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OBSERVATIONAL STUDY ON POSTURAL AND BIOMECHANICAL PATTERNS IN PATIENTS UNDERGOING ROBOT ASSISTED RADICAL PROSTATECTOMY WITH AND WITHOUT STRESS URINARY INCONTINENCE

<u>Hypothesis / aims of study</u>

In humans, given the high prevalence and pathophysiology of benign prostatic hyperplasia and prostate cancer in adulthood, diseases that may require recourse to surgery, the SUI is mainly due to iatrogenic causes. 3%-10% of patients undergoing robotic radical prostatectomy (RRP) have a tendence to urinary incontinence (1). The aim of this study is to explore the presence of common postural and biomechanical patterns in patients with stress SUI undergoing robot assisted radical prostatectomy.

<u>Study design, materials and methods</u>

From January to October 2015, 62 patients (age 64.6 ± 5.3 yrs) were recruited post robot assisted radical prostatectomy (between 2013 and 2015). The sample was evaluated with the International Consultation on Incontinence Questionnaire short form (ICIQ) and 24-hours pad test. Patients underwent postural and biomechanical assessment using the following tests: One Leg Standing Test, Active Straight Leg Raise test, Patrick's Faber Test, palpation test of long dorsal sacroiliac ligament, clinical assesement of the lumbosacral angle, activation of transversus abdonimis and multifidus, the modified Oxford Scale for the pelvic floor muscles power (P) evaluation. Data was analysed using the t-student functions and Pearson's Coefficient.

<u>Results</u>

Of the 62 subjects, 32 were incontinent (SUI) and 30 non-incontinent. The compared data on the performance of the tests revealing a significant difference between subjects with and without SUI; particularly for the following tests: One Leg Standing Test (weight-bearing limb) (p<0.0001); Patrick's Faber test (p<0.0001); palpation test of long dorsal sacroiliac ligament (p<0.0001); clinical evaluation of the lumbosacral angle (p<0.0001); activation of transversus abdominis and multifidus (p<0.0001 and p<0.001).

Characteristic		**Overall (n=62)**	**Incontinent (n=32)**	**Non incontinent (n=30)**	**p**
Median Age (yrs)		64,66 ± 5,32	64,43 ± 5,24	65,3 ± 5,79	0,979
One Leg Standing Test (Arto Flesso)		n=25 (40,32%)	n=17 (53,12%)	n=8 (26,67%)	<0,05
One Leg Standing Test (Arto in Carico)		n=35 (56,45%)	n=29 (90, 62%)	n=6 (20%)	<0,0001
ASLR		n=11 (17,74%)	n=11 (34,37%)	n=0 (0)	<0,0001
Compression Test		n=39 (62,89%)	n=25 (78,12%)	n=14 (46,67%)	<0,0001
Distraction Test		n=21 (33,87%)	n=17 (53,12%)	n=4 (13,32%)	<0,001
Patrick's Faber Test		n=21 (33,87%)	n=18 (56,25%)	n=3 (10%)	<0,0001
Forme Closure	LLD	n=24 (38,69%)	n=20 (62,50%)	n=4 (13,32%)	<0,0001
	L5/S1	n=34 (54,84%)	n=32 (100%)	n=2 (6,67%)	<0,0001
Force Closure	Multifido	n=37 (59,68%)	n=26 (82,25%)	n=11 (36,67%)	<0,001
	TrA	n=31 (50%)	n=27 (84,37%)	n=4 (13,32%)	<0,0001
PERFECT SCALE (p<3)		n=24 (38,71%)	n=23 (71,87%)	n=1 (3,34%)	<0,0001

Biomechanical tests	Coefficient of correlation r between tests and SUI	p value
One Leg Standing Test (limb in flexion)	0,2695425	<0,05
One Leg Standing Test (limb in load)	0,7118331	<0,0001
ASRL Test	0,4496731	<0,001
Compression Test	0,3254431	<0,01
Distraction Test	0,4201711	<0,001
Faber	0,4883664	<0,0001
LLD	0,5044394	<0,0001
L5-S1	0,9071147	<0,0001
Activation of Multifido	-0,4541897	<0,001
Activation of TrA	-0,7100469	<0,0001

<u>Interpretation of results</u>

Biomechanical tests showed statistically significant differences between incontinent and non-incontinent subjects. By examining the One leg standing test (limb load) we can see that 29 out of 35 positive individuals were incontinent and 6 non-incontinent.

This statistically significant difference ($p < 0.0001$), suggests that individuals with SUI are using an incorrect load transfer strategy through the sacroiliac joints. We also found a significant correlation between the positivity to this test and SUI ($p < 0.0001$).
All subjects who tested positive for ASRL test (11) were incontinent. We observed that the subjects with SUI presented a lumbo-pelvic motor control deficit which resulted in an erroneous strategy of load transfer between the trunk and lower limbs. Statistical analyses of our data supports the association between positivity to ASRL test and SUI: there is indeed a statistically significant correlation between the two variables ($p < 0.0001$).
Out of the 21 positive subjects who tested positive for Patrick Faber's tests 18 were incontinent and 3 non-incontinent. The positivity to this test is indicative of a mobility problem of the sacroiliac joints and / or coxofemoral joints[18]. There is also in this case, a significant positive correlation between the test and SUI ($p < 0.0001$). This finding leads us to suppose that the lumbosacral junction, the sacroiliac and coxofemoral joints, together with the muscles of the pelvic floor, act synergically.
Out of 24 subjects who tested positive for the palpation test of long dorsal sacroiliac ligament, 20 were incontinent and 4 non-incontinent. Vleeming argued that the tension of the long dorsal ligament increases with the sacroiliac joint dysfunction[25].
Also as regards the distraction test there is a statistically significant difference between incontinent and non-incontinent ($p < 0.001$) and an association with the presence of SUI ($p < 0.001$). We propose that the asymmetry of the movement of the iliac bones can alter the biomechanics of sacroiliac joints thus favoring the onset of SUI. We also found a statistically significant correlation between the positivity to this test and positivity to ASRL test ($p < 0.05$): this confirms the association between restriction of mobility of the sacroiliac joint and the deficit of the lombo-pelvic control.
All subjects tested positive for the viewing angle test L5-S1 with an increased lumbosacral angle; 2 non-incontinent subjects showed an alteration of the angle. Also in this case the difference is statistically significant ($p < 0.0001$). Although this test gives us a clear and significant correlation between the angle L5-S1, the SUI ($p < 0.0001$) and the weakness of the contraction of the PFM ($p < 0.0001$), there is no scientific evidence which demonstrates the specificity and reliability intra and inter operator.
The findings on "force closure" are very interesting. For both tests, there is a statistically significant difference between incontinent and non-incontinent subjects (Test Multifidus - $p < 0.001$; TrA test - $p < 0.0001$). We have also noted a correlation between the positivity to these two tests and SUI ($p < 0.001$ for the multifidus; $p < 0.0001$ for the TrA). These results suggest that the TrA muscles, multifidus and PFM work synergically and therefore should be considered as a group. Shishido (2) and Smith (3) in their work have demonstrated the relationship between incontinence and the loss of strength and timing in PFM. Even in our case we found a statistically significant correlation between the strength of PFM and SUI ($p < 0.0001$);

Concluding message

The study results show the association between SUI (after RRP) and some biomechanical and postural patterns: subjects with SUI shows non-optimal strategies for the lumbo-pelvic motor control and for transferring load through the sacroiliac joint. However we believe that the study population is numerically too low to draw any meaningful conclusions and that some of the tests used do not enjoy a good reliability intra and inter operator. The evaluation of a larger number of cases will provide more evidence, and possibly define whether these postural abnormalities and the pelvic girdle dysfunctions may be predictive for SUI.

References

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Disclosures

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