

UROGYNECOLOGY

Can levator avulsion be predicted antenatally?

Ka Lai Shek, MBBS, FHKAM (O&G), FRCOG; Hans Peter Dietz, FRANZCOG, PhD

OBJECTIVE: We sought to determine whether antepartum prediction of major levator trauma is feasible.

STUDY DESIGN: A prospective longitudinal study was undertaken on 488 pregnant nulliparous women seen between 36-38 weeks and again 4 months after delivery. All underwent an interview and 4-dimensional transperineal ultrasound. Diagnosis of levator trauma (avulsion) on tomographic ultrasound was correlated with predelivery demographic variables and ultrasound parameters.

RESULTS: In all, 367 women returned for postpartum assessment after normal vaginal delivery ($n = 187$), vacuum/forceps ($n = 54$), and ce-

sarean section ($n = 126$). Avulsion was diagnosed in 34 vaginally parous women (14%). Maternal age, family history of cesarean section, hiatal dimensions, levator muscle strain, bladder neck descent, and subpubic arch angle were not associated with avulsion. The only predictor identified was a lower body mass index ($P = .005$).

CONCLUSION: Antepartum prediction of major levator trauma may be difficult or impossible. Future studies should focus on modification of current obstetric practices and antepartum interventions applicable to the general population.

Key words: avulsion, childbirth, levator ani, prediction, ultrasound

Cite this article as: Shek KL, Dietz HP. Can levator avulsion be predicted antenatally? *Am J Obstet Gynecol* 2010;202:586.e1-6.

It has been estimated that approximately 200,000 women undergo inpatient procedures for female pelvic organ prolapse (POP) in the United States each year.¹ The estimated direct cost of pelvic organ surgery is >US\$1 billion.² With an aging population, prolapse and incontinence surgery will likely become more common. Recent estimates suggest that the demand for prolapse surgery will increase by 45% in the next 30 years.³ There is a clear need for further research in this area to allow better understanding of the pathogenesis of pelvic floor dys-

function and hence to develop preventative strategies.

While the pathogenesis of POP is likely to be multifactorial, childbirth has been identified as an important risk factor for POP.^{4,5} Macroscopic trauma to the levator ani muscle may partly explain the link between vaginal birth and POP. Recent magnetic resonance (MR) and ultrasound studies have shown major levator defects in 20-35% of vaginally parous women.^{6,7} No such defects have to date been found in women delivered exclusively by cesarean section. Major levator defects are associated with a decrease in pelvic floor muscle strength^{8,9} and are a risk factor for “ballooning,”⁹ ie, an abnormal hiatal area on Valsalva of ≥ 25 cm².¹⁰ Levator trauma (avulsion) is a strong risk factor for POP, especially in the anterior and central compartment, with a relative risk of 2.3-4.0, respectively.^{8,11} Avulsion seems to increase the risk of prolapse recurrence after surgical correction.¹²⁻¹⁴ Another recent study suggests that childbirth-related trauma may involve not only the pelvic floor muscle but may also involve damage to structures such as myofascial and connective tissue.¹⁵

Both prospective and retrospective studies using ultrasound and MR imaging have shown maternal age at first vaginal delivery to be associated with levator avulsion,^{7,16} raising the possi-

bility of antenatal prediction. The aim of this study was to identify potential antepartum predictors of levator avulsion.

MATERIALS AND METHODS

A total of 488 nulliparous women were recruited in the antenatal clinic of a tertiary hospital during May 2005 through February 2008. The inclusion criteria were: (1) singleton pregnancy between 34-36 weeks of gestation; (2) maternal age ≥ 18 years; and (3) no previous pregnancies >20 weeks of gestation. An invitation letter was sent and all potential participants were contacted by telephone about a week later. An appointment was arranged at around 36-38 weeks for those interested in participating. All participants were contacted again by telephone around 3-4 months after the estimated delivery date and were invited to attend a second assessment.

Written consent was obtained at the first appointment. All women underwent an interview. The ethnicity of all 4 grandparents and a family history of cesarean section (mother or sister) were recorded. Maternal height and weight were measured to determine the body mass index (BMI). All women underwent a 4-dimensional translabial ultrasound examination in the supine position after bladder emptying, using a GE Voluson

From the Department of Obstetrics and Gynecology, Nepean Clinical School, University of Sydney, and Nepean Hospital, Sydney, New South Wales, Australia.

Presented orally in abstract form by Dr Dietz at the 39th Annual Meeting of the International Continence Society, San Francisco, CA, Sept. 29-Oct. 3, 2009.

Received July 15, 2009; revised Sept. 5, 2009; accepted Nov. 18, 2009.

Reprints: Ka Lai Shek, MBBS, FHKAM, Nepean Clinical School, Nepean Campus, University of Sydney Nepean Hospital, Sydney, NSW 2750 Australia. shekkalai@yahoo.com.hk.

The study was funded by the Betty Byrne Henderson Foundation, Brisbane, Queensland, Australia.

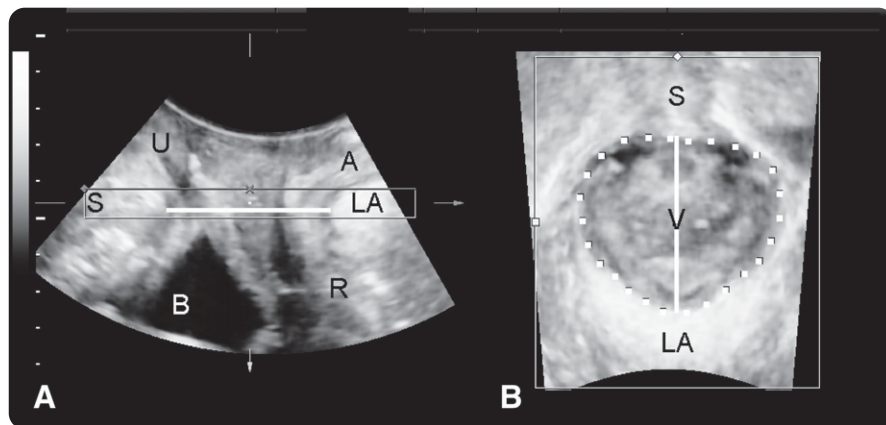
0002-9378/\$36.00

© 2010 Mosby, Inc. All rights reserved.

doi: 10.1016/j.ajog.2009.11.038

FIGURE 1

Determination of plane of minimal hiatal dimensions on translabial 4-dimensional ultrasound



Plane of minimal hiatal dimensions, defined as minimal distance between hyperechogenic posterior aspect of symphysis pubis (S) and hyperechogenic anterior border of levator ani muscle (LA) just posterior to anorectal angle, is represented by **A**, horizontal white line in midsagittal plane. **B**, Representation of exactly this cross section of volume is shown in axial plane. **B**, Vertical line is identical to **A**, horizontal line, both representing minimal hiatal diameter. Hiatal diameters, circumference, and area as well as bony arc length are measured in axial plane.

A, anal canal; B, bladder; R, rectum; U, urethra; V, vagina.

Shek. Can levator avulsion be predicted antenatally? *Am J Obstet Gynecol* 2010.

730 Expert system (GE Medical Systems, Zipf, Austria) with 8- to 4-MHz curved array volume transducer (acquisition angle 85 degrees) as described previously.¹⁷ Volume acquisition was performed at rest, on maximum Valsalva maneuver, and on maximum pelvic floor muscle contraction. At least 3 Valsalva maneuvers were performed for each patient. The volume data of the best Valsalva maneuver (ie, the Valsalva resulting in the greatest degree of pelvic organ descent) were used for analysis. Bladder neck position relative to the inferoposterior margin of the pubic bone at rest and on Valsalva was measured. The difference between these 2 measurements yielded a numerical value for bladder neck descent (BND).¹⁸ The subpubic arch angle was measured in the axial plane where the pubic arch was most clearly visible. Since this parameter has not been measured by ultrasound previously, we performed a test retest series of 21 data sets, blinded to measurement of the other observer. The intraclass correlation was 0.45 (95% confidence interval, -0.1 to 0.78) suggesting moderate correlation only.

The ultrasound assessment was repeated at the postpartum appointment at which time the assessor was blinded to all delivery data, with the patient's abdomen covered by a sheet. Women were asked not to divulge any information regarding their delivery until after the assessment. Data analysis was performed on a computer using proprietary software (4D View, Version 5.0; GE Medical Ultrasound Kretz GmbH, Zipf, Austria) several months after the ultrasound assessment. Ultrasound analysis was performed blinded to all patient data.

Hiatal anteroposterior and coronal diameters, circumference, and areas were measured at the plane of minimal hiatal dimension as defined in the midsagittal plane, evident as the minimal distance between the hyperechogenic posterior aspect of the symphysis pubis and the hyperechogenic anterior border of the levator ani muscle just posterior to the anorectal muscularis (represented by horizontal white line in Figure 1, A).¹⁹ With 4D View software used for 3-dimensional analysis, this plane is defined in the midsagittal orthogonal plane,

which then allows representation of exactly this cross section of the volume in the axial plane for measurement of hiatal dimensions. Our method of obtaining hiatal dimensions has been published previously¹⁹ and its reproducibility has since been confirmed by others.^{20,21}

To determine muscle strain, a component of elasticity, we also measured the bony arc length (ie, the nonelastic part of the hiatal circumference). This was subtracted from the hiatal circumference to obtain the muscular component of the levator hiatus. Muscle strain on maximum Valsalva and on contraction were calculated as a change in muscle length relative to the resting state as previously described.²²

Volumes on pelvic floor contraction, or at rest in those patients unable to contract, were used for the assessment of muscle integrity. Tomographic ultrasound imaging was used to diagnose levator avulsion, with slices obtained in the axial plane at 2.5-mm slice intervals, from 5 mm below the plane of minimal hiatal dimensions to 12.5 mm above that plane, to encompass the entire puborectalis muscle (Figure 2).²³ Levator avulsion was diagnosed if at least 2 of the central 3 slices (reference slice and the slices 2.5 mm and 5 mm cranial [ie, slices 3-5 in Figure 2]) showed a clearly abnormal muscle insertion, a methodology that has been validated against pelvic organ support data.²⁴ Good repeatability of the sonographic diagnosis of levator avulsion ($\kappa \geq 0.7$) has been demonstrated by the authors and others.^{23,25,26}

Delivery and postdelivery data were collected from the hospital database and/or participants' records. The study was performed in the context of a larger parent study investigating predictors of delivery mode. The parent study was approved by the Sydney West Area Health Service Human Research Ethics Committee (05/004). Maternal age, family history of cesarean section (as a measure of difficult delivery), ethnicity, BMI, subpubic arch angle, BND, hiatal areas, the ratio of hiatal anteroposterior diameter to coronal diameter at rest (hiatal index), and hiatal muscle strain on Valsalva and on contraction were correlated with the diagnosis of levator avulsion.

Download English Version:

<https://daneshyari.com/en/article/3435998>

Download Persian Version:

<https://daneshyari.com/article/3435998>

[Daneshyari.com](https://daneshyari.com)