

# OUTCOME OF FORCEPS DELIVERY VERSUS VACUUM EXTRACTION – A REVIEW OF 200 CASES

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## ABSTRACT

The outcome of 100 patients undergoing instrumental delivery with vacuum extractor is compared with that of 100 women delivered with the aid of obstetric forceps. Forceps deliveries were more commonly associated with maternal birth canal trauma (including episiotomy) whilst vacuum extractor carried higher odds of the neonate developing jaundice. Apart from these, there were no significant differences between these two groups in terms of maternal morbidity, neonatal trauma and morbidity and ultimate outcome (success with the type of instrument used).

We conclude that with meticulous handling of the instrument and with an appropriate decision on the indication and the type of instrument used, the maternal and neonatal outcome could be equally good with the use of either instrument.

**Keywords:** vacuum extractor, obstetric forceps, comparative morbidity, outcome.

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## INTRODUCTION

In certain situations, normal spontaneous vaginal delivery cannot or is not allowed to occur for a variety of reasons, and delivery has to be assisted with the use of instruments. Two modes of instrumental delivery which are most frequently used in modern day obstetric practice are the vacuum extractor (VE) and the obstetric forceps. The earliest use of the suction tractor is attributed to James Young Simpson, and it was remodelled by Malmstrom of Sweden in 1954<sup>(1)</sup>. It rapidly gained widespread acceptance in continental Europe, Russia, Africa, South America and even Japan and China, but it is still not widely used in the United Kingdom and United States. Johanson<sup>(2)</sup> analysed that the low usage in the United Kingdom is due to frequent technical difficulties encountered such as inability to maintain the vacuum and leaks in the tubing. Likewise, in the United States, the VE is still not widely used perhaps due to unfavourable reports<sup>(3)</sup>.

On the other hand, the renaissance of the obstetric forceps has its history from the time of the Chamberlain family in the seventeenth century. Since then, over 800 different models have appeared, and the forceps continues to be the preferred instrument in the United States.

In the light of these varying reports on popularity, it is most important to establish the issue of comparative safety of these instruments. This study has been carried out in order to evaluate the neonatal and maternal morbidity, failure and complications associated with the use of these two instruments, and to decide, if possible, which is the safer and more effective of the two.

## MATERIALS AND METHODS

A one-year retrospective study was carried out from 1 January 1987 at the University Hospital, University Science Malaysia, Kubang Kerian, Kelantan, Malaysia. One hundred consecutive cases of forceps delivery and another one hundred cases of vacuum extraction, formed the subjects of this study.

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Exclusion criteria from both groups were cases of multiple pregnancy, preterm (less than 37 weeks of gestation) or low birth weight (less than 2,500 grams), breech presentation and ABO or Rhesus incompatibility.

The instruments used were either the Bird's version of the Malmstrom VE using the 40 mm cup, or the obstetric forceps which was either the Wrigleys outlet forceps or Neville Barns mid-cavity forceps.

The case notes were scrutinised in detail for demographic data (such as age at delivery, height, weight and income status), gestational age, birth weight and indication for instrumental delivery. Outcome was assessed by details of maternal morbidity including trauma and Apgar score and the number of failures where some other method of delivery had to be resorted to.

For the purposes of analysis, the cases were classified as Group 1 and 2 for the VE and obstetric forceps group respectively. Statistical significance of difference was calculated using the chi square test, and "p" value less than 0.05 was taken as significant. In each case the odds ratio (OR), relative risk (RR) and approximate confidence interval (CI) was calculated using the method given by Fleiss<sup>(4)</sup>.

## RESULTS

The two groups did not vary significantly with respect to age, parity, maternal height, weight and socio economic status (Table I).

Table I – Demographic data

Variable	Group 1 (n = 100)	Group 2 (n = 100)
Mean Age	24.3 ± 4.7 years	25.6 ± 5.8 years
Parity	3.1 ± 1.4	3.4 ± 2.1
Height	151.2 ± 3.2 cm	152.3 ± 3.8 cm
Weight	55.4 ± 4.1 kg	56.3 ± 4.5 kg
Socio economic status		
1 & 2 (high)	38.4	41.6
3, 4 & 5 (middle and low)	61.6	58.4

1 & 2 (high) : total family income exceeding RM1000/month.  
3, 4 & 5 (middle and low): total family income less than RM1000/month.

Table II lists the indication of instrumental delivery in the two groups. Whilst the VE was used more frequently for prolonged second stage of labour (66% versus 58%; p = 0.243;

OR = 1.41) and poor maternal effort (15% versus 10%,  $p = ns$ ), the forceps was used more frequently for maternal distress (13% versus 3%,  $p = 0.019$ ) and for prophylactic shortening of second stage of labour when there were medical complications associated with the pregnancy.

The incidence of maternal birth canal trauma varied significantly in the two groups, when episiotomy was included in the list. Episiotomy was done in 26% of cases in Group 1 and 86% in Group 2 ( $p < 0.001$ ) (Table III). In Group 2, one episiotomy was inadvertently extended into a third degree perineal tear, one developed a perineal haematoma and a third developed a recto-vaginal fistula – all these complications were, however, managed appropriately. The single maternal death which occurred in the forceps group was due to disseminated intravascular coagulation (DIVC) secondary to an abruptio placentae, and was unrelated to the instrumentation per se. Apart from these complications, four vaginal lacerations were noted to have occurred in this group as compared to one in the VE group giving odds ratio (OR) of 4.13, ( $p =$  not significant).

In Group 1, there was one case who sustained cervical laceration (which was subsequently repaired) and one who developed atonic post partum haemorrhage (PPH), which responded to oxytocics and manual massage (Table III).

**Table II – Indications for instrumental delivery**

Indication	Group 1 (n = 100)	Group 2 (n = 100)
Prolonged 2nd stage	66	58*
Prophylactic	4	7
Distress – Foetal	12	12
Maternal	3	13**
Poor maternal effort	15	10

\*  $p = 0.243$ ; OR = 1.41; RR = 1.57

\*\*  $p = 0.01$

**Table III – Maternal trauma**

Type of injury	Group 1 (n = 100)	Group 2 (n = 100)
Episiotomy	26	86*
3rd degree perineal tear	nil	1
Recto vaginal fistula	nil	1
Perineal haematoma	nil	1
P.P.H.	1	nil
Vaginal/Cervical lacerations	1	4**
Maternal death	nil	1

P.P.H.: post partum haemorrhage

\*  $p < 0.001$

\*\*  $p = 0.174$ ; OR = 4.33, CI = 0.42 – 98.69

The mean estimated blood loss was slightly lesser in the vacuum group ( $160 \pm 50$  ml) than the forceps group ( $180 \pm 70$  ml) but the difference was not statistically significant (Table IV). Apart from this, there were no differences in the blood transfusion rates, febrile morbidity and length of hospital stay between the two groups. One mother in Group 1 and 5 in Group 2 developed post partum urinary retention ( $p = 0.09$ , OR = 5.21) and one in each group developed vulval oedema.

The neonatal outcome in terms of gestational age, birth weight and Apgar scores was essentially similar between the two groups (Table V).

**Table IV – Other maternal morbidity**

Variable	Group 1 (n = 100)	Group 2 (n = 100)
Blood loss	$160 \pm 50$ ml	$180 \pm 70$ ml
Blood transfusion	3	5
Febrile episodes	2	3
Length of hospital stay	28 hours	36 hours
Urinary retention	1	5*
Vulval oedema	1	1

\*  $p = 0.09$  (not significant); OR = 5.21; CI = 0.58 – 120.07

**Table V – Neonatal outcome**

Variable	Group 1 (n = 100)	Group 2 (n = 100)
Gestational age		
37 weeks	nil	2
37 – 40 weeks	98	95
40 weeks	2	3
Birth weight		
1999 grams	nil	nil
2000 – 3499 grams	92	90
3500 grams	8	10
Apgar score		
7 at 1 minute	2	4
9 at 1 minute	98	96

Table VI shows neonatal injuries sustained in the two groups. There was one case of sub-conjunctival haemorrhage (Fig 1) and one of cephalhaematoma in each group. In Group 1, there was one case of facial palsy and one case with both facial and brachial palsy, but these nerve injuries were not seen in Group

**Table VI – Neonatal trauma**

Type of injury	Group 1 (n = 100)	Group 2 (n = 100)
Facial palsy	nil	1
Facial & brachial palsy	nil	1
Cephalhaematoma	1	1
Lacerations/Abrasions of face/scalp	7	7
Sub-conjunctival haemorrhage	1	1

**Fig 1 – Subconjunctival haemorrhage following forceps delivery**

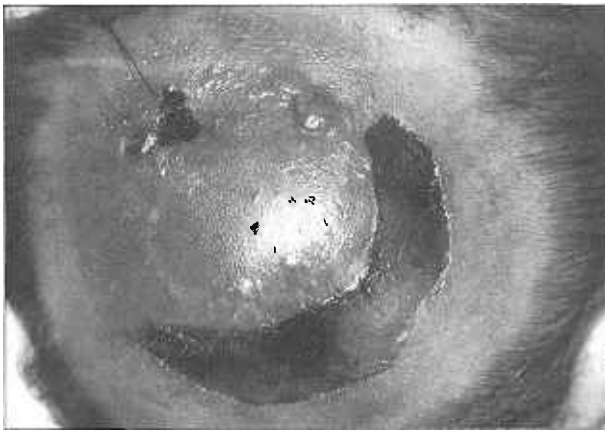


2. Superficial abrasions and lacerations occurred with equal frequency (7%) in both groups. Scalp lacerations were commoner in the vacuum group (Fig 2) while facial injuries (Fig 3) were more common with the use of forceps.

The odds ratio (OR) of developing jaundice was slightly higher in Group 1 (1.81) (Table VII). In both groups, about a third of the babies required phototherapy, and one case from Group 1 required exchange blood transfusion. Apart from these, there were no cases of subgaleal or intracranial haemorrhages and there were no perinatal deaths among the 200 cases studied.

Of the cases attempted for Ventouse, there were five that were unsuccessful due to cup slipping during traction. Ultimately three of these patients were delivered with forceps, as sufficient descent had occurred with Ventouse. In the other two, a recourse to caesarean section had to be undertaken. This outcome was not much different from Group 2, where three cases had to have a caesarean section for failed forceps (Table VIII).

**Fig 2 – Scalp laceration following vacuum extraction**



**Fig 3 – Facial injury following forceps delivery**



**Table VII – Other neonatal morbidity**

Variable	Group 1 (n = 100)	Group 2 (n = 100)
Jaundice	12	7*
Phototherapy	4	2
Exchange transfusion	1	nil
Neonatal convulsions	nil	nil

\* p = 0.227 (not significant)

OR = 1.81

CI= 0.63 – 5.37

**Table VIII – Ultimate outcome**

Type of delivery	Group 1 (n = 100)	Group 2 (n = 100)
VE	95	nil
Forceps delivery	3	97
Caesarean section	2	3

**DISCUSSION**

The total number of deliveries in the year of study were 8,142. Of these, 424 (5.2%) and 226 (2.78%) were delivered by forceps and vacuum respectively. Cases with maternal distress were more commonly delivered by forceps, whilst other indications for use of either instrument were prolonged second stage, foetal distress and poor maternal effort. The operator was usually a consultant or a registrar and the choice of method was dependent entirely on his/her judgement.

Although there were a few more cases of maternal birth-canal trauma in the forceps group (Table III), the difference was not statistically significant. Episiotomy is not done as a routine in most instances in the vacuum group but was done in most case in the forceps group. Carter et al<sup>(5)</sup> reported a higher incidence of maternal trauma with use of forceps as compared to vacuum. The deliveries involving a third degree perineal tear and recto-vaginal fistula were performed by registrars under training, and it is difficult to establish whether it is the fault of the operator or the instrument. A person who is forewarned is in a better position to be forearmed, so that with care and good technique such lesions may be avoided<sup>(6)</sup>.

The mean estimated blood loss was not significantly lesser in the vacuum than the forceps group (Table IV). This estimation is done by weighing the pads soaked and the amount of blood collected in the kidney tray. Incidence of PPH after forceps was comparatively less in our study as compared to the 22% reported by Sjostedt<sup>(7)</sup>. Urinary retention occurred more commonly in Group 2 and was thought to be due to pain, as there was no evidence of infection on urine microscopic and culture reportings. All these cases were relieved by catheterisation and oral analgesics.

The incidence of neonatal trauma was similar in both groups. Other studies<sup>(8)</sup> have reported higher incidence of neonatal trauma with the use of forceps as compared to vacuum. Almost all the babies in Group 1 developed a 'Chignon' (Fig 4) which resolved within 24 hours. The 'Chignon' may appear very unsightly at times to both parents and the physician. There was one case of

**Fig 4 – "Chignon" created by vacuum extraction**



sub-conjunctival haemorrhage in both groups, a finding echoed by Fall et al<sup>(9)</sup>. Bird theorised that the risk of the foetus suffering injury is directly related to the number of pulls, particularly negative or unrewarding ones, the number of times the cup lifts or becomes completely detached, and the duration of the cup's attachment to the scalp<sup>(9)</sup>.

Another study<sup>(10)</sup> showed that cephalhaematoma is the most common foetal injury associated with VE. The odds for developing jaundice were higher with Ventouse than with forceps delivery (Table VII). Other studies<sup>(10)</sup>, also found a slightly higher incidence of mild neonatal jaundice after VE delivery, though the level of serum bilirubin rarely was high enough to cause significant problems for the neonate. Besides jaundice, no significant neonatal morbidity or mortality was encountered in either group in this study. Neurological assessment at birth could not be obtained as this was a retrospective study. An 18-year follow-up by Nilsen<sup>(11)</sup> found a significantly elevated mean intelligence score in the forceps group as compared to vacuum delivered babies. Perhaps adjustable forceps<sup>(12)</sup> where electronic measurements of compression and traction force can be measured, should be looked into in future to minimise morbidity.

Of the 100 cases in Group 1, three were ultimately delivered by forceps as the cup slipped after some descent of the head had occurred. Slipping of the cup is an inbuilt safety mechanism in some instances in the Ventouse<sup>(13)</sup>. The procedure fails either because of an unsuspected disproportion or as a result of a wrong technique. Two patients were delivered by caesarean section for failed vacuum despite 6 pulls, and both these babies weighed more than 3.5 kg. In some centres, a silicone rubber cup is used to replace the metal cup, with varying reports on its usefulness. Some report higher failure rates<sup>(14)</sup>, whilst others report it is safer and easier to handle because negative pressure is applied only during traction, minimising scalp lacerations<sup>(15)</sup>. The three cases of failed forceps also occurred probably due to undiagnosed disproportion.

## CONCLUSION

In this study, the outcome following delivery with Ventouse was not markedly different from that with obstetric forceps delivery. There were no perinatal or maternal deaths related directly to the usage of either instrument, and the majority of the injuries

were minor and transitory. Many of the complications seen were not so much attributable to the vacuum or the forceps, but due to the problems of labour, for which the instrument was used *ab initio*.

The major factor which determines the safety of the instrument is the operator rather than the instrument. Either method can be used if the operator observes sound principles of usage and familiarity with both methods. It is hoped that newer technological advancements in the design of both forceps and vacuum cups would reduce the number of scalp and facial injuries sufficiently.

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