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PELVIC SURGERY WITH PARAVESICAL SPACE DISSECTION WOULD RESULT IN LOWER URINARY TRACT DYSFUNCTION – A RAT MODEL

Hypothesis / aims of study
The postoperative de novo SUI after extensive pelvic reconstructive surgery (PRS) was reported to be 11 %.1 The odds ratio related to various types of surgical mesh procedures with sacrospinous ligament fixation (SSF) were: Perigee mesh 0.95, Avaulta A 0.91, Prolift T 3.50 and Elevate A 3.48.1 High occurrence of post-operative de novo SUI was found in surgeries involving opening of the paravesical fossa which may cause more tissue damage and denervation in comparison with SSF, Perigee and Avaulta A. An animal model is necessary to test the hypothesis that opening the paravesical space causes lower urinary tract dysfunction (LUTS) after prolapse surgery. We hypothesize that opening of the paravesical space during dissection in pelvic surgeries would result in lower urinary tract dysfunction especially de novo SUI.

Study design, materials and methods
5 groups of 7 female Sprague Dawley (SD) rats each were used for the study. The Group-1 (control group) where no surgery was done but only has UDs and immunohistochemical study. The Group-2 (Sham-F) & -3 (Sham-H) were Sham groups, wherein anterior colporrhaphy were done. The Group-4 (Study-M-F) & -5 (Study-M-H) were Study groups, wherein synthetic mesh were implanted between vagina and bladder of SD rats. The difference between Sham-F & Sham-H, as well as Study-M-F & Study-M-H was the opening of the paravesical space. Sham-H had anterior colporraphy only; Sham-F had anterior colporraphy with paravesical space opened; Study-M-H had vaginal mesh implanted; and Study-M-F had vaginal mesh implanted into paravesical space.

Procedure starts with hydrodissection (normal saline, 0.5- 1.0cc) at the anterior vaginal wall followed by a 1 cm midline incision, then opening of the space between the vagina and bladder. A polypropylene mesh of 0.5 x 0.5 cm and 0.5 x 1.5 cm in size were inserted for the Study-M-H and Study-M-F groups respectively. The Sham groups had similar surgeries except that no mesh were implanted. Moreover, the paravesical space was opened and dissected on the Study-M-F and Sham-F groups.

For sham and study groups, the rats were sacrificed immediately after UDs on day 40. Mesh with the underlying vaginal and bladder wall was removed.

The outcome measures were the density of inflammatory reaction produced by the IL-1 (Interleukin-1), TNF-α (Tumour Necrosis Factor-α), NGF (Nerve Growth Factor) and MMPs (Matrix metalloproteinases) around the surgical site of implants and their association with the functional urodynamic investigation of the SD rats. ANOVA and Fisher exact test were applied for comparison of categorical data and periods. $p < 0.05$ were considered statistically significant for all comparisons.

Results
All rats survived with no complications observed during the post implantation period. Both the Sham-F and Study-M-F groups on day 40 had a significantly lower value on leak point pressure (LUPP) when compared to Sham-H, Study-M-H and control groups. The Sham-F and Study-M-F have similar features where paravesical space had been opened bilaterally. Meanwhile, Study-M-F on day 40 had significant shorter voiding interval when compared to control ($P = 0.005$). The other UDs data showed no difference in the voiding pressure (VP), voiding interval (VI) and voiding volume (VV) between groups on day 40 and within the study groups.

Histological examinations showed intense inflammatory reaction on day 40 in the study groups as compared to control. The IL-1, TNF-α, MMP-2, NGF and CD31 on day 40 in all group except Study-M-F were observed to return to almost normal when compared to control.

Interpretation of results
The lower levels of LUPP and higher levels of immunohistochemical data after paravesical space opening procedure imply greater incidence of de novo SUI surgery than those procedure that does not involve opening of the para-vesical space.

Concluding message
Opening of the paravesical space during dissection in pelvic surgeries would result in lower urinary tract dysfunction especially de novo SUI.

References
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