GYNECOLOGY

Atraumatic normal vaginal delivery: how many women get what they want?

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BACKGROUND: Trauma to the perineum, levator ani complex, and anal sphincter is common during vaginal childbirth, but often clinically underdiagnosed, and many women are unaware of the potential for long-term damage.

OBJECTIVE: In this study we use transperineal ultrasound to identify how many women will achieve a normal vaginal delivery without substantial damage to the levator ani or anal sphincter muscles, and to create a model to predict patient characteristics associated with successful atraumatic normal vaginal delivery.

STUDY DESIGN: This is a retrospective, secondary analysis of data sets gathered in the context of an interventional perinatal imaging study. A total of 660 primiparas, carrying an uncomplicated singleton pregnancy, underwent an antepartum and postpartum interview, vaginal exam (Pelvic Organ Prolapse Quantification), and 4-dimensional translabial ultrasound. Ultrasound data were analyzed for levator trauma and/or overdistention and residual sphincter defects. Postprocessing analysis of ultrasound volumes was performed blinded against clinical data and analyzed against obstetric data retrieved from the local maternity database. Levator avulsion was diagnosed if the muscle insertion at the inferior pubic ramus at the plane of minimal hiatal dimensions and within 5 mm above this plane on tomographic ultrasound imaging was abnormal, ie the muscle was disconnected from the inferior pubic ramus. Hiatal overdistensibility (microtrauma) was diagnosed if there was a peripartum increase in hiatal area on Valsalva by >20% with the resultant area ≥25 cm^2. A sphincter defect was diagnosed if a gap of >30 degrees was seen in ≥4 of 6 tomographic ultrasound imaging slices bracketing the external anal sphincter. Two models were tested: a first model that defines severe pelvic floor trauma as either obstetric anal sphincter injury or levator avulsion, and a second, more conservative model, that also included microtrauma.

RESULTS: A total of 504/660 women (76%) returned for postpartum follow-up as described previously. In all, 21 patients were excluded due to inadequate data or intercurrent pregnancy, leaving 483 women for analysis. Model 1 defined nontraumatic vaginal delivery as excluding operative delivery, obstetric anal sphincter injuries, and sonographic evidence of levator avulsion or residual sphincter defect. Model 2 also excluded microtrauma. Of 483 women, 112 (23%) had a cesarean delivery, 103 (21%) had an operative vaginal delivery, and 17 (4%) had a third-/fourth-degree tear, leaving 251 women who could be said to have had a normal vaginal delivery. On ultrasound, in model 1, 27 women (6%) had an avulsion and 31 (6%) had a residual defect, leaving 193/483 (40%) who met the criteria for atraumatic normal vaginal delivery. In model 2, an additional 33 women (7%) had microtrauma, leaving only 160/483 (33%) women who met the criteria for atraumatic normal vaginal delivery. On multivariate analysis, younger age and earlier gestation at time of delivery remained highly significant as predictors of atraumatic normal vaginal delivery in both models, with increased hiatal area on Valsalva also significant in model 2 (all $P \leq .035$).

CONCLUSION: The prevalence of significant pelvic floor trauma after vaginal child birth is much higher than generally assumed. Rates of obstetric anal sphincter injury are often underestimated and levator avulsion is not included as a consequence of vaginal birth in most obstetric text books. In this study less than half (33–40%) of primiparous women achieved an atraumatic normal vaginal delivery.

Key words: birth trauma, levator avulsion, obstetric anal sphincter injury, pelvic organ prolapse, ultrasound

Introduction

Trauma to the anal sphincter (obstetric anal sphincter injury [OASI]) is a well-known complication of vaginal childbirth with a quoted incidence of 4–6.6%.[1] The short-term effects of OASI can include pain, infection, dyspareunia, and sexual dysfunction, with the main long-term effect being anal incontinence.[2] Nevertheless, rates of diagnosis at the time of injury are poor, and the injury may be occult.[3,4]

Likewise, pelvic floor trauma due to childbirth can also involve levator ani muscle injury, which has a quoted incidence of 10–36%.[5,6] One form of such trauma is levator avulsion, described as a traumatic separation of the puborectalis muscle from its insertion at the superior pubic ramus, which typically occurs at the time of crowning of the fetal head during vaginal delivery of the first child.[7,8] Even more so than with OASI, recognition of injury at the time of delivery is problematic, although perineal and vaginal tears have recently been shown to be clinical markers of levator avulsion.[9] Levator trauma may also present as irreversible overdistention of the levator ani complex, termed "microtrauma." Microtrauma has been defined as an increase in peripartum hiatal area on Valsalva >20% with a resulting area ≥25 cm^2.[10] Both forms of levator injury play an important role in both the development of pelvic organ prolapse[11] and its recurrence.[12,13]

Predictive modeling of levator trauma and/or OASI has attempted to identify which women are at risk of pelvic floor trauma at the time of birth.[4,6,10,14] The use of ultrasound at the time of investigation has allowed a more accurate assessment of pelvic floor damage.[15] However, despite improved diagnosis of

Cite this article as: Caudwell-Hall J, Kamisan Atan I, Guzman Rojas R, et al. Atraumatic normal vaginal delivery: how many women get what they want? Am J Obstet Gynecol 2018;219:379.e1-8.

0002-9378/$36.00
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https://doi.org/10.1016/j.ajog.2018.07.022

AJOG at a Glance

Why was this study conducted?

It is assumed that pregnant women benefit from a normal vaginal delivery, and that normal vaginal delivery is the least traumatic way to give birth. We wanted to study the incidence of severe pelvic floor damage in normal vaginal delivery and try to create a predictive model for atraumatic normal vaginal delivery.

Key findings

Only 33−40% of the women in our study had an atraumatic normal vaginal delivery; younger age, larger hiatal area, and earlier gestation were associated with no trauma.

What does this add to what is known?

To our knowledge, this is the first study to attempt to create a predictive model for atraumatic normal vaginal delivery (as diagnosed on ultrasound).

pelvic floor birth trauma with the inclusion of postpartum imaging, accurate prediction of levator trauma and OASI, especially antenatal prediction, still remains challenging.[6,16,17] Another useful method for decreasing rates of pelvic floor trauma would be to abandon the prediction of levator trauma and OASI in favor of identifying those antenatal characteristics of women who successfully achieve an atraumatic normal vaginal delivery.

The World Health Organization defines normal birth as a low-risk pregnancy leading to a spontaneous, vertex delivery between 37−42 weeks of pregnancy that results in a healthy mother and child,[18] while the in the United Kingdom normal birth is spontaneous in both labor and delivery, but can include interventions such as augmentation of labor, artificial rupture of membranes (but not as part of a medical induction of labor), use of nitrous oxide or opioids, electronic fetal monitoring, or a managed third stage of labor.[19] In contrast, the current New South Wales Health policy, Towards Normal Birth, fails to define "normal birth" altogether, but instead focuses only on increasing the rates of vaginal delivery.[20] For the purposes of this study, we defined an atraumatic normal vaginal delivery as any vaginal delivery that was spontaneous, vertex, and did not result in permanent pelvic floor trauma in the form of levator avulsion, overdistention, or OASI.

Despite differences in the political definition of what constitutes normal birth, there is ample evidence that women themselves perceive normal vaginal delivery as desirable.[21,22] Furthermore, there is evidence that women may be much less risk averse than the clinicians looking after them. Turner et al[23] attempted to quantify the risk of morbidity from vaginal delivery that pregnant women would be prepared to accept before opting for an elective cesarean delivery. They found that while pregnant women (and their midwives) were much more tolerant of interventions such as episiotomy, perineal pain, and operative vaginal delivery (including the use of forceps) than clinicians, their willingness to trial vaginal delivery declined rapidly when faced with the prospect of emergency cesarean delivery or moderate to severe urinary or anal incontinence.[23]

In this study, we attempted to create a predictive model for an atraumatic normal vaginal delivery by examining the characteristics associated with women who successfully gave birth vaginally without intervention and/or major pelvic floor trauma as diagnosed at the time of delivery or on postpartum ultrasound.

Materials and Methods

This is an unplanned retrospective analysis of data sets of primiparous women seen in a randomized controlled trial undertaken in 2 tertiary obstetric units in Sydney, Australia. From July 2007 through March 2014, 660 patients were recruited through the antenatal clinic at participating hospitals and randomized into study arms examining if the use of a pelvic floor trainer could prevent levator ani trauma and/or OASI as diagnosed on transperineal ultrasound. The EpiNo device (Starnberg Medical, Sydney, Australia) is a perineal trainer that purports to stretch the pelvic floor muscles, thereby decreasing the risk of both perineal tears and the need for episiotomy. In all, 335 patients were randomized to use the device (with 269 returning for postpartum assessment) and 325 patients were randomized into the control group (with 235 returning for postpartum follow up). Inclusion criteria were as follows: (1) a nulliparous woman with no previous pregnancies ≥20 weeks' gestation, (2) a planned vaginal delivery, (3) a low-risk singleton pregnancy between 33−38 weeks' gestation, and (4) maternal age ≥18 years. After written consent was obtained, all participants underwent identical antenatal assessments consisting of a standardized interview; a clinical examination, including the Pelvic Organ Prolapse Quantification; and a 4-dimensional translabial ultrasound. Ultrasound imaging was performed in the supine position after bladder emptying using GE Voluson 730 Expert or E8 systems (GE Medical Systems Kretz Ultrasound, Zipf, Austria) with 8- to 4-MHz curved-array volume transducer with an acquisition angle of 85 degrees as previously described.[24] Volumes were acquired at rest, on Valsalva, and at maximum pelvic floor muscle contraction (PFMC) (defined as the contraction leading to the most marked reduction in anteroposterior hiatal diameter), with at least 3 Valsalva volumes acquired for each patient. All patients were invited back for repeat assessment 3−6 months postpartum, which was performed with the patient's abdomen covered to safeguard blinding against delivery mode. Patients were requested not to divulge any information relating to their labor, delivery, or outcome until after the completion of the examination.

Postprocessing of ultrasound volume data was performed on a desktop personal computer using proprietary

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