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Research Article

A comparative study of feto-maternal outcome in instrumental vaginal delivery at tertiary health level hospital in Uttarakhand state

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ABSTRACT

Background: Instrumental vaginal delivery is an age-long obstetric practice used to expedite vaginal delivery or avert recourse to caesarean delivery. Objective of the study is to compare maternal and neonatal outcomes of vacuum and forceps application in instrumental vaginal delivery.
Methods: This is a retrospective observational study. Retrospective study of 70 consecutive ventouse and 70 consecutive forceps deliveries was done. Maternal and neonatal morbidity were compared in terms of perineal laceration, episiotomy extension, postpartum hemorrhage, apgar score, neonatal injuries and NICU admissions.
Results: Maternal morbidity in terms of periurethral tear, second and third degree perineal tear were significantly more in forceps group (p=0.0332 and p=0.0173 respectively). However neonatal outcomes were found to be similar in both types of instrumental deliveries.
Conclusions: Ventouse should be preferred over forceps whenever there is an indication for instrumental delivery (except in fetal distress) as it is associated with less maternal trauma and most of the neonatal morbidities were insignificant in comparison with both instruments.

Keywords: Instrumental delivery, Forceps, Vacuum extraction, Maternal morbidity, Perinatal outcomes

INTRODUCTION

Vacuum extraction and forceps are the two options when an instrument is needed to facilitate a vaginal birth. The choice between these two options has usually been based on tradition and training.[1] In North America, forceps has been used more frequently than vacuum extraction whereas reverse is true in Europe and Asia.[2-4] Vacuum extraction has recently gained in popularity because of new designs of vacuum cups with reduced risk of injury to the neonate.[5] James Young Simpson was the first to use traction to deliver a baby in 1849. It was later modified by Malmstrom in 1953.The obstetric forceps had its history from the time of Chamberlain family in the seventh century.

Modern obstetric practice has witnessed an increased caesarean rate worldwide. Assisted vaginal delivery, with the use of forceps and vacuum extraction, offers the option to accomplish safe delivery for the mother and clinician. It avoids caesarean section and its associated morbidity and implications for future pregnancy. Forceps and vacuum have been compared in many studies.[6-9] Review of the literature suggests different maternal and neonatal outcomes and complications rates between the two methods. Both are associated with increased risk of maternal and neonatal injury when compared to normal spontaneous vaginal deliveries. Poor maternal and neonatal outcome has also been reported after the sequential use of vacuum and forceps for assisted vaginal delivery.[10] Furthermore, it has been repeatedly shown that maternal injury is less frequent and less extensive with the use of vacuum.

With this background the present study has been carried out to evaluate the maternal and neonatal morbidity, failiure and complications associated with these two instruments for assisted vaginal deliveries, at tertiary health care centre in the region of Uttarakhand State.

METHODS

A total of 140 cases of instrumental deliveries were taken in this retrospective study. It is carried out at SGRRIM&HS hospital, Dehradun, Uttarakhand. Seventy (70) consecutive cases of vacuum assisted delivery and seventy (70) consecutive cases of forceps assisted delivery were scrutinized for demographic data, various indications for instrumental delivery, parity, gestational age, maternal morbidity and neonatal outcomes. Exclusion criteria from both the groups were cases of multiple pregnancy, preterm (<34 wks of gestation) and breech presentation (for forceps in after coming head).Institutional Ethical Committee approval was taken.

The instruments used for vacuum extraction were sialistic 40mm and 60 mm cups. The negative pressure applied was upto 0.6 kg/cm^2. Forceps deliveries were performed using short curved outlet Wrigley's forceps.

Maternal morbidity was analyzed in terms of perineal, vaginal and cervical lacerations, episiotomy extensions, urinary and fecal incontinence and traumatic post partum hemorrhage. Neonatal complications in both groups included low apgar score at birth, unexplained convulsions, jaundice, facial and scalp injuries, cephalhaematoma, birth asphyxia, neonatal sepsis and NICU admissions. They all are compared in both groups. Condition of mother and neonate at the time of discharge was noted. χ^2 (Chi Square) test was used to analyze the data and p value <0.05 was considered as statistically significant.

RESULTS

Instrumental deliveries are an important tool to decrease caesarean rates and associated morbidity, only when strict protocols are followed. United States have the instrumental delivery rates between 10 and 15%.[11] In our institution we found instrumental delivery rate between 9 and 15% in last five years.

The mean age of women in our study was 26±3.12 yrs in ventouse and 25±4.45 yrs in forceps group. In our study 58.5% of ventouse deliveries and 71.4% forceps deliveries were carried out in primigravida. Mean birth weight in our study was 2.88±0.41 kg. We observed that birth weight >3.5 kg was significantly more common in forceps group (p=0.0144). Our study also showed that the use of instruments were more frequent in infants with higher birth weight and gestational age. We found no significant difference in apgar scores at 1 & 5 minutes, between the two study groups.

Table 1: Maternal and Neonatal characteristics.

Characteristics		Ventouse (n=70)	Forceps (n=70)	P value
Maternal age	Years; (Mean±SD)	26±3.12	25±4.45	NS
Parity n (%)	Primiparous	41 (58.5%)	50 (71.4%)	NS
	Multiparous	29 (41.5%)	20 (28.6%)	NS
Gestational age (weeks)	<37	01 (1.4%)	03 (4.3%)	NS
	37-40	58 (82.9%)	53 (75.7%)	NS
	>40	11 (15.7%)	14 (20%)	NS
Birth weight (gm)	<2.000	03 (4.8%)	04 (6.2%)	NS
	2.001-2.500	19 (30.7%)	13 (20%)	NS
	2.5001-3.000	27 (43.5%)	18 (27.7%)	NS
	3.001-3.5000	10 (16.1%)	17 (26.2%)	NS
	3.501-4.000	02 (3.2%)	09 (13.9%)	S (0.0144)
	>4.000	01 (1.7%)	04 (6.2%)	
Apgar score (at 1 min)	0-3	-	03 (4.6%)	-
	4-6	13 (20.9%)	20 (30.8%)	NS
	7-10	49 (79.1%)	42 (64.6%)	NS
Apgar score (at 5 min)	0-3	-	02 (3.1%)	NS
	4-6	7 (11.3%)	12 (18.5%)	NS
	7-10	55 (88.7%)	51 (78.4%)	NS

NS-non significant p-value (>0.05), S-significant p-value (<0.05)

Most common indication was to cut short the second stage of delivery (42.14%) as in cases of PIH, eclampsia, previous caesarean section, heart disease, severe anemia. Other indications were prolonged second stage of labour which was seen in 25.7% of ventouse and 12.9% of forceps deliveries. Poor maternal efforts were found in 4.3% of forceps and 14.3% of ventouse delivery. Maternal distress was observed in 4.3% of ventouse and

4.3% of forceps delivery. we observed that if the indication of instrumental delivery is fetal distress, then forceps is the instrument of choice (32.9%) as compared to ventouse (12.9%) and this difference is found to be significant (p=0.0082).The decision to delivery interval was 8.4±5.1 min for forceps and 15.4±6.8 min in ventouse assisted deliveries. This difference is also significant (p=0.0001). It shows that it is quicker to deliver the baby by forceps than ventouse, which makes forceps as a preferred choice in fetal distress cases.

Table 2: Indications for application.

Indications	Ventouse (n=70)	forceps (n=70)	P value
Prolonged second stage	18 (25.7%)	9 (12.9%)	NS
Poor maternal effort	10 (14.3%)	3 (4.3%)	NS
Fetal distress	9 (12.9%)	23 (32.9%)	S (0.0082)
Heart disease	2 (2.9%)	4 (5.7%)	NS
Severe anemia	5 (7.14%)	2 (2.3%)	NS
Pre-eclampsia	11 (15.7%)	15 (21.4%)	NS
Previous C.S.	9 (12.9%)	3 (4.3%)	NS
Eclampsia	3 (4.3%)	5 (7.14%)	NS
Maternal distress	3 (4.3%)	3 (4.3%)	NS
Preterm (34-37wks)	-	3 (4.3)	-

NS-non significant p-value (>0.05), S-significant p-value (<0.05)

Table 3, shows that unlike forceps delivery, vacuum delivery can be conducted in the first stage of labor with the cervical dilatation of 8cm and above, but only in highly selected cases such as umbilical cord prolapse before full cervical dilatation in multigravida women.

Table 3: Cervical dilatation at the time of application of ventouse.

Cervical dilatation (in cm)	No. of cases (n=70)	Successful VE (n=62)	Unsuccessful VE (n=8)
10	62	57	05
9	06	04	02
8	02	01	01

Figure 1 summarizes failure rates of assisted delivery. Our study showed the failure of eight cases in ventouse group (11.4%) and five cases in the forceps group (7.14%). Cephalo-pelvic disproportion was the cause in majority (61.5%). Adherence to strict guidelines for case selection and proper application of the instrument will decrease the failure rate in instrumental deliveries.

The maternal morbidity was significantly less in vacuum group as compared to forceps group (p<0.0001). We observed that episiotomy is given to all patients (100%) before forceps application but only 68.6% patients required it with vacuum application. Table 4, shows that except episiotomy extension other maternal morbidity as cervical tear, periurethral tear, vaginal tears and perineal tears were observed more frequently after forceps application.

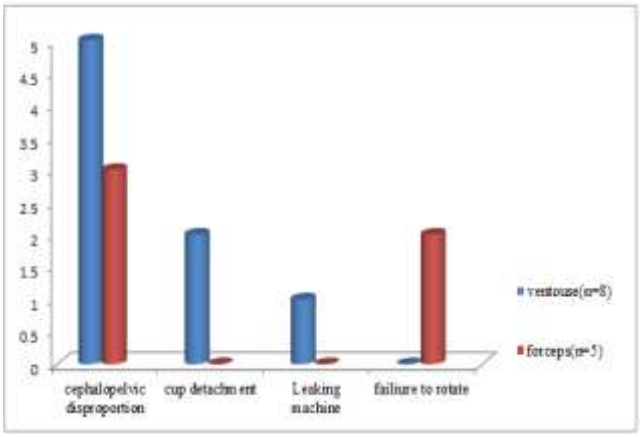

Figure 1: Reasons for failure of instruments in two study group.

Table 4: Maternal morbidity in instrumental deliveries.

Morbidity	Ventouse (n=70)	Forceps (n=70)	P value
Episiotomy	48 (68.6%)	70 (100%)	S (0.0001)
Episiotomy extension	11 (15.7%)	6 (8.61%)	NS
Vaginal wall tear	1 (1.4%)	5 (7.1%)	NS
Periurethral tear	1 (1.4)	8 (11.4%)	S (0.0173)
Extension to fornices	-	3 (4.3%)	-
Cervical tear	1 (1.4%)	4 (5.7%)	NS
First and second degree perineal tear	3 (4.3%)	8 (11.4%)	NS
Third and fourth degree perineal tear	3 (4.3%)	9 (12.9%)	S (0.0171)
Post-partum hemorrhage	1 (1.4%)	5 (7.1%)	NS
Length of hospital stay	48 hr	72 hr	-
Blood transfusion needed	1 (1.4%)	6 (8.57%)	NS

NS-non significant p-value (>0.05), S-significant p-value (<0.05)

The risk of neonatal morbidity was similar between infants delivered by vacuum or forceps (Table 5). Cephalhematoma in neonate were significantly (p=0.0077) more common with vaccum, but instrumental

marks and bruising were more common with forceps group (p=0.0001). NICU admissions were more (23.0%) with forceps as compared to vacuum (12.9), but this difference was statistically non-significant.

Table 5: Neonatal morbidity and mortality.

Variables	Ventouse (n=62))	Forceps (n=65)	P value
Cephalhematoma	11 (17.8%)	2 (3.0%)	S (0.0077)
Instrumental marks and bruising	7 (11.3%)	27 (41.5%)	S (0.0001)
Subconjunctival hemorrhage	-	5 (7.7%)	-
Brachial plexus injury	-	1 (1.5%)	-
Convulsions	3 (4.8%)	6 (9.2%)	NS
Neonatal hyperbilirubinemia and need of phototherapy	8 (12.9%)	2 (3.0%)	NS
Feeding difficulty	3 (4.8%)	2 (3.0%)	NS
Irritability	1 (1.6%)	1 (1.5%)	NS
Neonatal ICU admissions	8 (12.9%)	15 (23.0%)	NS
Perinatal mortality	-	2 (3.0%)	-

NS-non significant p-value (>0.05), S-significant p-value (<0.05)

DISCUSSION

The incidence of instrumental vaginal delivery in our institution in last five years was 13.8% of total births. It is still within the worldwide incidence of 2%-15%.[12,13] The variation in incidence in various health institutions and the decline in practice in recent times could be attributed to variation in practice protocols, litigation, non-availability of functional equipments and the declining skills of providers in conducting instrumental deliveries.[14,15]

In the past, forceps deliveries were highly favored over vacuum extraction in North America. According to official statistics from the 1980s,the vacuum/forceps ratio in Canada and United States were both 0.03,whereas in European countries, the ratio varied from 1.06 in Norway to13.0 in Finland.[16] Currently there is tendency to rely on vacuum extraction which may be because of recent evidence of decreased maternal trauma with vacuum extraction compared to forceps deliveries in randomized trials and by a substantial improvement in the technique of vacuum extraction, especially in the material used for vacuum cups.[17] In our study we also found the ratio of 1/6 between forceps and vacuum application, which is in accordance with findings derived from Lurie S et al.[18]

In our study 74% of forceps delivery and 58% of ventouse deliveries were carried out in primigravida, which is in accordance with prior study done by Akhtar S.[19] For vacuum delivery, common indications were to cut short the second stage of labour (42.85%) followed by prolonged second stage of labour (25.7%), poor maternal efforts (14.3%) and fetal distress (12.9%). For forceps delivery main indication was to cut short the second stage of labour (41.2%) followed by fetal distress (32.9%). Our study results showed that forceps are the instrument of choice in cases of fetal distress. However, different studies reported fetal distress as the commonest indication for vacuum delivery.[19-21]

Episiotomy was not done routinely in the ventouse group (31.4%), especially in multigravida, but it was given in all cases of forceps deliveries. Study done by Achanna S et al also supported this association.[22] We found that episiotomy extensions were more common with vacuum deliveries but this difference was statistically non-significant (p=0.3007). Table 4 shows that maternal morbidity was significantly less in ventouse group as compared to forceps group (p=0.0172), which is in accordance with the results of Cochrane Database.[23] It showed that vacuum extractor was associated with a lower caesarean section rate, a lower use of regional and general anesthesia, with apparently less pain at delivery, significantly less pain after 24 hr and significantly less likely to cause serious maternal injury than forceps. It seemed that vacuum extractor could, do no harm to mother or newborn.

In a randomized controlled trial, Eason E showed that a decrease of 4.9 in adjusted relative risk of anal sphincter injury was noted when vacuum was used over forceps.[24] Our study also reported only 1.4% patients in vacuum group had anal sphincter injury as compared to forceps group with 12.9% patients having anal sphincter injury.

Our study showed the failure rate of 7.14% with forceps and 11.4% with ventouse. Vacca A et al also reported the percentage of failure after forceps application was 7%, while it is almost double (12%) with vacuum delivery.[25] Failure of vacuum and the sequential use of forceps to complete deliveries increase the maternal and neonatal morbidity.

Neonatal morbidity differ substantially among various published reports.[22-29] Some authors highlight the risk of vacuum, but vacuum is generally considered as a safe alternative to forceps or with comparable outcomes concerning the neonatal morbidity. In the present study, low Apgar Score at 1 & 5 min, NICU admissions and duration of stay in NICU were non significantly higher after forceps application. Cephalhematoma was seen more common after vacuum application. Apart from causing neonatal jaundice, it is rarely of any significance. Instrumental marks and bruising were seen more commonly after forceps application. Both the fore mentioned complication, were dependent mainly on

operator´s skill of instrument application and case selection rather than type of instrument.

The present study was not without deficiencies, such as retrospective design and small sample of both group patients. Long term maternal and neonatal outcomes were also not studied in the study.

CONCLUSION

Instrumental vaginal delivery by experienced health care provider is associated with good obstetric outcomes with minimal risk. Our study concluded that ventouse application is associated with significantly less maternal trauma than with forceps. Neonatal outcomes were similar in both types of instrumental deliveries. The safety of the instrument is dependent mainly on operator's skills and right judgment regarding case selection. Improved training of residents in instrumental delivery may help to reduce the unwarranted and raised caesarean section rates.

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