

Short Term Maternal and Neonatal Outcomes in Operative Vaginal Deliveries in Singleton Term Pregnancies

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ABSTRACT

Objective: To compare the short term maternal and neonatal outcomes between vacuum assisted and forceps vaginal delivery.

Study design: Retrospective case notes review of instrumental vaginal deliveries.

Place and duration of study: This study was carried out in department of obstetrics and Gynecology, Fatima Memorial Hospital, Lahore from January 2008 to June 2008.

Material and methods: The outcome of sixty consecutive women who underwent instrumental delivery with vacuum extractor was compared with that of sixty consecutive women who were delivered with the aid of forceps. Maternal and delivery characteristic were noted. Neonatal and maternal outcomes were assessed in the form of Apgar score, neonatal trauma and perineal injury including extension of episiotomy, vaginal lacerations and injury to perineal body.

Results: The two groups vacuum assisted delivery versus forceps delivery did not vary significantly with respect to maternal age, parity, weight, height and indication of application of instrument. Neonatal outcome in terms of birth weight, gestational age and Apgar score was similar between two groups. Maternal birth canal trauma in the form of 2nd and 3rd degree perineal tears was significantly more common with forceps delivery (11.67% versus 3.33%, $p=0.032$ and 10% versus 0%, $p=0.027$ respectively) and there was significantly increased incidence of cephalhematoma and jaundice with the use of vacuum extractor (20% versus 05%, $p=0.013$ and 11.67% versus 3.33%, $p=0.032$ respectively). No serious maternal or fetal morbidity was seen in both groups.

Conclusion: Results of present study indicate that maternal birth canal trauma and genital tract laceration were significantly more common with forceps thus increasing the maternal morbidity. Cephalhematoma and jaundice associated with vacuum assisted delivery were minor and self limiting. We conclude that vacuum extractor should be considered over forceps in assisted vaginal deliveries.

Key words: Instrumental delivery, forceps, vacuum, maternal outcomes, neonatal outcome.

INTRODUCTION

Assisted vaginal delivery is an integral part of obstetric care world wide. Approximately 10% of all deliveries in the western world are accomplished by one of the two methods of operative vaginal birth, vacuum extraction or forceps assisted delivery¹. The rate of operative vaginal delivery has remained stable, whereas the rate of vacuum assisted delivery has increased against forceps application². The decision to use a vacuum extractor instead of forceps in assisted vaginal delivery is based on the clinical situation and the experience and expertise of the doctor. For many physicians these two instruments are interchangeable, while others are more comfortable with one or the other. Vacuum extraction has recently gained popularity because of new design of vacuum cups with reduced risk of injury to the fetus while number of forceps deliveries has declined^{2,3}. Operative vaginal delivery is indicated

during prolonged second stage of labor, for maternal exhaustion, to shorten second stage of labor, in certain maternal conditions in which bearing down is avoided like cardiovascular diseases and fetal conditions like non reassuring fetal heart rate status to prevent hypoxic brain damage or fetal death. Forceps and vacuum have been compared in many studies both are associated with increased risk of maternal and neonatal injury when compared to normal spontaneous vaginal deliveries^{4, 5}. Poor maternal and neonatal outcomes have also been reported after the sequential use of vacuum and forceps for assisted vaginal delivery⁶. Current evidence suggest that when assisted vaginal delivery is required the vacuum should be chosen first because it is significantly less likely to injure the mother, however this area remains controversial and there are different reports to support both ways of instrumental delivery and different rates of fetal and maternal complications have been mentioned by different authors⁷. There is a little doubt however that

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the right equipment in the right hand can achieve impressive and safe results⁸.

The aim of present study is to assess the rate of maternal and neonatal morbidity following vacuum and forceps assisted deliveries in singleton term pregnancies.

MATERIAL AND METHODS

Operative vaginal deliveries of singleton live infants at term were retrospectively studied from January 2008 to June 2008 in Obstetric and Gynecology department of Fatima Memorial Hospital, Lahore. Sixty consecutive cases who under went outlet forceps delivery were compared with consecutive sixty cases who were delivered by vacuum extractor. The instruments used were either silastic cup vacuum extractor or obstetric forceps (Wrigley's forceps). Maternal and neonatal records were reviewed from charts of obstetrics and neonatal charts. All deliveries were performed by experienced obstetrician and by residents under the supervision of an attending consultant in obstetrics. Prolonged second stage of labor, maternal exhaustion, non reassuring fetal heart rate status were considered as main indications for operative vaginal delivery. Multiple pregnancies, stillbirths, infants with birth weight less than 2500g or more than 4000g, gestational age less than 37 weeks, fetal anomalies and non cephalic presentation were excluded from the study.

Maternal demographic data such as mean maternal age, parity and delivery characteristics such as birth weight, gestational age, indication of operative vaginal delivery and duration of labor were recorded. The main maternal outcomes of interest were perineal injuries, vaginal and cervical lacerations, PPH and urinary retention. The main fetal outcomes of interest were poor fetal Apgar score (<7 at 1 and 5 minutes), need of admission to NICU and neonatal trauma including cephalhematomas, intracranial hemorrhage, retinal hemorrhage and shoulder dystocia. Incidence of jaundice and need for phototherapy were also recorded. A qualified neonatologist attended all the above deliveries. Admission criteria to NICU were Apgar score <4 at 1 minutes and the need for intubation in the delivery room as well as the presence of respiratory distress for more than 4 hours while in nursery.

Data analysis procedure: The collected data was analyzed by using SPSS version 11. Quantitative data including age was presented as mean and standard deviation. Qualitative data including parity and maternal complications were presented as frequency and percentage. Chi square test was used to assess any difference between two groups with reference to the instrument used. The p-value to be significant was taken as equal to or less than 0.05.

RESULTS

There was no significant difference between vacuum assisted and forceps deliveries as regard to maternal age 25.85 versus 25.27 years, rate of primiparous 53% versus 61%, rate of multiparous 46% versus 38% (Table-I) and duration of labor 7.9 versus 7.5 hours (Table-II).

Indications for the instrumental delivery were similar between two study groups and fetal distress was most common indication 47% versus 40% for both ways of operative delivery followed by prolonged second stage of labor 38% versus 36% and maternal exhaustion 15% versus 10% (Table -III).

The incidence of 2nd degree and 3rd degree perineal tears in forceps group was quite high as compared to vacuum assisted deliveries 11.67% versus 3.33% (p-value=0.032) and 10% versus 0% (p-value=0.027) respectively. One patient in forceps group had PPH and none in vacuum group. In forceps group 10% patients developed post delivery urinary retention in contrast to 0% in vacuum group p=0.027 (Table-IV).

The neonatal outcome was similar in terms of gestational age 39.0 versus 39.5 weeks, birth weight 3443 gm versus 3461 gm (Table-II) and Apgar scores in both groups. Apgar score in neonates in vacuum and forceps group was comparable <7 at 1 minute in 30% versus 36.67% (p=0.560) and <7 at 5 minutes in 8.33% versus 15% (p-value=0.394) respectively (Table V). Neonatal trauma in the form of cephalhematoma was high in vacuum assisted group versus forceps group 20% versus 05% (p=0.013). Subconjunctival hemorrhage was seen in 5% cases of vacuum delivery in contrast to 3.33% in forceps group. Jaundice was more commonly observed in neonates delivered by vacuum extractor in contrast to forceps delivery 11.66% versus 3.33% (p=0.023). No other serious fetomaternal morbidity was seen in both study groups (Table-V).

Table I: Maternal characteristic between vacuum and forceps delivery

Variables	Forceps delivery	Vacuum delivery	p-value
Mean age: (Years: mean \pm SD)	25.27 \pm 3.97	25.85 \pm 4.00	NS
Parity: (%)	37%	32%	NS
Primiparous	23%	28%	
Multiparous			
Height: (Cm: Mean \pm SD)	151.2 \pm 3.2	152.3 \pm 3.8	NS
Weight: (Kg: Mean \pm SD)	55.4 \pm 4	56.3 \pm 4.5	NS

Table II: Delivery characteristic between forceps and vacuum

Variables	Forceps delivery	Vacuum delivery	p - value
Birth weight: (Grams \pm SD)	3443 \pm 379	3461 \pm 335	NS
Duration of labor: (Hours: Means \pm SD)	7.9 \pm 3.5	7.5 \pm 3.6	NS
Gestational age: (Weeks: Means \pm SD)	39 \pm 1.2	39.5 \pm 1	NS

Table III: Indications of instrumental delivery

Indications of instrumental delivery	Vacuum delivery n=60 (%)	Forceps delivery n=60 (%)	p-value
Fetal distress	28 (47%)	24 (40%)	0.490
Prolonged second stage of labor	18 (38%)	22 (36%)	0.560
Maternal exhaustion	9(15%)	05 (10%)	0.394
Too short second stage of labor	05 (10%)	09 (15%)	0.394

Table IV: Maternal out come between vacuum & forceps assisted vaginal delivery

Maternal out come	Forceps delivery n=60 (%)	Vacuum delivery n:60 (%)	p-value
Perineal lacerations (%)	07 (11.67%)	02 (10%)	0.032
-2 nd degree	06 (10%)	Nil (0%)	0.027
-3 rd degree			
Perineal hematoma (n: %)	02 (3.33%)	01 (1.66%)	0.559
Periurethral injuries (n :%)	03 (5%)	02 (3.33%)	0.648
Vaginal and cervical laceration	02 (3.33%)	01 (1.66%)	0.559
Post delivery urinary retention	06 (10%)	Nil (0%)	0.027
P.P.H	01 (1.66%)	Nil (0%)	---

Table V: Neonatal out come between Forceps and vacuum delivery

Fetal outcome	Forceps delivery n: 60 (%)	Vacuum delivery n: 60 (%)	p-value
Apgar score:			
< 7 at 1 min	22 (36%)	18 (30%)	0.560
< 7 at 5 min	09 (15%)	05 (8.33%)	0.394
Neonatal trauma:			
Cephalhematoma	12 (20%)	03 (05%)	0.013
Subconjunctival hemorrhage	02 (3.33%)	03 (05%)	0.648
Jaundice	07 (11.66%)	02 (3.33%)	0.032
Phototherapy	02 (3.33%)	01 (1.66%)	0.559
Exchange transfusion	Nil (0%)	Nil (0%)	-
Neonatal convulsion	Nil (0%)	Nil (0%)	-
Admission to NICU	01 (0%)	01 (0%)	-

DISCUSSION

The goal of operative vaginal delivery is to assist the vaginal birth providing minimum maternal and neonatal morbidity⁴. In certain situations instrumental vaginal delivery is an integral part of obstetrical care because caesarean section in the second stage of labor is associated with higher rates of major obstetric hemorrhage, extension of uterine incision, prolonged maternal hospital admission and more frequent neonatal admission for special care than operative vaginal delivery. So the operating physician

has to weigh and balance the risks of caesarean section in second stage of labor against the potential risk for pelvic floor trauma following operative vaginal delivery. High levels of clinical and technical skills are required to perform operative vaginal procedures. Inappropriate use of vacuum /forceps leading to fetal trauma and shoulder dystocia is the fifth most common source of liability claims from obstetric care⁹.

This study was done to compare short term maternal and neonatal outcomes with vacuum

assisted and forceps deliveries. The two groups did not vary significantly with respect to maternal age, parity, and indication of application of vacuum and forceps. Most of the patients were primigravida in both groups and between 20-30 years of age. Most common indication in our study was fetal distress and accounted 47% cases in vacuum and 40 % cases in the forceps group. Prolonged second stage of labor was 2nd most common cause for instrumental delivery in both groups (38% versus 36%) followed by maternal exhaustion (9% vs 5%). Comparable results have been shown by Shahida Akhter in her study¹⁰.

In United States, vacuum assisted delivery is used 2 to 3 times more often than forceps for operative vaginal delivery. Many physician prefer to use vacuum because it has less potential for maternal trauma and is easier to use than forceps. In our study perineal damage in the form of 2nd degree & 3rd degree perineal tears was high with forceps delivery as compare to vacuum delivery 11.67% versus 2% and 10% versus 0% respectively. These results are comparable with studies conducted by Bofil and others^{11,12,13}. Similarly prineal hematomas and periurethral injuries although not statistically significant but were more commonly seen in forceps group.

Several other studies have also shown that forceps delivery is associated with three to four folds increase in levator avulsion^{14,15,16}. In contrast, the incidence of levator avulsion in women with vacuum delivery was comparable with the normal vaginal delivery group 9% versus 13%¹⁷. Vaginal and cervical lacerations caused by vacuum are usually due to accidental inclusion of these tissues into the cup and are preventable by checking the cup all around to ensure that vaginal skin and soft tissues are not sucked in when vacuum is applied. Maternal injury is less frequent and less extensive with the use of vacuum extractor^{12, 13} because it does not increase the width of the presenting part of the fetus as can happen with forceps delivery. Vacuum delivery is associated with less need of regional and general anesthesia and less pain at the time of delivery and at 24 hours. In our study incidence of urinary retention was high in forceps group versus vacuum group 10 % versus 0% (p- 0.027) and was due to pain, as there was no evidence of infection on urinary microscopy and culture reporting. All these cases were relieved by catheterization and oral analgesics.

The neonatal outcome in terms of gestational age, birth weight and Apgar scores was similar in vacuum versus forceps group. Apgar score at 1 minute in neonates in vacuum and forceps group was comparable <7 in 30% versus 36.67% (p-0.560). Similarly there was no significant difference in fetal Apgar score at 5 min in two groups <7 in 8.33%

versus 15% (p-0.394). Same results have been proved by Bofill et al and Johnsan JH in their studies^{11,12}.

Fetal injuries associated with vacuum are the formation of the chignon (cephalhematoma), abrasion and laceration of the fetal scalp. These are usually minor and self limiting and none have been linked to long term complications. Incidence of cephalhematoma in vacuum group was quiet high in our study as compare to forceps group 20% versus 5% (p-value 0.013). Similarly other studies have also shown increased incidence of cephalhematoma with vacuum extractor^{11,12}. The chignon appears very unsightly at times to both parents and the physician but almost all the babies in vacuum group who developed a chignon resolved within 24 hours. Cephalhematoma apart from causing neonatal jaundice is rarely of clinical significance and the level of serum bilirubin is rarely high to cause significant problems in neonates. In vacuum group 11% neonates developed jaundice as compared to 3.33% in forceps group p-0.032. However only 3.33% needed phototherapy in vacuum group verses 0% in forceps group and none required exchange transfusion in either group. Subconjunctival hemorrhage was seen in 5% patients in vacuum and 2% in forceps group (p-0.648). One case in each group was admitted to NICU due to Apgar score <4, both mothers were un-booked patients presented in labor ward at full dilatation of cervix and fetal bradycardia with history of trial of labor at private clinics. Poor fetal outcome associated with these two instrumental deliveries may be due to abnormal process of labor itself rather than due to instruments applied¹⁸. There were no other serious neonatal injuries like intracranial hemorrhage, subgaleal hemorrhage, retinal hemorrhages, skull fracture and facial nerve injuries in both groups. Johnson et al found that the overall neonatal trauma did not differ between the two modes of assisted vaginal deliveries^{11, 12}. With exception of cephalhematoma, there is no clear difference in neonatal morbidity^{19, 20}. Long term follow up of children delivered with vacuum versus forceps is reported in a study with no significant difference²¹.

Some studies have shown that forceps delivery causes more fetal injuries as compare to vacuum extraction because amount of traction applied to fetal head by vacuum is 40% less than that is produced by forceps; therefore the decent of fetus occurs in more controlled fashion with slow delivery of head when vacuum is used. Although in our study there was no significant difference in serious neonatal morbidity in two study groups, the over all number included in this study was relatively small in term of being to judge the relative risk of rare adverse outcomes.

The risk of the fetal injury with vacuum extractor is directly related to the number of times the cup lifts off or becomes completely detached, and the duration of the cups attachment to the scalp²². The sudden detachment of the vacuum extractor is dangerous²³. Moreover vacuum extractor takes longer time to accomplish vaginal delivery than forceps and its application is contraindicated in premature fetus. The chances of failure to accomplish the vaginal delivery with the vacuum extractor are more than forceps. This may be due to the fact that it is not possible to pull hard with this instrument and due to errors in technique e.g. incorrect cup application or pulling in the wrong direction.

Complication rates and neonatal morbidity differ substantially among published reports. Despite the fact that some authors highlight the risk of vacuum, it is generally considered a safe alternative to forceps or with comparable outcome concerning the neonatal morbidity²⁴.

CONCLUSION

With meticulous handling and appropriate decision regarding the indication and type of instrument used, application of both forceps and vacuum are safe alternative for assisted vaginal delivery. However maternal birth canal trauma and genital tract lacerations were significantly more common with forceps than vacuum extractor. Cephalhematoma and jaundice associated with vacuum extractor were minor and self limiting. Use of the vacuum extractor rather than forceps for assisted delivery appears to reduce maternal morbidity. We conclude that vacuum extractor should be considered over forceps in assisted vaginal deliveries.

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