



Comparative study of complications of forceps and vacuum applications in selected cases at a tertiary care hospital in Kannur

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Abstract:

This was a comparative study of vacuum and forceps on the usefulness and injuries caused by their application and the choice of instrument for assisted vaginal delivery, conducted in Kannur Medical College Hospital between the years 2008 and 2014. Sample size of vacuum is 767 and that for forceps is 131 out of a total of 906 instrumental deliveries conducted from 23rd October 2008 to 30th April 2014. Inclusion criteria were term fetus and vertex presentation. Exclusion criteria were cases with obstetrical and medical complications. Fetal injuries like cephalhematoma, subgaleal hematoma and intracranial hemorrhage are more with vacuum applications. Genital tract injuries like 3^o perineal tear and 4^o perineal tear are more with forceps, but sequelae are same till six months follow-up. Delivery time is less with forceps. Application-to-delivery time, application failure rate and hospital stay are less with forceps. Forceps is superior to vacuum in the following aspects 1) Simple and easy to handle and maintenance free. 2) Delivery time is less, statistical significance of <0.001. 3) Delivery is more effective; failure of application is less with a statistical significance <0.0001. 4) Fetal injuries are far less with forceps, statistical significance <0.0001. 5) Though genital tract injuries are slightly increased with forceps, follow-up shows no increased residual morbidity like sexual dysfunction or anal incontinence. 6) Training for forceps application should be promoted.

Key words: Obstetric forceps, vacuum, 3^o perineal tear, 4^o perineal tear, subgaleal hemorrhage, cephalhematoma, intracranial hemorrhage, shoulder dystocia, anal incontinence

Introduction:

Obstetric forceps and vacuum extractor are two forms of instruments used for conducting assisted vaginal delivery. Until 1954, there were no obstetrical instruments challenging the marvellous performance of forceps. There is a consensus that maternal trauma resulting from vacuum extraction is less compared to the forceps delivery. So also, the foetal injuries caused by this instrument are more than that of forceps. Various studies comparing the mode of delivery using both vacuum and forceps have shown that vacuum extraction is associated with more application failures, less maternal injuries, greater frequency of

birth injuries and an increase in hospital stay for babies creating mental apprehension for the mother. The common indications¹ for instrumental delivery are:

(A) Maternal

- Pre-eclampsia
- Heart disease
- Intra-partum sepsis
- Exhaustion or prolonged second stage
- Previous caesarean delivery kept for vaginal delivery
- Failure of rotation

(B) Foetal

- Prolapse of the umbilical cord

- Premature separation of the placenta
- Foetal distress
- Non-reassuring heart rate pattern

There has been a fall in the forceps delivery during the past decade and a rise in the case of vacuum extraction^{2,3}. 'Which instrument is better?' – is a matter of dispute in the arena of obstetrics. According to some authorities, forceps is a better instrument that causes less fetal injuries and according to some others vacuum is superior to forceps inflicting less maternal trauma. The aim of present study was to assess:

1. Usefulness of vacuum extractor and forceps in selected obstetric indications
2. Maternal and fetal morbidity during delivery and six months post-partum
3. Choice of instrument for assisted vaginal delivery

Materials & Methods:

This is a prospective comparative study of usefulness and injuries caused by forceps and vacuum application in assisted vaginal delivery conducted during the period from 23rd October 2008 to 30th April 2014 at Kannur Medical College Hospital

- Total number of deliveries:10952
- Total number of instrument application: 906
- Vacuum extraction:71cases (study sample size 767)
- Forceps Delivery:135 cases (study sample size 131)

A careful record of indications of instrument delivery, station at the time of instrument application, application-to-delivery time, maternal injuries and fetal injuries including Apgar score at 1 minute and 5 minutes was made. Forceps and vacuum applications in the present study were done for failure of secondary powers, fetal distress and vaginal birth after caesarean. All birth canal injuries were repaired immediately after delivery. Newborns with complications were shifted for pediatric care. The patients were

monitored in the third stage. One or two hours after delivery, the patient was shifted to the postnatal ward. The baby was also monitored in the postnatal ward, in the new born nursery or NICU. The details of the babies were collected. A follow-up was conducted upto six months postpartum to note residual morbidity of mother and baby. For this, a reply card containing relevant questionnaire was issued at the time of discharge. After six months of delivery, all mothers and infants were evaluated to assess residual morbidity.

Forceps is classified according to the level of application: (ACOG, 1998)⁴

Mid-cavity forceps: station above +2, but engaged; rotation >45°.

Low forceps: station at +2 or below, but not at pelvic floor; rotation not >45°.

Outlet forceps: scalp visible at introitus without separating labia; station at pelvic floor; sagittal suture in the antero-posterior diameter or rotation not >45°.

The forceps used for the present study is an outlet forceps, the definition of application comes under ACOG, 1988 guidelines.⁴ The type of instrument is Wrigley's outlet forceps. The vacuum extractor used for the study is Malmström's extractor with a metal cup of 50mm size.

Both instruments are applied after getting consent from the patients

Criteria for applying forceps and vacuum are

- Vertex presentation
- Cervix should be dilated full for forceps
- Membrane should be ruptured
- Bladder must be emptied
- Station is at pelvic floor

Statistical analysis:

Statistical analysis was with the help of SPSS version 11. Data analysis was by unpaired Student's 't' test and χ square test. P-value <0.05 was considered significant.

Results:

Out of the total number of 898 cases included for study, 347 were nulliparous women (no deliveries before), 400 primiparous (only one previous delivery) and 151 multiparous (more than 1 previous delivery). Most number of women who underwent instrument application were primiparous. **Table I** illustrates the demographic distribution

Table I: Demographic variables of all cases

Variable	N	Mean ± SD
Age		22.23±2.6
GA		40.5 ± 1.07
Nullipara	347	
Primipara	400	
Multipara	151	
TOTAL	898	

GA- Gestational Age

Mean application-to-delivery time was more with vacuum, which is statistically significant (p-value <0.001). The failure rate of application was also significantly more with vacuum with a statistical significance (p-value <0.000). **Table II** shows application-to-delivery time of vacuum and forceps (p-value <0.001). Failure of instrument application is more with vacuum (11.9% in vacuum and only 5.3% in forceps; p-value <0.0001).

Maternal complications by forceps and vacuum applications were identified and compared after proper treatment. Important maternal complications are 3° perineal tear, 4° perineal tear and traumatic post-partum haemorrhage. The most dangerous complication of instrumental delivery which is uterine rupture, was not

observed in our study. There was a little increase of 3° and 4° perineal tear with forceps comparing to vacuum. The injuries were properly repaired immediately after delivery.

Table II: Application-to-delivery time in

Instrument	Mean ± SD
Vacuum	10.23 ± 0.8
Forceps	7.17 ± 1.1

minutes

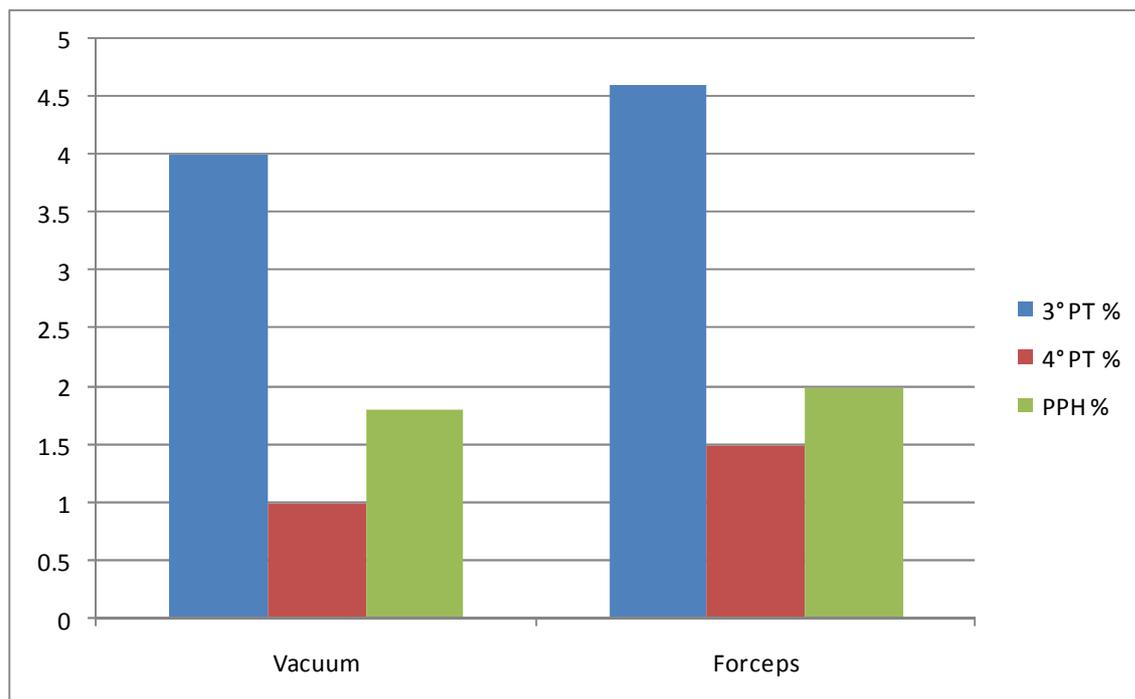
P-value <0.001

These women were observed for six months and re-evaluated after six months. Anal incontinence is a serious residual morbidity of 3rd and 4th degree perineal tear. In our study, population there was no anal incontinence both in forceps and vacuum application. Another important residual morbidity of 3rd and 4th degree perineal tear is sexual dysfunction. This morbidity was also not observed after six months' evaluation (**Figure I**).

Apgar score in 1 minute and 5 minutes were observed both in vacuum and forceps application. There was statistically significant difference in Apgar score in vacuum and forceps application (p-value <0.05) which are tabled for vacuum and forceps application (**Table III**).

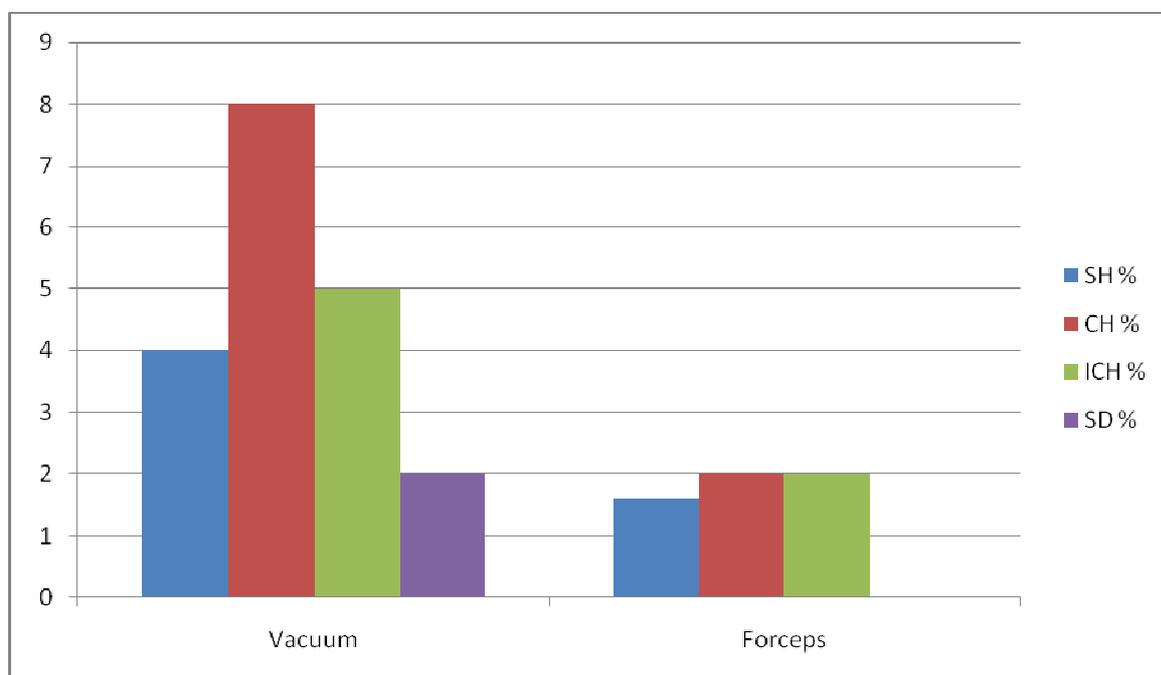
Birth injuries were looked for immediately after delivery and followed six months after delivery (**Figure II**). Important birth injuries after instrumental delivery are subgaleal hemorrhage, cephalhematoma, intracranial hemorrhage and shoulder dystocia. There was statistically significant increase in birth injuries with vacuum application (p-value <0.0001). Intracranial hemorrhage, a more serious complication, was not observed in forceps application. Though no residual morbidity like cerebral palsy was observed after six months in both groups, hospital stay and cost were more in vacuum applied cases.

Figure I: Maternal complications



PT - Perineal Tear
 PPH- Postpartum Hemorrhage

Figure II: Birth injuries



P-value <0.0001

SH - Subgaleal hematoma
 CH - Cephalhematoma

ICH - Intracranial hemorrhage
 SD - Shoulder dystocia

Table III: Mean Apgar Score 1 min and 5 min vacuum

	Vacuum			Forceps		
	Mean \pm SD	Range	Median	Mean \pm SD	Range	Median
Apgar 1'	7.2 \pm 0.8	6-8	7	8.2 \pm 0.9	7-10	8
Apgar 5"	8.4 \pm 0.6	8-9	8	9.4 \pm 0.6	8-10	9

P-value <0.001

Hospital stay was significantly more with vacuum application (p-value <0.001). Most of the cases with subgaleal hemorrhage and cephalhematoma were admitted to NICU with hyperbilirubinemia. Five cases with intracranial hemorrhage were admitted in NICU and discharged after 7 days (**Table IV**).

Table IV: Hospital stay in days

	Mean \pm SD	Range	Median
Vacuum	5.2 \pm 0.8	4-6	5
Forceps	2.4 \pm 0.6	2-3	2.5

P value <0001

Discussion:

There is an upward trend in the caesarean section rate worldwide and a decrease in instrumental delivery. The rate of forceps delivery is on the decline compared to an increased trend in vacuum delivery and caesarean.³ In Kannur Medical College Hospital, the rate of forceps delivery was 1.2 and vacuum delivery was 7%. The number of vacuum deliveries in U.S.A. has increased from below 3% in 1980 to 6% in 1997; as does a decrease in the forceps deliveries from 14% in 1980 to 5.9% in 1997.⁵

Application-to-delivery time - A study by Carmona⁶ et al has concluded that the Application-to-delivery time in forceps

delivery is much less than that for vacuum delivery. The present study has similar results. Average Application-to-Delivery time for forceps was 7.2 minutes and for vacuum was 10 minute. Forceps delivery is a simple and safe operation.⁷

Maternal injuries - There are conflicting reports regarding incidence of maternal injuries. Study by Williams⁸ et al, has the following results (**Table V**).

Table V: Incidence of maternal injuries (Williams⁸ et al)

Instrument	2° PT	3° PT	4° PT
Vacuum	15	7	22
Forceps	18	20	10

PT - Perineal Tear

Hagadon Freathy⁷ reported a 13% third degree perineal tear in forceps deliveries. However, according to the study by Gei⁹ et al, perineal injuries are more or less similar. According to the present study, maternal injuries were more in the forceps group than in the vacuum group. The incidence of 3° perineal tear was more or less same in both groups.

Birth injuries - The most worrisome neonatal complications are cephalhaematoma, subgaleal hematoma, intracranial hemorrhage and shoulder dystocia. Study by Bofill¹⁰ et al, Johanson RB¹¹ et al, Thacker KE et al¹², concluded that cephalhaematoma occasionally

presents in forceps deliveries but it was common in vacuum deliveries. A study by Plauché¹³ observed an increase in incidence of intracranial hemorrhage in vacuum delivery group. In a study by Pielgo Perez AR¹⁴ et al, the incidence of subgaleal hematoma, cephalhaematoma and intracranial hemorrhage were more with the vacuum delivery cases; similar results were also seen in the present study (Table VI). In a study by Caughey¹⁵ AB, the incidence of shoulder dystocia was more with vacuum delivery.

Table VI: Incidence of fetal injuries (Pielgo Perez AR¹⁴ et al)

Instrument	SH	CH	ICH
Vacuum	6.8 %	8.5%	2.8%
Forceps	2.3%	2.8%	0.2%

SH - Subgaleal hematoma

CH - Cephalhematoma

ICH - Intracranial hemorrhage

SD - Shoulder dystocia

Follow-up: Follow-up was conducted for mother and baby till six months. No maternal residual morbidities were observed in vacuum and forceps cases. So, a slight increase in maternal injuries caused during delivery does not pose an economic burden on the forceps applied women. Infant growth parameters and neurological development were also similar in both vacuum and forceps.

Conclusions:

A prospective study comparing the advantages and disadvantages of forceps and vacuum application in assisted vaginal delivery was conducted. Total number of cases were, vacuum 767 and forceps 131. From the analysis of all data, the following conclusions are arrived.

- Operative vaginal delivery by forceps and vacuum are invaluable in selected indications.

- Application-to-delivery time was much less in forceps delivery comparing with the vacuum extraction.
- Failure of instrumental application was more with vacuum
- Maternal injuries were less in vacuum extraction than that in the forceps delivery; but residual morbidity was similar in both cases after six months' follow-up
- Fetal injuries were much less in the forceps delivery group than in the vacuum extraction group.
- Number of days of hospital stay was more in the vacuum extraction category than that in the forceps delivery category which imposes a major economic burden on the patient
- Obstetric Forceps is much cheaper and a maintenance free instrument.
- More training in forceps delivery is necessary for the obstetricians in the future

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