

THE RELATIONSHIP BETWEEN MATERNAL AGE AT FIRST DELIVERY AND PELVIC FLOOR TRAUMA

Hypothesis / aims of study

There has been a marked increase in the age of women giving birth to their first child in developed countries. A number of studies have shown a higher risk of adverse outcomes such as miscarriage, pre-eclampsia, small for gestational age, gestational diabetes mellitus and Cesarean section with advancing maternal age(1). While there is some evidence of a higher risk of trauma to obstetric anal sphincter and the levator ani muscle (LAM) with advancing age, findings to date are inconclusive. The aim of this study was to assess the risk of pelvic floor injury using 3D/4D ultrasound relative to advancing maternal age in primiparous women after singleton vaginal delivery at term and to define statistical relationships between maternal age and obstetric anal sphincter injuries (OASIS), levator avulsion and irreversible overdistension of the levator hiatus.

Study design, materials and methods

This is a prospective observational study utilising data sets of primiparous women recruited in the context of a perinatal intervention trial. Between July 2007 and September 2013, 660 patients carrying an uncomplicated singleton pregnancy were seen at a tertiary unit at mean gestation of 35.6 (range 31.6-37.6) weeks. They all underwent an interview and 4D translabial pelvic floor ultrasound both ante- and postnatally for assessment of the levator ani (2) and anal sphincters (3). Postprocessing analysis of ultrasound volumes was performed blinded against all clinical data and analysed against obstetric data retrieved from the local maternity database. Levator avulsion was diagnosed on tomographic ultrasound as previously described (2), and 'significant hiatal overdistension' was defined as a peripartum increase of 20% in hiatal area measured in the axial plane of minimal hiatal dimensions (2) to 25 cm² or more, excluding concomitant avulsion. The anal sphincter was assessed with tomographic ultrasound in the coronal plane (3). Logistic regression analysis was performed to examine the association between maternal age and risk of pelvic floor damage on ultrasound including LAM avulsion, a significant increase in hiatal area on valsalva by 20% (hiatal overdistension or 'microtrauma') to 25 cm² or more, and OASIS. We included multiple confounders, and the most significant (Forceps and Vacuum delivery) were used for probability modelling. We did not undertake post- hoc power calculations for this particular sub-analysis, but they had been performed for the parent trial.

Results

A total of 498/660 women (75.5%) returned for a follow-up appointment at a mean interval of 5 months (SD 2.5). Mean age was 30.8 years (range 18.8 – 45.3), mean Body Mass Index (BMI) was 28.6 (range 18.0 -28.6) at time of recruitment, and mean gestation at delivery 39.8 (range 36.0- 42.2) weeks. Mean birth weight was 3.45 (range 2.2- 5.0) kgs. In 5 women we were unable to retrieve US data sets or imaging was unsatisfactory, and delivery record data was missing in 6 subjects. Of the remainder, 112 (23%) women had a caesarean section, therefore a total of 375 women were analysed who had a vaginal delivery. Those 375 women were delivered by NVD (n= 269, 72%), Vacuum (n=69, 18%) or Forceps (n=37, 10%). Mean length of first stage was 455 min (SD 267), and mean 2nd stage was 80 min (SD 67).

	Odds Ratio	Confidence Intervals	P value
Overall Injury*	1.064	1.021 – 1.108	0.003
Levator ani avulsion	1.050	0.996 – 1.108	0.07
Hiatal overdistension	1.058	1.0 – 1.125	0.07
OASIS*	1.038	0.989 – 1.089	0.13

Table 1: Logistic regression of maternal age and pelvic floor trauma by 3D/4D US in primiparae after a first vaginal birth. Odds ratios are given per year of age (n=375 exc. *361)

Of those who had a vaginal delivery, we diagnosed levator avulsion in 70/375 (18.7%), hiatal over- distension to 25 cm² or more in 48/375 (12.8%) and OASIS in 88/361 (24.4%; missing data in 14). 174 women (46.4%) showed evidence of at least one form of major pelvic floor trauma. The associations between maternal age and different forms of pelvic floor trauma are summarised in Table 1.

On adjusting for potential confounding factors such as trial group allocation, gestational age at delivery, BMI, birth weight and head circumference in a multivariate regression analysis (backwards elimination strategy) the significant relationship between age and pelvic floor trauma was confirmed (p=0.05). The trial intervention was not a confounder for the relationship between age and injury. The data was sub-analysed for each type of vaginal delivery and estimated probability of any major injury and each type of trauma. This is summarised in Figure 1.

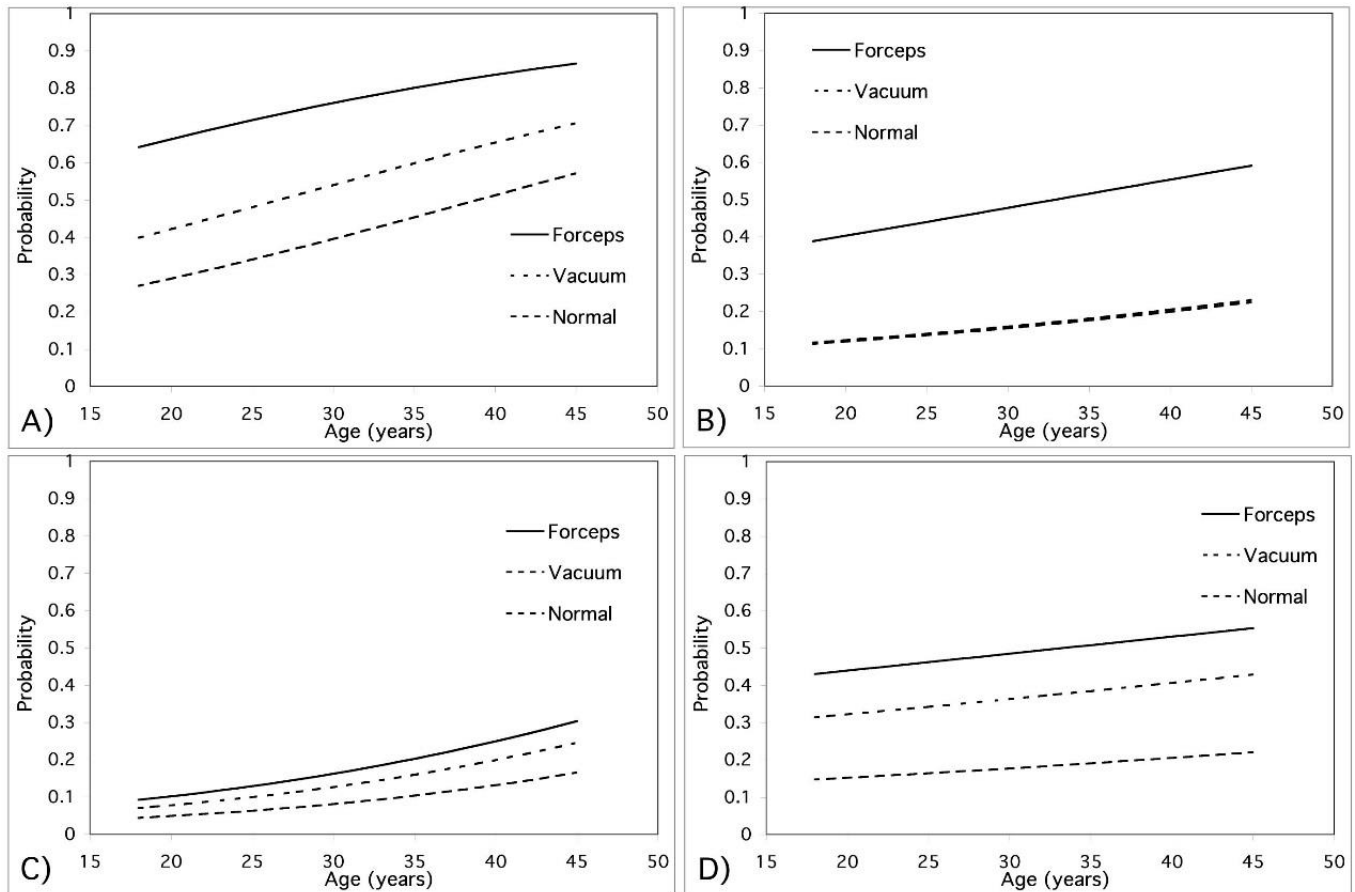


Figure 1: Estimated probability of A) Any major injury B) Levator ani avulsion C) Hiatal over-distension and D) OASIS, as function of age for each mode of vaginal delivery (n=375).

Interpretation of results

Pelvic floor trauma is very common in our population, affecting 46% of vaginally parous primiparae seen at an average of 5 months postpartum. Most such trauma is never diagnosed, and never treated. Advancing age is a major risk factor for multiple negative outcomes in obstetrics, and this also seems to be true for indicators of pelvic floor trauma identified using translabial 4D ultrasound.

With advancing maternal age at first delivery there is an incremental risk of major pelvic floor trauma at 5 months follow up. With an Odds ratio of 1.064 for overall risk of injury for each year of age, a 40 year old nulliparous woman is at a 346% (1.064^{20}) higher odds of injury compared to an 20 year old nulliparous woman. The probability of any type of trauma appears to be substantially higher for forceps delivery. Vacuum delivery appears to increase the risk of OASIS, but not of levator avulsion.

Concluding message

There is a significant association between the risk of major pelvic floor injury and increasing age at first delivery. This may be the result of changing tissue biomechanical properties. The likelihood of permanent pelvic floor trauma needs to be considered in women having their first delivery at a more advanced age.

References

1. Khalil A, Syngelaki A, Maiz N, Zinevich Y, Nicolaidis KH. Maternal age and adverse pregnancy outcome: a cohort study. *Ultrasound Obstet Gynecol* 2013; 42: 634–643.
2. Dietz HP. Pelvic floor ultrasound in prolapse: what's in it for the surgeon?. *Int Urogynecol J* 2011; 22: 1221-1232.
3. Guzman Rojas RA, Shek KL, Langer SM, Dietz HP. Prevalence of anal sphincter injury in primiparous women. *Ultrasound Obstet Gynecol* 2013; 42: 461-466.

Disclosures

Funding: Ozwac **Clinical Trial:** No **Subjects:** HUMAN **Ethics Committee:** Nepean Blue Mountains Local Health District Human Research Ethic Committee **Helsinki:** Yes **Informed Consent:** Yes