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Maternal and Fetal Outcome in Forceps Delivery

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ABSTRACT
Background: The obstetric forceps, once the savior in difficult vaginal deliveries has fallen to disrepute over the last few decades owing to the risk of poor maternal and fetal outcome. This study aims to study the indications for its use and the maternal and fetal outcome in forceps deliveries to help better understand if forceps delivery can be a suitable alternative to emergency caesarean section in difficult deliveries.
Materials and Methods: In this retrospective cohort study, conducted at Government Victoria Hospital, Visakhapatnam, a tertiary care teaching hospital, 80 cases of forceps deliveries are compared with 160 normal vaginal deliveries in terms of maternal outcome such as genital tract and perineal trauma, postpartum hemorrhage (PPH), wound infections, secondary suturing, sepsis, ICU admissions and maternal death, and neonatal outcome such as birth weight, APGAR at 1 min, birth trauma, NICU admissions, morbidity and mortality.
Results: The most common indication for forceps application was fetal distress. There were a total of 6 (Incidence 7.5%, Risk Ratio =54) cases of genital tract injuries out of which 4 were minor cervical and vaginal injuries, 2 were third degree perineal tears with one of them resulting in wound gaping and secondary suturing. Traumatic PPH occurred in 3 cases. 2 babies (I=3%, RR=1.59) had a poor APGAR score but survived after resuscitation. A total of 25 babies were admitted to the NICU (I=31.25%, RR=1.21), among which 11 (I =13.75%, RR=1.83) were diagnosed with perinatal asphyxia, 2 (I=2.5%, RR=0.36) were diagnosed with meconium aspiration syndrome and 4(I=5%, RR=0.88) were diagnosed with neonatal sepsis.
Conclusion: Forceps deliveries among other methods of assisted deliveries can play a vital role in reducing caesarean sections at full dilation and thereby the morbidities associated with it. Judicious use of forceps with adequate training under skilled supervision can be a lifesaving tool in difficult vaginal deliveries especially in smaller health care centers. This timely intervention can also prevent undue referrals to higher centers and save precious time and the life of both the mother and the fetus.

I. INTRODUCTION

The obstetric forceps, originally developed by the Chamberlain family has evolved over the centuries into the modern obstetric forceps.Among the several types of forceps described, only two types have found their footing in modern obstetrics, namely, outlet forceps and mid cavity forceps. Rotational forceps have almost been abandoned.The last few decades have witnessed a phenomenal increase in the caesarean section rates. Forceps deliveries can be a safe alternative to caesarean sections, thereby curbing the rise in caesarean section rates. In this study we aim to determine the different indications for forceps deliveries, the maternal outcome in forceps deliveries such as traumatic postpartum hemorrhage, genital tract trauma, maternal sepsis, maternal morbidity and mortality and fetal outcomes with respect to APGAR at birth, birth trauma, NICU admissions, neonatal morbidity and mortality. This study also aims to evaluate the scope of forceps delivery as an alternative to caesarean section in difficult vaginal deliveries.

II. MATERIALS AND METHODOLOGY

This retrospective cohort study was conducted at Government Victoria Hospital, a tertiary care center and a teaching hospital at Visakhapatnam, Andhra Pradesh. The duration of the study was from January, 2020 to December 2020. All the relevant data were obtained from hospital records and case sheets such as age of the antenatal mother, parity, type of forceps used, indication for forceps application, maternal genital tract trauma, traumatic postpartum hemorrhage, perineal injuries, maternal sepsis and wound infections, neonatal trauma, birth weight, APGAR at birth, NICU admissions and the cause for admission, maternal and fetal morbidity and mortality. All the relevant data was collected in 80

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cases of forceps deliveries and compared with a randomly collected sample of 160 normal vaginal deliveries conducted at the same hospital in in the year 2020. Hospital records from the past 5 years were also examined to assess changing trends in the mode of delivery. The data collected was then statistically analyzed using Risk Ratio and Chi square test. 'p' value was calculated to determine the statistical significance of the data collected.Prior permission was obtained from the Institutional Ethics Committee, Andhra Medical College, Visakhapatnam.

Inclusion Criteria
- Singleton pregnancy
- Term gestation
- Live fetus
- Cephalic presentation

Exclusion Criteria
- Multiple pregnancy
- Preterm delivery
- Intrauterine fetal demise
- Anomalous baby
- Malpresentation

III. RESULTS

The data collected from the last 5 years in the hospital show a steady decrease in the rate of assisted deliveries (both forceps and vacuum extraction) accompanied by an increase in the rate of caesarean sections as shown in the table no. 1. This table shows the increase in incidence of caesarean sections from 26.44% in 2016 to 42.26% in 2020 and the declining trend in the incidence of assisted deliveries from 4.32% in 2016 to 1.45% in 2020.

Table no. 1. Changing trends in the incidence of assisted deliveries and caesarean sections

Mode of delivery	2016	2017	2018	2019	2020
Normal Vaginal Delivery	5021	4575	4234	3592	3293
Assisted Delivery (Incidence in percentage)	314 (4.32%)	239 (3.43%)	221 (3.34%)	153 (2.53%)	85 (1.45%)
Caesarean Section (Incidence in percentage)	1918 (26.44%)	2153 (30.9%)	2517 (38.07%)	2305 (38.09%)	2473 (42.26%)

Out of the 80 cases of forceps deliveries that were included in this study, mid-cavity forceps were applied in 41 cases and outlet forceps in 39 cases. The most common indication for forceps delivery was fetal distress followed by inadequate maternal forces as shown in table no.2. Forceps deliveries were also conducted in some cases to expedite the second stage of labor. Forceps deliveries were more common in nulliparous women than in multiparous women as shown in table no. 3b.

Table no. 2. Indications for forceps deliveries

Indication	No. of cases	Incidence (in percentage)
Fetal distress	47	58.75%
Inadequate maternal forces	26	32.5%
Expedition of second stage of labor in medical/obstetric complicating pregnancies	6	7.5%
Malposition (occipitoposterior)	1	1.25%

Table no. 3a. Demographic distribution with respect to maternal age

Age	No. of cases	Incidence
<20 years	7	8.75%
20-30 years	67	83.75%
31-35 years	6	7.5%

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Table no. 3b. Demographic distribution with respect to parity

Parity	No. of cases	Incidence
Nulliparous	68	85%
Multiparous	12	15%

There were a total of 6 (Incidence 7.5%, Risk Ratio =54, $\chi 2 = 12.958$, $p = 0.006$) cases of genital tract injuries out of which 4 were minor cervical and vaginal injuries. There were 2 cases of third degree perineal tears with one of them resulting in wound gaping and secondary suturing. Traumatic PPH occurred in 3 cases. The risk of traumatic PPH and genital tract trauma is 3 times higher in forceps deliveries than in NVDs. Although there appears to be a significantly higher risk of atonic PPH in forceps deliveries, that can also be attributed to causes such as pre eclampsia and use of magnesium sulphate prior to delivery. There were no cases of wound infection, sepsis or maternal ICU admissions.

Table no. 4. Maternal outcome ($\chi 2 = 12.958$, $p = 0.006$)

Maternal outcome	Forceps deliveries	Normal Vaginal Deliveries	Risk Ratio
Atonic PPH	4	7	1.41
Traumatic PPH	3	1	3
Genital tract and perineal injuries	6	2	3

Forceps deliveries were more common (RR=2) in babies weighing >3.5kg at birth. A total of 2 babies (I=3%, RR=1.59) had a poor APGAR at birth ($\chi 2 = 0.6$, p=0.741), but were revived with effective resuscitation. A total of 25 babies were admitted to the NICU (I=31.25%, RR=1.21, $\chi 2$=0.588, p=0.443), among which 11 babies (I =13.75%, RR=1.83) were diagnosed with perinatal asphyxia, 2 babies (I=2.5%, RR=0.36) were diagnosed with meconium aspiration syndrome and 4 babies(I=5%, RR=0.88) were diagnosed with neonatal sepsis.

Table no. 5a. Distribution of birth weight

Birth weight	Forceps Deliveries	Normal Vaginal Deliveries
<2.5kg	7	11
2.5-3.5kg	63	139
>3.5kg	10	10

Table no. 5b. APGAR at 1 minute ($\chi 2 = 0.6$, p=0.741)

APGAR at 1 minute	Forceps Deliveries	Normal Vaginal Deliveries	Risk Ratio
6	0	1	
8	2	3	1.33
10	78	156	1

Table no. 5c. NICU Admissions ($\chi 2$=0.588, p=0.443)

NICU Admissions	Forceps Deliveries	Normal Vaginal Deliveries
Yes	25	41
No	55	119

Table no. 5d. Neonatal Morbidity ($\chi 2$=4.1107, p=0.336)

Final Diagnosis at NICU	Forceps Deliveries	Normal Vaginal Deliveries	Risk Ratio
Respiratory distress syndrome	11	12	1.83
Meconium aspiration	2	11	0.36

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syndrome			
Neonatal sepsis	4	9	0.44

IV. DISCUSSION

Forceps delivery is usually indicated in cases where the second stage of labor needs to be expedited such as maternal exhaustion, medical conditions (that preclude maternal efforts, where vacuum extraction is not possible) such as cardiac disease, hypertensive crisis, myasthenia gravis, spinal cord injury, proliferative retinopathy, obstetrical complications such as severe pre eclampsia, eclampsia, prolonged second stage of labor[1]. Outlet forceps are also used during caesarean section for controlled delivery of the head [2]. Forceps can be used inan undiagnosed breech presentation at full cervical dilation or for delivery of the second twin, where it helps in the controlled delivery of the fetus's head. Forceps delivery is chosen over vacuum extraction in premature fetus due to the risk of cephalhematoma and intracranial hemorrhagewith vacuum extraction[3]. Forceps delivery is the only option among assisted delivery methods in face presentation. Forceps may also be chosen when maternal effort is minimal secondary to epidural analgesia.

Although evidence suggests that forceps are safe and effective in difficult vaginal deliveries, most obstetricians have come to favor caesarean section or even vacuum extraction over forceps due to the litigations and legal issues arising from maternal and fetal morbidity associated with forceps delivery. Repeat caesarean section is one of the main causes for the increasing rates of caesarean section. A study conducted in Pondichery, India found that the rate of caesarean sections has increased from 12.3% in 1981 to 27.3% in 1989[4]. A recent study conducted in India found that the rate of caesarean sections have increased from 2.5% in 1974 to 14.12% in 1993[5]. By reducing primary caesarean sections, we can also reduce the overall caesarean section rate.The complications arising from caesarean section at full cervical dilation such as extension of uterine incision, hemorrhage, risk of scar dehiscence or rupture in subsequent pregnancy and most importantly a repeat caesarean sectioncan be avoided by choosing assisted delivery methods, where indicated. Studies also suggest that forceps are quicker and associated with less failure than vacuum extraction[6,7,]. Also, women who have instrumental vaginal deliveries typically have a shorter hospital stay and fewer readmissions than women who have caesarean sections[7].

Despite all the advantages with forceps delivery, it is not without complications. Many studies have showed an increase in the incidence of cervical lacerations, vaginal and perineal injuries, major hemorrhage, postpartum infection, subsequent pelvic floor disorders with forceps delivery than vacuum extraction[8]. Some studies also showed that forceps delivery is associated with a higher incidence of third degree perineal tear and fecal continence later in life, than vacuum extraction[9]. The findings are inconsistent regarding the effect of forceps delivery on neonatal outcome. Some studies demonstrated no significant increase in the incidence of poor APGAR scores and few serious injuries in those delivered by forceps than with vacuum extraction, although vacuum extraction was associated with a higher risk of intracranial hemorrhage and retinal hemorrhage[10]. A different study also showed that the number of admissions to the NICU were higher with emergency caesarean section done a full dilation than forceps delivery[11]. There are not enough studies describing the long term outcome of forceps delivery. One study reported no significant difference in the development of children born via forceps delivery and those delivered by vacuum extraction[12]. A recent prospective study showed a higher incidence of fetal acidosis and neonatal trauma in a failed instrumental delivery than after immediate caesarean section[11]. However, it is difficult to determine if the neonatal morbidity is due to complications arising during difficult vaginal delivery that result in instrumental vaginal delivery or whether the mode of delivery itself contributes to poor outcome.

V. CONCLUSION

Forceps deliveries among other methods of assisted deliveries can play a vital role in reducing caesarean sections at full dilation and thereby the morbidities associated with it. Judicious use of forceps with adequate training under skilled supervision can be a lifesaving tool in difficult vaginal deliveries especially in smaller health care centers. This timely intervention can also prevent undue referrals to higher centers and save precious time and the life of both the mother and the fetus.

Future research is needed to determine both the short term and long term effects of forceps delivery, especially with respect to subsequent deliveries following forceps delivery. A uniform protocol and practice guideline can help ensure safe and effective evidence based practice.

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