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[ORIGINAL ARTICLE]

Usefulness of transverse fundal incision method of cesarean section for women with placentas widely covering the entire anterior uterine wall

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Running footer: New surgical techniques for cesarean section

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ABSTRACT

Aims: To assess the usefulness of a new method for cesarean section (CS) that is comprised of a transverse incision into the uterine fundus, developed for women with placentas covering the entire anterior uterine wall, and introduced in September 2006.

Methods: Review of medical records of 12 and 29 women who underwent CS by the new and conventional methods, respectively, for placenta previa, placenta accreta (accreta, increta, and percreta), or placenta widely covering the entire anterior uterine wall in which placenta accreta cannot be excluded between June 2003 and March 2011.

Results: Placenta accreta (67% [8/12] vs. 10% [3/29], $P = 0.0006$) and cesarean hysterectomy (67% vs. 10%) were significantly more frequent in the group with the new compared with the conventional method. There were no significant differences between groups with the new and conventional methods in amount of blood loss (1732 ± 1067 vs. 1847 ± 1279 g, respectively), prevalence of blood loss > 3000 g (8.3% vs. 17%, respectively) or blood transfusion (92% vs. 72%, respectively), time required for cesarean hysterectomy (210 ± 58 vs. 195 ± 41 min), or neonatal conditions at birth. The amount of blood loss for cesarean hysterectomy was significantly less for the new than conventional method (1959 ± 1025 g vs. 4450 ± 1145 g, $P = 0.041$).

Conclusions: The new method was superior to the conventional method with respect to reduction of blood loss during cesarean hysterectomy. However, careful observations are mandatory in women with preserved uterus with respect to a possible increased risk of uterine rupture in future pregnancies.

Key words: cesarean hysterectomy; placenta previa; placenta accreta; postpartum hemorrhage

INTRODUCTION

Placenta previa is associated with increased blood loss during cesarean delivery, especially when complicated with placenta accreta including accreta, increta, and percreta [1,2,3]. The risk of placenta accreta increases with increasing number of previous cesarean section (CS) in the presence of placenta previa [1]. This risk increases markedly when the placenta overlies a uterine scar [3,4]. With the increase in rate of cesarean delivery, the prevalence of placenta accreta has increased by 10-fold over the past 50 years [5] and more than 3-fold in the past decade [1]. Cesarean hysterectomy is often necessary to control bleeding in such cases [1,3]. However, as bleeding is sometimes profuse, CS for women with placenta previa with placenta accreta (placenta previa accreta, PPA) is one of the most stressful situations encountered in obstetrics.

We employed the new procedure developed by Kotsuji and his colleagues [6,7] for cases with placenta previa widely covering the entire anterior uterine wall in which placenta accreta cannot be excluded. This new operative procedure is comprised of a transverse fundal incision in the uterine wall, which avoids transecting the placenta, followed by manual removal of the placenta from the uterus under direct observation of the bleeding point [6,7]. We conducted this retrospective study to assess the usefulness of this new method.

MATERIALS AND METHODS

This study was approved by the institutional review board of Hokkaido University Hospital. The new procedure for CS developed by Kotsuji et al. [6,7] was employed in September 2006 at our institution. This new method was indicated in patients with suspected PPA, placenta previa with placenta widely covering the entire anterior uterine

wall, and placenta widely covering the entire anterior uterine wall in which placenta accreta cannot be excluded. Kotsuji provided instruction in the details of the procedure. Briefly, the new procedure consists of wide abdominal incision allowing transverse incision into the uterine fundus apart from the placental edge and manual removal of the placenta from the uterus under direct observation of the bleeding point. Thus, the new method provides access to the intrauterine cavity while leaving the area around the placenta intact. To assess the usefulness of this new method, patients with pre-cesarean diagnosis of placenta previa or placenta accreta were selected from among 2394 women who underwent CS at and after 22 weeks of gestation during the period between June 2003 and March 2011 at Hokkaido University Hospital. Histological examination was performed for all placentas with or without uterus of the patients suspected as having placenta accreta. The clinical backgrounds and pregnancy outcomes were compared between women who underwent the new and conventional CSs. The conventional CSs and new procedures were performed by well-experienced 15 and 4 obstetricians, respectively.

Statistical analyses were performed using Fisher's exact test for categorical data, and Student's *t* test or Mann-Whitney U-test for comparison of medians or means. In all analyses, $P < 0.05$ was taken to indicate statistical significance.

RESULTS

A total of 41 patients underwent CSs for placenta previa and/or placenta accreta during the study period (Table 1). Twelve women underwent CSs using the new procedure accounting for 54.5% (12) of 22 women who gave birth at and after September 2006, while 7 women were possible candidates for the new CS procedure

(suspicious PPA in 3, placenta previa with placenta covering entire anterior wall in 3 and anterior low lying placenta with suspicious placenta accreta in one) among the 19 women who gave birth with conventional CS before September 2006. Indications for the new procedure were suspicious PPA in 8 women, placenta previa with placenta covering entire anterior wall in 3 women, and placenta covering entire anterior wall with suspicious placenta accreta in one woman.

As expected, the numbers of previous deliveries and previous CSs, and numbers of women with placenta accreta and placentation at the anterior uterine wall were significantly larger in the new method group than in the conventional method group.

A significantly larger number of women, therefore, required cesarean hysterectomy in the new method group than in the conventional method group, resulting in a significantly longer time for procedures in the former than in the latter (Table 1), but the time for cesarean hysterectomy did not differ between the two groups (210 ± 58 vs. 195 ± 41 min, respectively, $P = 0.99$) (Fig. 1).

Blood loss during the procedures did not differ between the two groups (Table 1 and Fig. 2). Among 11 women who required cesarean hysterectomy, however, the amount of blood loss was significantly less in the new than in the conventional method group (1959 ± 1025 g vs. 4450 ± 1145 g, $P = 0.041$) (Fig. 2). Among 11 women with placenta accreta, the amount of blood loss did not differ significantly between the new and conventional method groups (1674 ± 1160 vs. 3613 ± 2360 g, respectively, $P = 0.31$). A total of 6 patients had blood loss ≥ 3000 g during the procedures. In these 6 women, profuse bleeding occurred during hysterectomy at separation of the uterus from the urinary bladder in one patient in the new method group, while it occurred from the sites of placentation just after removal of the placenta in four patients in the conventional

method group, three of whom required hysterectomy to control bleeding (Fig. 2). Thus, profuse bleeding did not occur before the hysterectomy procedure in the new method group, although one woman with modest blood loss (2500 g) required hysterectomy to control bleeding after spontaneous separation of the placenta (Fig. 2). Two women with placental sites in the anterior wall of the uterus were strongly suspected to have placenta accreta preoperatively in the absence of placenta previa; one with a history of two previous CSs underwent the new CS procedure and the other with a history of four previous CSs was treated with the conventional procedure. The former and latter patients had blood loss of 1050 g and 5750 g, respectively (Fig. 2). The latter patient exhibited profuse bleeding from the placental site after spontaneous and partial separation of the placenta. Although overall rate of blood transfusion did not differ between the two groups, a significantly larger number of women required allograft blood transfusion in the new than the conventional method group (Table 1). Generally, candidates for the new method are considered to be at increased risk of massive bleeding and blood transfusion [1], and this may explain why women with the new method required more frequently allograft blood transfusion: only five (17.2%) of the 29 women treated with the conventional method were possible candidates for the new method.

Neonatal condition at birth did not differ significantly between the two groups (Table 1).

DISCUSSION

This study demonstrated that the new method was useful for cesarean hysterectomy with respect to reduction of blood loss during the procedure.

New surgical techniques for cesarean section

During the conventional CS procedure for women with PPA, it is often necessary to decide within several min whether hysterectomy should be performed because of sustained and active bleeding from the placental site. Even procedures for childbirth are often accompanied by active bleeding from the injured placenta. Indeed in the conventional method group, three of five women with a total blood loss ≥ 3000 g experienced profuse bleeding just after separation of the placenta in the absence of placenta accreta, while none exhibited such profuse bleeding after separation of the placenta in the new method group. Thus, the new method without incision of the lower segment of the uterus may have contributed to the reduction of blood loss that frequently occurs just after removal of the placenta in the conventional method. Although one patient with modest blood loss (2500 g) required hysterectomy to control bleeding from the site of placentation in the new method group (Fig. 2), no profuse bleeding exceeding 3000 g occurred unless we proceeded to hysterectomy in the new method group. Thus, the new method allowed us to carefully consider whether manual removal of the placenta was feasible to preserve the uterus.

As there is abundant vasculature in the myometrium and the lower uterine segment has poor contractility at and near the placental site, incision into the myometrium near or at the placental site may cause catastrophic bleeding [3,8]. This may be why even women with simple placenta previa are at increased risk of profuse bleeding and/or blood transfusion during CS [3]. Appropriate uterine muscle contraction is required to stop bleeding from the placental site [3]. In addition, we found that uterine muscle contracts better after than before suturing of the myometrium incised for childbirth in the conventional CS procedure. It is possible that an intact lower myometrium near the uterine cervix may be more contractile after separation of the placenta in the new

method. Avoidance of incision through the placenta is helpful to reduce blood loss during CS [9]. Thus, the new method allowing us not to incise the myometrium near or at the placental site or through the placenta may have contributed to the reduced blood loss after removal of the placenta. However, fundal approach may not be necessarily needed in a placenta previa with the placenta covering the entire anterior wall in the absence of placenta accreta [10].

Although not used in this study, transient occlusion of common iliac arteries or internal iliac arteries with balloon catheters is considered to reduce the amount of blood loss during hysterectomy [2,11,12,13]. One woman showed profuse bleeding during hysterectomy from the vasculature beneath the posterior wall of the urinary bladder at separation of the uterus from the urinary bladder in the new method group. This type of bleeding may have been efficiently reduced by these occlusion techniques, although its safety has yet to be established. Another method, so called “opening the bladder technique” is proposed to reduce the amount of blood loss during procedures for hysterectomy [14].

The major concern of the new CS method is a possible increased risk of future uterine rupture in women with preserved uterus after the large uterine fundal incision. The uterus was preserved in four women with the new method; we will carefully follow-up these four women’s future pregnancies. According to tentative guidelines for women after the new CS procedure proposed by Nishijima et al. [15], women are advised to use contraception for one year, they should receive intensive care from 25 weeks of gestation in the next pregnancy, and cesarean delivery should be performed at 34 – 35 weeks of gestation.

In conclusion, the new method of CS was superior to the conventional method for

women with placentas covering the entire anterior uterine wall with respect to reduction of blood loss during cesarean (hysterectomy) section. However, careful observations are mandatory in women with preserved uterus with respect to possible increased risk of uterine rupture in future pregnancies. The actual risk must be evaluated in future investigations.

DISCLOSURE

We declare that we have no conflicts of interest in connection with this paper.

REFERENCES

1. Publications Committee, Society for Maternal-Fetal Medicine, Belfort MA. Placenta accreta, Am J Obstet Gynecol 2010; **203**:430-439
2. Oyelese Y, Smulian JC. Placenta Previa, Placenta Accreta, and Vasa Previa, Obstet Gynecol 2006; **107**:927-941
3. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap III LC, WenstromKD eds. Williams obstetrics. 22nd edn. New York, McGraw-Hill, 2005; 819-823
4. Usta IM, Hobeika EM, Musa AA, Gabriel GE, Nassar AH. Placenta previa-accreta: risk factors and complications. Am J Obstet Gynecol 2005; **193**:1045-9
5. ACOG committee opinion. Placenta accreta, Int J Gynaecol Obstet 2002; **77**:77-78
6. Shukunami K, Hattori K, Nishijima K, Kotsuji F. Transverse fundal incision in a patient with placenta increta, J Matern Fetal Neonatal Med 2004; **16**:355-356
7. Shukunami K, Nishijima K, Tajima K, Hattori K, Kotsuji F. A Useful technique for controlling placental site bleeding for an uncommon type of placentation, Eur J Obstet Gynecol Reprod Biol 2005; **122**:247-248
8. Doumouchtsis SK, Arulkumaran S. The morbidity adherent placenta: an overview of management options, Acta Obstetricia et Gynecologica 2010; **89**:1126-1133
9. Ward CR Avoiding an incision through the anterior previa at cesarean delivery, Obstet Gynecol 2003; **102**:552-554.
10. Matsubara S. Uterine incision for anterior placenta previa without placenta accreta. Arch Gynecol Obstet 2012;**285**:557-558.
11. Dubois J, Garel L, Grignon A, Lemay M, Leduc L. Placenta percreta: balloon occlusion and embolization of the internal iliac arteries to reduce intraoperative blood losses. Am J Obstet Gynecol. 1997; **176**:723-726.

12. Weeks SM, Stroud TH, Sandhu J, Mauro MA, Jaques PF. Temporary balloon occlusion of the internal iliac arteries for control of hemorrhage during cesarean hysterectomy in a patient with placenta previa and placenta increta. *J Vasc Interv Radiol.* 2000; **11**:622-624.
13. Shih JC, Liu KL, Shyu MK. Temporary balloon occlusion of the common iliac artery: new approach to bleeding control during cesarean hysterectomy for placenta percreta. *Am J Obstet Gynecol.* 2005; **193**:1756-1758.
14. Matsubara S, Ohkuchi A, Yashi M, Izumi A, Ohwada M, Kuwata T, Usui R, Kuwata Y, Nakata M, Suzuki M: Opening the bladder for cesarean hysterectomy for placenta previa percreta with bladder invasion. *J Obstet Gynecol Res* 2009;**35**:359-363.
15. Nishijima K, Shukunami K, Orisaka M, Tajima K, Tsukahara H, Kawai Y, Yoshida Y, Kotsuji F. An operative technique for management of placenta accreta widely covers the anterior uterine wall: A transverse fundal incision in the uterine wall and eversion of the uterus like a clamshell, *Jpn J. Obstet. Gynecol. Neonatal Hematol* 2008; **17**:39-42

Figure Legends

Figure 1: Time required for performance of cesarean section.

○, Cases confirmed to have placenta previa alone; ●, Cases confirmed to have both placenta previa and placenta accreta to the uterine wall; ■, Cases confirmed to have placenta accreta to the uterus (†, for placenta accreta; and ‡, for placenta percreta) in the absence of placenta previa; §, Women who required cesarean hysterectomy. The time for the new procedure ($n = 12$) was significantly longer than for the conventional procedure ($n = 29$) (171 ± 74 vs. 74 ± 50 min, $P = 0.0001$) and for cesarean section alone (93 ± 7 min [$n = 4$] vs. 59 ± 23 min [$n = 26$], $P = 0.007$). However, time for cesarean hysterectomy (210 ± 58 min [$n = 8$] vs. 195 ± 41 min [$n = 3$], $P = 0.99$) did not differ significantly between the new and conventional method groups.

Figure 2: Estimated blood loss during cesarean section.

○, Cases confirmed to have placenta previa alone; ●, Cases confirmed to have both placenta previa and placenta accreta to the uterine wall; ■, Cases confirmed to have placenta accreta to the uterus (†, for placenta accreta; and ‡, for placenta percreta) in the absence of placenta previa; §, Women who required cesarean hysterectomy. The amount of blood loss did not differ between the new ($n = 12$) and conventional method ($n = 29$) groups (1732 ± 1067 vs. 1847 ± 1279 g, respectively). However, the amount of blood loss during procedures for cesarean hysterectomy was significantly less in the new compared with the conventional method group (1959 ± 1025 g [$n = 8$] vs. 4450 ± 1145 g [$n = 3$], $P = 0.041$).

Figure 1

Figure 2

Table 1 Demographic characteristics of study subjects

Group	New method	Conventional method	<i>P</i> value
Number of women	12	29	
Age (years old)	35.1 ± 5.1 (27 – 44)	33.5 ± 5.4 (20 – 43)	0.50
BMI (kg/m ²)	23.3 ± 3.6	21.1 ± 4.1	0.051
Number of previous deliveries	2.00 ± 2.00 (0 – 7)	0.69 ± 0.85 (0 – 4)	0.022
Nullipara	2 (16.7%)	13 (44.8%)	0.15
≥ 3	4 (33.3%)	1 (3.45%)	0.020
Gestational week at delivery	33.9 ± 4.1 (24 – 37)	34.8 ± 2.4 (28 – 37)	0.91
≥ 37	4 (33.3%)	9 (31.0%)	0.99
Number of previous cesarean sections	1.67 ± 1.50	0.14 ± 0.4	0.0008
≥ 2	5 (41.7%)	1 (3.5%)	0.053
Placenta previa	11 (91.7%)	28 (96.6%)	0.504
Presence of placenta accreta			
Overall	8 (66.7%)	3 (10.3%)	0.0006
Accreta	3 (25.0%)*	1 (3.4%)	
Increta	3 (25.0%)	1 (3.4%)	
Percreta	2 (16.7%)	1 (3.4%)*	
Cesarean hysterectomy	8 (66.6%)	3 (10.3%)	0.0006
Hysterectomy remote from the cesarean section	1 (8.3%)	1 (3.5%)	0.50
Placental site			
Anterior	8 (66.7%)*	5 (17.2%)*	0.036
Posterior	1 (8.3%)	23 (79.3%)	0.030
Others	3 (25.0%)	1 (3.4%)	0.14
Time for procedures (min)	171.3 ± 74.2 (86 – 320)	73.8 ± 49.9 (35 – 233)	0.0001
Estimated blood loss (g)	1732 ± 1067 (230 – 4220)	1847 ± 1279 (540 – 5750)	0.7

≥ 2000 g	4 (33.3%)	8 (27.6%)	0.72
≥ 3000 g	1 (8.3%)	5 (17.2%)*	0.65
Blood transfusion	11 (91.7%)	21 (72.4%)	0.24
Autologous	9 (75.0%)	19 (65.5%)	0.99
Allograft	4 (33.3%)	3 (10.3%)	0.035
Apgar score	2/9 (22.2%)	0/26 (0%)	0.061
at 1 min < 8†			
Hb of the cord blood	13.6 $\pm$ 2.06 (9.2 – 17.0)	13.2 $\pm$ 1.37 (11.3 – 16.9)	0.42
< 13 g/dL	3/12 (25%)	13/27 (48.1%)	0.29
< 12 g/dL	3/12 (25%)	4/27 (14.8%)	0.65
< 11 g/dL	1/13 (8.3%)	0/27 (0%)	0.31
pH of cord blood	7.23 $\pm$ 0.14 (6.81 – 7.33)	7.29 $\pm$ 0.04 (7.25 – 7.36)	0.21
of UmA			
< 7.20	2/12 (25%)	0/29 (0%)	0.20

BMI, body mass index; Hb, hemoglobin concentration; UmA, umbilical artery; *, one woman did not have placenta previa; †, among infants with birth-weight ≥ 2000 g.