Original Article

The Effect of Placental Spontaneous Delivery versus Manual Removal on Blood Loss during Cesarean Section: A Comparative Study

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ABSTRACT

Objective: To compare manual removal versus spontaneous delivery of the placenta at CS regarding blood loss.
Study Design: Randomized prospective comparative study.
Setting: Ain Shams university maternity hospital from June 2022 till December 2022
Methods: A total of 200 women who were planned for elective cesarean section were randomized into 2 groups: group 1 assigned for spontaneous placental delivery and group 2 in which the placenta was manually removed. Intraoperative blood loss, operative time and postoperative hemoglobin drop were evaluated.
Results: Group 2 had significantly higher blood loss (397.0±186.5 vs 245.5±113.3 ml) and more need for ecbolics when compared to group 1 with no significant difference between both groups in operative time.
Conclusion: Spontaneous placental separation during cesarean section results in less blood loss than manual placental separation without significant prolongation of operative time.

Key Words: Blood loss, cesarean section, manual placental removal, spontaneous placental separation.

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INTRODUCTION

Overall cesarean rate in Egypt is estimated to be above 55%[1] Being a developing country, with limited number of tertiary care centers and resources, as well as high flow rates, blood loss and operative time in cesarean section are issues of major concern.

The method of placental removal is a procedure that may affect the outcomes of cesarean section such as blood loss, operative time and postoperative endometritis[2]. Some obstetricians prefer to manually remove the placenta as they believe it is quicker than waiting for spontaneous placental delivery[3]. Others believe that manual placental removal may cause peripartum hemorrhage and increased risk of endometritis[4].

Whether manual placental removal increases blood loss or other complications remains a controversial issue, and most of the previously conducted studies that compared manual placental removal with spontaneous delivery did not reach a consistent conclusion[5].

AIM OF THE WORK

The aim of this study is to compare both methods of placental delivery regarding blood loss.

METHODS

After ethical committee approval and informed consent from the patients, this randomized prospective comparative study was conducted at Ain Shams Maternity University hospitals from June 2022 till December 2022 and performed on a total of 200 women who were planned for elective cesarean section.

Inclusion criteria:

Age (18 - 35) years, primigravida, unscarred uterus, singleton pregnancy, living baby, body mass index (18 - 30), pregnant at term (after 37 weeks) and intact membranes

Exclusion criteria:

Emergency cesarean section, abnormally adherent placenta, bleeding and/or infection, suspected chorioamnionitis, bleeding disorders to decrease blood

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loss, any previous pelvic surgery and women with medical illness.

Sample size:

By using PASS II program for sample size calculation, setting power at 80%, alpha error at 5%, and after reviewing previous study results[6] that showed the mean blood loss among pregnant females who underwent cesarean section with spontaneous delivery of placenta versus those with manual removal of the placenta were (434.09 ± 178.52 vs 505.08 ± 150.14 respectively), a sample size of at least 200 pregnant females undergoing cesarean section (100 patients in each group) were sufficient to achieve study objective.

Randomization and Concealment:

Included patients were randomized into one of the study groups. Randomization was performed using a computer-generated randomization system (Microsoft office excel, 2007). The assigned group was concealed in closed envelops, numbered according to the randomization tables. Packing, sealing and numbering was performed by a neutral health care provider other than the investigator. The recruitment and handling of candidates is represented in CONSORT flowchart (Figure 1).

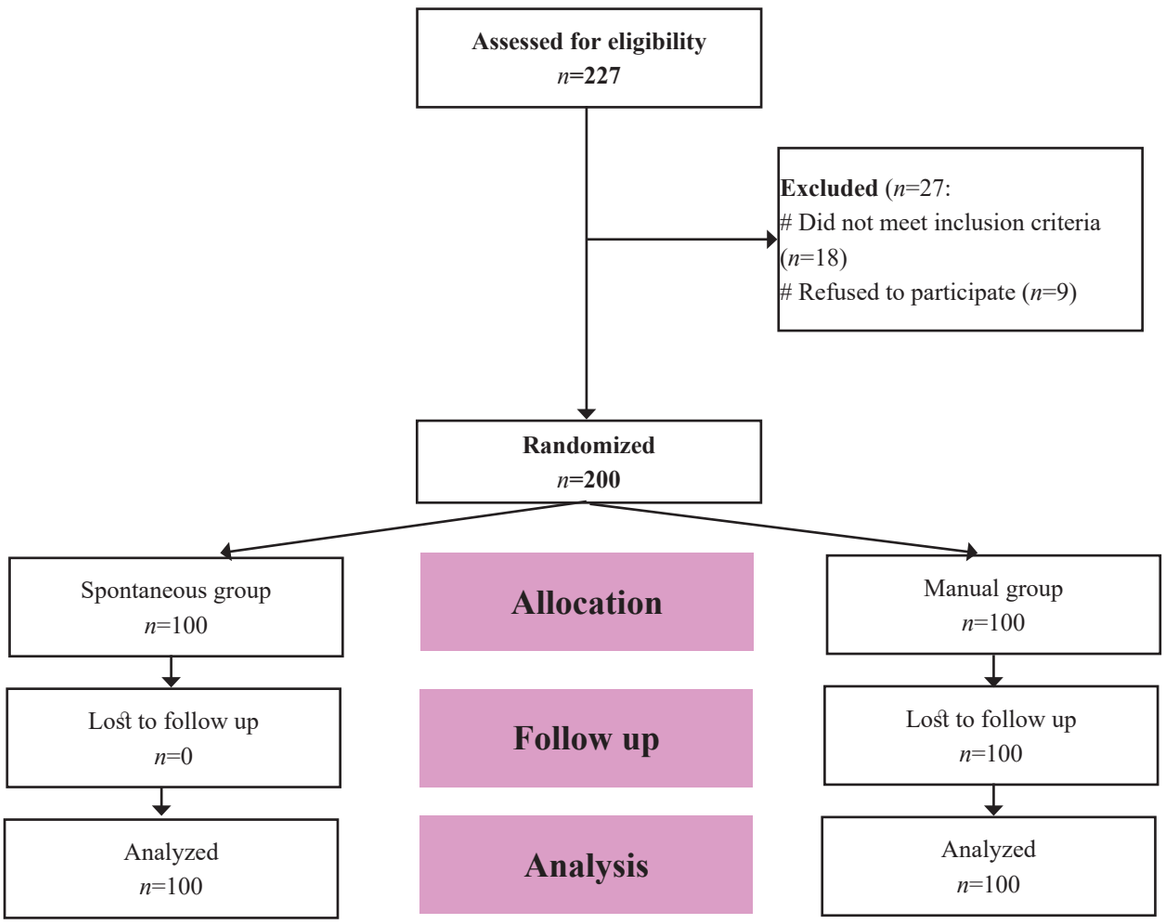

Fig. 1: Consort Flow chart

Study Tools:

The selected patients were subjected to history taking, general and abdominal examination, as well as ultrasound scan. Vaginal examination was performed to exclude rupture of membranes. Hemoglobin and hematocrit were measured before delivery.

Study procedure:

Spinal anesthesia was used for all included cases. The cesarean section was performed through a Pfannensteil abdominal incision, the rectus sheath was opened transversely, then dissected free from the underlying rectus abdominis, the peritoneal cavity was entered, and the

uterus was incised in the lower segment transversely, then the fetus was delivered. Routine intravenous infusion of 20 units of oxytocin after fetal delivery in both groups.

Group 1: Placenta was left to separate spontaneously and removed by gentle cord traction.

Group 2: Placenta was manually removed after creating a cleavage plan between the decidua and placenta by the surgeon's hand.

After placental delivery, the uterine incision was closed with continuous sutures in two layers, the fascia was closed continuously, and the skin was closed using subcuticular suture.

Duration of cesarean section was recorded from time of skin incision till the time of skin closure, duration of placental separation was recorded from time of complete fetal delivery till the time of complete placental delivery, and the need of extra ecbolics and blood transfusion was recorded.

Postoperative care:

Complete blood count was obtained 24 hours after operation. Any significant puerperal complication was recorded.

Primary outcome:

Blood loss estimation after placental separation during cesarean section with manual removal versus spontaneous separation. The blood lost was measured by recording the fluid in the suction bottle. The amount collected before placental separation was subtracted from the amount present after separation, because fluid in the bottle before fetal extraction was mostly amniotic fluid. The net amount of blood in the suction bottle was added to the volume of blood collected from blood-soaked surgical gauze and towels used after fetal extraction, and the drapes placed under the patient. Amount of blood which was collected from towels was measured according to gravimetric method.[7] This method assumed that the density of blood equalled that of water, as 1g =1ml. So, lost blood volume was obtained by subtracting weight of dry towels from weight of blood-soaked towels. The amount of blood loss was calculated using the formula: EBV x (Hi - Hf) / Hi, where the Hi is the preoperative hematocrit, Hf is the postoperative one and EBV is the estimated blood volume. The estimated blood volume was calculated by multiplying weight and average blood volume which is around 65 ml/kg in females[8].

Secondary outcome:

Operative time: (Form skin incision till skin closure). **Fetal extractionplacental separation interval:** (Time interval between fetal delivery and placental separation). Hospital stay, need of extra ecbolics and blood transfusion. **Other complications such as:** atonic uterus, postpartum hemorrhage, endometritis, inversion of uterus and ICU admission.

Statistical analysis:

The collected data was statistically analyzed using IBM SPSS statistics (Statistical Package for Social Sciences) software version 22.0, IBM Corp., Chicago, USA, 2013 and Microsoft Office Excel 2007. Descriptive statistics were done for qualitative data as number and percentage, and for quantitative data as minimum & maximum of the range as well as mean ± SD (standard deviation) for quantitative normally distributed data. Analyses were done for quantitative variables using independent t-test in cases of two independent groups with normally distributed data. In qualitative data, analyses for independent variables were done using Chi square test for differences between proportions and Fisher's Exact test for variables with small expected numbers. The level of significance was taken at *P value* < 0.05 is significant.

RESULTS

There were no significant differences between the preoperative characteristics of participants from both groups as shown in (Table 1). Our results showed that manual removal of the placenta caused significantly higher observed intraoperative blood loss after placental separation and significantly higher calculated blood loss during the first 24 hours (Table 2), which resulted in significantly lower postoperative hemoglobin and hematocrit when compared to spontaneous placental delivery (Table 3). There were no significant differences between both groups regarding duration from fetal delivery till placental separation and total operative time (Table 4). There was no significant difference between both groups regarding the need for blood transfusion, but there was a significantly higher need for ecbolics in patients who had manual removal of the placenta to maintain adequate uterine contraction (Table 5). There were no cases of endometritis, uterine inversion or ICU admission. There were no significant differences between both groups in incidence of atony and postpartum hemorrhage (Table 6), nor length of hospital stay (Table 7).

DISCUSSION

This study was conducted on 200 primigravid women who were planned for elective cesarean section. They were equally randomized into 2 groups to compare manual placental removal with spontaneous placental delivery during cesarean section. Our results showed a significantly higher blood loss in the manual removal group vs the spontaneous delivery group. This was consistent with

Table 1: Baseline characteristics among the study groups:

Vatiable	*s*	Spontaneous (Total=100)	Manual (Total=100)	^*p-value*
Age (years)	Mean±SD	23.9±4.6	24.2±4.9	0.638
	Range	18.0–35.0	18.0–35.0	
BMI (kg/m^2)	Mean±SD	25.2±2.4	25.3±2.5	0.841
	Range	20.0–30.0	19.0–30.0	
Gestational age (week)	Mean±SD	38.2±1.6	38.5±1.5	0.139
	Range	37.0–41.0	37.0–42.0	

^Independent *t*-test, BMI: Body mass index.

Table 2: Blood loss (mL) among the study groups:

		Spontaneous (Total=100)	Manual (Total=100)	^*p-value*	Relative effect Mean±SE 95% CI
Observed intraoperative blood loss after placental separation (ml)	Mean±SD	245.5±113.3	397.0±186.5	<0.001*	-151.5±21.8
	Range	109.0–800.0	102.0–926.0		-194.5–-108.4
Calculated blood loss during the first 24 hour (ml)	Mean±SD	375.6±174.8	606.7±286.1	<0.001*	-231.0±33.5
	Range	151.0–1279.0	128.0–1445.0		-297.1–-164.9

^Independent *t*-test, SE: Standard error, CI: Confidence interval, Relative effect: effect in spontaneous group relative to that in manual group.

Table 3: Hemoglobin (gm/dL) and Hematocrit (%) among the study groups:

		Spontaneous (Total=100)	Manual (Total=100)	^*p-value*	Relative effect Mean±SE 95% CI
Preoperative Hb (gm/dL)	Mean±SD	11.4±1.0	11.5±1.3	0.386	-0.1±0.2
	Range	9.3–14.4	9.2–15.0		-0.5–0.2
Postoperative Hb (gm/dL)	Mean±SD	10.4±1.1	10.0±1.2	0.005*	0.5±0.2
	Range	8.0–13.9	7.4–12.7		0.1–0.8
#Change (gm/dL)	Mean±SD	-0.9±0.4	-1.5±0.7	<0.001*	0.6±0.1
	Range	-2.6–-0.5	-3.3–-0.3		0.5–0.8
Preoperative HCT (%)	Mean±SD	33.0±3.1	33.4±3.7	0.424	-0.4±0.5
	Range	26.2–42.2	26.0–43.3		-1.3–0.6
Postoperative HCT (%)	Mean±SD	30.4±3.2	29.0±3.6	0.005*	1.4±0.5
	Range	22.9–40.6	21.6–38.3		0.4–2.3
#Change (%)	Mean±SD	-2.6±1.1	-4.4±2.1	<0.001*	1.8±0.2
	Range	-8.7–-1.3	-10.1–-1.0		1.3–2.2

#Change = Postoperative – Preoperative, negative values indicate reduction, ^Independent *t*-test, SE: Standard error, CI: Confidence interval, Relative effect: effect in spontaneous group relative to that in manual group

Table 4: Duration from fetal delivery till placental separation and Total operative time among the study groups:

		Spontaneous (Total=100)	Manual (Total=100)	^*p-value*	Relative effect Mean±SE 95% CI
Duration form fetal delivery till placental separation (minutes)	Mean±SD	5.2±1.2	4.9±1.2	0.069	0.3±0.2
	Range	3.0–10.0	3.0–7.0		-0.1–0.6
Total operative time (minutes)	Mean±SD	37.9±4.7	36.8±4.8	0.104	1.1±0.7
	Range	28.0–55.0	29.0–58.0		-0.2–2.4

^Independent t-test, SE: Standard error, CI: Confidence interval, Relative effect: effect in spontaneous group relative to that in manual group.

Table 5: Need for blood transfusion and extra uterotonics among the study groups:

	Spontaneous (Total=100)	Spontaneous (Total=100)	*p-value*	Relative effect 95% CI
Need for blood transfusion	1 (1.0%) 3 (3.0%) 0.621§	0.33		
Need for extra uterotonics	2 (2.0%)	11 (11.0%)	0.010* #	0.18

§Fisher's Exact test, #Chi square test, CI: Confidence interval, Relative effect: effect in spontaneous group relative to that in manual group.

Table 6: Postoperative complications the study groups:

Complications	Spontaneous	Manual	§*p-value*	Relative effect Relative risk 95% CI
Atony	2 (2.0%)	2 (2.0%)	0.999	1.00 (0.14–6.96)
PPH	1 (1.0%)	2 (2.0%)	0.999	0.50 (0.05–5.43)
Endometritis	0 (0.0%)	0 (0.0%)	NA	NA
Uterine inversion	0 (0.0%)	0 (0.0%)	NA	NA
ICU admission	0 (0.0%)	0 (0.0%)	NA	NA

PPH: Postpartum hemorrhage. NA: Not applicable. §Fisher's Exact test. CI: Confidence interval. Relative effect: effect in spontaneous group relative to that in manual group.

Table 7: Hospital stay among the study groups:

Duration	Spontaneous (Total=100)	Manual (Total=100)	#*p-value*	Relative effect Relative risk 95% CI
One day	94 (94.0%)	92 (92.0%)	0.579	1.02
Two days	6 (6.0%)	8 (8.0%)		0.95−1.10

#Chi square test, CI: Confidence interval, Relative effect: effect in spontaneous group relative to that in manual group.

previously published research. Anorlu *et al*.[4] performed a review in 2008, including 15 studies, involving 4,694 women. This review concluded that manual placental removal was associated with higher blood loss, and greater drop in hematocrit levels than spontaneous placental delivery, and the adjusted odds ratios (OR) for blood loss more than 1,000 ml was 1.81 (95 % CI: 1.44–2.28). A more recent meta-analysis by Yang *et al*.[5] explored 9 RCTs and their pooled data showed a significantly higher blood loss associated with manual placental removal. Several previous RCTs also concluded the same[9,10,11]. This might be explained by the fact that manual placental dissection could leave fetal membrane residue and interfere with the contractile function of uterus, which is an important factor for controlling bleeding.

In contrast to our results, some authors found no significant differences between both methods of placental separation regarding blood loss[12,13,14]. Another study found blood loss in spontaneous separation group to be higher than in manual removal group, yet they felt it was clinically insignificant. They explained this was due to longer operative time in the spontaneous separation group[15].

The results of different studies are conflicting because the method of blood loss estimation was not consistent in all trials. Methods ranged from the blood loss estimation by the experience, to including the amniotic fluid in the total blood loss, while in other trials ultrasound estimated amniotic fluid volume was subtracted from the total calculated blood loss.

Regarding operative time, we found there was no significant difference between both methods of placental removal. Previous studies showed a significantly shorter placental separation time in the manual removal group, but no significant difference in total operative time[10,11]. On the other side, some studies found the operative time to be significantly shorter in the manual removal group[16] These conflicting results might be due to the difference in inclusion criteria, as some studies included candidates of different parities and did not exclude emergency cesarean sections. Also the experience of the operating surgeon plays a major role in determining the operative time, which was not unified in all studies.

We found that manual removal of the placenta significantly increased the need for extra ecbolics. This was also found in some previous trials[15], while others found no significant difference[9,10].

Endometritis is a common complication of cesarean delivery, with an incidence of between 5-85%, depending on the population investigated. It was assumed that manual placental removal will decrease patient's immune response and introduce infection leading to endometritis. Our study

showed no significant difference between both groups regarding endometritis. This was concluded by other studies[13,14] However, the review by Anorlu *et al*.,[4] and the meta-analysis by Yang *et al*.[5] showed a significantly increased incidence of endometritis in patients who had manual placental removal. The discrepancy in the results might be due to inclusion of patients with prolonged rupture of membranes or emergency cesarean deliveries, and different antibiotic strategies.

Regarding postoperative hospital stay, they was no significant difference between both methods of placental separation, which was also reported by previous studies[5,15] However, postoperative hospital stay depends on many factors such as ambulance, pain control, bowel motility and patient personal factors, which are not essentially related to the operative procedure itself.

Among the points of strength in our study: limiting the inclusion to primiparas and elective cesarean deliveries, and estimating intraoperative blood loss by various methods. Limitations to our work included variation in the skill and rank of obstetricians performing the cesarean section, and the relatively short follow-up of patients.

CONCLUSION

As evident from the current study, there is a statistically significant increased amount of blood loss with manual removal of the placenta compared to the spontaneous placental separation with no effect on the duration of surgery. Consequently, we recommend spontaneous placental separation rather than manual separation.

ETHICAL CONSIDERATIONS

Ethical committee approval was obtained from Faculty of Medicine Ain Shams University Research ethics committee (FMASU) with the number MS 290/2022, and was registered on clinicaltrials.gov with number NCT05395585. All candidates signed an informed written consent.

CONFLICT OF INTERETS

There are no conflicts of interest.

REFERENCES

1. Wahdan M, Hakim S, El Gaafary M, Sos D, Wassif G, Hussein W, Mokhtar A, Hussein A, El Awady M, Rady M and Anwar W. Rising trends in delivery mode in 6 Egyptian governorates. East Mediterr Health J. 2022;28(5):336-344. https://doi.org/10.26719/emhj.22.012

2. Merchavy S, Levy A, Holcberg G, Freedman EN, Sheiner E. Method of placental removal during cesarean delivery and postpartum complications. Int J Gynaecol Obstet. 2007;98(3):0– 236. doi:10.1016/j.ijgo.2007.04.002

3. Morales M, Ceysens G, Jastrow N, Viardot C, Faron G, Vial Y, Kirkpatrick C, Irion O, Boulvain M. Spontaneous delivery or manual removal of the placenta during caesarean section: a randomised controlled trial. BJOG : an international journal of obstetrics and gynaecology 2004;111 (9):908-912. doi:10.1111/j.1471-0528.2004.00228.x

4. Anorlu RI, Maholwana B, Hofmeyr GJ. Methods of delivering the placenta at caesarean section. Cochrane Database 2008, Syst Rev 16(3):CD004737

5. Yang MC, Li P, Su WJ, Jiang R, Deng J, Wang RR, Huang CL. Manual Removal versus Spontaneous Delivery of the Placenta at Cesarean Section: A Meta-Analysis of Randomized Controlled Trials. Ther Clin Risk Manag. 2021;17:1283-1293 https://doi.org/10.2147/TCRM.S333557

6. El Garhy EMT, Mohamed AH, Shaaban HS & Salem AMM. Manual Placental Removal versus Cord Traction for Placental Delivery at Cesarean Section in Correlation to Blood Loss. The Egyptian Journal of Hospital Medicine 2018, 73(1), 5849-5855.

7. Al Kadri HM, Al Anazi BK, Tamim HM. Visual estimation versus gravimetric measurement of postpartum blood loss: a prospective cohort study. Arch Gynecol Obstet. 2011;283(6):1207-13.

8. Miller RD. Transfusion Therapy. In: RD Miller Editor. Anesthesia, Philadelphia ChurchillLivingston 5th Edition, 2000; Ch. 46: 1613-7.

9. Abdelfattah LE, Bastawy AMA, Fahmy MSD. Manual removal versus spontaneous delivery of the placenta at caesarean section: a randomized controlled trial. Int J Reprod Contracept Obstet Gynecol. 2022; 11(4):1062-1069.

10. El-behiedy TM, Soliman BS, Ali FA, Ali MR. Spontaneous Separation Versus Manual Removal of

Placenta During Elective Cesarean Section Regarding Blood Loss. The Egyptian Journal of Hospital Medicine. 2021;82(3):433-9.

11. Kamel A, El-Mazny A, Salah E, Ramadan W, Hussein AM, Hany A. Manual removal versus spontaneous delivery of the placenta at cesarean section in developing countries: a randomized controlled trial and review of literature. J Matern Fetal Neonatal Med. 2018;31(24):3308-13.

12. Magann EF, Washburne JF, Harris RL, Bass JD, Morrison JC. Infectious morbidity, operative blood loss, and length of the operative procedure after cesarean delivery by method of placental removal and site of uterine repair. J Am Coll Surg. 1995;181(6):517–520.

13. Chandra P, Schiavello HJ, Kluge JE, Holloway SL. Manual removal of the placenta and postcesarean endometritis. J Reprod Med. 2002;47(2):101–106.

14. Gol M, Baloglu A, Aydin C, Ova L, Yensel U, Karci L. Does manual removal of the placenta affect operative blood loss during cesarean section? Eur J Obstet Gynecol Reprod Biol. 2004;112(1):57–60. doi:10.1016/s0301-2115(03)00278-1

15. Altraigey A, Ellaithy M, Atia H, Ali I, Kolkailah M, Abbas A. How can methods of placental delivery in cesarean section affect perioperative blood loss? A randomized controlled trial of controlled cord traction versus manual removal of placenta. Journal of Obstetrics and Gynaecology Research, 2019; 45(1), 133-140.

16. Ramadani H. Cesarean section intraoperative blood loss and mode of placental separation. International Journal of Gynaecology and Obstetrics: the Official Organ of the International Federation of Gynaecology and Obstetrics. 2004;87(2):114-8.