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Original Research Article

Effectiveness of vacuum extraction during cesarean section- A pioneer pilot study

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Abstract: The rate of cesarean deliveries has increased over a decade due to multifactorial reasons explicitly; decrease in vaginal births after cesarean (VBAC), multiple gestation, maternal obesity, pre-term labor, gestational diabetes or hypertension, increased number of high-risk expectant mothers and the obstetrical medico-legal environment**.** Delivery of the fetal head at the cesarean section can sometimes be a cumbersome procedure and may result in maternal or fetal complications. The fetal vacuum extractor enables traction to be applied to the fetal head, in the birth canal, by means of a suction cup that is powered by an external vacuum source. To investigate the benefits and limitations of soft cup vacuum extractor on the fetal scalp during the cesarean section. This study was conducted on 88 full term pregnant women undergoing cesarean section at Nepalgunj Medical College and Teaching Hospital, Nepalgunj, Nepal. All patients were between 37 and 41 weeks of pregnancy with signs of healthy fetus and were divided into 2 groups; Group A- 42 patients subjected to vacuum extraction at the cesarean section, Group B- 46 patients subjected to the conventional cesarean method. The interval between the final uterine incision and complete delivery (U-D interval) and the Apgar score at 1 and 5 minutes after birth were evaluated. The data was statistically analyzed. In Group A, 24 (57.1%) women out of 42 and in Group B, 26 (56.5%) out of 46 were primagravida. Nine (21.4%) out of 42 women in Group A and 13 (28.3%) out of 46 women in Group B had a previous history of cesarean section. Lateral extension in uterine incisions was seen in 3 cases (7.1%) in Group A and 6 cases (13.0%) in Group B. The duration of scalp traction for Group A and Group B subjects were 32±3 sec and 48±16 sec respectively. The birth weight of the babies delivered in Group A and Group B were 3.08±0.47 and 3.07±0.46 respectively. The gestational age of the babies in Group A and B were 39.1±1.09 and 38.9±1.10 weeks. The initial Apgar score for Group A and Group B were 5.67±1 and 5.83±1.20. U-D interval for Group A and Group B were 75.6±9.02 and 43.5±8.6 respectively. It was found that the use of vacuum extractor is an easy, non traumatic and rapid method which abates the need of rough and prolonged fundal compression and its consequences and significantly fewer maternal complications.
Keywords: Vacuum extraction, cesarean section, traction, fetal scalp, suction cup

INTRODUCTION

The rate of cesarean deliveries has increased over a decade due to multifactorial reasons explicitly; decrease in vaginal births after cesarean (VBAC), multiple gestation, maternal obesity, pre-term labor, gestational diabetes or hypertension, increased number of high-risk expectant mothers and the obstetrical medico-legal environment [1]. At times, the delivery of the infant during a cesarean section may pose difficulties, depending on the size and station of the fetal head. It may also be associated with redundant maternal complications like lateral extensions in uterine incisions and lacerations up to the level of cervix [2].

Techniques which may help in smoother delivery under aforesaid circumstances include the use of forceps, additional pressure or incisions on the uterus; however, these maneuvers can be traumatic for both the mother and fetus [3].

The use of the vacuum cup to aid in delivery of the fetal head at cesarean section has been gaining momentum in the recent years.[2] Use of vacuum dates back to 1962 by Solomon for the extraction of fetal head; he suggested that its use will reduce the pressure on fetal head, decrease delivery time thereby decreasing fetal hypoxemia and decrease the extension of incision and vascular insult [4]. In 1705, Yonge described an attempted vaginal delivery using a cupping glass. First successful obstetric vacuum extractor was designed by James Young Simpson, professor of Obstetrics at the Edinburgh University in 1849. His device was made of

a metal syringe attached to a soft rubber cup, was placed against the fetal head, the syringe was evacuated followed by application of traction at the base of the cup and the infant extracted. The device had many disadvantages; the vacuum force was limited and replenishment was impossible after the initial evacuation of the syringe and the device lacked a pelvic curve. Multiple innovations followed, and a metal-cup extractor was developed by Malmstrom in 1953. Recently, bell-shaped and hemispheric silicone rubber cups have come into use [5].

Metal cups have a higher success rate as the cup placement in the occipito-posterior position is easier. However, their stiffness can make application cumbersome and are associated with an increased risk of fetal scalp injuries [6]. In comparison to metal cup, soft cup vacuum extractor's causes fewer neonatal scalp injuries. These can be used with a manual vacuum pump or an electrical suction device; some have an incorporated vacuum-release valve that permits pressure to be rapidly attained and accurately controlled [7].

Rarely, vacuum assisted cesarean deliveries may be associated with fetal and maternal complications. Common fetal complications include chignon (iatrogenic caput succedaneum), cephalohematomas and potentially life-threatening, subgaleal or subaponeurotic hemorrhages. Certain insignificant complications include scalp bruising or lacerations and retinal hemorrhages [8]. The rate of maternal injury with vacuum extraction is low in comparison with forceps or cesarean delivery. However, they do occur and include perineal lacerations, hematomas, blood loss and anemia, urinary retention, and long-term problems with urinary and fecal incontinence [9].

The present study was conducted to investigate the benefits and the limitations in using the soft cup vacuum extractor on the fetal scalp during the caesarean section and evaluate the maternal and fetal complications associated with the use of same. To the best of our knowledge this study is a pioneer study comparing the outcome of caesarean section with and without the use of vacuum extractor.

MATERIALS AND METHODS

This study was a hospital-based cross-sectional study and was approved by the institutional review board. In all subjects, written consent was taken before their inclusion in the study and was carried out for the period of one year from August 2013 to August 2014. Eighty-eight full term pregnant women undergoing cesarean section, elective or emergency (in absence of uterine activity and intact amniotic membranes), at Nepalgunj Medical College and Teaching Hospital, Nepalgunj, Nepal were enrolled. All patients were between 37 and 41 weeks of pregnancy with signs of healthy fetus. Epidural anesthesia was used for all patients. The subjects were divided into 2 groups; Group A- 42 patients were subjected to vacuum extraction at the cesarean section, Group B- 46 patients were subjected to the conventional cesarean method. The interval between the final uterine incision and complete delivery (U-D interval); and the Apgar score at 1 and 5 minutes after birth were evaluated. The exclusion criteria considered were pregnant women with obstructed labour or engaged foetal head.

Statistical analysis

Data was analyzed using SPSS 14.0 software programme. The significance of difference both the groups were tested using the t-test and the level of significance was considered to be a P-value of 0.05.

RESULTS

The present study comprised of 88 pregnant women divided into 2 groups; Group A- 42 patients were subjected to vacuum extraction at the cesarean section, Group B- 46 patients were subjected to the conventional cesarean method.

In Group A, 24 (57.1%) women out of 42 were primagravida (pregnant for the first time); whereas 18 (42.9%) had history of multiple deliveries. In Group B, 26 (56.5%) out of 46 were primagravida; whereas 20 (43.4%) had history of multiple deliveries. Nine (21.4%) out of 42 women in Group A and 13 out of 46 (28.3%) women in Group B had a previous history of cesarean section. Lateral extension in uterine incisions was seen in 3 (7.1%) cases in Group A and 6 (13.0%) cases in Group B. For group A, the duration of the scalp traction was considerably shorter (32 ± 3 sec) in comparison to group B (48 ± 16 sec) **(Table 1)**.

Table 2 demonstrates Neonatal outcome parameters of the study groups. The birth weight of the babies delivered in Group A and Group B were 3.08±0.47 and 3.07±0.46 respectively. There was no statistically significant difference between the birth weight of babies in both the groups (p= 0.45). The gestational age of the babies in Group A and B were 39.1±1.09 and 38.9±1.10 weeks; statistical difference between both the groups was insignificant (p= 0.29). The initial (after 1 min) Apgar score (5.67±1.12) of 42 neonates delivered by vacuum extraction during cesarean section was similar to the Apgar score (5.83±1.20) of 46 neonates delivered by an elective regular cesarean section; Apgar scores after 5 minutes of birth were 7.48±0.99 and 7.59±0.83 (p=0.29). It was found that the U-D interval was prolonged in case of the vacuum group in comparison to the conventional group (p<0.0001). U-D interval for Group A and Group B were 75.6±9.02 and 43.5±8.6 respectively. It was found that a maternal complication like spreading of uterine incision was lower in vacuum assisted group.

Table-1: Comparison of characteristics among the study groups

Parameters	Group A n (%)	Group B n (%)
Primagravida	24 (57.1)	26 (56.5)
Multiple pregnancies	18 (42.9)	20 (43.5)
Previous caesarean sections	9 (21.4)	13 (28.3)
Lateral extension in uterine incisions	3 (7.1)	6 (13.0)
Duration of scalp traction (secs)	32±3	48±16
Subtotal	42	46

Table-2: Neonatal outcome parameters of the study groups

Parameters	Group A Mean±SD	Group B Mean±SD	P value
Birth weight (kg)	3.08±0.47	3.07±0.46	0.45^{NS}
Gestational age (weeks)	39.1±1.09	38.9±1.10	0.29^{NS}
Apgar score at 1'	5.67±1.12	5.83±1.20	0.26^{NS}
Apgar score at 5'	7.48±0.99	7.59±0.83	0.29^{NS}
U-D intervals (mins)	75.6±9.02	43.5±8.6	<0.0001*

^{NS} – Non significant

*Extremely statistically significant

DISCUSSION

Over the past decade, cesarean section rate has increased three fold. Delivery of the infant at the time of cesarean section may pose difficulties, depending on the size and station of the fetal head. Thus, a vacuum cup is used to minimize the space requirements for hysterotomy and reduce the incidence of unwanted maternal and fetal complications [10].

The present study comprised of 88 pregnant women divided into 2 groups; Group A- 42 patients were subjected to vacuum extraction at the cesarean section, Group B- 46 patients were subjected to the conventional cesarean method.

In Group A, 24 (57.1%) women out of 42 and in Group B, 26 (56.5%) out of 46 were primagravida. Nine (21.4%) out of 42 women in Group A and 13 (28.3%) out of 46 women in Group B had a previous history of cesarean section. Lateral extension in uterine incisions was seen in 3 (7.1%) cases in Group A and 6 cases (13.0%) in Group B.

Duration of scalp traction for Group A and Group B subjects were 32 ± 3 sec and 48 ± 16 sec respectively. The duration of the scalp traction was considerably shorter in comparison to the manual extraction. These findings were in concordance with the study conducted by Dimitrov *et al.* [11] where the duration of the scalp traction was significantly shorter (30 $\pm$ 4 sec) in comparison to the classical manual extraction (53 $\pm$ 21 sec).

There was statistically insignificant difference between the birth weights (Group A and Group B: 3.08±0.47 kgs and 3.07±0.46 kgs) and gestational age in both the groups (Group A and B: 39.1±1.09 and 38.9±1.10 weeks). However, Shi Wu Wen et al. [12] in his study found that the use of instruments like vacuum or forceps was more frequent in infants with higher birth weight and gestational age.

The Apgar scores of the two groups were not significantly different after 1 and 5 minutes of birth. Similar results were found in the study conducted by Sritippayawan *et al.* [13].

The U-D interval was prolonged in case of the vacuum group in comparison to the conventional group ($p<0.0001$). U-D interval for Group A and Group B were 75.6±9.02 and 43.5±8.6 respectively. These results were in concordance with the study conducted by Arad *et al.* [14]. According to him, prolongation was due to the time required for application of the vacuum cup and negative pressure build up. Crawford *et al.* [15] demonstrated that the time elapsing between the initial incision of the myometrium and complete delivery was directly related to the fetal distress. They said that it could be due to interference with utero-placental blood flow or of prolonged handling of the infant during extraction from within the uterus.

In the present study maternal complications like spreading of uterine incision was found to be lower in vacuum assisted group. Similar results were found in a study conducted by Baghianimoghadam *et al.* [16] where maternal complications like spreading of uterine incision and cervical rupture was lower in control group. Pelosi *et al.* [17] also concluded that vacuum can lower maternal complications.

CONCLUSION

The use of vacuum extractor is an easy, non traumatic and rapid method which abates the need of rough and prolonged fundal compression and significantly fewer maternal and fetal complications. With vacuum extraction becoming increasingly popular,

it is important that obstetric care providers are aware of the risks associated with such deliveries and the alternatives available to aid in a safe and expedient delivery.

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