Surgical Management of Placenta Accreta — Does Staged Procedure Help?

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Objectives: To determine whether staged procedure involving classical Caesarean section without removing the placenta followed by arterial embolisation before hysterectomy had any clinical value in the surgical management of placenta accreta.
Methods: This retrospective case-controlled study was conducted in a tertiary obstetric unit in Hong Kong. All hysterectomy cases with confirmed histological diagnosis of placenta accreta from 1 January 2000 to 31 December 2011 were reviewed. The main outcome measures were total anaesthetic time, anaesthetic time before delivery, intra-operative blood loss, postoperative haemoglobin level, the need and amount of blood product transfusion, and the need and length of stay in the intensive care unit.
Results: A total of 35 cases of placenta accreta / percreta / increta were confirmed by histological diagnosis; 12 cases had successful staged procedure. These cases had significantly less operative blood loss (median, 1350 vs. 4500 mL; p=0.007), higher postoperative haemoglobin level (mean, 94 vs. 76 g/L; p=0.03), less need for blood transfusion (5 vs. 19 cases; p=0.022), and less amount of blood transfused (median, 0 vs. 10 units; p=0.003) than those who did not undergo staged procedure. The mean anaesthetic time before delivery of staged procedure group was longer (49.5 vs. 12.8 mins in the non–staged procedure group; p<0.001). However, there was no significant difference in the two groups in terms of the total anaesthetic time, as well as the need and length of stay in the intensive care unit.
Conclusion: In managing patients with placenta accreta, staged procedure involving classical Caesarean section without removing the placenta followed by arterial embolisation before hysterectomy was associated with decreased operative blood loss.
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Keywords: Cesarean section; Placenta accreta; Uterine artery embolization

Introduction

Women with placenta accreta are at increased risk of morbidity and mortality due to massive haemorrhage at delivery[1]. Traditionally, Caesarean hysterectomy is the definitive surgical treatment for placenta accreta. However, it is associated with a risk of significant haemorrhage. In the past few years, intra-operative arterial embolisation before hysterectomy has been introduced as an adjuvant haemostatic technique to reduce the blood loss, the need for and the amount of blood transfusion, as well as the number of admissions to the intensive care units[2-4]. Since 2004, with collaboration from the Department of Diagnostic Radiology, intra-operative arterial embolisation is performed before hysterectomy in selected patients with placenta accreta in Tuen Mun Hospital. This study aimed to review its clinical use in this aspect in Hong Kong.

Methods

We collected data from a series of women who had undergone hysterectomy for placenta accreta from 1 January 2000 to 31 December 2011. The diagnosis of placenta accreta in each case was confirmed with histological examination. Cases were first identified from the database of the Department of Histopathology and Operation Record Management System in our hospital. The hospital records including outpatient records, operative records, ultrasound records, blood transfusion records, intensive care unit records, and prenatal diagnosis records were then retrieved and reviewed. Cases without hysterectomy were excluded.

Since 2004, with the collaboration from Department of Diagnostic Radiology, our unit started to perform staged procedures for patients with placenta accreta in an elective or semi-emergency setting. Patients with ultrasonographic features of placenta accreta were counselled at 28 weeks

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of gestation by the maternal fetal medicine (MFM) subspecialist in our unit. Definitive management by staged procedure involving classical Caesarean section without removing the placenta, followed by arterial embolisation before hysterectomy versus conservative management with leaving the placenta in situ, were offered. We aimed at elective delivery at 37 weeks of gestation. In case earlier delivery was required for clinical reasons, only those patients in stable condition were offered staged procedure as semi-emergency cases. Otherwise emergency delivery without staged procedure would be performed.

On the day before the surgery, an informed consent was obtained by both the obstetrician and interventional radiologist. An ultrasonography was performed again by the MFM subspecialist to re-confirm the diagnosis and for detailed mapping of the placenta. After assessment by the anaesthetist, the patient was kept nil-by-mouth after midnight and cross-matched for 6 units of blood.

On the morning of the operation, the patient was transferred to the main operation theatre where the C-arm fluoroscopy unit could be accommodated. The operation theatre was located in the same block as our antenatal ward; the setup plan is shown in the Figure. Patient would first undergo anaesthetic preparation which included insertion of two large-bore intravenous accesses over the arms, a 12F Foley catheter, a triple-lumen or double-lumen central venous catheter, and a radial arterial line. The patient was then handed over to the interventional radiologist for insertion of bilateral femoral sheaths. Depending on the preference of the radiologist, this was performed under general, spinal, or local anaesthesia. After the start of anaesthesia, the patient was scrubbed and draped. Retrograde puncture of common femoral artery was performed bilaterally. Vascular sheaths were inserted with or without ultrasound guidance and were then secured by vicryl stitches. Canalisation of bilateral internal iliac arteries by C1 catheter was performed simultaneously and correct positioning was confirmed by internal iliac artery angiograms. In selected cases, bilateral ureteric catheters were inserted via cystoscopic approach by the urologist to have a better delineation of the ureters during hysterectomy. These were performed before handing over the patient to the interventional radiologist.

The surgery was then performed by at least two MFM subspecialists with the interventional radiologist on standby. The patient was put under general anaesthesia only if spinal or local anaesthesia was given for the insertion of femoral sheaths. A midline skin incision extending from the mons pubis to above the umbilicus was made. Classical Caesarean section was performed over the uppermost part of the uterus to avoid the placenta. The baby was delivered and resuscitated by a paediatrician. The cord was clamped and continuous running vicryl stitches were applied to the Caesarean wound edge to control bleeding from the wound edges. If there was significant haemorrhage, immediate hysterectomy would be performed.

If there was no sign of placental separation and the bleeding was not heavy, the operative field would be covered by an abdominal pack soaked in warm saline with an antimicrobial incise drape over it. Embolisation of both internal iliac arteries was then performed using Gelfoam pledgets till stasis was achieved. After embolisation, hysterectomy was performed and the specimen sent for histopathological examination.

The maternal demographic and outcome data, including age, parity, number of previous Caesarean sections, gestational age at delivery, total anaesthetic time (defined as the interval between the start of general or regional anaesthesia and reverse of anaesthesia), anaesthetic time before delivery (defined as the anaesthesia time required for insertion of the femoral sheaths and other preparatory procedures for embolisation before delivery), operative blood loss, lowest postoperative haemoglobin level, the need and amount of blood products transfused, as well as the need and length of the intensive care unit stay were collected. For comparison, the subjects were divided into two groups: those who underwent staged procedure and those who did not.

Statistical Analyses

Skewed continuous variables and near-normally distributed variables were presented as medians (interquartile ranges) and means ± standard deviations, respectively. Categorical data were presented as counts and percentages. The Mann-Whitney *U* test and the independent samples *t* test were used for comparisons of medians and means, respectively. The Pearson Chi-square or Fisher's exact tests were used for comparisons of frequencies where appropriate. The outcomes of the embolisation and the non-embolisation groups were described. All analyses were performed with the Statistical Package for the Social Sciences (Windows version 11.0; SPSS Inc., Chicago [IL], US). The statistical significance level was set at $p<0.05$.

Results

During the study period, 48 obstetric hysterectomies were identified from the Operation Record Management

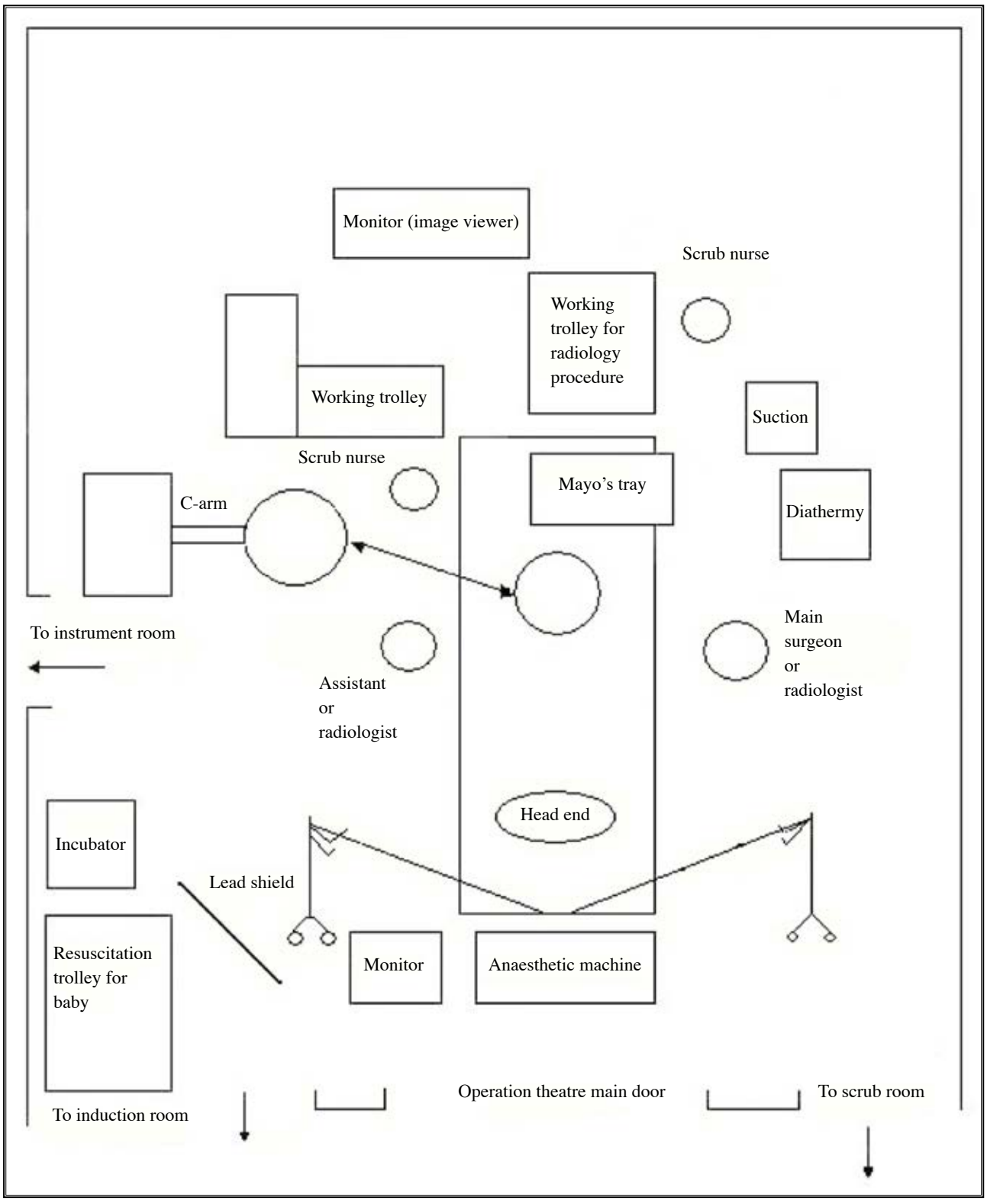

Figure. Operation theatre setup

System and 37 cases of placenta accreta, percreta, or increta were identified from the database of the histopathology department. After cross-checking, 35 cases were managed by hysterectomy and were included for further analysis. Two cases without hysterectomy were excluded.

Of the 35 cases in our series, 10 (cases 1-10) were managed before staged procedure was available. Histologically, there were 30 cases of placenta accreta, four cases of placenta increta, and one case of placenta percreta. In all, 29 cases had a history of Caesarean section,

of which 11 had had two or more Caesarean sections. Placenta praevia was present in 26 cases; 25 of these were major placenta praevia (Table 1). A total of 21 cases had a correct diagnosis of placenta accreta or percreta antenatally and all had placenta praevia. Of these, 12 were managed successfully by the staged procedure while nine were managed in the emergency setting with Caesarean hysterectomy (Table 1). Case 19 was a case of placenta percreta diagnosed at 16 weeks of gestation. The patient chose termination of pregnancy and staged procedure was performed.

A total of 14 cases were not diagnosed antenatally. Among these, 10 cases underwent direct Caesarean hysterectomy. Two cases (cases 16 and 30) presented with severe postpartum haemorrhage after a lower-segment Caesarean section and required hysterectomy as second operation after delivery. One case (case 13) presented with retained placenta after normal spontaneous delivery and failure of manual removal of placenta. Hysterectomy was performed for severe haemorrhage. Another case (case 28) was diagnosed with placenta accreta after normal spontaneous delivery and conservative management was adopted. However, she developed acute pelvic inflammatory disease on day 63, and had to undergo hysterectomy. In all, nine out of these 14 cases underwent manual removal of placenta (Table 2).

All 12 cases that underwent staged procedure had successful embolisation before hysterectomy. One of them (case 22) required a second embolisation on the left side before the end of operation for further haemostasis over the raw area. Bilateral ureteric catheter was inserted by the urologist in four of these 12 cases at the beginning of the operation to facilitate identification of the ureters during hysterectomy. Partial placental separation was observed in three of these 12 cases after embolisation, with only one case (case 35) having significant bleeding; however, this did not alter the subsequent management. No case in either groups required embolisation after hysterectomy was performed (Table 2).

The demographic data are summarised in Table 3. There was no difference in the age, parity, number of previous Caesarean sections, and the gestational age at delivery between the staged and non–staged procedure groups. The former group had significantly higher proportion of cases of placenta praevia than the latter group (p=0.015).

The outcomes are listed in Table 4. The staged procedure group had significantly less operative blood loss (median, 1350 vs. 4500 mL; p=0.007), higher postoperative haemoglobin level (mean, 94 vs. 76 g/L; p=0.03), less need for blood transfusion (5 vs. 19 cases; p=0.022), and less amount of blood transfused (median, 0 vs. 10 units; p=0.003). The anaesthetic time before delivery was significantly longer in the staged procedure group than non–staged procedure group (mean, 49.5 vs. 12.8 mins; p<0.001). However, in terms of the total anaesthetic time as well as the need and length of stay in the intensive care unit, no significant difference was noted in these two groups. Subgroup analysis was performed on cases with antenatal diagnosis of placenta accreta and percreta. There was significantly less blood loss, higher postoperative haemoglobin level, and less amount of blood transfused in the staged procedure group than non–staged procedure group.

Eight cases had complications (Table 5). Two patients (cases 3 and 18) had disseminated intravascular coagulation and required adrenaline infusion. Case 3 developed cardiac arrest and required cardiopulmonary resuscitation for 1 minute. Two patients (cases 7 and 19) had bladder perforation. Two patients (cases 3 and 7) required abdominal packing for haemostasis; a second laparotomy was performed on the second postoperative day in these two cases. Two patients (cases 18 and 30) received NovoSeven injection. One patient (case 23) had a 3-cm serosal tear on the ileum which was treated successfully with primary repair. One patient (case 33) developed severe vault bleeding on the second postoperative day; she was treated with vaginal plication of the bleeder under general anaesthesia. There was one embolisation-related complication. Case 26 had right lower limb ischaemia 3 hours after the operation; she was treated by a vascular surgeon with urgent angiogram, thrombectomy, and right iliac angioplasty and stenting. She had right lower limb weakness and foot drop afterwards, but had full recovery a year later. No significant difference between the two groups in terms of complications and the need for NovoSeven injection was noted (Table 4).

Discussion

The incidence of placenta accreta is increasing in parallel with the increasing rates of Caesarean section[5]. The maternal mortality and morbidity associated with placenta accreta have been reported to be as high as 7%[6] and 59%[7], respectively. Torrential bleeding is the most common cause leading to these consequences. The mean blood loss for placenta accreta, increta, and percreta was reported to be 3000 mL[6], 3630 mL[6], and 12,140 mL[8], respectively. It remains a challenging task for obstetricians worldwide to manage this condition.

Table 1. Background information of patients

Case No.	Age (years)	Parity	Previous C/S	Risk factor in the current pregnancy	Gestational age (weeks)	Antenatal diagnosis	Pathology	Summary of management
1	34	1	1	PP IV	37	Nil	Accreta	LS, Caesarean hysterectomy
2	33	2	2	Nil	38	Nil	Accreta	LS, Caesarean hysterectomy
3	37	1	1	PP IV, previous C/S for PP III	35	Nil	Accreta	LS, Caesarean hysterectomy
4	45	4	2	PP IV	30	Accreta	Accreta	Classical, Caesarean hysterectomy
5	38	1	1	Anterior PP III	35	Accreta	Accreta	Classical, Caesarean hysterectomy
6	32	1	0	Uterus perforated by IUCD insertion	37	Nil	Accreta	LS, Caesarean hysterectomy
7	32	2	2	PP IV	34	Accreta	Accreta	Classical, Caesarean hysterectomy
8	35	2	2	Anterior PP III	37	Accreta	Accreta	Classical, Caesarean hysterectomy
9	36	2	0	PP IV	34	Accreta	Accreta	Classical, Caesarean hysterectomy
10	27	1	1	PP IV	37	Accreta	Accreta	Classical, Caesarean hysterectomy
11*	40	2	1	Posterior PP III	35	Accreta	Accreta	Classical, staged procedure
12	35	1	1	Anterior PP I	38	Nil	Accreta	LS, Caesarean hysterectomy
13	38	2	0	Nil	40	Nil	Accreta	NSD, retained placenta, failed MROP, severe PPH, TAH done
14	31	1	1	Anterior PP III	35	Accreta	Accreta	LS, Caesarean hysterectomy
15	35	1	0	Anterior PP III	35	Nil	Accreta	LS, Caesarean hysterectomy
16	40	1	1	Posterior PP III	28	Nil	Increta	APH at 28 weeks, LS, blood loss of 1000 mL, shock after OT, TAH done
17*	37	4	2	PP IV	37	Accreta	Increta	Classical, staged procedure
18	36	2	2	Posterior PP III	32	Accreta	Accreta	LS, Caesarean hysterectomy
19*	29	5	5	PP IV	16	Percreta	Percreta	TOP, staged procedure
20*	37	1	1	PP IV	35	Accreta	Increta	Classical, staged procedure
21	38	1	1	Nil	38	Nil	Accreta	LS, Caesarean hysterectomy
22*	33	1	1	PP IV	37	Accreta	Accreta	Classical, staged procedure
23*	39	1	1	Posterior PP III	37	Accreta	Accreta	Classical, staged procedure
24*	37	1	1	Posterior PP III	35	Accreta	Accreta	Classical, staged procedure
25*	29	1	1	Anterior PP III	38	Accreta	Accreta	Classical, staged procedure
26*	39	2	1	PP IV	30	Accreta	Accreta	Classical, staged procedure
27*	27	1	1	PP IV	34	Accreta	Accreta	Classical, staged procedure
28	32	1	0	TOP x 2	38	Nil	Accreta	Diagnosis of accreta after NSD, conservative management, acute PID on day 63, TAH performed
29	42	2	2	Previous C/S for PP II	38	Nil	Accreta	LS, Caesarean hysterectomy
30	36	3	3	2 Previous classical C/S	36	Nil	Accreta	LS, blood loss of 1200 mL, haemoperitoneum 3 hours after OT, TAH performed
31	23	0	0	1 TOP	41	Nil	Increta	Failed induction, LS, Caesarean hysterectomy
32	30	2	1	1 TOP	38	Nil	Accreta	LS, Caesarean hysterectomy
33	29	2	2	PP IV	28	Accreta	Accreta	Classical, Caesarean hysterectomy
34*	43	3	2	PP IV	37	Accreta	Accreta	Classical, staged procedure
35*	38	1	1	Posterior PP III	35	Accreta	Accreta	Classical, staged procedure

Abbreviations: APH = antepartum haemorrhage; C/S = Caesarean section; Classical = classical Caesarean section; IUCD = intrauterine contraceptive device; LS = lower segment Caesarean section; MROP = manual removal of placenta; NSD = normal spontaneous delivery; OT = operative time; PID = pelvic inflammatory disease; PP = placenta praevia; PPH = postpartum haemorrhage; TAH = total abdominal hysterectomy; TOP = termination of pregnancy

* Cases with staged procedure performed

Table 2. Details of Caesarean hysterectomy or total abdominal hysterectomy

Case No.	Year of delivery	Placental separation	Urgency of operation	Femoral sheath	Embolisation	Ureteric catheter	Type of anaesthesia	Total anaesthetic time (mins)	Anaesthetic time before delivery (mins)
1	2000	No, MROP	Elective	No	No	No	GA	75	3
2	2000	No, MROP	Elective	No	No	No	GA	185	19
3	2000	No, MROP	Emergency	No	No	No	GA	340	15
4	2002	No	Emergency	No	No	No	GA	90	10
5	2003	No	Emergency	No	No	No	GA	105	7
6	2003	No, MROP	Elective	No	No	No	GA	65	14
7	2003	Partial	Emergency	No	No	No	GA	270	13
8	2003	No	Elective	No	No	No	GA	160	13
9	2003	No	Emergency	No	No	No	GA	115	3
10	2004	No, MROP	Elective	No	No	No	GA	80	6
11*	2004	Partial	Semi-E	Yes	Yes	No	GA	145	40
12	2004	No, MROP	Elective	No	No	No	SA	110	13
13	2005	No, MROP†	Emergency	No	No	No	GA	100	Not applicable
14	2005	Partial	Emergency	No	No	No	GA	175	3
15	2005	Partial	Emergency	No	No	No	GA	175	7
16	2006	No, MROP†	Emergency	No	No	No	GA	140	Not applicable
17*	2006	No	Elective	Yes	Yes	Yes	GA	205	65
18	2006	Partial	Emergency	No	No	No	GA	180	10
19*	2008	Not applicable	Elective	Yes	Yes	No	GA	135	Not applicable
20*	2008	No	Semi-E	Yes	Yes	Yes	GA	96	90
21	2008	Partial	Elective	No	No	No	SA + GA	155	36
22*	2008	No	Elective	Yes	Yes	Yes	GA	220	54
23*	2009	No	Elective	Yes	Yes	No	GA	240	49
24*	2009	No	Semi-E	Yes	Yes	No	GA	172	44
25*	2009	No	Elective	Yes	Yes	No	GA	235	38
26*	2009	No	Semi-E	Yes	Yes	No	GA	155	35
27*	2009	No	Semi-E	Yes	Yes	No	GA	170	53
28	2009	No†	Elective	No	No	No	GA	75	Not applicable
29	2010	Partial	Elective	No	No	No	GA	191	15
30	2010	No, MROP†	Elective	No	No	No	GA	230	Not applicable
31	2010	No, MROP	Elective	No	No	No	SA + GA	113	8
32	2011	No	Elective	No	No	No	SA + GA	277	31
33	2011	No	Emergency	No	No	No	GA	184	17
34*	2011	Partial	Elective	Yes	Yes	Yes	SA + GA	275	26
35*	2011	Partial	Semi-E	Yes	Yes	No	GA	276	51

Abbreviations: MROP = manual removal of placenta; GA = general anaesthesia; SA = spinal anaesthesia; semi-E = semi-emergency

* Cases with staged procedure performed

† Condition of placenta at the first encounter

Table 3. Demographic data of patients

Variable	Mean ± standard deviation, median (interquartile range), or No. of cases		p Value
	Staged procedure (n=12)	Non–staged procedure (n=23)	
Age (years)	35.7 ± 5.0	34.5 ± 4.9	0.517
Parity	1.9 ± 1.4	1.56 ± 2	0.355
Gestational age (weeks)	35 (34-37)	37 (34-38)	0.314
No. of previous Caesarean section	1.5 ± 1.2	1.1 ± 1	0.297
Cases with placenta praevia	12	14	0.015

Table 4. Overall outcome and subgroup analysis

Variable (overall)	No. of cases, mean ± standard deviation, or median (interquartile range)		p Value
	Staged procedure (n=12)	Non–staged procedure (n=23)	
Attempts to remove placenta	0	10	0.015
Emergency operation	0	11	0.005
Total anaesthetic time (mins)	193.7 ± 57.2	156.1 ± 72.1	0.127
Anaesthetic time before delivery (mins)*	49.5 ± 17.1 (n=11)	12.8 ± 8.7 (n=19)	<0.001
Blood loss (mL)	1350 (925-1900)	4500 (2000-7000)	0.007
Lowest postoperative Hb level (g/L)	94 ± 14	76 ± 17	0.03
Blood transfused (units)	0 (0-2)	10 (3-16)	0.003
Need for blood transfusion	5	19	0.022
Length of ICU stay (days)	1.1 (0-1.6)	0 (0-3)	0.685
Need for ICU stay	7	11	0.489
Complication(s) occurred	3	5	1.000
Need for NovoSeven	0	2	0.536
Variable (subgroup analysis: outcome excluding undiagnosed cases)	**No. of cases, mean ± standard deviation, or median (interquartile range)**		**p Value**
	Staged procedure (n=12)	Non–staged procedure (n=9)	
Attempts to remove placenta	0	1	0.429
Emergency operation	0	7	<0.001
Total anaesthetic time (mins)	193.7 ± 57.2	151.0 ± 60.1	0.114
Anaesthetic time before delivery (mins)†	49.5 ± 17.1 (n=11)	9.1 ± 4.8	<0.001
Blood loss (mL)	1350 (925-1900)	6000 (1600-25,000)	0.014
Lowest postoperative Hb level (g/L)	94 ± 14	77 ± 18	0.027
Blood transfused (units)	0 (0-2)	10 (1-18)	0.032
Need for blood transfusion	5	7	0.184
Length of ICU stay (days)	1.1 (0-1.6)	2 (0-5.7)	0.267
Need for ICU stay	7	5	1.000
Complication(s) occurred	3	3	1.000
Need for NovoSeven	0	1	0.428

Abbreviations: Hb = haemoglobin; ICU = adult intensive care unit

* Excluding cases 13, 16, 19, 28, and 30

† Excluding case 19

Table 5. Volume of blood loss, number of blood products transfused, length of intensive care unit stay, and complications

Case No.	Blood loss (mL)	Postoperative Hb level (g/L)	Blood (units)	FFP (units)	Platelet (units)	Cryoprecipitate (units)	Length of ICU stay (days)	Complication
1	4000	75	10	0	6	0	0	No
2	4500	65	6	4	4	0	0	No
3	55,000	40	69	36	40	6	10.8	CPR for 1 minute, adrenaline, DIC, aorta clamping, abdominal packing, second-look laparotomy, right ureteric occlusion, vesicovaginal fistula
4	2000	96	0	0	0	0	0	No
5	1200	82	0	0	0	0	0	No
6	6500	64	14	6	4	0	0‡	No
7	31,000	50	67	28	18	42	8.7	Abdominal packing, second-look laparotomy, bladder perforation
8	3500	94	5	0	0	0	0	No
9	6000	90	12	8	8	0	3	No
10	1200	92	2	0	0	0	0	No
11*	900	99	0	0	0	0	0	No
12	3000	89	3	0	0	0	0	No
13	1000†	64	8	4	6	0	2.8	No
14	10,000	54	10	6	6	0	4.6	No
15	10,000	85	19	6	6	0	3.2	No
16	2000†	71	14	6	6	0	2.5	No
17*	1600	115	2	0	0	0	0	No
18	15,000	80	22	10	10	0	6.8	Adrenaline, DIC, NovoSeven
19*	600	101	0	0	0	0	0	Bladder perforation
20*	200	91	0	0	0	0	0	No
21	1000	88	0	0	0	0	0	No
22*	5000	60	16	10	10	0	2.1	No
23*	1500	96	0	0	0	0	1.3	Serosal tear of ileum
24*	1000	109	0	0	0	0	1.5	No
25*	1500	89	2	0	0	0	1.2	No
26*	1000	107	1	1	0	0	0	Right lower limb ischaemia requiring urgent angiogram, thrombectomy and right iliac angioplasty and stenting
27*	1200	84	0	0	0	0	1.6	No
28	500†	110	0	0	0	0	0	No
29	5000	70	16	6	6	0	0	No
30	7000†	79	20	10	16	0	1	NovoSeven
31	3500	70	6	0	0	0	1.2	No
32	5000	81	9	8	8	0	0‡	No
33	6300	57	14	8	10	0	2	Vault bleeding on day 2, repair under general anaesthesia
34*	2000	96	0	0	0	0	1	No
35*	6500	86	8	6	6	0	1.8	No

Abbreviations: CPR = cardiopulmonary resuscitation; DIC = disseminated intravascular coagulation; FFP = fresh frozen plasma; Hb = haemoglobin; ICU = adult intensive care unit

* Cases with staged procedure performed

† Blood loss for hysterectomy only

‡ Refused ICU care because of financial reason

The ideal management for placenta accreta has been debated over the years and the common practice is to perform Caesarean hysterectomy without attempts to remove the placenta[9]. In patients with a strong desire for pregnancy in the future, cutting the cord close to the fetal surface, removing the cord and leaving the placenta in situ may be considered an alternative approach. In our series, all suspected cases were counselled in detail about both the conservative management and definite surgical management. All of them opted for Caesarean hysterectomy. The main reason behind this decision could be the multiparous status of these patients. Thus, fertility in the future was not their primary concern. Indeed, conservative management is not without risk, with severe vaginal bleeding requiring arterial embolisation, repeated blood transfusions and infection being reported in several of these cases[9]. Furthermore, successful pregnancies after such approach are rarely reported and, hence, hysterectomy remains the treatment of choice for patients with placenta accreta, except in specific cases[5].

Several interventional radiological techniques have been developed as an adjuvant measure to reduce blood loss during Caesarean hysterectomy. There are mainly two groups of techniques employed for this purpose. The first one involves the use of balloon catheters inserted bilaterally into pelvic arteries before the operation. After delivery of the fetus, the balloons are inflated and temporarily limit the blood supply to the uterus[10-12]. Reduced blood loss has been reported by some investigators[13], but there are also reports of complications and no benefits[14-16]. The second technique is a staged procedure involving preoperative insertion of femoral sheaths, classical Caesarean section, embolisation, and hysterectomy performed in that order. The latter technique was first proposed by Alvarez et al[17] in 1992 that they reported reduced blood loss, need for transfusion, and hospital stay in women who underwent embolisation. Subsequently, a number of reports have been published using staged procedure for managing placenta accreta[18-20]. In 2010, Angstmann et al[21] published a series of 26 cases in which a similar protocol was used. They found that the successful use of a staged embolisation hysterectomy procedure for placenta accreta was associated with decreased maternal morbidity. In this study, we reported a series of 35 patients of whom 12 underwent a staged procedure involving the use of arterial embolisation before hysterectomy. We found that there was a decrease in the operative blood loss, and the need and amount of blood transfusion in patients who underwent this staged procedure.

The anaesthetic time before delivery was significantly longer in the staged procedure group than the non–staged procedure group. On average, it took about 37 minutes in our series. However, even though the anaesthetic time was longer before delivery in the staged procedure group, the total anaesthetic time was not significantly different. As such, data show that the anaesthetic time for staged procedure could be as long as 6.59 hours[21]. This discrepancy between the reported and our records of anaesthetic time may be due to the fact that the whole staged procedure in our series took place in the main operative theatre and there was no need for patient movement at all. In most other case series reports, the femoral sheath insertion and embolisation procedure were performed in the angiography suite while the Caesarean hysterectomy was performed in the operation theatre[13,15,21]. The need for transportation and the repeated patient preparation after each patient movement may have led to a prolonged duration of anaesthesia. In fact, the anaesthetic time before delivery can be further decreased by putting the patient under local anaesthesia for the insertion of bilateral femoral sheaths and then under general anaesthesia for performing the rest of the procedure. However, in our setting, the patient had to be moved from the distal end of the operative table to the proximal end for intubation after insertion of the femoral sheaths, and then distally again for Caesarean hysterectomy and embolisation. This was because the design of our operative table could only accommodate the C-arm fluoroscopy unit at the distal end, and it would be difficult for the anaesthetist to intubate the patient in such position. The other reason why most of our cases needed general anaesthesia throughout was that some radiologists preferred to cannulate both internal iliac arteries by C1 catheter right after bilateral femoral sheath insertion, so that embolisation could be performed shortly after classical Caesarean section without wasting time to cannulate the arteries at that juncture when severe haemorrhage can occur. It was preferred to minimise further patient movement once the position of the catheter was confirmed by internal iliac artery angiograms. We were not able to further analyse the benefit of such cannulation in our series because of incomplete documentation.

Our study was not without limitations. Firstly, the sample size was small with only 12 cases in the staged procedure group. Secondly, all operations in the staged procedure group were performed consistently by a team of four MFM subspecialists in rotation, while the operations in the non–staged procedure group were performed by different on-duty consultant obstetricians. The gain of surgical experience in the staged procedure group might explain a more favourable outcome.

Thirdly, the number of emergency operations in the non–staged procedure group was higher, and, though statistically not significant, their gestational age at delivery was also more advanced than in the staged procedure group. Ramos et al[22] reported that there was increased blood loss and increased need for transfusion of blood and fresh frozen plasma among women with placenta accreta who had emergency rather than scheduled hysterectomies. In our series, we aimed for elective delivery at 37 weeks of gestation for asymptomatic patients and all emergency operations were due to significant antepartum haemorrhage or patients going into labour. A retrospective cohort study[7] suggested that planned Caesarean hysterectomy performed at an earlier gestational age to avoid emergency delivery might reduce morbidity in women with suspected placenta accreta. Another study[23] reported that scheduled delivery at 34 weeks of gestation was the preferred strategy and resulted in the highest quality-adjusted life years under the base case assumption. If we had adopted this practice, emergency operations might have been avoided in four patients in the non–staged procedure group with correct antenatal diagnosis of placenta accreta (cases 5, 7, 9, 14).

Fourthly, in the non–staged procedure group, attempts had been made to remove the placenta in 10 cases since most of them had undiagnosed placenta accreta. Reports have shown that attempts at placental removal in case of placenta accreta lead to significantly increased early maternal morbidity[7,9,24]. Nevertheless, even if all those undiagnosed cases were excluded, the amount of blood loss, the postoperative haemoglobin level, as well as the amount of blood transfusion between the staged and the non–staged procedure groups remained significantly different. However, the number of emergency operations remained higher in the non–staged procedure group (Table 4).

In summary, we found that a staged procedure involving classical Caesarean section without removing the placenta followed by arterial embolisation before hysterectomy was associated with decreased operative blood loss in the management of patients with placenta accreta.

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