**574**

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# PURIFIED PORCINE COLLAGEN MEMBRANE MODULATES INTEGRATION OF POLYPROPYLENE MESH IMPLANT IN A RAT MODEL

Hypothesis / aims of study

The raise of expectance of life has brought an increase of women which will underwent pelvic organ prolapse (POP) surgery, mainly in the post menopause period. The distress caused by POP affects women´s quality of life, as it alters their sexuality, urinary and bowel functions. In this scenario, the use of meshes is gaining popularity worldwide. Although polypropylene mesh (PM) is considered a good material to restore the pelvic floor, decreasing operative time and post-operative pain, there are concerns about infection and vaginal mesh exposure.

To study the characteristics of collagen deposition related to covering subcutaneous implants of monofilament polypropylene mesh in rats with purified suine collagen biomembrane and to describe the characteristics of the local inflammatory reaction.

Study design, materials and methods

Thirty female rats were shared in two groups according to the surgical implant in the abdominal subcutaneous áreas: (A) implant of PM covered by CM and (B) implant of PM alone. Five animals of each group were euthanized at the day 7, 14 and 28 of post-operative period (PO). The material were stained with HE and analyzed with Olympus BX51 polarized microscope and image Pro plus 6.0 software to study the collagen anisotropic properties and inflammatory reaction.

Results

In the $7^{o}$ PO the CM group showed vascular proliferation and intense infiltration of lymphocytes and fibroblasts. The PM without CM group presented a intense histiocytary infiltrate and a mild fibrosblastic reaction and angiogenesis. At the $14^{o}$ PO, the group A maintained a similar lymphocytic infiltrate which was observed at the $7^{o}$ PO, without expressive alterations in the degree of fibroblastic reaction and collagem deposition. In the group B, there was a intense fibroblastic reaction surrounding the PM. Also, there were multinucleated giant cells crushed by a wrap of collagen and fibroblasts. In the $28^{o}$ PO, the group A revealed a intense fibroblastic reaction process and collagen deposition. In contrast, in the group B, it is observed that the multinucleated giant cells tried to wrap up the polypropylene, and there were a decrease of fibroblastic reaction in comparison to the PM with CM group

Interpretation of results

The biomembrane processed from porcine small intestinal submucosa (BMSS) is one of the most studied and traded biological moulds, as they have great malleability, which permits their fitting to lesioned tissues. Also, they are receptive to host cells, non-carcinogenic, easily sterilized, and resistant to different mechanical forces. The regenerative process in the implant site generates a tissue structurally and functionally similar to the original tissue, which is more organized than the cicatricial tissue.

Based on what has been reported in literature, the hypothesis of coating the polypropylene mesh with BMSS in order to enhance the first cell and tissue responses enabling better incorporation of meshes to surrounding tissues in the implant site proves to be an evolution in the implantable materials. The search for hybrid materials, that is, implants that have absorbable or temporary components and non-absorbable or definite components comes up in medical literature as an alternative that may minimize complications associated with implants and isolated materials.

The results obtained in this experiment model showed that coating the polypropylene mesh with BMSS improved the quality of tissue repair with positive increase in the integration of polypropylene mesh, and that was also observed in other tissues. Synthesized collagen in the interface with the polypropylene mesh showed an organizational structure superior to the control group, according to the anisotropic properties analysis.

Concluding message

PM covered with a purified porcine collagen membrane showed earlier resolution of inflammatory reaction, better neoangiogenesis and more organized host collagen deposition than in pure PM. This can represent an advantage in clinical setting if these experimental results proved to be reproducible in other trials.



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| ***What were the subjects in the study?*** | **ANIMAL** |
| ***Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?*** | **Yes** |
| ***Name of ethics committee*** | **CEEA/Unicamp http://www.ib.unicamp/intitucional/ceea/index;htm** |