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Risk factors for anal sphincter tears in vacuum-assisted delivery

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ABSTRACT

Objective: The aim of the present study was to describe the prevalence of anal sphincter tears (AST) in relation to obstetric management and technique during vacuum extraction deliveries (VE) (re: indications, the station of the fetal head at application of the cup, number of tractions, the length for the extraction, cup detachments, pain relief, episiotomy, fetal presentation, and experience of the operator) as well as maternal and infant anthropometrics.
Methods: Descriptive study. Data on six hundred vacuum extraction deliveries were consecutively collected from six different delivery units in Sweden. Each unit contributed with data on 100 deliveries. The final study population included 596 women who delivered by vacuum extraction.
Results: There was no correlation between the management of the vacuum extraction and risk for anal sphincter tear. Women from Africa had nearly a fourfold risk for anal sphincter tear during vacuum-assisted delivery compared with Swedish-born women (OR 3.82 CI 1.47–9.89). Compared with infants with birth weight less than 4000 g, birth weight above 4000 g was associated with increased risk of AST (OR 1.87 CI 1.06–3.28).
Conclusions: In this study, the obstetric management in VE-assisted deliveries did not impact the risk of AST.

Introduction

Vaginal instrumental delivery is used when complications such as signs of fetal distress and dystocia occur during the second stage of labor [1]. In Sweden, approximately 9% of all deliveries end with a vaginal instrumental delivery. Forceps are rarely used, while VE is performed in 99% of all instrumental vaginal births [2].

Although VE is a common and life-saving intervention, it is related to maternal complications such as negative birth experience [3], postpartum hemorrhage [4,5], major vaginal lacerations, and anal sphincter tear (AST) [6]. AST includes both third- and fourth-degree perineal tears. A third degree anal sphincter tear is defined as partial or complete damage of the anal sphincter muscle while a fourth-degree tear means damage of the anal sphincter muscle and involvement of the rectal mucosa [7].

AST is related to various kinds of health-problems, which sometimes affect the woman years after birth [8]. Complications after AST include wound hematoma, wound breakdown, abscess formation, perineal pain, dyspareunia, and incontinence of flatus. Fecal urgency and incontinence of feces are overrepresented among women with AST in a long-term perspective [9].

Numerous studies have evaluated risk factors for AST. The vast majority have shown that primiparity, vaginal instrumental delivery, and high infant birth weight are strong risk factors for AST [6,10–14]. However, very few studies have investigated the risk of AST following VE-delivery. Thus, it is not clear *why* VE is associated with AST. We hypothesized that the obstetric management during VE-delivery is related to the risk of anal sphincter tears (AST). Previous studies that investigated specific risk factors for AST in VE and forceps deliveries [15–18] concluded that number of tractions during VE did not impact the risk for AST [16]; however, low/mid station of fetal head during VE/forceps deliveries increased the risk for AST compared with outlet station [15]. Moreover, occiput posterior position in VE-deliveries had also been associated to increased risk of AST [15,18].

The aim of the present study was to investigate the prevalence of AST in relation to obstetric management and technique during VE (re: indications, the station of the fetal head at application of the cup, number of tractions, the length for the extraction, cup detachments, pain relief, episiotomy, fetal presentation, and experience of the operator) as well as maternal and infant anthropometrics.

Abbreviations: AST, anal sphincter tear; BMI, body mass index; CI, confidence interval; CS, cesarean section; EDA, epidural analgesia; OR, odds ratios; SMBR, Swedish medical birth register; VD, vaginal delivery; VE, vacuum extraction.

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Methods

Study population

This study was based on data from medical charts of 600 VE deliveries at six different birth clinics during a 10-month period (March 6–December 15) in 2013. Every delivery unit contributed with consecutively collected data on 100 VE-deliveries. Four forceps deliveries were included by mistake, and therefore excluded from the analysis. The final study population included 596 VE deliveries, including one duplex pregnancy. The study was approved by the head administrators at the six different birth clinics, as well as by the Regional Research and Ethics Committee (2013/653-31/1).

Data collection

Data on 500 of the 600 VE deliveries included in the study were retrieved from a central database kept by Stockholm County Council, to which information about pregnancy and childbirth are transferred from medical records. Data on the 100 VE deliveries from a birth clinic located outside Stockholm County Council were retrieved manually from the local database kept by the hospital, since birth clinics outside Stockholm are not linked to Stockholm County Council database. In Sweden, data are routinely collected in a standardized way and covers prospectively collected information from the woman's first prenatal visit, generally at 8–12 weeks of gestation, and then on until postnatal care.

Pregnancy, birth and perinatal variables

We included information on maternal country of birth, age, parity, height, and BMI. Ethnicity was categorized as born in Sweden, Asia/Middle East, Africa (Eritrea, Ethiopia, Sudan, Egypt, Somalia and Gambia), European country, or other. Maternal age was categorized as <20, 20–29, 30–35 and >35 years. Parity was classified into nulliparous, multiparous, and multiparous with previous cesarean section. Maternal height was divided into four groups according to Table 1. Body mass index (BMI) was calculated from height and weight measured at the first antenatal visit. Women were categorized according to the World Health Organization's definitions of BMI as underweight (BMI <18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25.0–29.9) and obese (BMI >29.9). Gestational weeks were categorized into <34, 34–36, 37–41 and >41 completed weeks, and were based on routine ultrasound dating. Infant and obstetrical factors were: infant birth weight, head circumference, presentation at birth, number of pulls, and station of fetal head; these were categorized according to Table 2.

According to Swedish national classifications of VE-assisted deliveries, a high extraction is when the fetal vertex is stationed above the ischial spines (only performed at duplex delivery otherwise it is contraindicated). Midcavity extraction is when the fetal vertex is at the ischial spines or below, but has not yet reached the pelvic floor. Outlet extraction is when the fetal vertex is at or almost at the pelvic floor [19]. Data on epidural analgesia (EDA), pudendal nerve block (PNB), fundal pressure, episiotomy, and shoulder dystocia were also collected from the register and then coded into yes/no. Indications for VE were classified into prolonged labor, signs of fetal distress, exhausted mother, and correction of fetal position. All extractions with more than one indication were coded as a double diagnosis.

We defined an extraction to be "difficult" if there were more than five pulls used to deliver the infant, and/or two or three detachments of the vacuum cup, and/or extraction time was more than 15 minutes.

We assumed that an operator's experience on performing VEs is related to his/her profession (years in practice or profession). Thus, we divided the professions into specialist physicians (at least five years of training within the field of obstetrics and gynecology), non-specialist physicians (less than five years of training within the field of obstetrics and gynecology), and midwives. Midwives in Sweden are trained in the use of vacuum extraction (VE) and forceps for emergency situations; however today, in contrast to the situation 10–20 years ago, most VEs are performed by obstetricians. Midwives in Sweden have the responsibility of handling uncomplicated birth without the supervision of an obstetrician. Obstetricians are called upon when necessary to assess complicated deliveries or to perform vaginal instrumental delivery or cesarean section.

The length of second stage of labor (from complete dilatation to birth) was measured in hours, while the active second stage of labor (from the onset of active pushing to birth) and the total extraction time (duration from when the cup was applied until birth of the infant) were measured in minutes.

Table 1
Maternal characteristics in relation to AST.

Characteristics	Range	N = 596	Anal sphincter tear		Univariate OR 95% CI
			n = 71	%	
Parity					
Primipara		384	51	13.3	1.54 (0.85–2.78)
Multipara		177	16	9.0	1.0
Multipara + CS		35	4	11.4	1.30 (0.41–4.15)
Age	17–49				
<19		9	0		
20–29		247	37	15.0	1.0
30–35		254	25	9.8	0.62 (0.36–1.06)
>35		76	8	10.5	0.67 (0.30–1.50)
Missing		10			
Ethnicity					
Swedish		473	52	11.0	1.0
European		33	3	9.1	0.85 (0.25–2.89)
African		21	7	33.3	3.82 (1.47–9.89)
Asian/Middle Eastern		34	5	14.7	1.36 (0.50–3.69)
Other		30	3	10.0	0.85 (0.25–2.89)
Missing		5			
Length (cm)	150–186				
<155		24	3	12.5	1.15 (0.32–4.08)
155–165		271	30	11.1	1.0
166–175		256	33	12.9	1.19 (0.70–2.01)
>175		33	4	12.1	1.11 (0.36–3.37)
Missing		12			
BMI (mean)	17–46				
<18.5		46	6	13.0	1.06 (0.42–2.66)
18.5–24.9		331	41	12.4	1.0
25–29.9		140	19	13.6	1.11 (0.62–1.99)
>29.9		53	2	3.8	0.28 (0.07–1.18)
Missing		26			
Gestational age (weeks)	32–42				
<34		1	0	0.0	
34–36		20	3	15.0	1.26 (0.36–4.44)
37–41		530	62	11.7	1.0
>41		45	6	13.3	1.26 (0.51–3.13)
Missing		0			

Outcome variable

The outcome variable AST was defined according to the International Classification of Diseases, 10th revision (ICD-10). All women with a diagnosis of O702A (subtotal rupture) or O702B (total rupture but anal mucosa not involved) or O703 (total rupture with anal mucosa involved) were classified with an AST. First- and second-degree perineal lacerations were not considered in this study.