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DOES PREGNANCY AFFECT AFFECT PELVIC FLOOR FUNCTIONAL ANATOMY?

Hypothesis / aims of study

Pregnancy and childbirth are the main etiological factors in the pathogenesis of female pelvic floor dysfunction. Most macroscopically visible trauma damage seems to occur at crowning of the fetal head, especially in the form of levator and anal sphincter trauma, with Forceps being the main risk factor (1). However, pregnancy itself is also likely to have an effect, which may be hormonal or mechanical in nature. Women who have exclusively delivered by Caesarean Section (CS), without any attempt at vaginal delivery, are an interesting group for investigation since altered pelvic floor functional anatomy in this group is likely to be due to the effect of pregnancy, rather than childbirth. This study aimed to investigate pelvic organ support and pelvic floor function by comparing nulliparous women with those delivered only by CS.

Study design, materials and methods

This was a retrospective study using 266 archived data sets of vaginally nulliparous patients (identified in a database of 2930 patients) who presented to our urodynamic service with symptoms of pelvic floor dysfunction between 2006 and 2014. Patients had undergone an interview, ICS POP-Q and 3D/4D translabial ultrasound (TLUS) examination, supine and after voiding, using Voluson 730 Expert and Voluson S6 systems (2). Hiatal dimensions, pelvic organ descent at maximum Valsalva (Figure 1) and pelvic floor muscle function on pelvic floor muscle contraction (PFMC) were analyzed offline at a later date (3) on a desktop PC, using proprietary software, blinded against all other data.

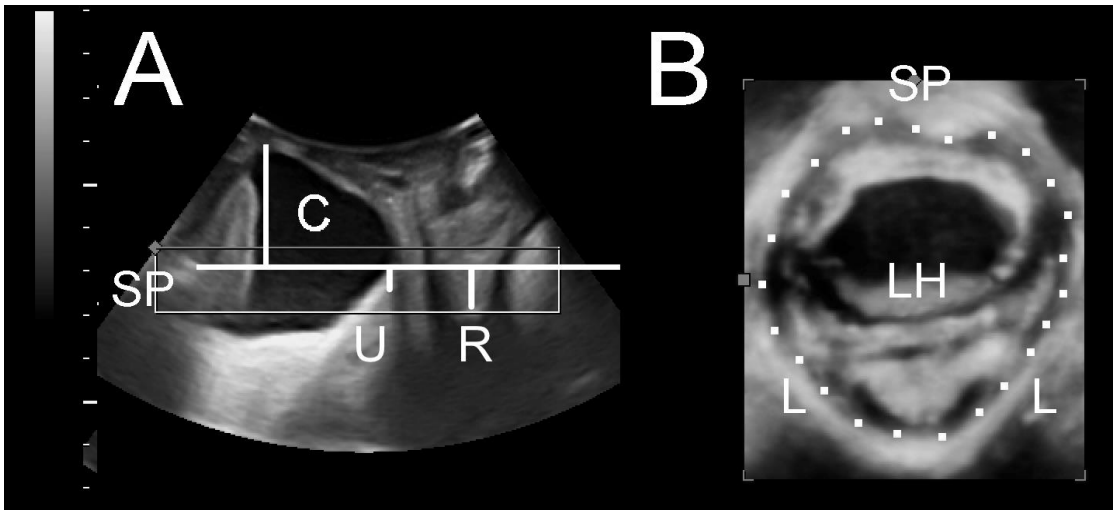

Figure 1: Determination of pelvic organ descent (A) and hiatal area (B). Pelvic organ descent, in this case a cystocele to 3 cm below the symphysis, and uterine descent to 0.5 cm above the symphysis, is measured against a horizontal reference line placed through the inferior symphyseal margin. Hiatal area on Valsalva is determined either in the axial plane of minimal hiatal dimensions, or in a rendered volume encompassing this plane. SP= symphysis pubis, C= cystocele, U= uterus, R= rectal ampulla, L= levator ani, LH= levator hiatus.

Results

266 women without previous vaginal delivery (i.e nulliparous or only Caesarean delivery) were seen during the study period. 24 were excluded due to missing US volumes, leaving 242, to whom subsequent results pertain. Valsalva US volumes were missing in 7 patients due to operator error, and similarly 6 patients had missing volume on PFMC. Therefore TLUS volume analysis for pelvic organ descent and pelvic floor function were possible in 235 and 236 patients respectively. Mean age was 49 (range 17-89) years with mean BMI of 29 (range 16-59) kg/m^2. A total of 129 (53%) women were nulliparous, and another 113 (47%) had Caesarean births only. Of the latter, 31 (27%), 53 (47%) and 29 (26%) had one, two and three or more C/S deliveries, respectively with a median parity of 2 (range 1-5). Due to the remote nature of these events for most patients, we did not attempt to distinguish between elective, first or second stage C/S to avoid recall bias. 38 (15.8%) had had a previous hysterectomy and 12 (5%) had incontinence / prolapse surgery. 66% (n=159), 66% (n=159), 40.2% (n=97), 47% (n=113) and 27.5% (n=66) presented with stress (SI) and urge incontinence, frequency, nocturia and symptoms of voiding dysfunction respectively. 23.6% (n=57) complained of symptoms of prolapse. Urodynamic stress incontinence (USI) and detrusor overactivity were demonstrated in 54.7% (n=109) and 30.7% (n=61) respectively. 19.6% (n=39) had objective voiding dysfunction. Mean urethral pressure was 52 (SD 24.7, range 5-125) cmH_2O. The two groups (nulliparae and C/S deliveries only) were similar for demographic parameters except for age (P=0.02) and the prevalence of SI (P<0.001) and USI (P=0.04) which were all higher in the CS group. On imaging, there were significant differences in all measured parameters between the two groups, with the nulliparae showing evidence of less pelvic organ mobility and distensibility of pelvic floor structures; see Table 1. All sonographic measures of PFM function in the C/S only group demonstrated greater tissue displacement on PFMC (Table 2).

Parameter	C/S only n=113	Nulliparae n=129	Mean difference (95% CI)	P
Pelvic organ descent (mm)				
- Bladder neck	19.7 (SD10.9)	13.7 (SD9.2)	6.0 (3.4-8.6)	<0.001
- Bladder*	9.1 (SD12.9)	14.6(SD11.5)	-5.5 (-8.7 to -2.4)	0.001
- Uterus*	19.1 (SD12.2)	22.6 (SD11.8)	-3.5 (-6.6 to -0.4)	0.03
- Rectal ampulla*	0.8 (SD15.6)	5.5 (SD15.4)	-4.8 (-8.8 to -0.8)	0.02
Hiatal area on Valsalva (cm^2)	20.0 (SD7.8)	17.2 (SD7.0)	2.84 (0.9 to -4.8)	0.004

*Table 1: Univariate analysis (t- test) showing pelvic organ support and hiatal area on Valsalva. All parameters were normally or near-normally distributed. *Lower values signify more descent towards/ beyond the symphyseal margin*

Pelvic floor function	C/S only n=113	Nulliparae n=129	Mean difference (95% CI)	P
- Bladder neck displacement (cranioventral, mm)	7.0 (SD4.1)	5.8 (SD3.7)	1.2 (0.2 – 2.2)	0.02
- Reduction in AP hiatal diameter (mm)	9.3 (SD5.1)	7.3 (SD5.8)	2.1 (0.7 – 3.5)	0.004
- Hiatal area reduction on PFMC (cm^2)	3.3 (SD2.0)	2.4 (SD1.5)	0.9 (0.5 – 1.34)	<0.001

Table 2: Univariate analysis (t-test) showing sonographic measures of pelvic floor function.

On multivariate analysis controlling for potential confounders associated with measures of functional pelvic floor anatomy, such as BMI, history of hysterectomy and incontinence or prolapse surgery, all associations remained significant except for descent of the rectal ampulla (P=0.43) and hiatal area on Valsalva (P=0.08)

Interpretation of results

All measures of pelvic organ descent on Valsalva and of tissue displacement on PFMC were higher in women delivered exclusively by C/S than in nulliparae, implying increased elasticity/ compliance or reduced tissue stiffness. This is consistent with a hormonal and/or mechanical effect of pregnancy on the biomechanical properties of soft tissues involved in pelvic organ support.

Concluding message

Pregnancy seems to have a distinct effect on pelvic floor functional anatomy, which may be independent of the well- defined effect of vaginal childbirth.

References

1. BJOG, 2013. 120(10): p. 1277-84.
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Disclosures

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