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Obstetric management in vacuum-extraction deliveries

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ABSTRACT

Objective: The aim of this observational study was to describe the obstetric management in vacuum extraction (VE) deliveries and to compare these findings to instructions in clinical guidelines on VE.
Methods: In 2013, detailed data on management of 600 VE cases were consecutively collected from six different delivery units in Sweden. Each unit also contributed their own clinical VE guideline.
Results: In total, 93% of the VEs ended with a vaginal delivery while 7% failed and were converted to an emergency cesarean section. In 2.3% extraction time exceeded 20 minutes, and in 6% more than six pulls were used to deliver the fetus. Cup detachment occurred in 14.6%, and fundal pressure was used in 11% of the deliveries. In 2.3%, fetal station was assessed as above the level of the maternal ischial spines. The clinical guidelines on VE varied in scope and content between units, and were often incomplete according to best practice.
Conclusion: The vast majority of the VEs were conducted in accordance with safety recommendations. However, in a few extractions, safety rules were disregarded and more than six pulls or an extraction time of more than 20 minutes were used to complete the delivery.

Introduction

Vacuum extraction (VE) delivery plays an important role in obstetric care when it is necessary to shorten the second stage of labor for maternal or fetal reasons. In Sweden, in 2014, 7.6% of all delivering women in the country had a VE-assisted delivery [1]. Although VE is a life-saving intervention, it is associated with both maternal and neonatal complications; for instance, obstetric anal sphincter tears and hemorrhage in the mother [2] and bruising, cephalohematoma, subgaleal hematoma and intracranial hemorrhage in the neonate [3]. Some of these complications are directly related to how the VE is performed; therefore, a correct assessment and performance is considered of utmost importance.

To perform a safe VE and to prevent neonatal and maternal complications, the operator must conduct several assessments and evaluate prerequisites before and during the VE. Nonnegotiable prerequisites are known fetal station and position, fetal head at or below the level of the maternal ischial spines, no suspected fetal disproportion and an accepted indication [4–6]. Recommendations regarding performance are that a VE should be completed within 15–20 minutes, not include more than six pulls, and have a maximum of two cup detachments [7,8].

To support clinicians in safe performance and decision making in vacuum extractions, clinical guidelines are used in everyday practice. In Sweden, no national guidelines similar to those endorsed by the British and American Royal College of Obstetricians and Gynecologists [9,10] on VE exist. Instead of national guidelines on VE, each obstetric department has its own local clinical guideline.

In Sweden both midwives and obstetricians are responsible for performing vacuum extractions. Yet since the late 1990s, midwife-assisted extractions seem to have decreased, and most VE cases are handled by obstetricians or obstetric trainees. It is not known how many VE cases are performed by midwives in Sweden today.

Even though VE is a frequently used intervention, no study has, to our knowledge, been published on how the intervention is performed. For example, it is not known how many pulls are generally needed to deliver a fetus; neither has the average duration of the extraction nor the frequency of cup detachments been described.

The aim of this study was to describe the obstetric management in 600 VE deliveries and to compare their management with recommendations for safe practice in local clinical guidelines.

Methods

Six different delivery units participated in this observational study, five situated in Stockholm County and one in Västmanland County.

Abbreviations: ACOG, American College of Obstetricians and Gynecologists; RCOG, Royal College of Obstetricians and Gynecologists; VE, vacuum extraction.

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Each delivery unit contributed data on 100 consecutive VE cases. Data collection time varied from 2 months to 10 months in 2013 (March 6 – December 15), depending on the annual number of births at the participating units. The numbers of annual births and annual proportion of instrumental vaginal deliveries at the participating units were approximately 1700 (8.2%), 3000 (7.2%), 3700 (10.8%), 4800 (7.1%), 6700 (6.2%), and 7400 (6.8%). Data that were retrieved on the 600 VE cases were collected from the computerized template for documenting instrumental delivery procedure used at all participating units. Data on VE cases from the hospitals located in Stockholm were retrieved from the obstetric database kept by Stockholm County Council. Data on the 100 VEs performed at a county hospital located in Västmanland were retrieved manually, directly from the medical charts. The variables collected were categorized as described below. In cases of missing information, it was noted.

Indications for VE were signs of fetal distress, prolonged labor, maternal exhaustion and correction of fetal position, as well as any combination of these indications. Correction of fetal position refers to when the fetal head is manipulated into a more favorable position in the pelvis by pulling downwards with the cup placed on the flexion point. Fetal station refers to the level of the fetal vertex in relation to maternal pelvis and was categorized into outlet, midpelvic, or high. In outlet extractions, the fetal head (vertex) had reached the pelvic floor; in midpelvic extractions the vertex had reached the level at or below the maternal ischial spines but not the pelvic floor; finally, in high extractions the vertex had not yet reached the level of the maternal ischial spines. Fetal position was categorized into occipito-anterior, occipito-posterior or any other malposition. Gestational week was categorized into three different groups: < 34 completed gestational weeks, 34 + 0 to 36 + 6 gestational weeks, and ≥ 37 completed gestational weeks. The types of cup were metal cups, OmniCup devices, and soft rubber cups. The number of pulls used to deliver the fetus was grouped into 1–3, 4–6 and 6–14. Duration of the extraction describes the time in minutes from application of the cup until birth. Extraction time was categorized into 1–6, 6–10, 11–15, 16–20 and 20–41 minutes. The number of detachments was categorized into no detachment, 1, 2, and 3 detachments. Fundal pressure and episiotomy were grouped into yes and no categories. Operator experience was divided into groups of specialist obstetricians, trainee obstetricians and midwives. Specialist obstetricians were physicians with five years or more of experience within the field of obstetrics and gynecology, and trainee obstetricians were those with less than five years of experience.

Each participating delivery unit was asked to submit the clinical guideline for VE in use during the study period. The information we reviewed in the guidelines was the same as the variables collected from the medical charts: indication, classification of VE based on fetal station, fetal presentation, gestational week, type of cup, number of pulls, extraction time, detachments, episiotomy, fundal pressure and operator experience.

The study was approved by the director at each birth clinic, as well as by the Regional Research and Ethics Committee (2013/653-31/1).

Statistical analyses

Data are presented as absolute numbers, median, minimum, maximum and percentages. Data description was performed using the SPSS version 22.0 for Windows (SPSS Inc., Chicago, IL).

Results

Data from 600 VE cases were collected. Four cases were forceps deliveries and therefore excluded from the study cohort. The final study population consisted of 596 VE cases, of which 595 were singletons and one was a twin delivery. Of all the VE cases included, 7% (n = 42) failed; for all of these cases, a subsequent cesarean was used to deliver the fetus.

Table 1 presents the obstetrical and operative characteristics of the VE cases. In all but one case, at least one accepted indication for the extraction was documented. The most common indication in both nulliparous (32.6%) and multiparous women (40.1%) was fetal distress. Most extractions were midpelvic (75.5%), whereas high extractions were performed only in a few women (2.3%). Malposition was present in 11.2% of all extractions, mainly occipito-posterior position, which was equally frequent in nulliparous and in multiparous women. Among all newborns, 21 (3.6%) extractions were undertaken in the preterm period (<37 + 0). One newborn was delivered in gestational week 32 with a soft rubber cup while the other 20 had reached gestational age ≥ 34 + 0 weeks. The median number of pulls was three for both nulli- and multiparous women. In 91.8% of the extractions, a maximum of six pulls was used. More than six pulls were needed in 8.1% of nulliparous and in 2.4% of multiparous women. The median duration of extraction was six minutes, ranging from 1 to 41 minutes. For ten nulliparous and four multiparous women, the extraction time exceeded 20 minutes. In one of six VE cases, at least one cup detachment occurred, and in eight deliveries the cup detached three times. Fundal pressure was used in 11.4% of the extractions. Almost all VE cases were performed by a senior obstetrician or a trainee obstetrician. In total, 16 extractions (2.7%) were conducted by a midwife. In three hospitals no extractions were performed by a midwife, while in one hospital 7.1% of the extractions were conducted by midwives.

The clinical guidelines differ across clinical locations in content, scope, and definitions (Table 2). Information on accepted indications for VE and maximum traction time were present in all guidelines. Only three guidelines contained information about VE classification by station and among these, the definition of a high extraction differed. In two of the guidelines, high extraction was defined as vertex stationed at or above the level of the ischial spines; in another of the guidelines, a high extraction was defines as vertex is stationed above the level of the ischial spines. One of these three guidelines clearly stated that a high extraction is contraindicated. Only one of the clinical guidelines defined a maximum number of pulls (n = 6–8). All guidelines stated a maximum number of cup detachments, which ranged from one to three. Four guidelines specified conditions under which midwives should perform vacuum extraction deliveries, which was for emergency situations only.

Discussion

The main finding of this study is that prerequisites were to a large extent assessed, and the vast majority of VE cases were performed based on evidence and best practices. Deviation in clinical practice from recommendations mainly pertained to the number of pulls, the total application time, and extractions performed even though the vertex had not reached the level of the maternal ischial spines. In addition, in 11% of the VE, fundal pressure was used to deliver the fetus. We also found that the clinical guidelines used at the six different hospitals varied in content and definitions, and several guidelines lacked clear information on fundamental prerequisites such as assessment of fetal station and position.

Fetal station

According to national guidelines on VE from the ACOG and the RCOG, a high extraction is present when the vertex is stationed above the level of the maternal ischial spines. A station at this level is considered a contraindication for VE, although it can be performed during the delivery of the second twin [9,10].