Original Article

Comparison of Intra-Operative Hemorrhage by Blunt and Sharp Expansion of Uterine Incision at Caesarean Section

Summaira Shabbir, Syeda Maryam Batool, Arooj Naseem

ABSTRACT

Objective: To determine the difference in mean drop in post-operative haemoglobin level after caesarean section with blunt and sharp expansion of uterine incision during the operation.

Study Design and Setting: The study design was a randomized controlled trial, which was carried out at the Department of Obstetrics and gynecology, CMH Rawalakot, between 01- October-2024 and 31-March-2025.

Methodology: 130 women who had elective lower segment caesarean section were recruited and randomly divided into two equal groups: blunt expansion (n=65) and sharp expansion (n=65). Females between 20 and 40 years old with singleton pregnancies of 37 weeks and above with hemoglobin of 10 g/dL and above were included. Haemoglobin was determined before and after the operation (24 hours later). A decrease of more than 1.5 g/dL was regarded as a clinical significance. Analysis of data was done in SPSS version 22; independent-sample t-test was used.

Results: The mean haemoglobin drop in the blunt expansion group (1.37+0.79 g/dL) was significantly less than in the sharp expansion group (1.72+0.85 g/dL; p=0.016). Stratified analysis showed that there were significant differences in favor of blunt expansion in women aged >30 years (p=0.003), gestational age >39 weeks (p=0.008), and parity >2 (p=0.002).

Conclusions: Blunt expansion of the uterine incision is related to much less intraoperative blood loss than sharp expansion, which is why it should be used as a safer method of reducing blood loss during a caesarean section, especially in more at-risk subgroups.

Keywords: Caesarean section; Haemorrhage; Hemoglobin; Uterine incision; Uterotomy

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INTRODUCTION

Caesarean section is among the most common surgical procedures conducted in obstetrics where vaginal birth is deemed to be a risk to the mother or the baby. It entails opening of the abdominal wall and the uterus to provide safe delivery of the baby. This procedure over the years has been critical in minimizing maternal and neonatal morbidity and mortality especially in complex pregnancies and includes obstructed labour, fatal distress, and placenta previa.[1] Although it is lifesaving, caesarean section is a major surgical procedure and comes with inherent risks.[2] As such, the decision to use a particular surgical method is critical in determining short-term operative success and long-term maternal health.[3] The process of the procedure has different stages, the method of the uterine incision extension being one of the most crucial. This measure may have a crucial impact on intraoperative blood loss, level of tissue injury, and postoperative recovery.[4] Intraoperative bleeding is one of the most common complications experienced in caesarean birth and may be caused by factors like uterine atony, placental abnormalities, maternal comorbidities, and differences in surgical technique.[5]

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Reducing blood loss intraoperative is thus a major goal when performing a caesarean section. Several measures have been considered to accomplish this aim such as pharmacological interventions, enhanced surgical expertise and optimization of operative procedures, but handling of uterine incision during its extension has been established as a crucial measure in minimizing unnecessary bleeding.[6] Appropriate technique during this phase may assist in maintenance of vascular integrity, minimise injury to the surrounding tissues and better overall surgical outcomes.[7] Both blunt and sharp extensions are very common in obstetric surgery, where the uterine incision may be extended by either the fingers or a scalpel. In blunt extension, the tissues are separated by hand, typically with the fingers, and allowed to part along their natural lines. This procedure is believed to reduce the destruction of blood vessels and other structures around. Sharp extension, on the contrary, can be done with the instruments of surgery (scissors or scalpel) and provide a more controlled and accurate enlargement of the incision, but it can be accompanied by a higher risk of vascular trauma and consequent bleeding.[8] Clinical research indicates that blunt extension might be linked to less blood loss during surgery than the sharp approach.[9] As an example, in one study (a randomized controlled trial) by Faiza et al., women undergoing lower segment caesarean section were compared between the two techniques.[10] The research showed that the average decrease in postoperative hemoglobin levels, which is a surrogate endpoint of blood loss, was less in the blunt extension group (1.47 ± 1.08 g/dl) than in the sharp extension group (1.95 ± 0.85 g/dl). The results of this study correspond with the idea that blunt extension can be a more effective and safer method of reducing the amount of hemorrhage during surgery.[11] Such findings are even more relevant in such areas as Azad Kashmir and other resource-constrained environments where the proportion of caesarean births is constantly growing.[12] The availability of blood transfusion services, sophisticated surgical centers, and competent medical professionals in these regions might be low. The adoption of less risky surgical procedures that cause less blood loss can thus be significant in enhancing patient safety and resource optimization.[13] Finally, the approach to extending uterine incision in a caesarean section is one of the most important factors that determine the results of operations both intraoperative and postoperative. Although both blunt and sharp techniques are widely used, the existing evidence indicates that blunt extension can benefit in terms of less blood loss and the decreased risk of complications. Implementing evidence-based surgical care that suits local health care environments can assist in leading to better maternal outcomes and safer obstetric care.

METHODOLOGY

This randomised controlled trial was conducted in the Department of Obstetrics and Gynecology, CMH Rawalakot, from 01-October-2024 to 31-March-2025 (six months). Ethical approval was obtained from the Institutional Ethics and Research Committee prior to initiation of data collection (ERC Approval No: 1105/Dated 01-08-2023). The study was conducted in accordance with the Declaration of Helsinki and applicable institutional guidelines. The required sample size was calculated using the WHO sample size calculator with a 5% level of significance (two-tailed) and 80% statistical power. Using published reference values of mean postoperative haemoglobin drop of 1.47±1.08 g/dL with blunt expansion and 1.95±0.85 g/dL with sharp expansion, a minimum of 60 participants per group was determined.[14] To account for potential dropouts, 65 participants were enrolled in each group, yielding a total sample of 130. Participants were recruited using a non-probability consecutive sampling technique. Inclusion criteria were: women aged 20–40 years; singleton pregnancy with gestational age =37 weeks confirmed by first-trimester ultrasonography; elective lower segment caesarean section; parity of =4; placenta located in the upper uterine segment on antenatal ultrasound; and preoperative haemoglobin =10 g/dL. Exclusion criteria were: multiple gestation; preoperative haemoglobin <10 g/dL; uterine fibroids identified on ultrasound; personal or family history of thromboembolic disease; and any contraindication to regional anaesthesia.

Written informed consent was obtained from each participant after a detailed explanation of the study objectives, procedures, potential risks, and benefits. Participants were assured that their decision regarding participation would not affect the quality of care received. Demographic data including age, gestational age, parity, residence, socioeconomic status, and baseline haemoglobin were recorded on a structured proforma. Computer-generated block randomisation was used to randomise the study groups. Abdominal entry was done through Pfannenstiel incision with blunt subcutaneous dissection in both groups. On the lower part of the uterus, a transverse incision 12 cm was made. In the blunt expansion group, this was extended laterally by traction of the fingers in bilateral directions along the natural tissue planes. Lateral extension under direct vision was performed using Mayo scissors in the sharp expansion group. Controlled cord traction was used to achieve placental delivery and 10 IU oxytocin (syntocinon) was given intravenously to actively control the third stage. Incision of the uterus was stitched in two layers using chromic catgut sutures; extra haemostatic sutures were added where necessary. Standard technique was used to complete closure of peritoneum, rectus sheath and skin. Intraoperative haemoglobin drop, which was determined as the difference between the preoperative haemoglobin and the haemoglobin 24 hours after the surgery was considered the primary outcome measure. Clinically significant blood loss was considered to be a haemoglobin reduction of more than 1.5 g/dL at 24 hours. The information was keyed into SPSS version 22. Mean ± standard deviation is used to show continuous variables. The independent-sample t-test was used to measure the difference in the mean haemoglobin drop between groups. A p-value =0.05 was considered statistically significant. The frequencies and percentages are used to summarise categorical variables. Stratification was used to control potential confounders such as age, gestational age and parity, and post stratification independent-sample t-tests were conducted on each sub-group.

RESULTS

The demographics of patients were comparable at baseline, with a mean age of 30.31 ± 6.35 years in the blunt expansion group compared to 28.74 ± 5.57 years in the sharp expansion group. The mean gestational age was 38.91 ± 1.48 weeks in the blunt expansion group versus 38.80 ± 1.52 weeks in the sharp expansion group. There was no significant difference in the distribution of residence and socioeconomic status between the groups (Table 1). There was no significant difference in pre-operative haemoglobin levels (11.88 ± 1.11 g/dL in the blunt group vs 11.94 ± 1.08 g/dL in the sharp group). Postoperatively, haemoglobin levels were 10.50 ± 1.11 g/dL in the blunt group and 10.22 ± 1.32 g/dL in the sharp group (Table 2). The primary outcome analysis demonstrated a statistically significant difference in haemoglobin drop: the blunt expansion group showed a mean decrease of 1.37 ± 0.79 g/dL compared to 1.73 ± 0.86 g/dL in the sharp expansion group (t = -2.446, p = 0.016), as demonstrated. Age-, gestational age-, and parity-based stratified analyses demonstrated that the advantage of blunt expansion was statistically significant in higher-risk subgroups: patients aged >30 years (p = 0.003), gestational age >39 weeks (p = 0.008), and parity >2 (p = 0.002). No statistically significant difference was observed in the lower-risk subgroups (Table 4)

Table 1: Patient Demographics in Both Groups

Variables	Blunt Expansion n=65	Sharp Expansion n=65
	Mean ± SD	**Mean ± SD**
Age (years)	30.31 ± 6.35	28.74 ± 5.57
Gestational Age (weeks)	38.91 ± 1.48	38.80 ± 1.30
Parity	2.49 ± 1.28	2.22 ± 1.23
Residence	**n (%)**	**n (%)**
Rural	25 (38.5%)	28 (43.1%)
Urban	40 (61.5%)	37 (56.9%)
Socioeconomic Status		
Low	26 (40.0%)	32 (49.2%)
Middle	25 (38.5%)	28 (43.1%)
High	14 (21.5%)	5 (7.7%)

DISCUSSION

In the current research, blunt expansion of uterine incision during caesarean section was related to a significant decrease in intraoperative haemorrhage in comparison to sharp expansion. This was evidenced by a smaller mean decline in haemoglobin levels (1.37 ± 0.80 g/dL vs 1.73 ± 0.86 g/dL; p = 0.016). These results confirm the hypothesis that the method of extension of uterine incision has a quantifiable effect on maternal blood loss during caesarean section. This reduced bleeding through blunt expansion may be attributed to preservation of tissue structure and vascular integrity since this technique does not cut tissues but instead cuts them along the natural body lines. This enables the myometrial fibres to spontaneously recede around interrupted vessels to enable effective haemostasis.

Stratified analysis also revealed that there were significant tendencies in the riskier subgroups, including women aged >30 years, gestational age >39 weeks, and parity >2. This higher advantage in the older patients could be due to age-

Table 2: Pre- and Post-operative Haemoglobin Levels in Both Groups

Hemoglobin Levels	Blunt Expansion n=65	Sharp Expansion n=65
Pre-op Hb (g/dL)	11.88 ± 0.72	11.94 ± 0.81
Post-op Hb (g/dL)	10.50 ± 1.11	10.22 ± 1.32

Table 3: Comparison of Mean Drop in Haemoglobin between Groups

	Blunt Expansion n=65	Sharp Expansion n=65	t	P value
Drop in Hb (g/dL)	1.3718 ± 0.79546	1.7266 ± 0.85732	-2.446	0.016

Table 4: Stratified Analysis of Mean Haemoglobin Drop by Demographic Factors

Demographic Factor	Stratum	Group	Mean Drop in Hb (g/dL) Mean ± SD	n	p Value
Age (years)	=30	Blunt	1.4709 ± 0.77213	33	0.327
		Sharp	1.6855 ± 0.85657	38	
	>30	Blunt	1.2697 ± 0.81835	32	0.003
		Sharp	1.7844 ± 0.87129	27	
Gestational Age (wks)	=39	Blunt	1.5197 ± 0.84934	38	0.356
		Sharp	1.7017 ± 0.84077	42	
	>39	Blunt	1.1637 ± 0.67381	27	0.008
		Sharp	1.7722 ± 0.90411	23	
Parity	=2	Blunt	1.4784 ± 0.71534	31	0.193
		Sharp	1.7367 ± 0.89353	33	
	>2	Blunt	1.2747 ± 0.86115	34	0.002
		Sharp	1.7163 ± 0.83248	32	

associated variations in uterine vascularity and less tissue elasticity making them more prone to vascular damage during sharp dissection. Similarly, the pregnancies which extend beyond 39 weeks are often associated with increased uterine vascular engorgement and tissue fragility and blunt expansion would be more useful in maintaining vascular integrity. The multiple stretching and remodelling of uterine tissues in multiparous women could be a predisposing factor to vascular disruption; hence, blunt separation along natural tissue planes could be used to reduce excessive bleeding in this population.

These results are in line with the previous studies. Shaukat et al. showed a much less haemoglobin reduction with blunt expansion (0.79 ± 0.19 vs 1.21 ± 0.19 g/dL; $p < 0.05$).[15] Similarly, previous trials demonstrated reduced haemoglobin drop with the blunt technique (1.47 ± 1.08 vs 1.95 ± 0.85 g/dL; $p = 0.031$). These observations were further supported by a meta-analysis by Saad et al. which reported lower rates of blood transfusion and fewer unintended uterine extensions with blunt expansion.[16] All these studies confirm the notion that vascular structures are saved using blunt techniques with the assistance of natural tissue planes.

Nevertheless, there are studies that have indicated the opposite. Fatima et al. have found more changes in haematocrit using blunt expansion.[17] Tahir et al. also reported similar findings.[18] These inconsistencies could be explained by the differences in surgical experience, dissimilarity in the methods of operation, or the dissimilarity in patient groups. Blunt expansion is a procedure that is greatly reliant on the surgeon to properly identify and trace the natural tissue planes, which can affect the results. In addition, conflicting results of surrogate markers such as unintended uterine extensions are also found. Jayasundara et al. did not observe a significant difference in haematocrit drop >10% between methods, but found higher rate of blood transfusion in the blunt group.[19] In the same manner, El-Berry et al. did not find any significant difference in haemoglobin drop >2 g/dL between the two methods.[20] These results indicate that although significant haemorrhagic events might be similar, a cumulative minor bleeding, as indicated by changes in mean haemoglobin, may be more appropriate to indicate the haemostatic benefit of blunt expansion.

A significant value of the current study is the identification of certain subgroups that might be more benefited by blunt expansion especially women who are older than 30 years, gestational age of more than 39 weeks and those with more than 2 parity. The stratified analysis has not been well researched in the literature with the majority of the past studies not examining the patient specific factors. This shows that there is a great evidence gap when it comes to individualized surgical methods. Future research should incorporate stratified analyses to assist in offering more evidence-based and patient-specific obstetric care by helping to determine the patient groups that are most benefited by each approach.

Limitations: The research was carried out in one centre (CMH Rawalakot), and this might not be generalisable to other healthcare facilities that have different patient populations, resource base, or surgical skills. The sample size was sufficient to identify the difference in mean haemoglobin drop observed, but might not be enough to identify smaller, but clinically significant differences in the secondary outcomes or infrequent complications. The authors have not taken into consideration potential confounding variables such as the experience of individual surgeons, intra-group variations in surgical technique or variations in anaesthetic management that could influence intraoperative blood loss. Blood loss was also not assessed on a volumetric basis but on a basis of changes in haemoglobin and this might not be able to fully capture the entire haemorrhagic morbidity. Also, the operating surgeon could not be blinded due to the characteristics of the intervention, which would introduce some performance bias.

CONCLUSION

This paper finds that blunt expansion of the uterine incision during lower segment caesarean section is related to much less intraoperative haemorrhage than sharp expansion, as indicated by a reduced mean postoperative haemoglobin drop in the blunt expansion group (1.37 ± 0.79 vs 1.72 ± 0.86 g/dL; $p=0.016$). The advantage of blunt expansion was the greatest in women of age >30 years, gestational age of over 39 weeks and multiparous women of parity >2, which is directly proportional to the main study aim. These results justify the use of blunt uterine incision expansion as the technique of choice in reducing blood loss in caesarean birth, especially in subgroups of patients with increased risks.

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Authors Contribution:
Summaira Shabbir: Study design, conception statistical analysis, data collection
Syeda Maryam Batool: Literature review, proof reading
Arooj Naseem: Data collection, data interpretation

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