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Original Research Article

A comparative study of neonatal and maternal outcome between forceps delivery and vacuum extraction

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ABSTRACT

Background: Aims and objectives of the study were to compare maternal and neonatal outcomes of forceps versus vacuum application in assisted vaginal delivery.

Methods: This prospective study was conducted in a tertiary care hospital of West Bengal over one year. Women in labor with vertex presentation were delivered by vacuum and forceps. A total of 100 cases were included of which 50 patients selected for forceps delivery and 50 patients for vacuum extraction. The instruments were either silastic cup vacuum extractor or Wrigley's outlet forceps. Maternal morbidity was studied in terms of cervical tears, vaginal lacerations, episiotomy extension, perineal tears, PPH, and retention of urine. Neonatal morbidity was studied in terms of Apgar score, instrumental injuries, cephalhematoma, NICU admission and the outcome was compared. Chi square test was used to analyze the data.

Results: Observations maternal morbidity viz. episiotomy extension, traumatic PPH were significant in the forceps group ($p=0.01$). With regards to neonatal morbidity, SNCU admission were significantly higher in forceps delivery ($p=0.02$) and incidence of cephalohematomas were more in ventouse delivery ($p=0.02$).

Conclusions: Vacuum and forceps should remain appropriate tools in the armamentarium of the modern obstetrician. However, ventouse may be chosen first (if there is no fetal distress) as it is significantly less likely to injure the mother.

Keywords: Vacuum extraction, Forceps, Maternal injuries, Foetal complications

INTRODUCTION

Previous trials and studies have shown that vacuum extractor is associated with less maternal genital tract injuries than forceps.¹⁻³ So these studies recommended that vacuum extractor to be the first choice in instrumental vaginal delivery. But there are studies which suggest that when forceps are applied under strict supervision fulfilling all criteria it has less failure rates than vacuum.⁴⁻⁶ Forceps delivery is quicker than vacuum which is of critical importance in fetal distress. Therefore, this study was undertaken to compare the fetal and maternal outcome in forceps versus vacuum extraction.

METHODS

Study type

It was a prospective comparative study.

Place of study

The study was conducted at the labour room, Department of Obstetrics and Gynecology, Calcutta National Medical College, Kolkata, West Bengal.

Study time

The duration of the study was 1 year (September 2019 to August 2020).

Sample size

In the study 100 patients were selected after fulfilling the inclusion criteria for forceps and vacuum delivery with proper consent (n=100). Among them 50 women were delivered by outlet forceps (n=50) and 50 women were delivered by vacuum extraction (n=50)

Study population

Women attending the labour room with singleton pregnancy and vertex presentation and who were delivered by forceps or ventouse were included in the study.

Study tool

APGAR score card, weighing machine, forceps, Ventouse devices were used as study tool.

Ethical approval

The study was granted from appropriate authority conducted in Calcutta National Medical College.

Inclusion criteria

Inclusion criteria for vacuum extraction was term pregnancy >37 completed weeks with full dilation of cervix, ruptured membranes, no cephalopelvic disproportion. For forceps delivery it was term pregnancy >37 completed weeks, full dilation of cervix, ruptured membranes, no cephalopelvic disproportion.

Exclusion criteria

For vacuum extraction it was gestational age <34 weeks, malpresentation cephalopelvic disproportion, fetal bleeding disorder, patient refusal. For forceps delivery it was unengaged head, unknown fetal position, malpresentation (brow and mentoposterior), cephalopelvic disproportion, fetal bleeding disorder, patient refusal.

Study procedure

A prospective comparative study to be conducted in labour room of department of obstetrics and gynecology of Calcutta National Medical College and Hospital for 1 year. Ethical approval taken from concerned authority. One hundred pregnant women meeting the inclusion criteria registered. The risk and benefits explained. An informed consent using their data in research obtained. A detailed history, (including demographics, age, parity, duration of gestation), duration of 1st and 2nd stage of labour, analgesia, reason for assisted vaginal delivery and birth weight recorded. Detailed examination, abdominal,

vaginal examination done, and labour monitored as per labour room protocol and partograph maintained. 50 patients selected for forceps delivery and 50 patients for vacuum extraction.

The instruments were either silastic cup vacuum extractor or Wrigley's outlet forceps. Maternal morbidity was studied in terms of cervical tears, vaginal lacerations, episiotomy extension, perineal tears, PPH, and retention of urine. Neonatal morbidity was studied in terms of Apgar score, instrumental injuries, cephalhematoma, NICU admission and the outcome was compared. Neonatal assessment with APGAR score at 1 min and 5 min, incidence of cephalohaematoma and rates of neonate trauma to be studied and compared.

Statistical analysis

The findings were analyzed as simple descriptive mean and standard deviation of the quantitative data. The qualitative data presented as mean and percentages. The routine investigations presented as mean and standard deviations. The outcome variables (complications) presented as frequency, percentages, and chi-square used to assess any difference between the two groups with reference to the instrument used. The P value to be significant will be taken as equal to or less than 0.05.

Parameters to be study

History of the patient (age, parity, gravid, comorbidities), gestational age, general: (pallor, blood pressure, pulse), degree of post-delivery vaginal bleeding and to rule out PPH, degree of perineal injury including complete perineal tear, cervical tear, and para urethral tear.

Examination of neonate

Weight of the baby, APGAR score at 1 min and 5 min, NICU admission were examined.

RESULTS

Table 1 shows that in forceps delivery group, the mean age of patients was 25.5 years and in vacuum extraction group, the mean age of patients was 25.53 years. Difference of mean age with each group was not statistically significant (p=0.97). In case of other parameters like booked/unbooked, parity, position of fetal head, indication of instrumental delivery the results were comparable. All of them had p value >0.05 which was statistically insignificant.

Association between indication of operative vaginal delivery were compared in forceps and vacuum extraction group. The results were comparable in both groups. The indications like fetal distress, maternal exhaustion, prolonged second stage of labour, preeclampsia, maternal heart disease.

Table 1: Comparison between baseline characteristics.

Baseline characteristics	GROUPS		P value using Chi square test
	Forceps delivery (n=50)	Vacuum extraction (n=50)	
Age (mean)	25.50	25.53	0.97
Gestational age (weeks)	38	39	0.01
Parity			
Para 0	28 (56)	21 (42)	0.0918
Para 1	21(42)	24 (48)	
Para 2	1 (2)	3 (6)	
Booked/unbooked			
Booked	23 (46)	29 (58)	0.23
Unbooked	27 (54)	21 (41)	
Position of fetal head			
Occipito anterior	45 (90)	47 (94)	0.31
Occipito posterior	5 (10)	2 (4)	
Occipito trasverse	0	1(2%)	
Indication of instrumental delivery			
Fetal distress	23 (46)	14 (28)	0.54
Prolonged 2nd stage of labour	10 (20)	11 (22)	
Preeclampsia	5 (10)	4 (8)	
Maternal heart disease	4 (8)	6 (12)	

Table 2 shows association between instrumental delivery and maternal morbidity. In forceps delivery there is higher incidence of extension of episiotomy as compared to ventouse group (34% in forceps versus 14% in ventouse). So association between extension of episiotomy and forceps delivery is statistically significant with p value 0.01. Number of traumatic PPH is also higher in forceps deliveries (12% in forceps vs no traumatic PPH in ventouse). Mean duration of hospital stay is more in ventouse delivery as compared to forceps delivery (5.48 days in ventouse versus 4.82 days in forceps delivery, p value 0.03). Mean decision to delivery interval in forceps delivery was less than ventouse delivery (231.2 seconds in forceps versus 296.5 seconds in ventouse, p value <0.0001). Other parameters like episiotomy, cervical tear, vaginal laceration, perineal tear, complete perineal tear, periurethral injury, atonic PPH, blood transfusion were comparable.

Table 3 shows association between neonatal outcome in forceps vs ventouse delivery. Ventouse delivery was associated with higher number of cephalohematomas as compared to forceps (16% in ventouse versus no cephalohematoma in forceps). SNCU admission rates were higher in forceps delivery groups as compared to ventouse group (30% in forceps versus 12% in ventouse group, p value 0.02). The mean weight of the babies delivered by ventouse were more than those with forceps (3.08 kgs in ventouse versus 2.77 kgs in forceps, p value

0.003). The results were comparable with other parameters like scalp injury, abrasion and bruises, subconjunctival hemorrhage, mean APGAR score at 1 min and 5 mins.

Table 2: Comparison of maternal morbidity.

Characteristics	Forceps delivery (n=50)	Vacuum extraction (n=50)	P value Chi square test
Episiotomy	50 (100)	47 (94)	0.15
Vaginal laceration	47 (94)	48 (96)	0.65
Cervical tear	4 (8)	1 (2)	0.17
Extension of episiotomy	17 (34)	7 (14)	0.01
Perineal tear	7 (14)	1 (2)	0.05
Complete perineal tear	3 (6)	1 (2)	0.30
Periurethral injury	2 (4)	5 (10)	0.24
Atonic PPH	2 (4)	5 (10)	0.24
Traumatic PPH	6 (12)	0	0.01
Blood transfusion	2 (4)	1 (2)	0.56
Duration of hospital stay (mean) (days)	4.82	5.48	0.03
Decision to delivery interval in seconds (mean)	231.2	296.5	<0.0001

Table 3: Neonatal morbidity in instrumental delivery.

Variables	Forceps delivery (n=50)	Vacuum extraction (n=50)	P value By chi square test
Scalp injury	2 (4)	0	0.15
Abrasion and bruises	3 (6)	1 (2)	0.30
Cephalohematoma	0	8 (16)	0.003
SNCU admission	15 (30)	6 (12)	0.02
Subconjunctival hemorrhage	1 (2)	0	0.31
Mean weight of babies at birth	2.77	3.08	0.003
Mean APGAR score at 1 min	7.24	7.70	0.07
Mean APGAR score at 5 mins	7.64	8.08	0.06

For retention of urine after catheter removal, episiotomy wound infection after 7 days, urinary tract infection after 7 days the results were comparable in both groups.

DISCUSSION

Most studies done previously have shown that use of vacuum extraction is preferred over forceps to reduce the

maternal morbidity. Though cephalo-hematoma and retinal hemorrhages are less with forceps.⁷ This study was done to compare maternal and neonatal outcome in forceps and ventouse. Several studies have shown that maternal vaginal lacerations and perineal injuries are more in forceps delivery.^{1,8-10} These Studies have shown that number of maternal perineal trauma is largely due to the head being delivered in occipito posterior position. In vacuum autorotation occurs with traction and head is delivered in occipito-anterior position. Our study provided same result with higher number of extension of episiotomy, and traumatic PPH in forceps delivery. It clearly denotes a superiority of vacuum extraction cup as it doesn't occupy additional space in lateral pelvic wall and doesn't impinge on pelvic wall soft tissue.¹¹

Most studies agree that serious neonatal injuries are rare with vacuum extraction.^{11,12} But cephalohematoma is more common in vacuum extraction. In our study cephalohematoma is higher in vacuum extraction group which is similar to previous studies.

SNCU admission rates in the present study was higher in forceps group than vacuum (30% versus 12%). This may be probably because most babies delivered by forceps were associated with fetal distress, meconium stained liquor, fetal bradycardia, born to diabetic mother.

In a study by Singh et al 2012⁸ reported that mean birth weight in their study was 2.8±0.39 kg and birth of >3.5 kg babies were more common in forceps group. But in our study baby weighing >3.5 kg were successfully delivered with vacuum extraction without failure and no significant increase in maternal trauma.

Chaudhuri et al and Singh et al suggested that decision to delivery interval was shorter in forceps than vacuum extraction.^{8,13} Similar findings also noted in our study which makes forceps ideal in fetal distress.

Duration of hospital stay is less in forceps delivery than vacuum extraction as babies were discharged earlier in forceps group.

Limitations

The sample size was very small. Only 100 cases are not sufficient for this kind of study. It has been done in a single centre and the study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out.

CONCLUSION

From the point of view of maternal morbidity, assisted vaginal delivery by vacuum extraction gives better results than by forceps. However, vacuum extraction increases the risk of cephalohematoma in newborn, whereas neonates' delivery by forceps have more facial injury. So, where indicated, ventouse should be the instrument of first choice for assisted vaginal delivery.

Recommendations

Most of studies available are based on retrospective analysis. But this study was prospective study.

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