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IMPACT OF CHILDBIRTH AND MODE OF DELIVERY ON PELVIC FLOOR MUSCLE STRENGTH: A COMPARATIVE PROSPECTIVE STUDY.

Hypothesis / aims of study

The most established risk factor for pelvic floor dysfunction is vaginal delivery and especially instrumental birth (1). The pelvic floor muscles (PFM), in particular the levator ani, plays a significant role for pelvic organ support, and during vaginal delivery the pubococcygeous part of this muscle undergo a stretch estimated to three times its own length (2). When striated muscles are forcibly stretched general muscle weakness and injury may occur resulting in reduced ability to contract. To date there is still scant knowledge regarding strength reduction in the PFM in relation to delivery mode. The aim of the present study was to measure vaginal resting pressure, PFM strength and endurance at gestational week 22 and six week post partum. Further on investigating the difference between vaginal delivery, caesarean section, and instrumental delivery on those measures.

Study design, materials and methods

This comparative study took place at a university hospital from January 2010 to March 2011. 147 primiparous women were included in gestation week 18-22 for the first study visit, and seen again at six-eight weeks post partum. Inclusion criteria were ability to speak and understand the native speaking language. Exclusion criteria were multiple pregnancies or premature birth < 32 weeks. Ongoing exclusion criteria were miscarriage or still birth.

Clinical assessments of ability to contract the PFM were done by observation and vaginal palpation. Measurement of vaginal resting pressure, PFM strength and endurance was undertaken by a vaginal balloon connected to a pressure transducer. The method has been found to be reliable and valid if used with simultaneous observation of inward movement of the perineum/catheter (3). Data on delivery mode was collected from the hospital's electronic medical record. Other background data were collected through an electronic questionnaire following the participants' first study visit.

Statistical analysis was performed using SPSS version 15. Background variables are presented as frequencies and means with standard deviations (SD). Data for vaginal resting pressure, PFM strength and endurance did not show normal distribution (Kolmogorov-Smirnov and Shapiro-Wilk tests). Differences in measurements going from gestational week 22 to 6 weeks post partum were analysed using Wilcoxon signed rank test, and Mann-Withney U test when analysing differences between delivery modes at six weeks post partum. P-values < 0.05 were considered significant.

Results

Of the 147 women enrolled, twelve were lost to follow-up (four gave birth at another hospital, seven did not want to continue, one had a still birth), The remaining 135 women, had a mean age of 28.6 years (SD 4.3). Prepregnancy body mass index (BMI) was 24.0 kg/m^2 (SD 4.1). 93.3% of the women were married or cohabitant and 75.6% had a university or college degree. 84.4% delivered vaginally, 13.3 % had a vaginal instrumental delivery (1.5% with forceps, 11.9% with vacuum) and 15.6% had caesarean section (3.7% of those were elective). Going from gestational week 22 to 6 weeks post partum (n=135) vaginal resting pressure was reduced by 10.6 cm H_2O (CI 95%: 9.1-12.0), PFM strength by 15.0 H_2O (CI 95%: 12.6-17.5) and endurance by 95.8 cm H_2O (CI 95%: 78.3-113.4), p=0.000 for all measures. Measurements at six weeks post partum showed that women who delivered by c-section had significantly higher vaginal resting pressure, higher PFM strength, and higher endurance when compared to those who delivered vaginally (Table 1). The difference between non-instrumental vaginal deliveries vs. instrumental vaginal deliveries during the same observation period was statistically significant in favour of the non-instrumental group for PFM strength, but not for endurance and resting pressure (Table 1).

Table 1. Differences in vaginal resting pressure, PFM strength and endurance between different delivery modes at 6 weeks post partum.

Variable	SC, n=21 Mean (SD)	VD, n= 114. Mean (SD)	SC vs. VD Mean diff (CI, 95%)	P*	Non-IVD, n=97. Mean (SD)	IVD, n= 18. Mean (SD)	Non-IVD vs. IVD Mean diff (CI, 95%)	P*
Vag. resting pressure; cm H_2O	37.4 (11.8)	29.2 (7.8)	8.2 (2.6-13.7)	0.002	29.2 (6.6)	30.2 (13.4)	- 1.0 (-7.7-5.8)	0.627
PFM strength; cm H_2O	31.4 (17.0)	15.0 (13.1)	16.5 (8.4-24.5)	0.000	16.2 (13.8)	9.4 (6.6)	6.7 (0.1-13.3)	0.013
PFM endurance; cm H_2O sec.	207.1 (145.6)	101.4 (82.8)	105.7 (38.0-173.5)	0.000	107.9 (86.2)	67.7 (47.7)	40.2 (-1.2-81.7)	0.057

VD = vaginal delivery; SC = caesarean section; IVD = instrumental vaginal delivery with vacuum or forceps, Non-IVD = vaginal delivery without vacuum or forceps

*Mann-Whitney U test

Interpretation of results

There was a significant reduction in all measured aspects of PFM function from gestational week 22 to 6-8 weeks post partum. Vaginal resting pressure, PFM strength and endurance were reduced by 25%, 46%, 45 % respectively. Vaginal delivery had a significantly greater impact on vaginal resting pressure, pelvic floor muscle strength and endurance when compared with caesarean section. Similar, but less pronounced results were found for PFM strength when comparing non-instrumental versus instrumental vaginal delivery. We could not investigate the impact of forceps versus vacuum, or elective versus emergency c-sections as the sample did nor reveal enough cases within each category. In addition to a general weakness of the muscles due to excessive stretching during childbirth, muscle-, peripheral nerve- and connective tissue injuries may play an important role in reduction of PFM function. So far, there is scant knowledge about the association between diagnosed injuries and PFM function. The evidence regarding effect of postpartum PFMT in prevention and treatment of pelvic floor dysfunction is conflicting, and there is still a need of high quality randomized controlled trials addressing this topic. To which degree injured PFM respond to training is still not known.

Concluding message

Using a reliable and valid measurement method this study found a statistically significant reduction in vaginal resting pressure, PFM strength and endurance at 6-8 weeks postpartum. Vaginal delivery and instrumental delivery resulted in significantly greater reduction in PFM function.

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Was the Declaration of Helsinki followed?	**Yes**
Was informed consent obtained from the patients?	**Yes**