Original Research Article

A prospective study of immediate maternal and neonatal effects of forceps and vacuum assisted deliveries

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Abstract

Introduction: The unaided human birth process is not perfect. All round the world 10% to20% of all pregnant women receive assistance with their delivery.

Aim: This present study was to analyze and study the contribution use of operative forceps with vacuum extractor.

Materials and methods: The present prospective study was undertaken in the department of OBG for a period of 2 years. Cases were chosen at random 50 cases of vacuum extraction and 50 cases of forceps delivery were taken and the maternal and fetal outcomes were studied.

Results: In the present study, it was observed that 66% of forceps deliveries were primipara and 34% were multipara. In the present study it was observed that occipito anterior position was most common (64%) position observed in forceps. Occurrence of OA position in forceps deliveries was significantly higher $p<0.001$ when compared to vacuum deliveries. it was observed that 100% of patients in forceps group delivered with 10 cm of cervical dilatation. Majority of forceps deliveries 96% occurred when head was at station +3, 4% forceps deliveries occurred when head was at +2 station. Application of vaccum was significantly more with no caput 58% compared to forceps 32 %. Fetal distress was the indication for 40% in forceps and 38% in vacuum. In the present study it was observed that the number of pulls required to extract the baby was significantly high in vacuum group $p<0.001$. 46% of forceps delivered babies had a birth weight of 2.6-3.0 kg, 36% of vacuum deliveries had a birth weight between 3.1-3.5 kg. The mean APGAR score at birth for forceps deliveries was 6.54 $\pm$ 1.47 and vacuum deliveries was 6. 74 $\pm$ 1.33. There was no significant difference in mean APGAR score at birth in either of the groups $p=0.47$. The mean APGAR score at 5 min for forceps deliveries was 8.06$\pm$1.33 and vacuum deliveries was 8.16$\pm$1.34. There was no significant difference in mean

APGAR score at 5 min in either of the groups p= 0.71. In the present study there was not much of a variation in terms of maternal or perinatal out come with both the groups. While scalp lacerations, face marks were more common in the forceps groups, vacuum extraction had a slightly higher incidence of cervical laceration and cephalhematoma, though not statistically significant. The incidence of perineal injuries was comparatively higher in the forceps group though significant difference did not exist in terms of maternal outcome.

Conclusions: The advantage of vacuum was its ease of application and hence an apparently safe alternative in the hands of poorly trained personnel.

Key words

Vaccum, Forceps, Cervical laceration.

Introduction

Although there is periodic and vocal demand to delete assisted vaginal delivery, clinical experience provides recurring evidence that leaving all to nature or the scalpel will not accomplish any goals. As the health of the mother, baby and the emotional satisfaction of the family, the need for operative vaginal delivery cannot be overemphasized. Involvement in the care of the women in labour cannot being without consideration of the passage and the powers. Today one might observe that we have a better insight into the dynamic mechanism of parturition which had eluded our predecessors, but this does not necessarily make the does not necessarily make the process of labour and vaginal birth less dangerous. As once said by an obstetrician "There are still those who think that the delivery of a woman is easy" [1, 2].

The unaided human birth process is not perfect. All round the world 10% to 20% of all pregnant woman receive assistance with their delivery. The last 100 years have seen a dramatic reduction in maternal mortality which can be attributed to the modern medical care including the use of operative deliveries, though there is a decreased trend over the last decade for instrumental deliveries, especially forceps application, there will always be a need for instrumental use [3, 4].

The response to either fetal dystocia or apparent fetal distress is not necessarily a cesarean section. What is required is a balanced view of the risks and benefits when any means of assisted delivery is chosen. Conversely, the attitude of vaginal delivery at an adverse outcome [5].

Hence it is of utmost importance to consider all the available options be it non operative options like observation, assessment and augmentation of labour or operative options like instrumental delivery or a cesarean section.

While considering instrumental delivery the safety and efficacy of both vacuum and forceps are to be kept in mind and which instrument best answer the present need. Though, in recent years there a decreasing trend in the use of operative forceps with vacuum extractor taking its place. The controversy regarding their safety still remains. This present study is to analyze and study the contribution of these two instruments to the present day obstetrics.

Materials and methods

The present prospective study was undertaken in the department of OBG SVS hospital, Mahabubnagar from October 2013 to June 2015. Cases were chosen at random 50 cases of vacuum extraction and 50 cases of forceps delivery were taken and the maternal and fetal outcomes were studied. A detailed history was taken with regard to amenorrhea, onset of labour pain, any problems during pregnancy, whether the patient had regular etc.

The obstetric history was elicited as to whether the patient is a primigravida or a multigravida

and her past obstetric history noted. The menstrual history with reference to LMP was taken and the period of gestation calculated. The patient was asked for any significant past and family history.

A detailed general examination was done following which a perabdominal examination was done to determine the height of uterus, the lie of fetus, position and presentation and Fetal heart Rate. A pelvic examination was done to determine the consistency, effacement and dilation of cervix. Pelvic assessment as done to rule out contracted pelvis and cephalapelvic disproportion.

The forceps or vacuum was applied only in those cases where it was indicated. Once a valid indication of forceps is present, and pre requisites for the application of forceps are fulfilled that is full dilatation, bowel& bladder emptied, vertex presentation, membranes ruptured, presence of good uterine contraction and presenting part at +3.

Patient was put in dorsal position, the parts were painted & draped. Local infiltration with 5-10 ml of 15% xylocaine solutions was done. Syntocinon drip was started if patient is not getting adequate contractions. A vaginal examination was performed to reassess the cervical effacement, dilatation, position and station of the presenting part. Caput and moulding if present, are noted.

A ghost application was performed. After lubricating the forceps blades with soframycin cream, the middle and index fingers of the right hand are introduced into the vagina and the lubricated left blade is introduced first posteriorly and is then gently rotated laterally. The same is done on the opposite side.

Then the blades are locked by gently depressing the shanks over the perineum. Episiotomy was given either before the application or after correct applications. Application is checked with reference to the posterior fontanelle and the saggital sutures. Once the correct application was done and the forceps locked, traction was given along with contractions first horizontally and then upwards and forwards. Once the head is delivered the forceps were removed. On completion of the delivery of the baby, the cord was clamped and cut. Placenta was weighed and a note of the duration of 1st, 2nd and 3rd stages of labour made.

Then the mother was thoroughly examined for any lacerations, cervical tears, extensions of the episiotomy. The episiotomy was sutured in layers, patient was observed in the labour room for four hours following delivery. The baby's apgar score is noted. Special note is made on blade marks or any scalp injuries. Perinatal out com is assessed by apgar scores at 1 and 5 min.

Vacuum Extraction

For all the cases vacuum cup of 6 mm diameter is used in the study. Patient was put in dorsal position, parts were painted and draped local infiltration with xylocaine 1% was done. Vaginal examination was done to reassess the effacement, dilatation, position and station of the head. LMLE was given.

The metal cup was then introduced into the introitus after lubrication by gently spreading the labia. The vacuum hose along with the suction apparatus is attached to the cup. The correct position of the cup is checked with reference to the anterior fontanelle (approx 2 finger breadths) and the vacuum hose of the metal cup is directed to lie parallel to saggital suture. After checking that no maternal tissue is included under the cup margin, a initial suction pressure of 15 mm of HG was given to fix the device to the scalp, and then the pressure was raised to 550 mm of Hg. Traction was applied with the right hand while the left hand figures maintained permanent contact, with the traction cup and fetal head to prevent any sudden detachment. The traction was applied during contractions only with maternal bearing down efforts. In between contractions the cup was allowed to be removed with the vaccum switched off.

The direction of traction was horizontally and then up wards and forwards. After the head was delivered the cup was allowed to get released by switching off the suction. The same procedure was followed after delivery of the baby as forceps delivery.

The mother and baby were then followed up until discharge. Appearance of any delayed complications like neonatal jaundice and infections were noted down. The duration of hospital stay was noted and patients we discharged on the fourth postnatal day if there are no complications.

The data obtained was analyzed using SPSS software appropriate statistical tests were used to assess the outcome of instrument assisted delivery. Descriptive results are expressed as mean and SD of various parameters. Probability value (p value) was used to determine the of significance, p value <0.05 was considered as significant, p value <0.01 was considered as highly significant.

Results

The present study was under taken in the department of obstetrics and Gynecology, at S.V.S Medical College and Hospital. A total of 100 patients aged between 16-32 years recruited from SVS medical college and Hospital for the present study to evaluate maternal and neonatal risks. Associated with the use of forceps and vaccum during vaginal delivery. Per abdominal examination was done to record necessary finding with respect to height of the uterus in weeks, presentation of the foetus, rate of the fetal heart, engagement of head.

In the present study it was observed that age group of patients varied from 16 yrs to 32 years. Mean age group was 21.9 years and 22.96 years respectively in patients with forceps and vaccum assisted 52% and 48% cases respectively, there was no significant mean difference in either group p>0.05 (**Table – 1**).

In the present study it was observed that 66% of forceps deliveries were primipara and 34% were multipara compared to 60% of vacuum deliveries that were primipara and 40% were multipara. There was no significant difference in incidence of parity in either groups (**Table – 1**).

In the present study 52% of forceps delivery was between 37-38 weeks, 44%were between 39-40 weeks and 4% were above 41 weeks. 505 of vacuum delivery was between 37-38 weeks, 40% were between 39-40 weeks and 4% were above 41 weeks (**Table – 1**).

Table - 1: Distribution of patients according to Age.

Age groups in years	**Forceps**	**Vacuum**
15-20	16(32%)	15(30%)
21-25	26(52%)	24(48%)
26-30	7(14%)	10(20%)
31-35	1(2%)	1(2%)
Total	50(100)	50(100%)
Mean±SD	21.9±3.3	21.26±3.39
T value	1.55	P=0.12
Parity		
Primi	33(66)%	30(60%)
Multi	17(34%)	20(40%)
Chi square	0.386	P=0.53
Gestational age in weeks		
37-38	26(52%)	25(50%)
39-40	22(44%)	23(46%)
41 and above	2(4%)	2(4%)
Total	50(100%)	50(100%)

In the present study it was observed that occipito anterior position was most common (64%) position observed in forceps. Occurrence of OA position in forceps deliveries was significantly higher p<0.001 when compared to vacuum deliveris. Left occipito anterior position was most common (80%) position observed in vacuum deliveries occurrence of LOA position in vacuum deliveries was significantly higher p<0.001 when compared to forceps deliveries.

In the present study it was observed that 100% of patients in forceps group delivered with 10 cm of

cervical dilatation. 98% patients in vacuum group delivered with 10 cm of cervical dilatation and 2% delivered when cervix was 8-10 cm (**Table – 2**).

Majority of forceps deliveries 96% occurred when head was at station +3, 4% forceps deliveries occurred when head was at +2 station. No forceps application could be done when head was at +1 station. When compared to vacuum deliveries it was observed that vacuum deliveries significantly occurred at a higher station, 805 occurred at +2 station, 16 % occurred at +3 station and 4% occurred at +1 station. The above table shows advantage of vacuum over forceps (**Table – 2**).

Application of vacuum was significantly more with no caput 58% compared to forceps 32 %. In the present study it was observed that various indications caused instrument application. Fetal distress was the indication for 40% in forceps and 38% in vacuum. Other obstetric indications which lead to use of forceps and vacuum as depicted in the table above shoes no significant difference in indication versus operative vaginal delivery p>0.05 (**Table – 3**).

Table - 2: Distribution of position dilatation of cervix and station of head.

Position	**Forceps**	**Vacuum**
Occipito anterior	32(64%)	5(10%)
Left occipito anterior	17(34%)	40(80%)
Left occipito temporal	-	1(2%)
Right occipito anterior	1(2%)	4(8%)
Total	50(100%)	50(100%)
Chi Square	31.78	P<0.001
Dilatation of cervix (cm)		
8-10 cm	0	1(2%)
10 cm	50	49(98%)
Total	50(100%)	50(100%)
Station of presenting part		
+1	0	2(4%)
+2	2(4%)	40(80%)
+3	48(98%)	8(16%)
Total	50(100%)	50(100%)
Chi Square	64.9	P<0.001

In the present study it was observed that the number of pulls required to extract the baby was significantly high in vacuum group p<0.001. Mean pulls required for forceps was 1.54 compared to 1.98 in vacuum deliveries (**Table – 3**).

Table - 3: Distribution based on caput formation and number of pulls.

On caput formation	**Forceps**	**Vacuum**
No	16(32%)	29(58%)
Moderate	29(58%)	17(34%)
Severe	5(10%)	4(8%)
Total	50(100%)	50(100%)
Chisquare	6.99	P=0.03
No of pulls		
1	23(46%)	10(20%)
2	27(54%)	31(62%)
3	-	9(18%)
Total	50(100%)	50(100%)
Mean±SD	1.54±0.503	1.98±0.622
t- value	3.88	P<0.001

46% of forceps delivered babies had a birth weight of 2.6-3.0 kg, 36% of vacuum deliveries had a birth weight between 3.1-3.5 kg. Mean birth weight of vacuum deliveries was significantly higher than forceps deliveries p= 0.002 (**Table – 4**).

The mean APGAR score at birth for forceps deliveries was 6.54 +- 1.47 and vacuum deliveries was 6.74 ±1.33. There was no significant difference in mean APGAR score at birth in either of the groups p=0.47 (**Table – 4**).

The mean APGAR score at 5 min for forceps deliveries was 8.06+- 1.33 and vacuum deliveries was 8.16+-1.34. There was no significant difference in mean APGAR score at min in either of the groups p= 0.71 (**Table – 4**).

Fetal morbidity in forceps deliveries included facial abrasions in 10 % cases, scalp injuries in 4% cases, jaundice in 6% cases, convulsions in

4% cases compared to cepalohematoma in 4% cases, scalp injuries in 4% cases, jaundice in 10% cases and convulsions in 2 % in vacuum deliveries. There was no significant difference in occurrence of fetal complication and mode of assisted delivery p=0.16 (**Table – 5**).

Table - 4: Distribution based on birth weight and APGAR score of neonate.

Birth weight	**Forceps**	**Vacuum**
Less than 2kgs	1(2%)	0
2-2.5kgs	10(20%)	8(16%)
2.6-3kg s	23(46%)	11(22%)
3.1-3.5kgs	14(28%)	18(36%)
3.6kgs	2(4%)	13(26%)
Total	50(100%)	50(100%)
Mean +_SD	2.83±0.44	3.12±0.49
T value	3.12	p=0.002
APGAR at birth		
<3	2(4%)	1(2%)
4-6	16(32%)	14(32%)
7-10	32(64%)	35(70%)
Total	50(100%)	50(100%)
Mean +_SD	6.54±1.47	6.74±1.33
t- value	0.71	P=0.47
APGAR after 5 min		
<3	0(0%)	1(2%)
4-6	5(10%)	4(8%)
7-10	45(90%)	45(90%)
Total	50(100%)	50(100%)
Mean+-SD	8.06±1.33	8.16±1.34
t- value	0.374	P=0.71

Maternal complications in forceps deliveries included vaginal laceration 14%, cervical lacerations 4%, extension of episiotomy 14%, perineal injuries 14%, vulval hematoma 2%, nil 48% compared to vacuum deliveries which included vaginal laceration 14%, cervical lacerations 18%, extension of episiotomy 4% perineal injuries 8% colporrhexis 2%, nil 58%. There was no significant difference in occurrence of maternal complication and mode of assisted delivery p=0.14 (**Table – 5**).

Table - 5: Distribution of patients based on fetal and maternal complications.

Fetal complications	**Forceps**	**Vacuum**
Cephalhematoma	0	2(4%)
Facial marks and abrasions	5(10%)	0
Scalp injuries	2(4%)	2(4%)
Jaundice	3(6%)	5(10%)
Convulsions	2(4%)	1(2%)
Nil	38(76%)	40(80%)
Total	50(100%)	50(100%)
Chi square	7.88	P=0.16
Maternal complications		
Vaginal lacerations	7(14%)	5(10%)
Cervical lacerations	4(8%)	9(18%)
Extension of episiotomy	7(14%)	2(4%)
Perinaeal injuries	7(14%)	4(8%)
vulval hematoma	1(2%)	-
Colporrhexis	-	1(2%)
Nil	48%	58%

Discussion

Operative vaginal delivery is an important component of obstetric care with the use of forceps and vacuum. The present study was under taken to evaluate the yield of maternal and neonatal outcome with use of vacuum and forceps.

In a study by Johnson, et al., use of vacuum was 82% compared to forces which were about 78%. in a study by Shihadeh, et al., use of forceps 76% was high compared to vacuum 74% in a study by Kabiru, et al. use of forceps was 65.3% and that of vacuum was 60% (**Table – 6**).

In the present study, there was high use of forceps 66% and vacuum 60% in primi gravidae. Incidence of instrumental deliveries was high in primigravida due to prolonged 2 stage, fetal distress, and failure of secondary force. The above studies correlate with our study (**Table – 6**).

In a study by Shihadeh, et al. [6], prolonged

second stage was a common indication for vacuum extraction, while fetal distress was the most common reason for forceps (p value <0.02). in as studies was used more often for prolonged 2 stage of labor (66% versus 58%; p=<0.243) and poor maternal effort. Forceps was used more frequently for maternal distress and prophylactically (**Table – 6**).

In present study, fetal distress was common in forceps and vacuum. Prolonged second stage was next common indication in forceps in forceps (16%) and vacuum (14%). In the present study forceps were conducted when head was at +2 and below station. There was no forceps application at 0 and +1 station. Vacuum was applied at a higher station, when head was at +1 & +2 station. This is one of vacuum, where it can be applied at a higher station (**Table – 6**).

In Shihadeh, et al. [6], outlet forceps was about 95.3% and vacuum application at +2 station was 92.8%. In a study by Broekhuizen, et al. [8], vacuum extraction at 0 station was 20%, +1 station was +36%, +2 station and above 40.5%. in our study there was no vacuum application at 0 station (**Table – 6**).

Occipito anterior position was commonest position observed in forceps 63%. Left occipito anterior position was commonest in vacuum (80%) group (**Table – 6**).

In a study by Okunwobi-Smith, et al. [9], 82%of forceps were applied when head was in occipitoanterior, where as the vacuum was used more frequently with in occiput treansverse positions. In our study, vacuum was applied at occipitotransverse position in 2% **(Table – 6)**.

In a study by Shihadeh, et al. [6], occipitoanterior position was seen in 82% of forceps and 77.3% of vacuum. Occipitoanterior positions were seen in 17.38% of vacuum and 17.33% of forceps. In present study, there were no occipitoposterior positions (**Table – 6**).

Table - 6: Distribution Variables in studies.

Distribution in Primigravida	**Forceps**	**Vacuum**
Jhonson, et al. [5]	78	82
Shihadeh, et al. [6]	76	74.76
Kabiru, et al. [7]	65.3	60
Present study	66	60
Station of the vertex		
Broekhuizen [8]	91	40.25
Shihadeh, et al. [6]	95.33	92.86
Present study	100	96
Occipital position		
Shihadeh, et al. [6]	82	77.38
Kabiru, et al. [7]	77.1	85. 6
Jhonson, et al. [5]	82	61.5
Present study	64	10

In present study, most of birth weight between 2.5-3.5kg. In a study by brain Jhonson, et al. [5] wt of babies between 2.5-4 kg were 82% in forceps and 84% in vacuum. In a study by Shihadeh, et al. wt of babies between 2.5-4 kg were 66.67% in forceps and 76.18 in vacuum (**Table – 7**).

In a study by Adaji, et al. [11] operative vaginal deliveries were mostly performed for infants weighing between 2.52-3.99kg. Forceps delivery was mostly performed in 31.6% of preterm infants. Delivery of preterm babies was excluded from our study (**Table – 7**).

There was no statstically significance of birth weight in either group in the present study (p=0.16) which correlates with the studies conducted by brain greis, et al. and shihadeyh, et al. (**Table – 7**).

In clinical trials of Johnson et al, about 1% in forceps and 35 in vacuum deliveries had APGAR <3 at 1 minute. In present study vacuum had 2% and forceps had 4% APGAR <3 at 1 minute. This was statistically insignificant. In a study by Shihadeh, et al., low APGAR <7 was seen 3.34% of forceps and 3.58% of vacuum. APGAR scores were similar between both the groups. There was

no statistical significance. In a study by Gardella, et al. [12], the sequential use of vacuum and forceps was compared with spontaneous vaginal deliveries. There was a significantly depressed 5 min APGAR (RR, 3.0; 95%CI, 2.2-4). Outcome of individual instrument was considered (**Table – 7**).

In study by Jhonson, et al. [10], low APGAR <7 was not seen in forceps group and in 1% of vacuum. In present study low APGAR was usually in babies with fetal distress (40% VS 32%), but this was not related to instrumental application. There was no stastically significance in APGAR-7 (**Table – 7**).

Longer second stage labour and longer vacuum procedure allows time for accumulation of more interstitial scalp fluid, which inturn leaves the tissues more vulnerable for abrasions, lacerations and cephalhaematoma formation (**Table – 7**).

Study done by Johanson, et al. [5], had cephalhaematoma 3% in forceps and 9% in vacuum which which is comparable with the present study in which no neonate in forceps had cephalhaematoma while 4% in vacuum group. In a study by Shihadeh, et al., ceplalohematoma was seen 1.67% of forceps group and 4.76% of vacuum group (**Table – 7**).

When properly applied, forceps adds to the volume passing through the introitus, where as the vacuum cup adds no extra volume. This may partly explain the tendency for more lacerations, face marks, abrasions in the forceps group (**Table – 7**).

Study by Shihadeh, et al. showed facial cuts & abrasions were more in forceps group with significant difference. There was a significant difference in neonatal morbidity in gestation age 40 WKS, and weight of 4000G. In this study, convulsion was seen in 0% of forceps and 2% of vacuum. RDS diagnosed in 6%infants born by forceps and 0% in vacuum group (**Table – 7**). In a study by Shihsdeh, et al. mortality was 0.67% in forceps and 0.48% in vacuum. In our study, there was no mortality in either forceps or vacuum group (**Table – 7**).

Table - 7: Birth weight and APGAR scores in studies.

Birth weight	**Forceps**	**Vacuum**
Jhonson, et al. [5]	82	84
Shihadeh, et al. [6]	66.67	76.18
Present study	74	58
APGAR score <3 at 1 minute		
Shihadeh, et al. [6]	21.43	23.33
Jhonson, et al. [5]	1	3
Present study	4	2
APGAR score < 7 at 5 min		
Jhonson, et al. [5]	4	6
Shihadeh, et al. [6]	3.34	3.58
Jhonson, et al. [10]	0	1

In a study by William, et al. [13], there was 28% of retinal hemorrhage in vacuum extraction and 13% in forceps delivery. In our study no c/o retinal hemorrhage found (**Table – 7**).

In a study by Shihadeh, et al. [6], 3 and 4 perineal injuries, extension to fornix & vaginal laceration were all significantly more common in the forceps group ($p<0.01$), as were cervical ears ($p<0.05$). Paraurethral tears were also more common in forceps delivery. In our study no paraurethral tears found. In a study by Danielsen, et al. [14], the use of forceps was associated with a high success rate than we vacuum, but with greater risk of rectal sphincter injury (**Table – 7**).

The above studies correlate with present study where birth canal injuries were more in analysis of maternal and neonatal outcome in operative vaginal delivery using forceps and vacuum, suggests maternal birth canal injuries more with forceps. Neonatal morbidity like facial bruise and abrasion was mare in forceps deliveries, whereas cephalohematorma was more in vacuum deliveries.

Conclusion

In present study, maternal outcome was studied in vacuum and forceps deliveries. There is less

maternal trauma with vacuum extraction than with forceps deliveries. Fatal morbidity does not alter significantly with both the groups. Cephalohaematoma is more common with the vaccum extraction while blade marks and abrasions are more common with forceps delivery.

There was more of vaginal lacerations, perineal injuries and extension of episiotomy in the forceps group compared to vacuum and cervical tear was common in vacuum group. In general, forceps deliveries are more traumatic to the mother then vacuum extraction. If the vacuum extractor is applied for too long period of time or if not applied with careful attraction, serious fetal scalp injuries can result. Its ease to use and apparent safety marks vacuum extraction easier in poorly trained hands. On the other hand, it is easier to train personnel on vacuum use. The application of the cup is less critical in terms of exact anatomic positioning that with forceps blades. But when operative intervention in the second stage of labour is required, the options, risks, and benefits of vacuum, forceps, and caesarean section must be considered. The intention needs to be individualized, as one is not clearly safer or more effective than the other.

Adequate clinical experience and appropriate training of the operator are essential to the safe performance of operative deliveries.

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