

## Comparison of Maternal and Fetal Outcome in Instrumental Delivery: Vacuum versus Forceps Vaginal Delivery

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### ABSTRACT

**Objectives:** To compare the proportions of successful vaginal deliveries following the use of forceps and vacuum extractor in second stage of labour and to compare the maternal and neonatal morbidity and mortality associated with these instruments in second stage of labour.

**Study design:** Quasi experimental study

**Place and duration:** June 2008 to December 2008, Department of Obstetrics & Gynaecology, Jinnah Hospital, Lahore

**Materials & methods:** Sixty pregnant women with delayed second stage of labour. They were allocated randomly to two groups of 30 each, to either forceps or vacuum extraction using random number table.

**Results:** Analysis revealed that success rate was similar with both instruments (94% with forceps & 92% with vacuum extraction). Majority of mothers were primigravida (74% in forceps 74% in vacuum group). Maternal birth canal injuries ( $P < 0.003$ ), >500 ml blood loss (8%) and infant soft tissue injuries were more common with forceps. No marked difference in 1 & 5 minutes Apgar score. Cephalhaematoma was more common among infants delivered by vacuum. Delay in second stage of labour was more common indication for vacuum delivery (46%) while fetal distress for forceps delivery (44%).

**Conclusion:** Vacuum extraction should be considered over forceps delivery.

**Keywords:** Assisted vaginal delivery, operative vaginal delivery, forceps delivery, vacuum assisted delivery, ventouse delivery.

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### INTRODUCTION

The rate of normal vaginal deliveries varies between 75-90%. Among them rate of operative vaginal delivery is 11.2%. The commonly used instruments for operative vaginal delivery are forceps and vacuum extraction. Operative vaginal deliveries are accomplished by applying direct traction on the fetal skull with forceps, or by applying traction to the fetal scalp by means of a vacuum extraction.

Assisted vaginal delivery offers the option of an operative procedure to safely and quickly remove the fetus, mother and obstetrician from a difficult or even hazardous situation. When spontaneous vaginal delivery does not occur within a reasonable time, a successful operative vaginal delivery trial avoid caesarean section with its attendant uterine scar and implications for a future pregnancy and avoids potential birth asphyxia from prolonged fetal and cord compression<sup>2</sup>.

The indications are nearly the same for both instruments. Common indications are prolonged second stage of labour, maternal and fetal distress and to shorten the second stage of labour in maternal

disorders such as cardiac disease, pulmonary odema and neuromuscular conditions. Forceps and vacuum extractor deliveries before full dilatation of cervix are contraindicated. The vacuum extractor is contraindicated with a face presentation and gestations of less than 36 weeks<sup>3</sup>.

The use of ventouse compared to forceps is associated with relatively higher rate of failure, more cephalhaematoma, more retinal haemorrhages but less use of regional/ general anesthesia, less maternal perineal or vaginal trauma. No significant differences between ventouse and forceps were found in caesarean section rates, Low apgar scores at five minutes or long term follow up of others and children. Where indicated, ventouse should be the first instrument of choice for assisted vaginal delivery<sup>4</sup>.

An operative vaginal delivery should only be considered when the likelihood of success is high because there will be a higher rate of birth trauma after failed attempts at operative delivery (although one can never be certain of a successful outcome)<sup>5</sup>.

Performing an episiotomy appears the risk of perineal trauma. In one study episiotomy did not affect the rate of perineal trauma from forceps delivery but increase the risk of such trauma related to vacuum extraction. In another, extensive perineal

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tears occurred more often with the use of episiotomy 7.5% versus 2.5%<sup>6</sup>.

A study carried out in Nishtar Hospital showed that there was no marked difference between forceps and vacuum delivery regarding maternal and fetal morbidity<sup>7</sup> sequential use of vacuum and forceps is associated with increased risk of both neonatal and maternal injury<sup>8</sup>.

## MATERIALS & METHODS

Non probability purposive sampling

### Inclusion Criteria

1. Singleton pregnancy
2. Term pregnancy
3. Full dilatation of cervix
4. Cephalic presentation

### Exclusion Criteria

1. Cephalopelvic disproportion
2. Vesicovaginal fistula, rectovaginal fistula and Manchester repair
3. Previous uterine surgery e.g. caesarean section, myomectomy

**Data collection:** Sixty admitted pregnant women selected on inclusion criteria registered. They were asked to sign an informed consent for allocating them to either procedure and to use their data for research. The confidentiality was insured. The two procedures did not carry any serious hazard to both mother and child.

Demographic information was recorded including the past fertility history. The history of present pregnancy was elicited. The routine investigations were carried out. Those pregnant women were randomly allocated in two groups, using random number table. Thirty women in each group, Group A was given a trial of forceps and group B was given a trial of ventouse. The subjects were then followed up in their management group.

The data was analyzed using SPSS Version 11. The variables under study were age, symptoms, severity, duration and gravidity. These variables were assessed using simple descriptive statistics, calculating mean and standard deviation of age of mother and duration of pregnancy. Frequency tables, mode of symptoms, their severity, gravidity and condition of mother.

The outcome of investigation was presented as positive or negative. The outcome variables were maternal morbidity that included perineal, vaginal or cervical tears and/ or haematoma formation, urinary retention and bowel problems and fetal morbidity like soft tissue injury over face, eye or scalp.

The outcome of the two procedures was presented as comparative tables for assessing the

relative success or failure in terms of delivery time and maternal and fetal morbidity.

The two groups were also compared for efficacy and avoidance of complications applying chi square test of significance at a p value of 0.05 or less.

## RESULTS

The study was conducted in Gynae Unit I of Jinnah Hospital, Lahore and a data of 60 patients was collected in six months. In distribution of mothers according to their age undergoing instrumental delivery, Analysis of data revealed that mean age of mothers was comparable in both groups ( $26.60 \pm 4.56$  in vacuum group and  $24.24 \pm 3.82$  in forceps group).

Out of collected data, analysis of distribution of parity among mothers having instrumental deliveries show that nulliparous women are more likely to deliver by either vacuum or forceps than parous women (74% in vacuum and 74% in forceps groups).

Data analysis revealed that at gestation of < 37 weeks, the use of forceps was more common (12% of subjects undergo forceps delivery whereas 4% underwent vacuum extraction). Majority of subjects have gestational age between 37-40 weeks in both groups (96% in vacuum group and 82% in forceps group).

Analysis of data revealed that at neonatal birth weight of <2.5kg, the use of forceps was significantly more common ( $p=0.014$ ).

Apgar score at 1 and 5 minutes were comparable in both groups. 24% of neonate in forceps groups and 26% in vacuum group have Apgar score up to 3 at 1 minute. 76% neonates in forceps group and 74% in vacuum group have Apgar score 4-6. mean Apgar score at 5 minutes was  $6.96 \pm 0.20$  in vacuum group and  $7.10 \pm 0.42$  in forceps group.

Regarding the indication for forceps and vacuum delivery, delay in the second stage of labour was the most common indication for vacuum extraction (46% in vacuum and 38% in forceps group), while fetal distress was the most common reason for forceps delivery (44% in forceps and 38% in vacuum group).

Analysis of maternal complications due to both instrumental delivery procedures were that rate of 1<sup>st</sup> and 2<sup>nd</sup> degree perineal tears in vacuum delivered women were 36% and 66% in forceps delivered women. The rate of 3<sup>rd</sup> and 4<sup>th</sup> degree perineal tears in vacuum group was 2% and 8% in forceps group. Rate of vaginal lacerations and periurethral tears was 28% in vacuum group and 4% in forceps group. The rate of cervical tear was 2% in vacuum group and 4% in forceps group. Severe birth canal injuries (3<sup>rd</sup> and 4<sup>th</sup> degree tear, extraction to fornix), and

lesser birth canal injuries (1<sup>st</sup> and 2<sup>nd</sup> degree tears, vaginal lacerations) were all significantly more common in forceps delivery group, as were cervical tears—during the procedure blood loss >500ml was significantly more likely to occur in the forceps delivery group.

Neonatal complications were observed with both instrumental delivery procedures. Facial cuts were significantly more common after forceps deliveries (4% in forceps and none in vacuum group). No significant difference was found in 1 and 5 minute apgar score. The rate of jaundice was 12% in vacuum group and 4% in forceps group. No intrapartum or neonatal death was observed in either group.

Analysis of data revealed that success rate was comparable in both groups (92% in vacuum and 94% in forceps group). There were 4 cases of failed vacuum extraction and 3 cases of failed forceps delivery, which were delivered by caesarean section.

## DISCUSSION

The rate of operative vaginal delivery is estimated to be 11.2%<sup>1</sup>. When operative intervention in second stage of labour is required, the options, risks and benefits of vacuum, forceps and caesarean section must be considered. The choice of intervention to be individualized as no one is clearly safer or more effective than the other<sup>9</sup>. Failure of chosen method, vacuum or forceps, to achieve delivery of fetus in reasonable time should be considered as an indication for abandonment of method<sup>9</sup>.

In our study of 60 cases, regarding parity among mothers undergoing instrumental delivery, majority were primigravidae 74% delivered by forceps and 74% delivered by vacuum were primigravidae, these results are comparable to another study carried out at Riyadh in year 2000, in which 70% of the forceps deliveries and 49% of ventouse deliveries were carried out in primigravidae<sup>10</sup>.

We found increased maternal birth trauma and estimated blood loss for forceps delivery. In our data, episiotomies were used for all patients undergoing vacuum delivery and forceps delivery when properly applied, forceps add to the volume passing through the intortus where as vacuum cup adds no extra volume. This may partly explain the tendency for more lacerations in the forceps group<sup>11</sup>. 1<sup>st</sup> and 2<sup>nd</sup> degree tears, vaginal wall lacerations and cervical lacerations were all significantly more common with forceps delivery<sup>11</sup>.

Our study also confirms the findings of other studies, in a study carried out by Angioli, the greater degree of perineal trauma associated with instrumental delivery was illustrated by a

retrospective review of 50,210 vaginal deliveries. The rate of third and fourth degree lacerations for spontaneous vaginal delivery, vacuum extraction and forceps delivery is 1.7, 93 and 19.2% respectively<sup>12</sup>.

Another study carried out by Damrae in 2004 showed that fetal position also had an impact on perineal trauma. For occipito posterior position, rectal injury with forceps and vacuum was 72% and 33% respectively, which was higher than the rate with occipito-anterior position (54% with forceps and 27% for vacuum)<sup>13</sup>.

Blood loss of >500 ml was also more common in the forceps group (12%) than in the vacuum group (4.05%) with significant statistical difference. This is due to higher incidence of maternal birth canal injuries with forceps delivery<sup>11</sup>.

In a study carried out by Johanson JH – USA in 1998, 508 operative vaginal deliveries were included. Multivariable logistic regression analysis showed that forceps use was associated with an increase in major perineal and vaginal tears<sup>14</sup>.

A population based analysis of singleton births in United States provided crude morbidity and mortality data for over 11 million unassisted, forceps assisted and vacuum assisted births. Vacuum assisted deliveries were associated with significantly lower rate of birth injury, seizures and assisted ventilation than forceps assisted deliveries.<sup>15</sup> Cephalhaematoma, in parturition is more common after vacuum assisted extraction than forceps delivery (15% versus 2%)<sup>15</sup>.

In our study there were no significant differences between forceps delivered and vacuum delivered group in the incidence of superficial injuries such as abrasions and bruising. There was however, significantly increased incidence of jaundice, caput and cephalhaematoma in the vacuum delivered group compared with the forceps delivered group. When extrinsic pressure is applied to fetal scalp, either from the dilating cervix, pelvic soft tissue or vacuum cup, interstitial fluid and micro-haemorrhages accumulate to form the caput.

Forceps delivery was more likely to have resulted in facial cut than vacuum extraction, a significant difference. There was a significant increase in major neonatal morbidity and mortality in gestational age <37 weeks and >40 weeks, and in birth weight <2500g and >4000g. There was also significant increase in maternal morbidity in patients with gestational age >40 weeks and infants >4000g.

In our study no neonatal mortality occurred in either group. Data from our study support that failed instrumental delivery performed using forceps and/ or vacuum extraction in a setting where a caesarean section can follow promptly is not associated with increased morbidity of either mother or baby.

Sequential use of vacuum and forceps was not done because of increased risk of maternal and neonatal injury.

## CONCLUSION

The success rate of both operative procedures is comparable. 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 cephalhaematoma in newborn, where as neonates delivered with forceps have more facial injuries. So, where indicated, ventouse should be the instrument of first choice for assisted vaginal delivery.

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