

RESEARCH ARTICLE

Outlet Forceps Delivery: Role in Modern Obstetric Practice

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ABSTRACT

Aim: The dramatic rise of cesarean section rate is a global problem. The forceps delivery has also led to numerous litigations due to poor fetal and sometimes maternal outcome. Still, it is having a prominent role to reduce the rate of cesarean section deliveries. The aim of this study was to assess fetomaternal outcome in outlet forceps delivery.

Methods: A prospective cohort study of 92 patients who delivered by outlet forceps conducted in the department of obstetrics and gynecology, Jawaharlal Nehru Hospital and Research Centre, Bhilai, Chhattisgarh, India. The result was analysed for Fetomaternal outcome over a period of 1 years from 15 October 2015 to 14 October 2016.

Results: Incidence of Wrigley's outlet forceps delivery is 2.76% in our study. The most common indication was nonreassuring fetal heart rate (40.21%). Nearly 70.65% babies had normal APGAR score. 43.48% neonates had birth weight between 2.5–3 kg. Neonatal morbidities found in this study were impression marks over face in 18.47%, convulsions in 6.52%, neonatal hyperbilirubinemia and subconjunctival hemorrhage in 3.26% each, hypoxic ischemic encephalopathy in 2.17% and facial palsy in 1.09% neonates. Only 5.43% neonates required NICU stay of more than seven days. Extended episiotomy was observed in 6.76% and only three patients had atonic PPH. Cervical tear, first-degree perineal tear, traumatic PPH and vulvovaginal hematoma were observed in 2.7% patients each. 1.35% patients had a paraurethral tear, second and third degree perineal tear each. No maternal or fetal mortality due to forceps found in our study.

Conclusion: Use of forceps is a safe alternative to cesarean section deliveries. The rates of maternal and perinatal morbidity and mortality in outlet forceps delivery are negligible and comparable to normal delivery in experienced hands.

Keywords: Fetal outcome, Instrumental delivery, Maternal injuries, Outlet forceps, Prospective cohort study.

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INTRODUCTION

Instrumental vaginal deliveries like forceps and vacuum deliveries were very popular in older times. But in the modern era, their role is debatable. Nowadays, due to newer safer cesarean techniques, safe anesthetic practices and good outcome of cesarean section, instrumental deliveries are less and less preferred.

But assisted vaginal delivery offers quick delivery in the difficult situation of fetal or maternal compromise at full dilatation of the cervix. The only other option available is cesarean section, which at full dilatation is technically challenging and is also associated with higher maternal morbidity and its consequences on future pregnancy. Despite this fact, it is seen that for the past few decades, the overall rate of operative vaginal delivery is on decline.¹

This art of instrumental delivery, though has benefited many, it has also led to numerous litigations due to the poor fetal and sometimes maternal outcome. This has led to reluctance in its use. There is a concern about the dramatically rising rates of cesarean delivery worldwide as unnecessary cesarean sections are associated with increased maternal and perinatal morbidity.^{2,3} Hence the art of the forceps should be used to avoid an unnecessary cesarean section and its associated complications.

Outlet forceps procedure with appropriate mediolateral episiotomy has been demonstrated to give fetal and maternal results equal to if not exceed the spontaneous vaginal vertex delivery.⁴

METHODS

The present study "Outlet Forceps Delivery: Role in Modern Obstetric Practice" is a prospective cohort study, which has been carried out in the Department of Obstetrics and Gynecology, Jawaharlal Nehru Hospital and Research Centre, Bhilai, Chhattisgarh, India.

Cochran formula (sample size $n = 1.96^2 \times p \times q / e^2$) is used to calculate the sample size. Taking p (percentage of birth injuries due to forceps) as 18.84% based on the previous study of Iyengar and Patel⁵ sample size came to be 92.

After taking institutional ethical committee clearance, 92 patients, who gave consent for the study and got

admitted to the labor room were taken up for study. The study was done from 15 October 2015 to 14 October 2016.

Cases were enrolled in the study after satisfying the inclusion and exclusion criteria.

Inclusion Criteria

- Confirmed singleton pregnancy of 37–42 weeks with cephalic presentation
- No contraindication for vaginal delivery
- Inadequate maternal expulsive efforts and maternal exhaustion
- Where maternal strain of bearing down has to be avoided (e.g., anemia, hypertensive crises, cardiac disease, cerebrovascular diseases)
- Fetal distress with vertex at +2 station or below

Exclusion Criteria

- Gross cephalopelvic disproportion
- Unsuccessful trial of vacuum extraction
- Intrauterine fetal death
- Previous cesarean section delivery.

After admission, a careful and complete history was taken. A general medical and obstetric examination was carried out with special reference to the presentation and position of the fetus, the dilatation of cervix, the presence and absence of bag of membrane, the presence and absence of caput, the position of sutures and fontanelles, the position of ear whenever required, the type of pelvis and the adequacy of pelvic cavity. Basic investigations were done.

Baby weight was estimated clinically. Fetal monitoring was done with the use of CTG. Partographic management of labor was done. The progress of labor was observed according to the parity of the mother.

When maternal and fetal distress has developed, and it became evident that immediate natural delivery is not possible a decision to intervene was taken. Prophylactic forceps delivery also planned in conditions where expulsive efforts are to be avoided (e.g., anemia, hypertensive crises, cardiac disease, cerebrovascular diseases).

Written consent to the forceps delivery was taken after explaining the maternal and fetal risks and benefits. Wrigley's outlet forceps were used after fulfillment of the following prerequisites.

Prerequisites

- Scalp visible at introitus without separating the labia
- The sagittal suture in anteroposterior position or right or left occipitoanterior or occipitoposterior position.
- Completely dilated cervix
- Ruptured membrane

- The bladder must be empty.
- The operator should be competent in the use of the instruments and the recognition and management of potential complications. The operator should also know when to stop.

The left blade was applied first followed by the right blade. It was ensured that blades were correctly applied in occipitontal diameter with biparietal diameter occupying the greatest distance between blades. Gentle, intermittent, horizontal traction was exerted with each uterine contraction. With traction when vulva was distended by the occiput, an episiotomy was done. Finally, as the blades were elevated, the head was delivered by extension. Delivery of trunk was similar to normal vaginal delivery.

Full details of the procedure were noted including the time of application of the instrument, time of delivery, and the anesthesia given. The obstetrician delivering the patient made an immediate assessment of the degree of maternal trauma. The attending pediatrician documented the information about the baby's condition at birth.

After primary data collection, a master chart was prepared. Parameters studied were statistically analyzed using the Chi-square test, paired and unpaired 't' test. The mean and the standard deviation was used for the analysis of continuous data. A *p* value of <0.05 was considered to be statistically significant, *p* value <0.01 was highly significant and *p* value >0.05 was not significant.

RESULTS

A total of 3326 antenatal cases were delivered out of which 92 cases were delivered by outlet forceps. The incidence of outlet forceps deliveries— $92/3326 \times 100 = 2.76\%$. Out of 92 cases, 74 (80.43%) cases were booked, and rest 18 (19.57%) were unbooked cases.

The following are the distribution of various maternal and fetal risk factors in our study. Sickle cell disease was found in five (5.43%) patients, one (1.09%) case had congenital heart disease, three (3.26%) cases had cord around the neck of the fetus, one (1.09%) case had cord prolapse, one (1.09%) case had decreased diastolic flow in umbilical arteries in doppler study. Hypertensive disorders like eclampsia and severe preeclampsia were found in four (4.34%) cases, one (1.09%) case had GDM. Five (5.43%) cases had meconium stained liquor, three (3.26%) cases had IUGR, four (5.43%) cases had severe anemia, two (2.17%) cases had oligohydramnios, three (3.26%) had previous one LSCS, and five (5.43%) cases had PROM.

The most common indication for application of forceps was nonreassuring fetal heart rate in 37 (40.21%) cases followed by maternal exhaustion in 24 (26.09%)

cases, to cut short second stage of labor in 18 (19.57%) cases and prolonged second stage of labor in 13 (14.13%) cases.

Table 1 shows that the extension of episiotomy was the most common complication noted in six (6.52%) cases followed by atonic PPH in three cases (3.26%). No complications occurred in 71 (77.17%) cases.

Out of 92 cases, 85 (92.40%) mothers were discharged from the hospital in <48 hours of delivery. The hospital stay was lengthened for >48 hours in seven (7.60%) cases.

The majority, i.e., 74 (80.43%) of the neonates delivered by outlet forceps had an Apgar score between 7 and 10 at 5 minutes. 17 (18.48%) neonates had an Apgar score between 4 and 6 and only one neonates had very low Apgar score, i.e., between 0 and 3 at 5 minutes.

A maximum number of babies, i.e., 40 (43.48%) was found between birth weight group 2500 and 3000 grams. Twenty-seven (29.35%) babies between 3000 g and 3500 g,

15 (16.3%) babies between 2000 g and 2500 g, 9 (9.78%) babies between 3500 and 4000 g and only one (1.09%) baby were found with a birth weight of fewer than 2000 grams.

Table 2 shows that there were no neonatal morbidity in 58 (61.95%) cases. Among all the morbidities the commonest one is the impression marks of forceps applications, which was found in 17 (18.47%) babies, followed by convulsions in 6 (6.52%) babies.

Table 3 shows that, out of 92 neonates delivered by outlet forceps, maximum 72 (78.26%) had NICU stay of fewer than 48 hours. The second common duration of stay was 3–7 days in eight (8.7%) cases. Seven (7.61%) neonates had NICU stay between 48 and 72 hours and only five (5.43%) neonates required more than seven days of NICU facility.

Table 4 shows that statistically highly significant association exists between birth weight and maternal morbidity (*p* value = 0.0003).

Table 1: Distribution of cases according to maternal morbidity in outlet forceps delivery

Maternal morbidity	Present study	Shekhar Shashank et al. ⁶	Lopamudra et al. ⁷	Iyengar et al. ⁵	Akanksha Lamba et al. ⁸	Priyanka Chaudhari et al. ⁹
Extended episiotomy	6.52%	–	–	8%	14.2%	8.61%
Episiotomy wound infection	1.09%	–	–	4%	–	–
Atonic PPH	3.26%	–	2.5%	2%	5.7%	7.1%
Traumatic PPH	2.17%	–	1.67%	–	–	–
Vulvovaginal hematoma	2.17%	–	–	–	2.8%	–
I degree perineal tear	2.17%	–	–	–	–	11.4%
II degree perineal tear	1.09%	–	–	6%	–	–
III degree perineal tear	1.09%	4%	–	–	–	12.9%
IV degree perineal tear	–	–	3.33%	–	2.8%	–
Cervical tear	2.17%	4%	–	–	–	5.7%
Paraurethral tear	1.09%	2%	–	4%	–	11.4%
Uterine rupture	–	–	1.67%	–	1.4%	–

Table 2: Distribution of neonatal morbidity in outlet forceps delivery

Fetal morbidity	Present study	Shekhar Shashank et al. ⁶	Iyengar et al. ⁵	Akanksha Lamba et al. ⁸	Priyanka Chaudhari et al. ⁹
Impression marks/abrasions	18.47%	–	14%	10%	41.5%
Subconjunctival hemorrhage	3.26%	–	–	1.4%	7.7%
Convulsions	6.52%	–	–	–	9.2%
Cephalhaematoma	3.26%	4%	4%	–	3%
Neonatal hyperbilirubinemia	3.26%	6%	–	–	3%
Facial palsy	1.09%	2%	–	2.8%	–
Hypoxic ischemic encephalopathy	2.17%	–	–	–	–
Brachial plexus injury	–	–	–	–	1.5%
Feeding difficulty	–	–	–	–	3%
Irritability	–	–	–	–	1.5%
NICU admission	All	–	12%	12.8%	23%
Mortality	–	–	2%	7%	3%

Table 3: Distribution of neonates based on duration of stay in neonatal intensive care unit

NICU stay	No. of cases	Percentage
<48 hours	72	78.26
48–72 hours	7	7.61
>72 hours to 7 days	8	8.7
>7 days	5	5.43
Total	92	100

As depicted in Table 5, the difference in maternal morbidity was studied between booked and unbooked cases. All maternal morbidity variables show insignificant association with booked and unbooked cases except episiotomy wound infection which was statistically significant (Chi-square test, p value = 0.04). Percentage calculated on booked 74 cases and unbooked 18 cases.

DISCUSSION

Forceps delivery still has a significant role in obstetrics as it is a lifesaving procedure in many situations as it is a simple, speedy and comparatively safe for fetus and mother both. In experienced and skilled hands, the obstetric forceps is an effective instrument to reduce maternal efforts and fetal morbidity and mortality.

Prophylactic use of forceps has been proposed as a safe alternative to cut short the second stage of labor in high-risk pregnancies like anemia, preeclampsia, eclampsia, heart disease, previous LSCS, etc.

The American College of Obstetrics and Gynecology (2015) recommends forceps and vacuum extractors have a low risk of complications and are acceptable for operative vaginal delivery.

Incidence of Outlet Forceps Deliveries

According to ACOG medical teaching module; 2011, the incidence of outlet forceps was 0.8%. But the incidence of Wrigley's outlet forceps delivery is 2.76% in our study. The very high incidence in our institute is because of 24 hours availability of skilled obstetricians trained in performing forceps deliveries, cesarean section facility, neonatologist, anesthetist, good neonatal care and very less incidence of vacuum-assisted vaginal deliveries in the hospital.

The incidence of forceps delivery in the study by Ayala-Yáñez et al.¹⁰ is 2.55%, Werner et al.¹¹ is 2.1% in 2003, which is comparable to our study.

The discrepancy in the incidence as reported by various authors from different institutions may also be attributed to the type of pelvis in a particular community,

Table 4: Correlation between birth weight and maternal morbidity

Birth weight (g)	Extended episiotomy	Episiotomy wound infection	Atonic PPH	Traumatic PPH	First-degree perineal tear	Second-degree perineal tear	Third-degree perineal tear	Paraurethral tear	Vulvovaginal hematoma	Cervical tear	No complications
<2000											1 (100%)
2000–2500											15 (100%)
2500–3000	1 (2.5%)	1 (2.5%)	1 (2.5%)		2 (5%)			1 (2.5%)	1 (2.5%)		33 (82.5%)
3000–3500	4 (14.81%)		1 (3.7%)	1 (3.7%)		1 (3.7%)					20 (74.07%)
3500–4000	1 (11.11%)		1 (11.11%)	1 (11.11%)			1 (11.11%)		1 (11.11%)	2 (22.22%)	2 (22.22%)

Table 5: Correlation between maternal morbidity and booked/unbooked status

Maternal morbidity	Booked	Unbooked	p value
Extended episiotomy	5 (6.76%)	1 (5.56%)	0.85
Episiotomy wound infection	0 (0%)	1 (5.56%)	0.04
Atonic PPH	3 (4.05%)	0 (0%)	0.38
Cervical tear	2 (2.7%)	0 (0%)	0.48
First degree perineal tear	2 (2.7%)	0 (0%)	0.48
Paraurethral tear	1 (1.35%)	0 (0%)	0.62
Second degree perineal tear	1 (1.35%)	0 (0%)	0.62
Third degree perineal tear	1 (1.35%)	0 (0%)	0.62
Traumatic PPH	2 (2.7%)	0 (0%)	0.48
Vulvovaginal hematoma	2 (2.7%)	0 (0%)	0.48
Total	19 (25.68%)	2 (11.11%)	0.18

attitude of obstetrician and cesarean section rate of the institute.

Distribution of Cases According to Antenatal Care

In the present study out of 92 cases of forceps delivery, 74 (80.43%) cases were booked and 18 (19.57%) cases were unbooked. This is in accordance with our expectations because 60% of patients delivered in our hospital were booked cases. We conduct psychoprophylaxis classes in our hospital for the booked cases where we explain the physiology of labor and indications of forceps delivery. These pregnant females are well motivated for vaginal delivery including instrumental delivery.

Distribution of Cases According to Indications of Outlet Forceps Delivery

In our study, the most frequent indication for forceps application was nonreassuring fetal heart rate due to meticulous fetal monitoring. Our detection rate of fetal distress is very high due to CTG monitoring every 5 minutes in the second stage of labor. In a study by Lamba et al.⁸ the most common indication was fetal compromise and failure to deliver spontaneously with maximum maternal effort, which agrees with our present study. Our findings differed from Saini et al.,¹² where to cut short second stage of labor was the chief indication followed by a prolonged second stage of labor.

Distribution of Cases According to Maternal Morbidity in Outlet Forceps Delivery

As per Table 1, the maternal morbidity in the Shekhar Shashank et al.,⁶ Lopamudra et al.,⁷ Iyengar et al.,⁵ and Lamba et al.⁸ studies are comparable to our study. But the morbidity in the study of Chaudhari et al.⁹ is much higher than the rest of the studies.

This reflects the importance of patient selection and the competency of the surgeon for forceps delivery.

Distribution of Cases According to the Duration of Hospital Stay

In the present study, most of the patients 85 (92.40%) were discharged from the hospital in <48 hours and in seven (7.60%) patients the hospital stay was >48 hours. The hospital stay was prolonged in seven cases because babies of two patients were on phototherapy due to neonatal hyperbilirubinemia and one baby was on injectable antibiotics due to PROM in the mother. Hence, three patients had prolonged stay in the hospital due to their babies. Two cases had a cervical tear, one case had a third-degree perineal tear, and one case had an episiotomy wound infection. They were discharged

in >48 hours after passing stools and when their wound looked healthy.

Distribution of Babies According to APGAR Score at 5 Minutes

The 5 minutes Apgar score is a useful index of the response to resuscitation. Apgar score at 5 minutes was 7–10 in 80.43% of the babies in our study. The studies by Singh and Rathore¹³ and Chaudhari et al.⁹ also show similar results.

Distribution of Neonates According to Birth weight

In the present study, the mean birth weight was 2863.47 grams with SD 418.56, the majority of babies 40 (43.48%) had a birth weight between 2500 and 3000 g. The studies by Singh and Rathore,¹³ Shekhar et al.,⁶ Iyengar and Patel⁵ also show a majority of babies are within 2500 to 3000 g birth weight.

Distribution of Neonatal Morbidity in Outlet Forceps Delivery (Table 2)

In our study, neonatal morbidity was seen in 35 (38.04%) cases. Impression marks were observed in 17 (18.47%) cases but the majority of these were small and superficial. Convulsions occurred in six (6.52%) babies. On investigation in NICU out of those six babies, three of them had hypocalcemia, and three had hypernatremia. Cephalhaematoma was noted in three (3.26%) cases which may be due to the prolonged second stage of labor. Neonatal hyperbilirubinemia occurred in three (3.26%) cases. On further investigation, it was found to be physiological jaundice in two babies, and one baby had jaundice due to ABO incompatibility. It was resolved within one week. One (1.09%) case of facial palsy was also noted which was transient and recovered in 48 hours. Observational data on instrumental deliveries have suggested that they are associated with neonatal injuries so careful practice can minimize these risks. Type 1 hypoxic ischemic encephalopathy was observed in two (2.17%) cases. These babies responded well to resuscitation. We have sent all the babies delivered by forceps routinely for observation, and they are transferred to the mother within 24–48 hours. Duration of stay in NICU was <48 hours in most of the babies in our study (Table 3). There was no neonatal death in our study.

Correlation between Birth Weight and Maternal (Table 4)

The present study shows a statistically highly significant association between birth weight and maternal morbidity (p value = 0.0003). There was no morbidity in the <2000

g and 2000–2500 g birth weight range. Gradually, the morbidity increased as the birth weight increased from 2500–4000 g.

Correlation between Maternal Morbidity and Booked and Unbooked Status (Table 5)

In the present study, all maternal morbidity variables show a statistically insignificant association between booked and unbooked cases except episiotomy wound infection. The correlation between these two variables can be reconfirmed by performing the study with a large sample size.

CONCLUSION

On the basis of our prospective study of 92 cases, the following facts have been drawn:

- The incidence of outlet forceps delivery is 2.76% in our study.
- A maximum number of patients undergoing outlet forceps delivery were booked patients.
- Nonreassuring fetal heart rate was the most common indication for outlet forceps delivery followed by maternal exhaustion.
- The prophylactic use of outlet forceps in skilled hand to cut short the second stage of labor is a safe alternative in high-risk pregnancies like anemia, severe hypertensive disorders, heart disease, and previous cesarean delivery.
- All babies were alive and most are with good Apgar scores.
- Most of the babies were between 2.5 kg and 3 kg and were appropriate for gestational age.
- Major maternal morbidity and mortality due to forceps were not found in our study. Proper selection of cases, sound clinical examination, strict adherence to the guidelines, timely decision for forceps application, 24 hours availability of senior and skilled obstetrician, anesthetist, neonatologist, blood and blood components transfusion and appropriate intensive care facility minimize the risk of failure and complications. The overall rates of maternal and perinatal morbidity in outlet forceps delivery were less and even comparable to spontaneous vaginal delivery.
- The most common maternal morbidity was an extension of episiotomy followed by PPH. No maternal mortality occurred in our study.
- The perinatal morbidity in the present study has been very low. This is due to extensive fetal monitoring during the second stage of labor, availability of trained neonatologist for prompt and effective resuscitation

of newborn and well equipped neonatal intensive care unit.

- The most common neonatal morbidity in our study was impression marks due to forceps. No neonatal death occurred in our study.
- Statistically significant correlation between birth weight and maternal morbidity was found.

To cut down the cesarean section rates in the second stage of labor, outlet forceps delivery is a reasonable option but the patient must be counseled regarding the risks and benefits of alternative approaches. Optimum maternal and the perinatal outcome depends on good obstetric practice and timely judgment. There is a need for proper antenatal care, timely referral, institutional delivery, intensive monitoring during labor and availability of trained skilled personnel for forceps application and effective resuscitation of newborn to improve both maternal and perinatal outcome.

Outlet forceps is having a definitive role in modern obstetrics.

CLINICAL SIGNIFICANCE

It is well evident from the present study that providing proper awareness, health education and adequate antenatal care to all pregnant women regardless of their risk status is essential for the optimum reproductive outcome.

Strict vigilance, careful monitoring, pelvic assessment is essential in the management of labor. Availability of experienced obstetrician, blood transfusion services, anesthetist, operation theatre and neonatal intensive care unit facility greatly reduces the maternal and fetal morbidity and mortality in the instrumental delivery.

As the safety of the forceps delivery is dependent mainly on the operators skills and right judgment regarding case selection. Training programs should be conducted to impart knowledge about its indications, the technique of use and to deal with the complications.

In this cesarean-era forceps delivery is one of the important and viable option to reduce the alarmingly high rate of cesarean sections. Obstetricians should not hesitate to use this instrument just because of fear of litigation.

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