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Basic fibroblast growth factor loaded polypropylene meshes in repair of abdominal wall defects in rats

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Abstract

Background and Aim: Incisional hernia following laparotomy and recurrent herniation after its repair are still common problems in spite of mesh augmentation. The underlying biological mechanism may be related to collagen metabolism. Recently, some members of growth factors family have been tested in the prevention of wound failure and incisonal hernia formation. Growth factors may promote fibroblast proliferation and collagen deposition. In the present study, we searched the effects of basic fibroblast growth factor (bFGF) loaded polypropylene meshes in an incisional hernia model in rats.

Methods: A total of 80 Wistar albino rats were randomly divided into five groups. A uniform surgical procedure was employed in all groups: a 5 cm skin incision was made at the midline and a full segment of the abdominal wall sized 3 x 2 cm was excised. Abdominal wall was closed with rapidly absorbable 3/0 catgut. Following this standard surgery, five different procedures were applied to the groups before closing the skin with 4/0 monofilament polypropylene sutures. Control subjects (Group 1) received no extra procedure after abdominal wall suturing. Polypropylene meshes were used in onlay position by fixing 4/0 monofimalent polypropylene interrupted sutures in other four groups. A standard mesh with no chemical treatment was used in Group 2. Gelatin coated meshes were used in Group 3, while Group 4 and 5 received bFGF loaded meshes with 1 microgram (μg) and 5 μg doses respectively. All the groups then divided into 1st month (early: E) and 2nd month (late: L) subgroups (n=8 each) according to sacrification dates. Tensiometric and histopathological evaluations were done. The specimens for histopathology were obtained from the interface area of the meshes and stained with hematoxylin and eosin, and also Masson trichrome. The variables were examined and evaluated by a single blinded pathologist under light microscopy in respect of inflammation, vascularization, fibroblast activity, collagen fibers and connective tissue organization. The avidin-biotin-peroxidase method was performed using the primary monoclonal antibodies against collagen type I and collagen Type III.

Results: bFGF loaded meshes showed higher tensile strength values in comparison with a standard polypropylene mesh after 2 months. Histopathological and immunohistochemistry studies also revealed somewhat better scores in favor of bFGF loaded mesh over a standard polypropylene mesh. These limited effects of bFGF did not seem to be dose dependent.

Conclusions: The use of bFGF loaded polypropylene mesh in the abdominal wall healing may cause somewhat higher tensile strength values in comparison with a standard polypropylene. However, histopathological and immunohistochemistry studies revealed only a slightly better healing in favor of bFGF loaded mesh over a standard polypropylene mesh.

Key words: growth factor, fibroblast, FGF, wound healing, abdominal wall, incisional hernia, hernia repair, mesh

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