Vacuum Extraction—Maternal and Neonatal Complications

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Abstract: The purpose of this research was to evaluate the complications for the mother and newborn, using vacuum extraction, and to compare them with spontaneous delivery. This study included group of vacuum-assisted deliveries in time period 2014-2016 ($n = 726$) in Riga Maternity Hospital, and it was compared to the group of spontaneous vaginal deliveries ($n = 726$). Data statistically processed in Microsoft Excel and SPSS Statistics 22.0. Results of the study: in vacuum-assisted deliveries vaginal lacerations was 13.8% more, cervical lacerations was 9.8% more than in group of spontaneous vaginal deliveries, perineal lacerations were 25.6% less in group with vacuum extraction, neonatal cephalohematomas was 26.9% more, and clavicle fractures was 3.3% more in vacuum-assisted deliveries. Vacuum extraction was used for the first delivery in 86.9% of cases, for the second delivery 10.9% of cases. Vacuum-assisted deliveries in comparison with spontaneous vaginal deliveries are associated with higher risks for maternal soft tissue ruptures and neonatal cephalohematomas, clavicle fractures. It is important to evaluate the indications for use of vacuum extractor. Staff skills, using vacuum extraction method, should be at a high level.

Key words: Vacuum extraction, operative vaginal delivery, maternity resolution.

1. Introduction

Fetal vacuum extractor is in use as delivery instruments. This is a method to assist delivery of a baby using a vacuum device. It is used in the second stage of labour if it has not progressed adequately. It may be an alternative to a forceps delivery and caesarean section. The use of fetal vacuum extractor is generally safe, but it can occasionally have negative effects on either the mother or the child [1, 2].

This research is topical because only few studies on vacuum assisted deliveries have been published in Latvia till nowadays.

Vacuum extractor has a long history. The initial applications of vacuum techniques in deliveries began in the 18th century. While vacuum extractor became widely popular in Europe, the technique was little used in the United States until after the early 1980s, following the introduction of a series of new instruments, including disposable soft-cup extractors,

new rigid cup designs, and handheld vacuum pumps [2, 3].

Use of vacuum extraction is variable in different countries. In the world it is average 1.2%-8.4% every year, in Latvia 2014 2.2%, 2015 3.1%, in Riga Maternity Hospital 2014 2.77%, 2015 3.23%, 2016 4.18% [1]. As we can see, use of these method is only increasing. In Karolinska Institutet (Sweden) (2014) study results—rates of vacuum extraction increased from 11.5% in 1992 to 14.8% in 2010. The risk of vacuum extraction increased with maternal age. The increased use of vacuum extraction over time was partly explained by increasing maternal age and increased use of epidural anesthesia [4].

Vacuum device contain a cup, shaft, handle and vacuum generator. Vacuum cups may be metal, hard plastic or soft plastic and may also differ in their shape, size, and reusability. The soft cup is a pliable funnel- or bell-shaped dome, whereas the rigid type has a firm flattened mushroom-shaped cup and circular ridge around the cup rim. Several investigations have compared outcomes with various

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rigid and soft cups. Metal cups provide higher success rates, but greater rates of scalp injuries, including cephalohematomas [1-3]. In other study, Kuit et al., found that the only advantage of the soft cups was lower incidence of scalp injury. In a review, Vacca, concluded that there were fewer scalp lacerations with soft cup, but that the rate of cephalohematomas and subgaleal hemorrhage was similar between soft and rigid cups [1-3, 5].

Fetal vacuum-extraction most common indications are dysfunction uteri or fetal distress, prolonged second stage of labor, maternal exhaustion [2, 6, 7].

It cannot be used when the baby is in the breech position or for premature births [3].

As any other medical procedures, vacuum extraction also may have some complications. In literature and medical studies use of vacuum extraction is associated with higher risks for maternal complications like vaginal lacerations (due to entrapment of vaginal mucosa between suction cup and fetal head), and with neonatal complications like cephalohematoma, scalp abrasions, intracranial hemorrhage, subgaleal hematoma, retinal hemorrhage [1-3, 8].

2. Material and Methods

2.1 Materials

This study included group of vacuum-assisted deliveries in time period 2014-2016 ($n = 726$) in Riga Maternity Hospital, and it was compared to the group of spontaneous vaginal deliveries ($n = 726$) in time period 2014-2016 ($n = 726$) in Riga Maternity Hospital. Patients characteristic: Women of all ages, 36-42 gestation weeks, first-third delivery, cephalic presentation. Material use in the study—Riga Maternity Hospital patients medical histories.

2.2 Statistic Analysis

Data statistically are processed in Microsoft Excel and SPSS Statistics 22.0. This study had a retrospective design.

3. Results and Discussion

Results of the study are divided into two categories (Fig. 1). The first category includes comparisons of the complications between two groups, and the differences are statistically significant ($p < 0.05$): In vacuum-assisted deliveries episiotomy was made more than in control group. Also in vacuum-assisted deliveries vaginal lacerations and cervical lacerations were more than in group of spontaneous vaginal deliveries. In vacuum-assisted deliveries perineal lacerations were less than in control group.

In statistically significant data category also is included neonatal complications like cephalohematomas and clavicle fractures, which were more in vacuum-assisted deliveries (Fig. 2).

The second category includes comparisons of the complications between two groups, and the differences are not statistically significant ($p > 0.05$):

Maternal complications:

- In vacuum-assisted deliveries subinvolution uterus was 0.3% more than in control group;

Neonatal complications:

- In study group superficial scalp wounds were 0.8% more than in control group;
- In study group retinal hemorrhage was 0.8%, in control group also—0.8%;
- In study group facial nerve damage was 0.3% more than in control group;
- In study group brachial plexus damage was 0.3% more than in control group;
- In study group intraventricular haemorrhage was 1.8% more than in control group;
- In study group subgaleal hematoma was 0.3%, only in two cases, and in control group no subgaleal hematomas was detected.

Vacuum extraction was used for the first delivery in 86.9% of cases, for the second delivery 10.9% of cases and for the third delivery only in 2% of the cases (Fig. 3).

This study showed that episiotomy was made 63.4% more in vacuum-assisted deliveries in

comparison with spontaneous vaginal deliveries. Episiotomy was done in an effort to prevent against spontaneous perineum soft-tissue tearing which may involve the anal sphincter and rectum.

In literature it is facts that episiotomy during operative vaginal delivery also increases the incidence

of postpartum hemorrhage and perineal infection, the need for stronger analgesia, and neonatal birth trauma [6, 9].

Taken together, it is important to evaluate the indications for use of the episiotomy in vacuum-assisted delivery.

Fig. 1 Maternal complications.

Fig. 2 Neonatal complications.

Fig. 3 The fetal vacuum extraction number in a row.

Most common maternal complications, using vacuum extractor, are maternal soft tissue ruptures like vaginal lacerations and cervical lacerations. In opposite due to literature data [1, 3, 9]—this study shown that perineal lacerations in vaccum-assisted deliveries were significantly less than in spontaneous vaginal deliveries. Which can be explained by the fact that the in this study was analyzed the first, second and third deliveries in a row, but in other medical studies was analyzed only first deliveries.

Most common neonatal complications in this study were shown—cephalohematoma and clavicle fractures. In literature and medical studies use of vacuum extraction is associated with higher risks for neonatal complications like cephalohematoma, scalp abrasions [4, 6, 9]. And there are no data about clavicle fractures, which was associated with fetal vacuum extraction. In literature clavicle fractures are the most common injury sustained by newborns during birth [8].

4. Conclusions

Vacuum-assisted deliveries in comparison with spontaneous vaginal deliveries are associated with

higher risks for maternal soft tissue ruptures and neonatal cephalohematoma, clavicle fractures.

It is important to evaluate the indications for use of vacuum extractor. In future studies need to identify and analyse other vacuum-assisted delivery outcomes like maternal post partum blood loss, recovery terms (days in maternity hospitals after delivery) and neonatal Apgar score, because these creteria also can show vaccum-extractor both negative and positive qualities.

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