

**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ
БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»**



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The aim of the study: to investigate the study was to evaluate the morphological changes of hernia sac and hernia-surrounding tissues with inguinal hernias.

Material and methods. For the research purpose we used bioplates of hernia tissues of 24 patients (aged 60-83, mean 67.47 ± 2.54 yrs.), obtained during the inguinal hernioplasty. Special attention was paid to evaluation of the muscular tissue atrophy and development of cicatrize and inflammatory changes. The following tissues were evaluated: hernia sac, subcutaneous cellular tissue, muscular tissue and, in some cases, preperitoneal cellular fat. Fragments of tissues were preserved and processed in accordance to histological standards.

Results. Principal signs of chronic inflammation of the hernia sac in all 24 patients were studied. In 8 (33.3%) patients isolated inflammation of hernia sac tissues were found, and in 16 (66.7%) patients it was associated with chronic inflammatory changes of hernia-surrounding tissues. In 6 (25.0%) patients with the recurrent inguinal hernias the inflammatory changes of hernia sac and hernia-surrounding tissues were very pronounced and associated with their cicatrize changes. In all patients pronounced atrophic changes of the muscular tissues were determined. Use of suture-free techniques in elderly patients may greatly reduce inflammatory changes impact on healing, though not providing complete protection.

Conclusions. Inflammatory and cicatrize changes after the suture methods of hernioplasty cause ischemia, atrophic and cicatrize changes in muscles during postoperative period, making these methods of surgery not sufficiently effective.

Dudko O.G.

COMPUTER MODELING STUDY OF MECHANICAL STRENGTH OF METAL AND POLYMERIC SCREWS FIXATION IN CORTICAL BONE

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Introduction. Indications for osteosynthesis of bone fractures of extremities are increasing from year to year. Screws can be used alone or in combination with plates and nails. As a bone fracture, healing depends a lot on the stability of its fixation, so each component of the biomechanical system that is fixing bone fragments is important. The fixation properties of screws depends from many factor, such as bone diameter, the thickness of the cortical layer, the quality of bone tissue, the mechanical properties of the material that was used for screws manufacturing. The use of computer modelling helps to study biomechanical interactions between the screw and the bone tissue according to the applied load.

The aim of the study. The aim was to study biomechanical interactions between the screws made of different materials (stainless steel, bioinert polyamide-12 and biodegradable PGA/PLA) and the bone tissue. To perform biomechanical evaluation the computer models of AO screws and cortical layer were made in Autodesk Fusion 360.

Materials and methods. The pull-out loads of 100 N, 500 N, 1000 N, 2000N and 4000 N were modelled and the displacement of screws were determined for various thickness of cortical layer (range from 1mm to 5 mm). For all types of screw material there was the relation between the thickness of cortical layer and the force applied with the displacement of the screw.

Results. With the increasing of the applied force to the stainless steel screw in its axial direction on 100 % (from 2000 N to 4000 N), the displacement was increased (from 1.253 mm to 4.163 mm) on 232 % for cortical layer with the thickness of 2 mm. The maximum stress area for this loading condition increased on 43.2 %, from 14.898 MPa to 21.335 MPa.

The biomechanical results were comparable with our previous laboratory tests, when the mechanical strength was evaluated for stainless steel and PGA/PLA screws 3,5 mm in diameter with unicortical fixation in pig bones. The stability of the screws were similar, but in laboratory test, the maximum load was determined for screws of various sizes and diameters. The average tensile strength of fixation for 3,5 mm PGA/PLA screws was 26,7 kgp, that was 26 % less than of stainless steel screws, and for 4,5 mm screws the difference was 34 %. For bones of a larger diameter, the

fixation strength was proportionally higher. On the other hand, the peak stress in the surrounding bone tissue was decreasing when the thickness of the cortical layer was increased.

Conclusions. The mechanical strength of fixation was related with the thickness of bone cortical layer and with the material of the screws. The nonlinear adverse correlation between the displacement and the thickness of the cortical layer was found. However, the mechanical parameters of polymeric materials were lower than of metal screws, but achieved results showed that their fixation strength is enough for internal fracture fixation in non-weight bearing areas. The polymeric screws can be used alone or in combination with metal devices, as they revealed good biocompatible properties and biodegradable properties in our previous studies.

Knut R.P.

HISTOLOGICAL PRECONDITIONS FOR THE DEVELOPMENT OF COMPLICATIONS IN HERNIOPLASTY USING PROLENE ALLOGRAFTS

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Introduction. In recent years, the use of alternative methods of allograft fixation in anterior abdominal hernioplasty have become increasingly common, as the use of prolene ligatures leads to additional trauma of tissues and nerve fibers in the area of plastics, which can in its turn lead to postoperative complications. The use of stitch-free methods of hernioplasty and of surgical sealants avoids the above complications, however, insufficiently effective fixation of the allograft can lead to its displacement in the postoperative period and cause recurrence of hernia.

The aim of the study: to study the terms of allograft fixation to tissues of bed with fibrin and collagen fibers for further elaboration of more effective methods of surgical treatment of anterior abdominal wall hernias.

Material and methods. The study is experimental. As the examination material were used 26 white rats, which were implanted in the muscles of the anterior abdominal wall with the prolene allografts measuring 0.5×0.5 cm. Collection of the material for histological examination was performed by biopsy of muscles with implanted allograft after 1, 3, 5, 7 and 10 days from the moment of modeling the experiment. 3-5 μm thick sections were stained according to standard methods. The study was performed at a magnification of $\times 100$ using a descriptive method of detecting changes.

Results of the study show that during the first four days after modelling the experiment, the fixation of the allograft occurs mainly due to fibrin fibers. When taking biopsy during this period, the allograft was easily moved. After the 5th days of the modelling the experiment in tissue biopsies there was a predominance of collagen fibers. During taking the biopsy, the allograft was fixed to the tissues of the bed and did not move.

Conclusions. During the first four days of the postoperative period, the allograft's fixation is not effective enough, which can cause its displacement or twisting and lead to recurrence of hernia. Therefore, it is advisable to use surgical sealants to fix it and prevent the development of complications of the postoperative period.

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MANAGEMENT OF CHRONIC WOUNDS IN MODERN CONDITIONS

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Introduction. Chronic wounds occupy a leading position among diseases and hospitalization of patients in the department of purulent surgery. Such patients are characterized by long-term disability, expensive treatment, slow rehabilitation after treatment, or permanent disability. According to the World Health Organization, the main causes of wounds that do not heal for a particularly long time are insufficient blood flow in the wound, imbalance of inflammatory and reparative processes in the wound, microbial contamination and antibiotic resistance due to microbial biofilms, slowing down the formation of the demarcation wall, excess production of