic fluid embolism)**		Prothrombin time ≥15 s (≤50%) or hepaplastin test ≤50%	1
b. **Amniotic fluid embolism**		On full mechanical ventilation or occasionally on assisted ventilation	4	Erythrocyte sedimentation rate ≤4 mm/15 min or ≤15 mm/h	1
With acute cor pulmonale	4	On oxygen mask	1	Bleeding time >5 min	1
On full mechanical ventilation	3	c. **Severe organ damage to heart, liver, central nervous system, or gastrointestinal tract**		Abnormal values of the other biomarkers for coagulation, fibrinolysis, and kinin	1
On assisted ventilation	2	Heart (rales, foamy sputum, etc.)	4	(e.g., AT-III ≤18 mg/dL or ≤60%,	
On oxygen mask	1	Liver (recognizable jaundice)	4	or prekallikrein, α2-PI, plasminogen,	
c. **Postpartum hemorrhage**		CNS (unconsciousness, convulsion, etc.)	4	or other coagulation factors ≤50%)	
Sampled blood or blood from birth canal, uncoagulated or hypocoagulated	4	Gastrointestinal tract (necrotizing enterocolitis)	4		
Blood loss of ≥2000 mL (≤24 h)	3	d. **Bleeding tendency**			
Blood loss of ≥1000 and <2000 mL (≤24 h)	1	Macroscopic hematuria, melena, purpura, or bleeding from mucosa, gingiva, or sites where needle is inserted	4		
d. **Eclampsia**		e. **Shock state**			
Eclampsia	4	Pulse ≥100/min	1		
e. **Others (leading to DIC)**	1	Systolic blood pressure ≤90 mmHg or ≤40% of baseline	1		
		Sweating	1		
		Paleness	1		

α2-PI = α2-plasminogen inhibitor; AT-III = anti-thrombin-III; CNS = central nervous system; CTG = cardiotocogram; DIC = disseminated intravascular coagulation; FDP = fibrin degradation products.