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IS PELVIC ORGAN MOBILITY ASSOCIATED WITH PERIPHERAL LIGAMENTOUS LAXITY DURING PREGNANCY?

Hypothesis / aims of study

The main risk factor reported for pelvic floor disorders (PFD) occurrence is vaginal delivery in opposition to cesarean section. However, pregnancy itself could induce PFD. In pregnant women, increased pelvic organ mobility and ligamentous laxity are described and may explain some PFD [1]. This could be related to changes in elastic properties of musculo-ligamentous tissues in pregnant women. We hypothesize that taking into account biomechanical parameters of pregnant women could improve our PFD prediction.

Our primary endpoint was to analyze correlation between ligamentous laxity and levator hiatus (LH) area on Valsalva as well as LH distension (between rest and Valsalva) during pregnancy. Our secondary endpoint was to look for an association between ligamentous laxity and: bladder neck descent, pelvic organ prolapse quantification system (POP-Q) parameters and PFD during pregnancy.

Study design, materials and methods

Monocentric prospective cohort with a visit planned at each trimester of pregnancy. Only data from women who participated to the three visits were further analyzed. Each visit contains pelvic floor and ligamentous laxity assessments. Stress urinary incontinence (SUI) was considered if one of the following circumstances of the International Consultation on Incontinence Questionnaire short-form was ticked: “leaks when you cough or sneeze”, or “leaks when you are physically active/exercising”. Pelvic organ prolapse (POP) related symptoms were considered in case of a score different from 0 for the POP section of the Pelvic Floor Distress Inventory-20 questionnaire. Pelvic floor was clinically assessed with the POP-Q system (POP of stage 2 or more were considered) and with perineal ultrasound for LH area and bladder neck descent. LH distension was the difference between LH area on Valsalva and LH area at rest. Ligamentous laxity was assessed with a measure of passive extension of the non-dominant index finger for 0.26 N.m applied to the second metacarpo-phalangeal joint (MCP laxity). We looked for changes in studied parameters during pregnancy. We searched for a correlation between MCP laxity and other measures using a mixed linear regression for quantitative variables and a mixed logistic regression for qualitative variables. The study was approved by our Institutional Review Board.

Results

26 women accomplished the entire follow-up. During pregnancy LH area (at rest and Valsalva) significantly increase whereas the increase of LH distension and urethral descent did not reach significance. We reported a caudal shift of anterior and posterior POP-Q points and an increase of POP-Q segments (Table 1). LH distension and MCP laxity were correlated during pregnancy whereas MCP laxity and urethral mobility were not. We found a positive correlation between MCP laxity and LH area on Valsalva but it didn’t reach significance. During pregnancy none of correlations between ligamentous laxity and POP-Q point’s positions or POP-Q segment’s length reached significance (Table 2). The prevalence of SUI increase from 42.3% at first trimester to 57.7% at the third trimester (p=0.08), from 11.5% to 34.6% for the POP prevalence (p=0,14) and the POP related symptoms prevalence did not change from the first (61.5%) and the thrird trimester (61.5%). POP related symptoms were not significantly associated with MCP laxity (correlation’s coefficient = 0.1; p=0.07). SUI was not associated with MCP laxity (correlation’s coefficient = -0.26; p=0.582).

Table 1: Pelvic floor and ligamentous laxity changes during pregnancy (N=26).

	1st trimester mean (sd)	2nd trimester mean (sd)	3rd trimester mean (sd)	p
Ligamentous laxity				
Metacarpo-phalangeal laxity, °	43.3 (15)	52.5 (11.3)	53.6 (12)	0.001
Ultrasound				
LH area at rest, cm^2	14.4 (2.4)	16.9 (3)	18.5 (3.3)	<0.0005
LH area on Valsalva, cm^2	18.5 (3.6)	22.5 (4.9)	24.7 (5.8)	<0.005
LH distension, cm^2	4 (2.6)	5.6 (3.2)	6.2 (4)	0.19
Bladder neck descent, mm	10.8 (7.6)	12.4 (8.5)	13.3 (7.8)	0.07
POP-Q				
Aa position, cm	-2.3 (0.9)	-1.8 (1)	-1.5 (1.1)	<0.0005
Ap position, cm	-2.7 (0.6)	-2.3 (0.7)	-2.2 (0.9)	0.0004
C position, cm	-7.1 (1.7)	-6.8 (1.7)	-7.1 (1.6)	0.52
D position, cm	-8.3 (1.6)	-8 (1.6)	-8.1 (1.6)	0.66
tvl length, cm	9.6 (1.3)	10 (1.2)	10.4 (1.1)	0.0009
gh length, cm	3.9 (0.7)	4.3 (0.7)	4.6 (0.6)	<0.0005
pb length, cm	3.2 (0.5)	3.4 (0.6)	3.9 (0.6)	<0.0005

Table 2: Metacarpo-phalangeal laxity and ultrasound or POP-Q parameters during pregnancy

	% of variance explained by MCP laxity	Correlation coefficient with MCP laxity	p
Ultrasound parameters			
Levator Hiatus Distension	6.8	0.26	0.023
Levator Hiatus area on Valsalva	4.5	0.21	0.096
Bladder Neck Descent	0.3	0.06	0.71
POP-Q parameters			
Aa position	2.7	0.05	0.73
Ap position	6.8	0.26	0.086
C position	1.3	0.11	0.089
D position	-1	0.1	0.29
Tvl lenght	0.3	0.06	0.46
Gh lenght	-1,7	0.13	0.83
Pb lenght	-1,6	0.13	0.44

Interpretation of results

During pregnancy, we found an association between ligamentous laxity and LH distension. Considering the association between LH area and pelvic organ prolapse, this result is consistent with previous studies in non-pregnant women reporting an association between ligamentous laxity and pelvic organ prolapse [2, 3]. This supports the hypothesis of global changes in elastic properties of musculo-ligamentous tissues in pregnant women [2].

The absence of significant association between MCP laxity and POP-Q parameters and also between MCP laxity and PFD might be related to a lack of power of our study which is focused on LH assessment (primary endpoint). Further analyses will be necessary to assess correlations between ligamentous laxity and these parameters during pregnancy with an appropriate study's power for this endpoint. Currently, there is a lack of described techniques to assess pelvic floor elastic properties in pregnant women. Ligamentous laxity assessed at the metacarpo-phalangeal joint could then be useful to assess these elastic property changes especially because it is not subject to constraints exerted by fetal presentation or weight gain during pregnancy [1]. Indeed, some changes in elastic properties of the pelvic floor during pregnancy could be, at least partially, explained by a continuous solicitation made by the fetal presentation. By including biomechanical parameters of pregnant women in our risk analysis for PFD occurrence, we could take into account changes in elastic properties of the pelvic floor. This could lead to a personalized risk prediction of PFD.

Concluding message

LH distension and ligamentous laxity are associated during pregnancy, supporting the idea of global changes in elastic properties of musculo-ligamentous tissues in pregnant women. We could improve our PFD prenatal prediction by taking into account biomechanical parameters such as ligamentous laxity in pregnant women.

References

1. GACHON B, DESSEAUVE D, FRADET L, DECATOIRE A, LACOUTURE P, PIERRE F, FRITEL X. Changes in pelvic organ mobility and ligamentous laxity during pregnancy and postpartum. Review of literature and prospects. Prog Urol. 2016. DOI: 10.1016/j.purol.2016.02.001
2. VEIT-RUBIN N, CARTWRIGHT R, SINGH AU, DIGESU GA, FERNANDO R, KHULLAR V. Association between joint hypermobility and pelvic organ prolapse in women: a systematic review and meta-analysis. Int Urogynecol J. 2015; DOI: 10.1007/s00192-015-2896-1
3. DIETZ HP, SHEK C, DE LEON J, STEENSMA AB. Ballooning of the levator hiatus. Ultrasound Obset Gynecol. 2008;31:676-6

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