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Original Research Article

A comparative study of maternal outcome between vacuum extraction and outlet forceps delivery

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ABSTRACT

Background: Instrumental delivery is an art that is fading and may disappear in the near future as more and more obstetricians are resorting to caesarean sections. Instrumental vaginal deliveries comprise the use of vacuum assisted devices and /or forceps to assist in delivering a fetus, offering the alternative to accomplish vaginal delivery in properly selected cases thereby reducing maternal morbidity in terms of blood loss and increase hospital stay which is a consequence of cesarean sections. The objective of the present study is to compare the maternal morbidity with vacuum and outlet forceps delivery.

Methods: A prospective comparative study was conducted in women delivering at department of obstetrics and gynaecology, in SDUMC, R L Jalappa Hospital, Kolar from March 2016 - March 2017 for a period of one year. A minimum of 180 patients were taken up for study. 90 women delivered by outlet forceps delivery and 90 women by vacuum delivery. Cases which require instrumental vaginal delivery and fulfilling the inclusion criteria for forceps or vacuum were taken up for the study, after taking informed consent. Maternal outcomes including episiotomy wound and extension, perineal tear, post-partum hemorrhage, hospital stay was analyzed and compared.

Results: Mostly forceps and vacuum were applied for age group of 26-30 years and primigravida, which showed a statistical significance. Extension of episiotomy was more with forceps that is 21.1% and with vacuum being 4.4%. This difference was statistically significant. Postpartum hemorrhage was also more common in forceps group that is 13.3%compared to vacuum 11.1% but the difference was not statistically significant. The need for blood transfusion was seen more in cases of forceps that is 11.1% cases whereas in vacuum i.e. 6.7% cases but was not statistically significant.

Conclusions: With the expertise and appropriate decision on the indication and meticulous handling of the instrument whether outlet forceps or vacuum, especially in a tertiary care centre, the maternal outcome is equally good with both the instruments.

Keywords: Instrumental vaginal delivery, Outlet forceps, Vacuum

INTRODUCTION

Instrumental delivery is an art that is fading and may disappear in the near future as more and more obstetricians are resorting to caesarean sections. In the advent of modern medicine along with the advancement of surgery as an option and simultaneous breakthroughs achieved in the field of anesthesia the science and art of operative deliveries will become a thing of the past and will be reminisced as an anecdote in the history of medicine. The ultimate aim of antenatal care is achieving optimal health of the mother and the neonate at the end and hence the need to reassert the importance of operative vaginal deliveries.

Instrumental vaginal deliveries comprise the use of vacuum assisted devices and /or forceps to assist in delivering a fetus, offering the alternative to accomplish

vaginal delivery in properly selected cases thereby reducing maternal morbidity in terms of blood loss and increase hospital stay which is a consequence of cesarean sections. Historically various types of forceps such as high forceps, rotational forceps and mid cavity forceps been used but are obsolete in the era of modern obstetrics. The only accepted form of forceps used today is the outlet forceps. The rationale behind vacuum assisted delivery is the application of the suction device or cup to a pump in order to create adequate negative pressure allowing traction to be exerted on the fetal head thereby facilitating the delivery via the birth canal.

Among the developed countries the rates of instrumental vaginal delivery range between 5-20% of all births. In the U.K incidence is between 10-12%, in United States of America is 3.6% and in India it is documented as 3.1% .[1,2,3] Hence the need for this study in today's modern era of elective and repeat cesarean sections where the morbidities to delivering women have increased many fold, simultaneously leading to increase in the incidence of rate of cesarean sections, along with the fact that the expertise and the know-how of instrumental deliveries is diminishing and fading among the younger obstetricians.

METHODS

A prospective comparative study was conducted in women delivering at Department of Obstetrics and Gynaecology, RL Jalappa Hospital, attached to Sri Devaraj Urs Medical Academy, Kolar from March 2016 - March 2017 for a period of one year.

A minimum of 180 patients was taken up for study. 90 women delivered by outlet forceps and 90 women by vacuum. Cases which require instrumental vaginal delivery and fulfilling the inclusion criteria for forceps or vacuum were taken up for the study, after taking informed consent.

Forceps or Vacuum application will be done using American College of Obstetrics and Gynaecology (ACOG guidelines 2010). Indication for forceps or vacuum application was noted in each case.

Table 1: Inclusion criteria.

Vacuum delivery	Outlet Forceps delivery
Term pregnancy >37 completed weeks	Term pregnancy >37 completed weeks
Full dilatation	Full dilatation
Station+4 and more (fetal head is at or on perineum)	Station+4 and more (fetal head is at or on perineum)
No CPD	No CPD
Vertex presentation	Vertex presentation
Ruptured membranes	Ruptured membranes

Table 2: Exclusion criteria.

Vacuum delivery	Outlet Forceps delivery
Malpresentation-brow, face, breech	Malpresentation-brow, face, breech
True CPD	True CPD
Premature infants	Premature infants
High fetal station less than +4	High fetal station less than +4
Cervical dilation <10cms	Cervical dilatation <10cms
Presence of severe caput	IUFD
Anomalous babies and IUFD	Anomalous babies
Birth weight <2.5 kg and > 4kg	Birth weight <2.5 kg and > 4kg

Maternal morbidity in terms of episiotomy extension, need for episiotomy, perinealtears, vaginal tears, hospital stay, postpartum haemorrhage, anemia,need for blood transfusion were documented.

Statistical analysis

Study design: Comparative study

Sample Size: Was estimated based on the difference in proportion of maternal morbidity (episiotomy) at term in two types of Instrumental deliveries which gave the maximum sample size for all the morbidities.

By using the formula:

Sample size = $r+1/r \times (p^*) (1-p^*0) (Z_\beta + Z_{\alpha/2})^2 / (p_1-p_2)$

Where r = ratio of control to cases, 1 for equal number of case and control; p* = average proportion exposed = proportion of exposed cases + proportion of control exposed/2; Z_β = Standard normal variate for power = for 80% power it is 0.84 and for 90% value is 1.28. Researcher has to select power for the study; $Z_{\alpha/2}$ = Standard normal variate for level of significance as mentioned in previous section; p_1-p_2 = Effect size or different in proportion expected based on previous studies. p_1 is proportion in cases and p_2 is proportional in control.

From the Study by Singh A, Rathore P, p1 = 80%, p2 = 93.3% at 90% confidence level (α = 0.10) and 80% power, with equal ratio in both groups.

$N = 2 \times 0.866 \times 0.134 (1.64 + 0.84)^2 = 81$ in each group
$(0.133)^2$
P* = 80 + 93.3 / 2 = 86.65 or 0.866

Considering Non-response rate of 10% 81 + 81 = 90 patients in each group was included.

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and

proportions. Chi-square test was used as test of significance for qualitative data.

Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs such as bar diagram. p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data. EPI Info (CDC Atlanta), Open Epi, Med calc and Medley's desktop were used to estimate sample size and reference management in the study.

In all the tables n = number of outlet forceps applied and vacuum applied i.e. n= 90 for outlet forceps and vacuum.

RESULTS

Table 3: Age distribution between two groups of study.

Age(years)	Instrumental Vaginal Deliveries			
	Outlet Forceps		Vacuum	
	n=90	%	n=90	%
<20	20	22.2	17	18.9
21-25	29	32.2	32	35.6
26-30	36	40.0	39	43.3
>31	5	5.6	2	2.2

In the Forceps and Vacuum group majority i.e. 36 (40%)and 39 (43.3%) were in the age group 26 to 30 years respectively. There was no significant difference in age distribution between two groups.

Table 4: Parity distribution between two groups of study.

Parity	Instrumental Vaginal Deliveries			
	Outlet Forceps		Vacuum	
	n=90	%	n=90	%
Primigravida	59	65.6	38	42.2
Gravida 2	22	24.4	46	51.1
Gravida 3	6	6.7	6	6.7
>Gravida 3	3	3.3	0	0.0

In the Forceps group majority 59 (65.6%) were Primigravida and in Vacuum group majority 46 (51.1%) were Gravida 2.

There was significant difference in parity distribution between two study groups.

Most common indication in Forceps and Vacuum groups was Poor maternal bearing down efforts in 30(33.3%) and 34 (37.8%) respectively.

Next common indication for forceps was prolonged second stage in 18 (20%) and in Vacuum group Severe Preeclampsia in 19 (21.1%). There was no significant difference in indications between two groups.

Table 5: Comparison of Indications between outlet forceps and vacuum study groups.

Indications	Instrumental vaginal deliveries			
	Outlet Forceps		Vacuum	
	n=90	%	n=90	%
Prolonged second stage	18	20.0	14	15.6
Severe pre-eclampsia	14	15.6	19	21.1
GDM	1	1.1	2	2.2
Fetal distress	11	12.2	9	10.0
Prolonged second stage + fetal distress	5	5.6	3	3.3
Severe pre-eclampsia + fetal distress	2	2.2	4	4.4
Poor maternal bearing down efforts	30	33.3	34	37.8
Poor maternal bearing efforts+fetal distress	7	7.8	5	5.6
Maternal heart disease	2	2.2	0	0.0

$\chi 2 = 5.541$, df = 8, p = 0.699

Table 6: Comparison of Episiotomy extension and perineal tear between outlet forceps and vacuum study groups.

Episiotomy extension	Instrumental vaginal deliveries			
	Outlet forceps		Vacuum	
	N=90	%	N=90	%
No extension	71	78.9	86	95.6
3rd degree perineal tear	15	16.7	4	4.4
Complete perineal tear	4	4.4	0	0.0

$\chi 2 = 11.80$, df = 2, p = 0.003*

Table 7: Comparison of Blood Transfusion between outlet forceps and vacuum study groups.

Blood Transfusion	Instrumental Vaginal Deliveries			
	Outlet Forceps		Vacuum	
	n=90	%	n=90	%
Required	10	11.1	6	6.7
Not required	80	88.9	84	93.3

$\chi 2 = 1.098$, df = 1, p = 0.295

In the outlet forceps groups Episiotomy was extended up to 3rd degree in 15(16.7%), complete Perineal tear was seen in 4(4.4%) and in Vacuum group 4(4.4%) had 3rd degree and 0(0%) had complete Perineal tear.

This difference in Episiotomy extension between two groups was statistically significant.

In Forceps group 10 (11.1%) required blood transfusion and in Vacuum group 6 (6.7%)required blood transfusion. There was no significant difference in blood transfusion between two groups.

Table 8: Comparison of PPH between two study groups.

PPH	Instrumental Vaginal Deliveries			
	Outlet Forceps		Vacuum	
	n=90	%	n=90	%
No PPH	78	86.7	80	88.9
Atonic PPH	8	8.9	10	11.1
Traumatic PPH	4	4.4	0	0.0

χ 2 = 4.24, df = 2, p = 0.120

In Outlet Forceps group 78(86.7%) had no PPH, 8(8.9%) had Atonic PPH, 4(4.4%) had Traumatic PPH. In vacuum group 80(88.9%) PPH was absent, 10(11.1%) had Atonic PPH and 0% had Traumatic PPH. There was no significant association of PPH between two groups.

DISCUSSION

In the current study the use of forceps and vacuum exclusively at the outlet only was studied using 90 patients in either group.

Age

In the Present study, the mean age was 24.1 years for both groups and it was seen that 32.2% in outlet forceps group and 35.6% in vacuum group belong to age group of 21- 25 years. In a study by Gardella C in 2001 mean age of use of forceps and vacuum were 26.4 years and 26.8 years respectively4. Similar type of study done by Prameela R.C in 2014 showed mean age to be 24.1 years which was similar to present study.[5]

Parity

In the Present study, there was high use of forceps 65.6% compared to vacuum 42.2% in primigravida. In a study by Johanson R.B, use of vacuum was 82% compared to forceps which was about 78% in primigravida.[6]

In a study by Gardella C, use of forceps 75% was high compared to vacuum 68% in primigravida.[4]

Indications for application

In present study, poor maternal bearing down efforts were the most common indication for both forceps and vacuum application. In a study by Shihadeh, failure of secondary forces was the most common indication for both forceps and vacuum extraction.[7] Prameela R.C, found that forceps was used more often for prolonged 2nd stage of labor and failure of secondary forces whereas vacuum was used more frequently for fetal distress and prophylactically.[5]

Maternal complications/morbidities

In present study, episiotomy extension was seen in 21.1 % cases of outlet forceps and 4.4% were seen in vacuum which was statistically significant, and these results were similar to Shameel F in 2016 where 9.1% cases was applied in forceps and none in vacuum.[8] Singh Abha concluded with episiotomy and extension of 40% in outlet forceps and 13.3% in vacuum group.[9]

In a study by Shihadeh in 1995, 3rd and 4th perineal injuries were all significantly common in the forceps group.[7]Achanna S in 1994 inferred that, incidence of birth canal trauma varied significantly with forceps being higher.[10] In a study by Prameela R.C, blood transfusion was required in 10% cases of forceps and 3 % in vacuum group which was almost similar to present study which required 11.1% in forceps and 6.7% in vacuum.[5]

In present study, there was not much significant difference between PPH in two groups but forceps group was 13.3 % which was slightly higher than vacuum group. In a study by Shihadeh in 1995, PPH was more significant in forceps group i.e. 12% compared to 4 % in vacuum group.[7] This was almost similar to study done in 2016 by Chaudhari P where 7.1% cases of forceps requires blood transfusion and 1.4% of vacuum.[11]

CONCLUSION

In present study, maternal and neonatal outcome was assessed amongst vacuum and forceps deliveries. There was evidence of less maternal trauma with vacuum extraction than with forceps application. Fetal morbidity was higher in vacuum group compared to forceps delivery.

In today's modern obstetric era the use of operative vaginal deliveries is on a decline due to various reasons such as maternal and neonatal morbidities even though few and far in between leading to litigations.Thereby, reiterating the fact that institutional programmed training modules for younger residents in the art of operative vaginal delivery will eventually bring down the incidence of cesarean sections. With the expertise and appropriate decision on the indication and meticulous handling of the instrument whether outlet forceps or vacuum, especially in a tertiary care centre, the maternal outcome is equally good with both the instruments.

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