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Original Article

Relationship Between the Length of the Perineum and Position of the Anus and Vaginal Delivery in Primigravidae

D. E. E. Rizk and L. Thomas

United Arab Emirates University, Al-Ain, United Arab Emirates

Abstract: The aim of the study was to determine perineal length and anal position in primigravidae and to evaluate their effect on vaginal delivery. The distances between the fourchette and each of the center of the anal orifice and the inferior margin of the coccyx were measured in 212 primigravidae with singleton term pregnancies during the first stage of labor. Anal position index was calculated by dividing the first measurement by the second. The mean $\pm$ SD length of perineum was 4.6 $\pm$ 0.9 cm. The mean $\pm$ SD anal position index was 0.49 $\pm$ 0.12. Women with a short perineum (<4 cm) or a small anal position index (<0.42) had significantly higher rates of episiotomy, perineal tears and instrumented delivery. This association was also significant by multiple logistic regression analysis. It was concluded that a short perineum and anterior displacement of the anus were associated with traumatic vaginal delivery in primigravidae.

Keywords: Anal position; Ectopic anus; Length; Perineum; Primigravidae; Vaginal delivery

Introduction

The perineum is situated between the vaginal orifice and the anus and its length is therefore dependent on the position of the anus (Fig. 1). Anterior displacement of the anus is a mild form of ectopic anus where the anal orifice is situated in the anterior portion of the perineum. This disorder is a common cause of constipation in infancy and early childhood [1–6]. The length of the perineum influences the resistance it offers and the injuries it sustains during childbirth [7,8]. A 'short' or 'long' perineum is thus often cited in the literature as a cause of traumatic vaginal delivery in primigravidae, without a clear description being given of the normal measurements of the perineum [7–12]. This type of delivery is responsible for genital prolapse and genuine stress urinary incontinence as a result of injury to the pelvic floor [13,14]. Episiotomy has been performed to protect against these complications [15–17]. However, the value of this procedure is increasingly questioned

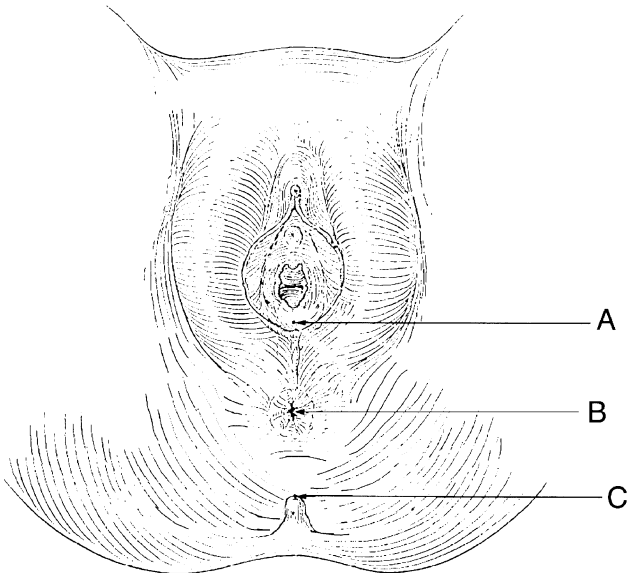

Fig. 1. Length of the perineum and position of the anus in women. Note that anterior or posterior displacement of the anus will result in a short or a long perineum, respectively. A, Fourchette; B, center of anal orifice; C, inferior margin of the coccyx. Distance AB = length of the perineum; distance AC = distance between the fourchette and the inferior margin of the coccyx; anal position index = AB/AC.

Correspondence and offprint requests to: Dr Diaa E. E. Rizk, PO Box 17666, Al-Ain, United Arab Emirates.

because of the associated postopertive morbidity in the absence of clearly defined evidence for efficacy [13–17].

The normal values for defining an abnormally long perineum, including anterior displacement of the anus, are available for newborn infants [1]. The diagnosis of both conditions in adult women is, however, unknown and their effects on the outcome of vaginal delivery have not been previously reported. It is important to investigate this topic because anthropometric studies of the perineum may provide additional information about the anatomy of the pelvic floor, and the data obtained might be of value in predicting damage to the perineum during delivery, particularly in primigravidae.

The aims of this study were therefore (1) to determine the length of the perineum and the position of the anus in primigravid women during labor, and (2) to ascertain whether there are any associations between a short perineum and/or anterior displacement of the anus and the outcome of vaginal delivery.

Materials and Methods

An observational study was conducted in Al-Ain Hospital, a teaching hospital affiliated with the Faculty of Medicine and Health Sciences in Al-Ain, United Arab Emirates, from 1 May 1997 to 30 April 1998. The study protocol was approved by the Research Ethical Committee of the Hospital. There are between 3200 and 3300 deliveries per year in this hospital. All primigravid women with singleton pregnancies who went into spontaneous labor at term during the study period (n = 224, or 14% of all deliveries) were eligible for entry into the study. Primigravid women delivered by elective cesarean in the absence of labor, and multigravid women were excluded. Of the eligible group, 212 subjects (95%) gave informed consent to participate. Consent was obtained during the last antenatal visit in the majority of the patient population (n = 200, 94%) who had their antenatal care in the hospital. The remaining 12 women were seen for the first time after the onset of labor. Therefore, it was only possible to obtain their consent intrapartum.

Two distances were measured in each woman during the first stage of labor (Fig. 1). The first was the distance between the fourchette and the center of the anal orifice in order to determine the length of the perineum. The second was the distance between the fourchette and the inferior margin of the coccyx, in order to calculate the anal position index, previously described by Reisner et al. [1], by dividing the length of the perineum by this distance. The inferior margin of the coccyx was identified as the caudal most bony prominence of the vertebral column that could be palpated in the dorsal lithotomy position (Fig. 1).

Measurements were performed by a qualified research nurse (LT) using a standard tape measure in the dorsal lithotomy position to the nearest 0.5 cm. During the data acquisition, 50 patients were re-examined after 2 hours by the same observer and by the principal investigator (DEER), and measurements were repeated in order to assess the intra- and interobserver differences. Only the first measurements were used in further statistical analysis, so that subjects would not be represented more than once. Demographic, medical and obstetric data were also collected.

The annual episiotomy rate in primigravid women in our hospital is 75%. A standard mediolateral episiotomy is routinely performed. The wound is repaired in layers using interrupted 00 polyglactin (Vicryl) suture. The criteria used to decide whether episiotomy is indicated are excessive bulging and/or impending rupture of the perineum, as judged by the attending obstetrician, who was blinded to the measurements of perineal length and anal position index.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, version 6). Student's t-test was used for comparison between groups, and calculation of the κ value for measurement of intra- and interobserver agreement. The measure of association between confounding variables was assessed by multiple logistic regression. Receiver operating characteristic (ROC) curve analysis for determination of cut-off points of measurements was performed by Medcalc (version 4.16g – Windows 95, copyright Frank Schoonjans). For all analyses, $P < 0.05$ was considered significant.

Results

A total of 212 women participated in the study. All were primigravidae with singleton pregnancies at term, and were examined during the first stage of labor. Table 1 gives the demographic characteristics of the study subjects. The majority of women were of average weight (mean $\pm$ SD = 71.1 $\pm$ 16.5 kg) and height (mean $\pm$ SD = 153.5 $\pm$ 42.8 cm). Eighteen women

Table 1. Demographics of the study population (n = 212)

Age (years)	24.1 ± 3.9*
Gestational age (weeks)	39.1 ± 1.6
Body mass index	26.1 ± 5.6
Weight (kg)	71.1 ± 16.5
Height (cm)	153.5 ± 42.8
Shoe size (UK†)	6.5 ± 0.9
Occupation	
Manual	8 (3.8)§
Housewife	200 (94.3)
Professional	4 (1.9)
Medical history	
Chronic constipation	6 (2.8)
Fecal incontinence	4 (1.9)
Urinary incontinence	4 (1.9)
Anorectal operations	4 (1.9)
Repair of genital prolapse	–

* Mean $\pm$ SD
† UK standards
§ Values in parenthesis are the percentage.

Table 2. Obstetric outcome in study patients (n = 212)

Presentation	
Vertex	208 (98.1)*
Occipitoanterior	192 (92.3)
Occipitolateral	12 (5.8)
Occipitoposterior	4 (1.9)
Breech	4 (1.9)
Extended	3 (75)
Flexed	1 (25)
Outcome of labor	
Length of first stage (h)	7.2 ± 0.42†
Length of second stage (min)	32.6 ± 6.6
Use of oxytocin	106 (50)
Mode of delivery	
Normal	182 (85.8)
Ventouse	6 (2.8)
Forceps	2 (0.9)
Cesarean	22 (10.4)
Episiotomy	145 (76.3)§
Perineal tears	29 (15.2)§
Neonatal outcome	
Birth weight (kg)	3.2 ± 0.5
Apgar score at 1 and 5 minutes respectively	7.6 ± 0.9, 8.8 ± 0.6
Admission to special care unit because of asphyxia	6 (2.8)
Birth injuries	1 (0.5)

* Values in parenthesis are the percentage.
† Mean $\pm$ SD
§ Percentage of the total number of women who had a vaginal delivery (n = 190)

(8.4%) had previous bowel or bladder symptoms, such as chronic constipation, fecal incontinence and urinary incontinence, or a history of anorectal operations for the treatment of anal fissure or piles. There was no history or current evidence of genital prolapse in any subject.

The obstetric outcome is presented in Table 2. Fetal presentation in 98.1% of subjects was vertex and in 92.3% of these the position was occipitoanterior. The incidence of instrumental delivery (3.7%) and of cesarean section (10.4%) was not different from the annual perinatal statistics of our hospital. Also, the episiotomy rate (76.%) was approximately similar to the annual episiotomy rate in the hospital primigravid population (75%). All perineal tears were first and second degree; no third-degree tears were encountered. Six neonates were admitted to the special care until because of birth asphyxia and were discharged in good condition. One of these had a fracture of the clavicle as a result of shoulder dystocia, without further neurological injury. Other obstetric data were unremarkable.

The distributions of perineal length and anal position index are plotted in Figures 2 and 3, respectively. Both measurements had an approximately normal frequency distribution. The mean perineal length $\pm$ SD was 4.6 $\pm$ 0.9 cm. The mean anal position index $\pm$ SD was 0.49 $\pm$ 0.12. The intra- and interobserver variations of perineal measurement were acceptable (κ = 0.37 and 0.36, respectively). Using episiotomy as an outcome variable in ROC curve analysis. a short perineum was defined as <4 cm (sensitivity 64.3%, specificity 65.5%) and a small anal position index as <0.42 (sensitivity 69.1%, specificity 62.1%). Women with a short perineum and a small anal position index as previously defined had significantly higher rates of episiotomy, instrumental delivery and perineal tears on further statistical analysis (Table 3). In a multiple logistic regression model which included other confounding variables, such as fetal presentation, duration of labor, use of oxytocin and birthweight, the associations between each of a short perineum and a small anal position index and the frequency of episiotomy and of perineal tears were also significant (Table 4). There was no significant association, however, between the length of the perineum or the anal position index and other obstetric outcome variables, nor a number of demographic variables such

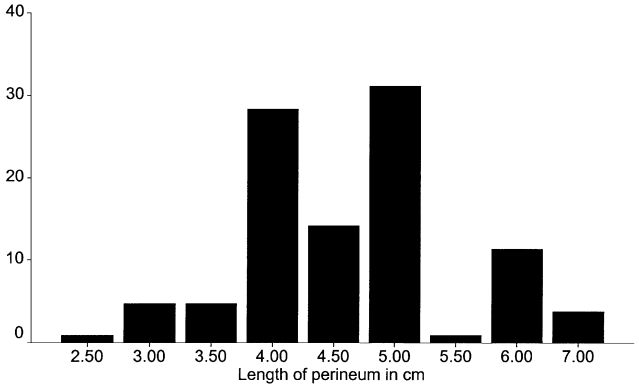

Fig. 2. The frequency distribution of the length of the perineum in cm (n = 212).

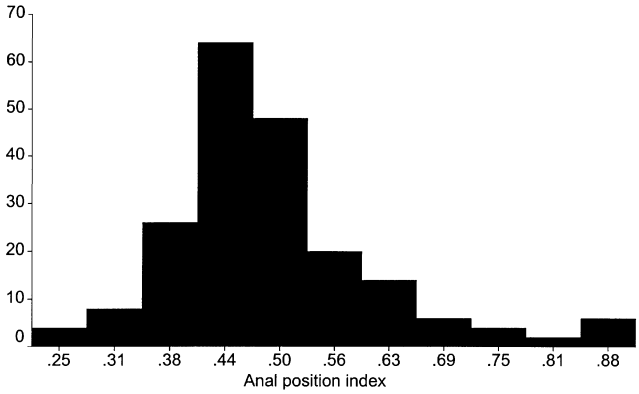

Fig. 3. The frequency distribution of the anal position index (n = 212).

Table 3. The association between short perineum (<4 cm) and a small anal position index (<0.42) and the outcome of vaginal delivery using Student's t-test

	Short perineum (<4 cm)		Small anal position index (<0.42)	
	t	P	t	P
Episiotomy	2.26	0.02	2.12	0.04
Perineal tears	1.84	0.03	1.12	0.04
Instrumental delivery	0.64	0.04	1.42	0.04

Table 4. The association between a short perineum (<4 cm) and a small anal position index (<0.42) and the outcome of vaginal delivery using multiple logistic regression analysis

	Short perineum (<4 cm)			Small anal position index (<0.42)		
	OR	95% CI	*P*	OR	95% CI	*P*
Episiotomy	0.21	0.17–0.69	0.001	0.31	0.18–0.71	0.003
Perineal tears	0.43	0.22–0.74	0.04	0.39	0.18–0.78	0.03

as height, weight, shoe size and a history of bowel or bladder symptoms.

Discussion

This is the first report to address the relationship between the length of the perineum and/or position of the anus and vaginal delivery. A MEDLINE search of the literature from 1966 to the present yielded no references to this subject. The length of the perineum is also rarely, if ever, described in anatomy texts, and we have also been unable to locate a discussion of its measurements as regards episiotomy or perineal tear closure in obstetrics and gynecology texts [7–12]. In addition, the functional importance of the length of the perineum has been largely neglected by clinicians, despite the fact that its important role in the diagnosis and classification of pelvic organ prolapse has recently been appreciated [18–20]. Objective measurements of the perineum have been included by the International Continence Society (ICS) in the new standardized terminology of pelvic organ prolapse and pelvic floor dysfunction [18]. A short perineal body (<3 cm) was identified as being associated with weakness of the anatomical support of the pelvic viscera in their report, but without further discussion of the significance of the finding. The diagnostic and prognostic potential of perineal measurements was further highlighted in two subsequent studies of women with pelvic organ prolapse and pelvic floor dysfunction [19,20].

The objective measurements of the perineum standardized by the ICS are similar to those performed in the present study, although there are few differences [18]. First, the measurements of the ICS apply to non-pregnant women, unlike the obstetric population of the present study. Therefore, these measurements include the genital hiatus (middle of the external urethral meatus to the posterior midline hymen) but not the anal position index. As the object of our study was to evaluate the effect of perineal measurements on vaginal delivery, anal position index was thought to be a more appropriate measurement than genital hiatus, which is used to describe perineal measurements in gynecologic patients with pelvic organ prolapse. Secondly, the terminology used by the ICS is length of the 'perineal body', whereas 'perineum' was used in our series. These terms can be considered synonymous as they are used interchangeably in anatomy and obstetrics and gynecology texts [7–12]. Thirdly, the anterior margin of the perineum in the ICS measurements is the posterior midline hymen or the perineal body, as opposed to the fourchette in our study. These reference points are almost interposed, but the fourchette may be easier to identify during labor.

Although the measurements performed in the present series were not exact, the frequency distribution of data was normal. In spite of individual anatomic variations, the interrelationships remain constant. Our measurements were confined to those pregnant women in their first term pregnancy and during the first stage of labor, because differences in perineal measurements are expected between the first and second stages of labor, when the perineum bulges during delivery [7]. The effects of pregnancy and of previous vaginal delivery on these measurements must also be considered. Furthermore, there are considerable genetic and ethnic variations in the topography of the female perineum [6,7,12].

Our results showed that the incidence of episiotomy, perineal tears and instrumental delivery was increased in patients with a perineal length of <4 cm and an anal position index of <0.42. A possible obstetric application for these measurements, therefore, could be the identification of these primigravid women who are at risk of perineal injury during vaginal delivery, and in whom an elective episiotomy may be beneficial. A mediolateral episiotomy may be safer than a median episiotomy in women who have a short perineum or a small anal position index [7]. The findings of the present study indicate that the length of the female perineum is not related to other anthropometric measurements such as height or shoe size, although height is known to be related to pelvic size in women [7,10,11].

Our results suggest that the anal position is near the midway point between the coccyx and the fourchette. This is consistent with the findings of Leape and Ramenofsky [4]. Reisner et al. [1], however, found that the normal anal opening in female newborns and young girls was anterior to this point, and was therefore closer to the vulva. In their study anterior displacement of the anus was considered if the anal position index was <0.34, compared to <0.42 in our series. Measurement of the anal position index could be used to detect subtle abnormalities of anal position in women with chronic constipation because the procedure is simple, reliable and non-invasive [3]. Anterior ectopic anus may occur in many mild forms in females, where the anus is located slightly forward of its normal position [3–6]. This variety may not be recognized until adult life, even after vaginal delivery and thorough inspection of the perineum [2,6]. Although these patients may sometimes be asymptomatic, they usually suffer from chronic or unexplained constipation because the oblique direction of the anal canal results in loss of the expulsive force of straining during defecation [5]. This findings was not observed in our study, presumably because of the small number of symptomatic patients.

Certain important questions remain to be answered in determining the anatomic etiology of pelvic organ prolapse [20]. These include the factor responsible for enlargement of the urogenital hiatus, the relationship between endopelvic fascia and hiatal size, and the effect of treatment such as pelvic muscle exercise and operative intervention on the size of the urogenital hiatus. The design of our study did not permit further investigation of the relationship between the length of the perineum and pelvic organ prolapse. We nevertheless believe that improving our knowledge of the anatomy of the perineum and anus may also have a significant impact on future research in this field [13,15].

Conclusion

Our study clearly showed that a short perineum and anterior displacement of the anus were associated with traumatic vaginal delivery in primigravidae, and gave evidence to support the judicious use of episiotomy in this group of women. Such information should aid those physicians interested in improving the clinical outcome of perineal injury in labor. Now that a simple technique is available to assess perineal length and anal position index in the obstetric population, it should be possible to collect further data about such measurements in non-pregnant women with and without pelvic organ prolapse.

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EDITORIAL COMMENT: This interesting study quantifies what obstetricians have long known, that is that the length of the perineum in a pregnant woman is an important determinant of whether or not an episiotomy will be needed, or if one is done, whether or not it will extend. This study adds the important factor of the location of the anus and relates this to the length of the perineum. Knowledge of an anteriorly displaced anus and a short perineum in a given patient should alert the obstetrician to the potential for complications related to perineal trauma from delivery.