Neonatal and Maternal Complications Among Pregnant Women Delivered by Vacuum Extraction or Forceps Extraction

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Abstract

A historical cohort study was used to analyse the maternal and neonatal complications among pregnant women delivered by vacuum or forceps extraction at Rajavithi Hospital, 1994. The maternal complications (third and fourth degree of perineal tear and postpartum hemorrhage) were statisically significant more often in the forceps group than in the vacuum extraction group. But fetal complications (neonatal hyperbilirubinemia, low Apgar scores (<7) at 1 and 5 minutes and the transfer to NICU) were statistically significant more often in the vacuum extraction group than in the forceps group.

Key word : Neonatal and Pregnancy Complications, Vacuum Extractions, Forceps Extraction

Both forceps and vacuum deliveries are the operative obstetrics used to reduce the cesarean section rate[1]. In general, the incidence of forceps and vacuum extraction in any given institutions will depend upon the attitude of the staff, the kinds of analgesia and anesthesia used for labor and delivery, and the parity of the obstetric population.

The theoretical advantages of the vacuum extraction over forceps that it does not take more space occupying steel within the vagina and positioning of the blades precisely over the fetal head, as required for safe forceps delivery, and the fetal head can be rotated without impinging upon maternal soft tissues, and there is reduction in intracranial pressure during traction.

However, in the United States, vacuum extraction is not used extensively now, partly because of the reports of fetal damage, such as lacerations and abrasions of the scalp, cephalhematomas, intracranial hemorrhage, and death of the infant[2,3].

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In Europe, vacuum extraction is more popular than forceps[4-8]. For example, in Sweden, the incidence of vacuum extraction has increased from 4.2 per cent in 1973 to 6.4 per cent in 1981 compared with forceps 0.3 per cent in 1981[5].

In Rajavithi Hospital, one with the highest number of deliveries in Thailand, had 15,814 total deliveries in 1993. 4.3 per cent and 2.6 per cent were delivered by vacuum and forceps extraction respectively[9]. Up until now there has been no report on the neonatal and maternal complications among pregnant woman delivered by vacuum or forceps extractions. The aim of this study was to compare the neonatal and maternal complications between vacuum and forceps extractions.

MATERIAL AND METHOD

The study design was historical cohort study.

The study population included 380 pregnant women who were delivered by Simpson forceps extraction and vacuum extraction in Rajavithi Hospital from January 1, 1994 to June 30, 1994. The sample size of the subjects in each group was calculated using the rate of complications from the study of Vacca[7] at St. Mary's Hospital, England. There were at least 159 cases in each group and making a 20 per cent allowance for incompletion of the collected data, 190 cases were recruited in each group. The exclusion criterias were dead fetuses *in utero*, failed vacuum or forceps extraction.

The instruments were Simpson forceps and the modified Malmstorm vacuum extractor.

Statistical Analysis

The data was analysed using Chi-square test (X^2), Fisher's extract test (number less than 5 in each cell), Student's T-test, arithmetic means and standard deviation. The level of statistical significance at ($P<0.05$). All data was collected and analysed by using the computer program SPSS/PC$^+$ and EpiInfo.

RESULTS

Three hundred and eighty pregnant women were enrolled in the study. The forceps and vacuum extraction groups had the equal number of one hundred and ninety pregnant women.

Demographic data is shown in Table 1. The maternal age, parity and gestational age at delivery were not statistically different between both groups.

Attending obstetricians were divided into 4 groups : staff, 1st, 2nd and 3rd year residents. The OB-GYN staff used vacuum extraction more significantly than forceps extraction. On the contrary, the 2nd year residents used forceps extraction more significantly than vacuum extraction. (Table 2)

Table 3 shows the indications for forceps and vacuum extractions. The most common indication was prolonged 2nd stage labor (37% in both groups). Vacuum extraction was used significantly more in persistent occiput posterior and deep transverse arrest of head. Forceps extraction was used significantly more in pregnancy induced hypertension (PIH).

Maternal complications are shown in Table 4. Third and fourth degree perineal tears and postpartum hemorrhage were found to be statistically significant in the forceps extraction group.

Table 1. Demographic data in the study groups.

Demographic data	Vacuum extraction group (n=190) (mean ± SD)	Forceps extraction group (n=190) (mean ± SD)	Test	P-value
Age (years)	27.08 ± 4.49 (range 17-38)	26.92 ± 5.69 (range 17-40)	t=0.3	0.76 (NS)
Parity	0.48 ± 0.67	0.37 ± 0.65	t=1.03	0.3 (NS)
Gestational age at delivery (weeks)	39.11 ± 1.10 (range 36-43)	39.22 ± 1.75 (range 33-42)	t=0.8	0.4 (NS)

NS = Not significance

Table 2. Level of obstetricians.

Level of Obstetricians	Vacuum extraction group (n=190)	Forceps extraction group (n=190)	Test X^2	P-value
OB-GYN staff	78 (41.05%)	53 (27.89%)	6.70	0.009 (S)
3rd yr resident	19 (10.00%)	24 (12.63%)	0.42	0.5 (NS)
2nd yr resident	25 (13.16%)	53 (27.89%)	11.76	0.0006 (S)
1st yr resident	68 (35.79%)	60 (31.59%)	0.58	0.45 (NS)

NS = Not significance
S = Significance

Table 3. Indications for the forceps and vacuum extraction.

Indication	Vacuum extraction group (n=190)	Forceps extraction group (n=190)	Test	P-value
1. Prophylaxis	34 (17.89%)	40 (21.05%)	X^2=0.42	0.52 (NS)
2. Prolonged 2nd stage of labor	72 (37.90%)	71 (37.38%)	X^2=0	1.0 (NS)
3. Fetal distress	3 (1.58%)	7 (3.68%)	X^2=0.9	0.34 (NS)
4. Persistent occiput posterior position	14 (7.37%)	2 (1.05%)	X^2=7.89	0.005 (S)
5. Deep transverse arrest of head	24 (12.63%)	0 (0%)	F	<0.00001(S)
6. PIH	8 (4.21%)	26 (13.69%)	X^2=9.34	0.02 (S)
7. Heart disease	2 (1.05%)	7 (3.68%)	F	0.17 (NS)
8. Maternal exhausion	31 (16.32%)	32 (16.84%)	X^2=0	1.0 (NS)
9. Moderate to thick meconium staining amnionic fluid	2 (1.05%)	5 (2.63%)	F	0.45 (NS)

NS = Not significance
S = Significance

Table 4. The postpartum maternal complications.

Maternal complications	Vacuum extraction group (n=190)	Forceps extraction group (n=190)	Test	P-value
1. 3rd and 4th degree of perineal tear	2	10	X^2=4.2	0.04 (S)
2. Postpartum hemorrhage	12	26	X^2=4.9	0.03 (S)
3. Puerperal morbidity	15	15	X^2=0.03	0.85 (NS)
4. Mean duration of hospital stay (mean ± S.D, days)	4.70 ± 1.50	4.43 ± 1.63	t=1.68	0.09 (NS)

S = Significance
NS = Not significance

The mean and S.D. of neonatal birth weight was 3,166.08 ± 464.82 g and 3,101.38 ± 552.40 g in the vacuum extraction and forceps extraction group respectively. There was no statistically significant difference in both groups.

The Apgar scores of neonates are shown in Table 5. The low Apgar scores (<7) was found to be statistically significant in the vacuum extraction group.

Table 6 shows the neonatal complications. Neonatal hyperbilirubinemia and transferred to NICU were found to be statistically significant in the vacuum extraction group.

Table 5. The Apgar scores of neonates.

Apgar scores		Vacuum extraction group (n=190)		Forceps extraction group (n=190)		Test	P-value
At 1 minute							
Apgar scores < 7	(0-3)	3	20	0	8	X^2=4.67	0.03 (S)
	(4-6)	17		8			
Apgar scores ≥ 7	(7-10)	170		182			
At 5 minute							
Apgar scores < 7	(0-3)	0	6	0	0	F	0.03 (S)
	(4-6)	6		0			
Apgar scores ≥ 7	(7-10)	184		190			

S = Significance

Table 6. Neonatal complications.

Neonatal complication	Vacuum extraction group	Forceps extraction group	Test	P-value
1. Cephalhematoma	8	2	F	0.1 (NS)
2. Subconjunctival hemorrhage	2	8	F	0.1 (NS)
3. Shoulder dystocia	5	3	F	0.7 (NS)
4. Brachial nerve injury	2	0	F	0.5 (NS)
5. Neonatal Hyperbilirubinemia	63	40	X^2=6.4	0.01 (S)
6. Neonatal anemia	3	0	F	0.25 (NS)
7. Endotracheal intubation	3	0	F	0.25 (NS)
8. Transfer to NICU	20	8	X^2=4.7	0.03 (S)
9. Mortality	0	0	-	-
10. Mean duration of hospital stay (Mean ± S.D., days)	4.95 ± 2.52	4.51 ± 1.96	t=1.9	0.06 (NS)

NS = Not significant; S = Significant; F = Fisher Extract Test

DISCUSSION

In this study, we chose to use historical cohort because there is the ethical issue of randomizing the case for example in selecting a case for vacuum but in the fetal distress condition, forceps would be the preferred instrument.

The demographic data about maternal age, parity, gestational age at delivery were not statistically significant difference between both groups. It suggested that our study had good randomization.

Forceps extraction was used more significant by to deliver PIH (pregnancy induced hypertension) than vacuum extraction.

In this hospital, we had less experience with Kielland forceps extraction, so Kielland forceps was excluded from this study and vacuum extraction was routinely used for deep transverse arrest of head. Herabutya et al[10] reported that there were more complications with Kielland forceps compared with vacuum extraction for deep transverse arrest of head if the operator inexperienced.

Persistent occiput posterior was the another condition that vacuum extraction was used more than forceps extraction possibly because the obstetricians were afraid of the greater size of the episiotomy when delivered by forceps extraction and there was a likely chance of spontaneous autorotation when delivered by vacuum extraction. In the study

by Broekhuizen et al[4], 58 per cent autorotation occurred in the vacuum extraction.

In our study, the maternal complications such as postpartum hemorrhage and 3rd and 4th degree perineal tear were found statistically significant more often in the forceps extraction group which were the same as those of Greis et al[1] and Vacca et al[7].

Our results about puerperal morbidity and mean duration of hospital stay had no statistically significant difference in both groups and were the same as those of Greis (1981)[1], Vacca (1986)[7], Punnonen (1986)[3] and Broekhuizen (1987)[4].

The mean neonatal birth weight was not statistically significant diference in both groups. In the study by Chamberlain[11], he concluded that vacuum extraction was not appropriate in pre-term newborns because it could produce intracranial hemorrhage or severe cephalhematoma. Williams et al[12] reported vacuum delivery in small-for-gestational-age newborns could produce moderate to severe retinal hemorrhage.

The low Apgar scores (<7) at 1 and 5 minutes were found statistically significant more common in the vacuum group which was the same as in Fall[5] and Punnonen[3].

The neonatal hyperbilirubnemia was found statistically significant more in the vacuum extraction group which was the same as those of Punnonen[3] and Broekhuizen[4] possibly because the extravasation and hemolysis of red blood cells in the chignon changed to bilirubin. Neonates transfered to NICU were found statistically significant in the vacuum extraction group.

One of the factors influenced the maternal complication especially postpartum hemorrhage and 3rd, 4th degree perineal tear in our study may be the surgical experience. In our study, staffs and 3rd year residents perform 51.05 per cent of the vacuum extraction and 40.52 per cent of the forceps extraction. The 2nd year residents performed statistically significant more in forceps extraction possibly because the 2nd year residents needed to practice skill with forceps extraction. The staffs performed statistically significant more in vacuum extraction possibly because they did not wish to repair the extended episiotomy from forceps extraction.

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ภาวะแทรกซ้อนต่อทารกและมารดาที่ช่วยคลอดโดยใช้เครื่องดูดสุญญากาศและคีม

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การศึกษาแบบ Historical cohort เพื่อเปรียบเทียบภาวะแทรกซ้อนต่อมารดาและทารกที่ช่วยคลอด โดยใช้เครื่องดูดสุญญากาศและคีมในโรงพยาบาลราชวิถี พ.ศ. 2537 โดยมีสตรีผู้คลอดกลุ่มละ 190 ราย พบว่าการใช้คีมช่วยคลอด มีความสัมพันธ์กับการเกิดภาวะแทรกซ้อนในด้านของการฉีกขาดของช่องคลอดระดับที่ 3 และ 4 และการตกเลือดหลังคลอดมากกว่าการใช้เครื่องดูดสุญญากาศช่วยคลอดอย่างมีนัยสำคัญทางสถิติ แต่ในทารกของมารดาที่ช่วยคลอดโดยการใช้เครื่องดูดสุญญากาศ พบว่ามีความสัมพันธ์กับการเกิดภาวะแทรกซ้อนในด้านของคะแนนแอพการ์ที่ 1 และ 5 นาทีต่ำกว่า 7 ภาวะบิลิรูบินสูงในทารกและการส่งต่อไปยัง NICU มากกว่าทารกของมารดาที่ช่วยคลอดโดยการใช้คีมอย่างมีนัยสำคัญทางสถิติ ในการศึกษานี้ไม่มีการตายของทั้งมารดาและทารก

คำสำคัญ : ภาวะแทรกซ้อนต่อทารก–มารดา, ช่วยคลอดโดยเครื่องสุญญากาศ, โดยคีม

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