



## A Comparative Study of Manual Extraction and Vacuum Extraction of High Floating Fetal Head in Caesarean Section

\*Dr. Sachin G<sup>1</sup>, Dr. Oby Nagar<sup>2</sup>, Dr. Suwa Ram Saini<sup>3</sup>, Dr Shilpi Bansal<sup>4</sup>

<sup>1,4</sup>Junior resident, <sup>2</sup>Senior professor, <sup>3</sup>Associate Professor,

Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur, Rajasthan, India

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\*Corresponding author: Dr. Sachin G

Department of Obstetrics and Gynaecology, SMS Medical College, Jaipur, Rajasthan, India

### Abstract

**Introduction:** A major technical problem of delivery by caesarean section is delivery of the fetal head through the uterine incision, especially if it is a high floating or a deflexed fetal head. Either single blade, double blade forceps or a vacuum device is often used to assist the delivery of the high floating fetal head at caesarean delivery to decrease the time, requirement of fundal pressure, and hence decrease the chances of fetal asphyxia and other maternal complications.

**Method:** A comparative study was conducted in the department of Obstetrics and Gynecology, SMS medical college Jaipur from April 2021 to august 2022. We compared 70 cases (of each group) of high floating fetal head patients undergone caesarean with manual extraction (Group-A) and vacuum extraction (Group-B).

**Result:** In vacuum extraction compared with manual extraction incision delivery time will be less, requirement of fundal pressure to deliver the fetal head is less and low rates of maternal and fetal complications.

**Conclusion:** As per LAQSHYA program fundal pressure is condemned in both normal vaginal delivery and in caesarean section. In vacuum extraction requirement of fundal pressure is less and time for incision to delivery is less, so less chances of fetal and maternal complications.

**Keywords:** Manual extraction, vacuum extraction, fundal pressure, incision to delivery time.

## INTRODUCTION

A major technical problem of delivery by caesarean section is delivery of the fetal head through the uterine incision, especially if it is a high floating or a deflexed fetal head.<sup>[1]</sup> Either single blade, double blade forceps or a vacuum device is often used to assist the delivery of the high floating fetal head at caesarean delivery to decrease the time and hence decrease the chances of fetal asphyxia.<sup>[2]</sup>

Use of vacuum in extraction of fetal head has an added advantage of reduction of the greater diameter being extracted out of the uterine incision, which may be associated with decreased incidence of extension of the uterine incision.<sup>[3]</sup> All other methods of extraction of head are associated with increase in total diameter being extracted out.

However, the use of a vacuum device is a well-established part of obstetric practice, in vaginal delivery, especially with upcoming use of epidural or spinal anesthesia. A vacuum source, a hospital piped-vacuum supply is often used, by connecting it with a pressure reduction valve; we develop the required vacuum around 300mm Hg for ventouse delivery.

As with quality care under LAQSHYA programme fundal pressure to deliver the fetal head at the time of delivery both during normal labour or LSCS has been strongly condemned.

During caesarean section surgeons hand is used to guide the presenting part through the abdominal incision. Some man oeuvre are also used to aid into delivery as use of surgeon's own other hand applying fundal pressure, fundal pressure by assisting surgeon or bimanual fundal pressure by anesthetist.<sup>[5,6]</sup>

Various other methods are also employed to deliver the fetal head such as, ventouse vacuum device<sup>[8]</sup>, single blade forceps(vectis) and outlet forceps for extraction of fetal head<sup>[7]</sup>.Speed is required for delivering the fetus from making incision on uterus and puncturing the membranes as through this large incision site liquor is drained very fast and it causes placental site's acute retraction which may lead to fetal hypoxia and sometimes under these condition cord compression may also occur. This explains why the operating surgeon should have adequate knowledge of techniques of delivering fetal head during lower segment caesarean section.

Sometimes obstetrician face difficulty while extracting the fetal head especially if there is high floating head, lower segment of uterus is not formed or not effaced fully. In these type of cases few methods which can be used to deliver fetal head are manual delivery using internal podalic version, lateral vertical incision (J incision), inverted T incision.<sup>[12]</sup> These are known to be traumatic to mother and fetus, also increase rates of maternal morbidity as well as delay in delivery of fetus leading to increasing trends of neonatal morbidity<sup>[13]</sup> and uterine rupture in subsequent pregnancies.

The aim of this study is to find out the efficient method of fetal head extraction during lower segment caesarean section. In this study we are focused at the use of VACUUM CUP in delivering the high floating fetal in LSCS and comparing the case and difficulties encountered with manual extraction.

Soft silicon cup of medium size is applied in occipital region of baby with applying pressure around 300mmhg from hospital piped vacuum supply with a pressure reduction valve and delivery the fetal head after rupturing the membrane. This study helps in identifying advantage and disadvantage of using vacuum extractor in comparison of using manual method of fetal head extraction during lower segment caesarean section.

One of the advantages of using vacuum cup is decrease in the frequency of using fundal pressure required for fetal head extraction during lower segment caesarean section. It also helps in decreasing dependency on assistant.

Also there are less chances of uterine incision extension or uterine artery injury. This instrument can be used by surgeon quickly and has a short learning curve and no extra equipment other than readily available vacuum cup and suction machine which is routinely found in all OT and labour room. In Obese patients or patients with big size of baby usually there is difficulty in delivery of fetal head manually, however by using vacuum cup there are chances of less blood loss and better outcome of caesarean delivery<sup>[14]</sup>.

In this study vacuum cup delivery proves to be an efficient method of fetal head extraction during lower segment caesarean section (LSCS) and leads to lowering of maternal complications such as uterine incision extension, intraoperative blood loss, necessity of fundal pressure, maternal morbidity and neonatal complications like respiratory distress and decreased number of NICU.

## Material and Methods

A comparative study was conducted in department of obstetrics and gynaecology, SMS medical college, Jaipur from april 2021 to august 2022. 70 cases of manual extraction (Group-A) and 70 cases of vacuum extraction (Group-B) have done.

After applying inclusion and exclusion criteria informed consent is obtained, with routine investigations and pre anaesthetic review posted for LSCS. By using simple randomization technique 2 groups are made. Group A of 70 patients for manual extraction and Group B of 70 patients for vacuum extraction. Caesarean section is performed in above mentioned groups in following approach. Using Pfannenstiel incision abdomen is opened upto general peritoneal cavity. Lower segment incision given. In Group A delivery of high floating fetal head by manual extraction and in Group B delivery of high floating fetal head by vacuum extraction. In vacuum extraction soft silicon cup is applied in occipital region of baby with applying of pressure around 300 mmhg and delivery the fetal head after rupturing the membrane.

Then comparing the two methods in terms:-

Maternal outcome measures noted were:-

1. Length of abdominal incision (using measuring tape).
2. Time interval between incisions on the lower uterine segment to the delivery of head.
3. Necessity of fundal pressure, if given then duration of fundal pressure.
4. Maternal morbidity in terms of extension of uterine incision, hemorrhage due to extension of uterine incision and blood loss.
5. Pre and post-operative haemoglobin estimation.

**Fetal outcomes**

1. APGAR at 1 and 5 minute
2. Any injury or neonatal mark to the baby during lower segment caesarean section was noted.
3. Respiratory distress after birth and number of NICU admissions were noted.



Vacuum extraction and Manual extraction of fetal head in LSCS

**Results:** The following data were collected in the study conducted at SMS MEDICAL COLLEGE AND ATTACHED GROUP OF HOSPITALS in the DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY.

**Table No- 1 ASSOCIATION BETWEEN GROUP AND LENGTH OF ABDOMINAL INCISION.**

Parameter	Group A		Group B		P-value
	Mean	Sd	Mean	Sd	
Length of abdominal incision	11.8	0.8	10.3	0.4	<0.0001

T- Test was used to explore the association between ‘Group’ and Length Of Abdominal Incision’. The mean of length of abdominal incision in the Group: A was 11.8cm while the mean of length of abdominal incision in the Group:-B was 10.3cm .There was a significant difference between the various groups in terms of distribution of Length Of Abdominal Incision (p = <0.0001).

**Table No- 2 ASSOCIATIONS BETWEEN GROUP AND I-D INTERVAL.**

Parameter	Group A		Group B		P-value
	Mean	Sd	Mean	Sd	
I-D interval	48.2	8.4	29.8	5.3	<0.0001

T-test was used to explore the association between Group and I-D interval. The mean of I-D Interval in the Group: A group was 48.2 second while the mean of I-D Interval in the Group: B group was 29.8 second. There was a significant difference between the 2 groups in terms of I-D Interval (Seconds) ( p <0.0001), with the median I-D Interval (Seconds) being highest in the Group: A.

**Table No- 3 ASSOCIATIONS BETWEEN GROUP AND FUNDAL PRESSURE.**

Parameter	Group A		Group B		P-value
	No. of patients	Percentage	No. of patients	Percentage	
Fundal pressure(manual)	62	88.57	3	4.29	<0.001

T-test was used to explore the association between ‘Group’ and Fundal Pressure’. 88.57% of the women in the Group: A needed assistance of Fundal Pressure while remaining 11.43% of the women did not need Fundal Pressure. 4.29% of the participants in the Group: B needed assistance of Fundal Pressure while remaining 95.71% of women did not need

Fundal pressure. Participants in the group Group: A had the larger proportion of Fundal pressure. There was a significant difference between the various groups in terms of distribution of Fundal Pressure ( $p < 0.001$ ).

Table No- 4 ASSOCIATIONS BETWEEN GROUP AND EXTENSION OF UTERINE ANGEL.

Parameter	Group A		Group B		P-value
	No. of patients	Percentage	No. of patients	Percentage	
Extension of uterine angle	13	18.57	3	4.29	0.008

T-test was used to explore the association between 'Group' and 'EOA'. 18.57% of the women in the Group: A had EOA while remaining 81.43% of the women in the Group: A had no EOA. 4.29% of the women in the Group: B had EOA while remaining 95.71% of the women in the Group: B had no EOA. There was significant difference between the various groups in terms of distribution of EOA ( $p=0.008$ ).

Table No- 5 ASSOCIATIONS BETWEEN GROUP AND PPH.

Parameter	Group A		Group B		P-value
	No. of patients	Percentage	No. of patients	Percentage	
PPH	15	21.43	3	4.29	0.008

T-test was used to explore the association between 'Group' and 'PPH'. 21.43% of the women in the Group: A had PPH while remaining 78.57% of the women did not have PPH. 4.29% of the women in the Group: B had PPH while remaining 95.71% of the women did not have PPH. There was significant difference between the various groups in terms of distribution of PPH ( $p = 0.008$ ).

Table No- 6 ASSOCIATIONS BETWEEN GROUP AND CHANGE IN HAEMOGLOBIN.

Parameter	Group A		Group B		P-value
	Mean	Sd	Mean	Sd	
Hb (before)	10.3	0.7	10.7	0.9	0.6
Hb (after)	8.9	0.6	10.1	0.9	<0.0001

T-test was used to explore the association between Group and Change In Hemoglobin. The median SD of Percent Change In Hemoglobin in the Group: A was 0.6 while the median SD of Percent Change In Hemoglobin in the Group: B was 0.99. There was a significant difference between the groups in terms of Percent Change In Hemoglobin ( $p=0.0001$ ).

Table No- 7 ASSOCIATIONS BETWEEN GROUP AND APGAR AT ONE MINUTE.

Apgar score at one minute	Group A		Group B	
	No. of patients	Percentage	No. of patients	Percentage
4-7	54	77.14	43	61.43
>7	16	22.86	27	38.57
Total	70	100.00	70	100.00
Mean± SD	6.5± 1.09		6.9± 1.0	
P-value	0.02			

T-test was used to explore the association between Group and APGAR at one minute. The mean of APGAR score at 1 Minute in the Group: A was 6.5 while the mean of APGAR at 1 Minute in the Group: B was 6.9. There was a significant difference between the groups in terms of APGAR (1 Minute) ( $p = 0.02$ ).

**Table No-8 ASSOCIATION BETWEEN GROUP AND APGAR AT FIVE MINUTE**

Apgar score at five minute	Group A		Group B	
	No. of patients	Percentage	No. of patients	Percentage
4-7	21	30	6	8.57
>7	49	70	64	91.43
Total	70	100	70	100
Mean± SD	8.1± 0.9		8.4± 0.7	
P-value	0.02			

T-test was used to explore the association between Group and APGAR at five minute .The mean of APGAR score at 5 Minute in the Group: A was 8.1 while the mean of APGAR at 5 Minute in the Group: B was 8.4. There was a significant difference between the groups in terms of APGAR (5Minute) ( $p = 0.02$ ).

**Table No- 9 ASSOCIATIONS BETWEEN GROUP AND NEONATAL MARKS OR INJURY.**

Parameter	Group A		Group B		P-value
	No. of patients	Percentage	No. of patients	Percentage	
Neonatal marks or injury	0	0	0	0	1

T-test was used to explore the association between ‘Group’ and ‘Neonatal marks or Injury’. There were no neonatal injuries associated with use of vacuum application. There was no significant difference between the various groups in terms of distribution of Injury ( $p = 1$ ).

## DISCUSSION

This is a comparative study in which in Group A called manual extraction of high floating fetal head and in Group B use of vacuum in extraction of high floating head in lower segment caesarean section.

The most practical step of lower segment caesarean section is delivery of the fetal head, which becomes difficult in conditions such as unengaged head, following disengagement of a deeply impacted head. These situations necessitate the need of fundal pressure thereby causing fetal distress due to aspiration, maternal discomfort and post-operative complaint of persistent pain and panic situation for obstetrician to deliver the baby safely. So specialized instrument silicon vacuum cup as a new fetal head extractor during caesarean section.

In the present study mean length of abdominal incision in centimeter for Group A was 11.8cm and for Group B was 10.3cm,  $p$  value  $<0.0001$  which is significant. Hence smaller abdominal incision is required in Group B that is vacuum group.

In the present study mean time interval between incision on the lower uterine segment to the delivery of fetal head is 48.2 seconds in Group A and 29.8 seconds in Group B.  $p$  value is  $<0.0001$  which is significant, hence the time interval needed to deliver the fetal head was more with conventional method. This was due to the need of fundal pressure assistance in fetal head extraction manually.

In the present study 18.57% of patient of Group A had extension of angle of uterine incision while in Group B 4.29%.  $p$  value was 0.008 which is significant. Therefore, extension of angle is affected by the method of head extraction in conventional group.

In the present study 21.43% of patient of Group A had postpartum hemorrhage while 4.29% in Group B.  $p$  value was 0.008 which is significant. There is a high incidence of post-partum hemorrhage in manual method.

In this study 88.57% of patient of Group A required fundal pressure for fetal head extraction while in Group B it was 4.29%.  $p$  value is  $<0.001$  which is significant. In group B fundal pressure was not given routinely during the application of vacuum, and fundal pressure was given additionally when fetal head extraction was not successful by vacuum alone and only 3 out of 70 cases of Group B required application of fundal pressure. So in this study application of vacuum declines the need of fundal pressure for fetal head delivery.



In this present study hemoglobin was estimated pre operatively as well as 48 hours after the surgery. There is a change in hemoglobin in Group A and in Group B. p value was <0.0001 which is significant. So application of vacuum instrument was associated with lesser blood loss during surgery than conventional group.

In this study mean APGAR at 1 minute in Group A was 6.5 while in Group B was 6.9. p value is 0.02 which is significant. Mean APGAR at 5 minute for Group A was 8.1 while for Group B was 8.4. p value is 0.02 which is significant. So mean APGAR score was lower in conventional group.

In this study no neonatal marks or neonatal injuries were noted in the newborns of Group A by the application of vacuum cup.

In this study vacuum was used in 70 cases (group B) for extraction of fetal head during lower segment caesarean section and fetal head was successfully delivered by vacuum alone in 63 women (90%), while in 3 women(5%) additional fundal pressure was needed and vectis application used in 3 women(5%) for successful delivery of fetal head. So need to encourage routine use of this instrument to develop proper skill among obstetricians to deliver fetal head in lower segment caesarean section. And larger sample size studies are required to further evaluate the advantages of vacuum over the conventional method of head extraction during lower segment caesarean section.

## CONCLUSION

Due to advancement in technology and diagnostic modalities, caesarean section is an important surgery to reduce adverse fetomaternal outcome in modern obstetrics. The rising attainability of caesarean section has been deliberated to advocate maternal and neonatal outcome in circumstances where vaginal delivery is not considered safe. The manifestation for caesarean section as a substitute to vaginal delivery has advanced in last 50 years.

With time the technique of caesarean section has been improved. It's accessibility, obtainability, practicality have positioned caesarean section as a first line plan of action in many clinical and medical conditions. Other factor subscribed to publication of caesarean section is liberalization of use of a comparatively safe procedure. Ultimately newer acceptances of indication of 'caesarean section on maternal request' lead to change in rate of caesarean section significantly.

Various methods for safe and effective fetal head extraction through uterine incision have evolved over time. In our study a specialized instrument to deliver fetal head called vacuum cup has been compared to conventional method of fetal head extraction.

Two groups: Group A (manual) and Group B (vacuum) were selected by matching demographic factors (age, residence), parity and period of gestation. Smaller incision was required in the vacuum group to extract the fetal head. The time taken for fetal head extraction in vacuum group was less when compared to manual group. Extension of angle was more in conventional group. There was significant postpartum hemorrhage associated with manual group. Diminishes the requirement of fundal pressure for delivery of head during lower segment caesarean section. There was significant blood loss in terms of change in hemoglobin in the manual group. No neonatal marks and injuries were present in the vacuum group. Numbers of admissions in NICU and Respiratory distress were lesser in vacuum group.

In this study vacuum alone was successful in delivery of fetal head in 90% of cases. In remaining 10% fetal delivery was also successful with the help of vectis and fundal pressure. Inculcation of proper skill, knowledge and motivation to increase the use of vacuum as a fetal head extractor routinely will help to minimize various maternal and fetal complications.

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