

## INFLUENCE OF SLING MATERIALS ON COLLAGEN DEPOSITION

### Hypothesis / aims of study

Tissue integration of the different materials employed in prolapse and incontinence surgery and its influence in the amount and type of resulting collagen deposition remain little investigated. Thus, the aim of this study was to compare the influence of 4 types of sling materials (TVT, Marlex, SIS and autologous fascia) in the type and quantity of produced collagen, in a model which could reproduce the conditions encountered in hypoestrogenic elder women.

### Study design, materials and methods

Animal Ethics Committee approval was obtained prior to commencing the study. For the experiment, adult female Wistarfur rats (weight= 230-300 g, age= 4-5 months) were submitted to ooforectomy and balloon vaginal dilation. Thirty days later, the animals were randomized in 5 groups: Sham operation (laparotomy and lateral dissection of the bladder, abdominal wall closure, n=24); autologous fascia (n=30); Marlex (n=30); SIS mesh (n=30,) and TVT (n=30). The different materials of 5x8 mm were positioned by laparotomy, just under the urethro-vesical transition and fixed to the abdominal wall with 6-0 nylon, avoiding tension to the bladder or to the urethra. One third of the animals in each group were sacrificed 7, 30 e 90 days after the operations and samples of the operated areas were obtained for analysis. A pathologist unaware of the type of implant material examined the histological HE slides. The inflammatory intensity in the area around the implant received a score varying from 0 to 3 (0= < 25%, 1= 25%- 50%, 2= 50%-75% e 3= >75%). Presence of granuloma and necrosis was considered as positive or negative in each case (1 or 0). Penetration of vesical muscles was given scores of 0 to 3 (0=absence; 1= one third; 2 two thirds; and 3= > two thirds). Mean results of 5 observed fields were taken as the final result of each case. An inflammatory score was created with the sum of the results of all items of the inflammatory process. The amount and type of collagen was analyzed under by Picro-Sirius staining. In each case the area of collagen I and III and total amount were also measured in five fields, obtaining a mean number in each case. Qui-square and Kruskal-Wallis tests were utilized. When a statistically significant difference was observed ( $p<0.05$ ), the Mann-Whitney-U test modulated by Bonferroni was applied to identify the differences between groups.

### Results

The Sham Group on day 7 presented differences with the other groups regarding the inflammatory parameters, except for the finding of necrosis. There was no difference between groups in terms of collagen production (total, collagen I and III). After 30 days autologous fascia group showed an inflammatory reaction similar to the Sham Group. These 2 groups were different from the others. The amount and type of collagen produced were not different among the various materials. Synthetic materials (TVT and Marlex) showed greater inflammatory response on day 60. Autologous fascia, SIS and Sham revealed similar inflammatory pattern. Groups, in which TVT and SIS was employed, produced more type III collagen at this time of the study.

### Interpretation of results

Although presenting an inflammatory pattern similar to the Sham animals, the SIS group produced more type III collagen after 60 days. Larger production of this collagen also observed with TVT could be consequence of a longer maturation phase, resulting in more fibrosis and greater tissue resistance, what would be ideal for sling surgeries. Nevertheless, the precise role of this additional fibrosis is unclear. One single study has investigated tissue reaction in humans after SIS slings and found no inflammatory reaction. However, fragments of swine DNA and glucosaminoglycans were identified in the material before implantation (1). Our findings were not able to explain collagen III elevation, perhaps related to immunological reactions. Synthetic materials have shown a more prolonged inflammatory pattern. The Marlex group, however, despite inflammatory response similar to TVT, did not show greater collagen III production. It has to be considered that Marlex is a macroporous type of mesh,

however the diameter of the TVT porous is twice as larger (1500µm x 600 µm) which favors fibroblast migration and collagen deposition (2).

**Concluding message**

TVT and Marlex triggered a similar, more intense and longer inflammatory reaction. This process resulted in later collagen III production only when TVT was utilized. Presence of SIS, despite less inflammatory response, also induced larger amounts of collagen III. More studies and longer follow-up are necessary to define the clinical implications of these findings.

**Bibliography**

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