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The experimental argumentation of alloplasty in case of complicated hernia

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Abstract
The aim of study was to prove the applicability of polypropylene mesh for hernioplasty in cases of infection, phlegmon of hernia sac in the experiment. The experiment was conducted on 150 white male rats "Wistar" weighing 250-300. We concluded, that reaction of tissue to implant mesh matches with reaction of tissue bordering to necrotic cells, and the presence of an infected hernia does not worsen the conditions of integration polypropylene implant with tissues. We showed, that strengthening mesh in tissues observed at 21 day, and the most pronounced effects of fixation - on 90 days after alloplastic hernioplasty of the hernia defect. The results of experimental studies confirm the possibility of using plastic mesh implants for hernia defect in phase of inflammation that often occurs in strangulated hernia.

Keywords: complicated hernia, experiment, alloplasty

1. Introduction
The prevalence of abdominal wall hernia is 10% in the adult population and take 3-4 place in the structure of surgical diseases. Each year, on the planet performed over 20 million operations of hernia, which is 10-15% of all interventions. For plastic hernias of the abdominal wall during 1 year used 1 million synthetic fishing nets [4]. In Ukraine, about 13 thousand operations performed on strangulated hernias of the abdominal wall when there is inflammatory exudate, infection in the wound [1, 2, 3].
The main method of surgical treatment of complicated hernias is plastic by the local tissues. In patients with large and giant hernias, which are often complicated by strangulation, relapse is 30-50% [6]. Notice opportunity alloplastic of abdominal wall by the polypropylene mesh in infected conditions are solitary in nature [7, 8].
Outstanding issues of herniology is scientific justification the possibility of surgical alloplastic treatment hernia defect of the abdominal wall hernia in case of jamming with the development of infection wounds, phlegmon of hernia sac, and so on.

The aim of study was to prove the applicability of polypropylene mesh for hernioplasty in cases of infection, phlegmon of hernia sac in the experiment.

2. Materials and Methods. The experimental study was conducted on 150 white male rats "Wistar" weighing 250-300 g, same age, without disease, detained in accordance with generally accepted standards, at least 10 days before the experiment [9]. In carrying out the experiment followed the major domestic and international standards in accordance with national "general ethical principles of animal experimentation" (Ukraine, 2001), and in compliance with the provisions of the basic "rules of work using experimental animals" Decree №755 of 12.08.1977r., GLP (1981), the Council of Europe Convention for the Protection of Vertebrate Animals and MOH Ukraine №281 from 01.11.2000r. And "general ethical principles of animal experimentation" [10].
Experimental tests were performed under general anesthesia, which was performed by intraperitoneal by of 5% kalipsol solution rate of 0.05 ml per 100 g of weight white rat. Taked of the animals from experiment by deep anesthesia [6].
Rats operated for the purpose of modeling the abdominal wall hernia by method Harpola A.J in our modification. The technique was follow: in animals was created defect in the abdominal wall size 1, 5-1, 5 cm saving skin-subcutaneous parietal flap. To prevent iatrogenic damages, disclosure of abdomen were used hidropreparation of aponeurosis by saline. The skin sutures superimposed on a thin wire, which did not give rats crack seams. The wounds healed and formed a hernia of the anterior abdominal wall. Modeling phlegm on of hernia bag conducted

as follow: in the outer surface of the hind legs subcutaneously injected 0.5 mL of 10% solution of calcium chloride [11]. After 48 hours prepared 5% fecal mixture and injected in abdominal wall above the existing hernial protrusion (based on a mixture of 3 ml of 1 kg of weight) [12]. In animals after 2 days in the area of hernia formed abscess.

The rats are divided into 3 groups: group 1- animals, which held plastic of hernia by polypropylene mesh Linteks esfil standard (St. Petersburg); 2 group - animals who performed plastic of hernia by polypropylene mesh Linteks esfil light; group 3- animals, who performed plastic of hernia by polypropylene mesh Linteks esfil heavy. During surgery-implantation, festering wound was thoroughly washed with 0.02% solution of dekasan, then treated by Octenisept farblos (Germany). During 7 days of test animals injected solution of imunofani and ceftriaxoni intramuscular in back leg, based on body weight. Obtained microbiological results from content of the simulated abscess in the area of hernia in 96% of cases showed intestinal sticks, and in 95% of animals cultured infection that is highly sensitive to the cephalosporin group of antibiotics.

In the postoperative period observed behavior, appetite of rats, wound state with implanted mesh. Deduced from experimental animals at 7, 14, 21 days. For morphological studies the biopsy material was fixed in 10% of neutral formalin solution. Histological sections were stained with hematoxylin and eosin, and threechrom by Masson.

3. Results and Discussion. In postoperative period in 30% of three groups of rats during 3-5 days was observed reduced activity of movements and appetite, which we associate with the development of inflammation in the wound. After the said period in the main part of the rats the mentioned features were disappeared. Inspecting of the operation area shows that the mesh implant germinate throughout the muscles of the abdominal wall, and from the abdomen adhesive process was observed in 68% of cases. Received results of wound seeding wounds of the abdomen confirmed a high concentration of microorganisms E. coli in rats of 3 experimental groups and only in 22 cases detected stafilokok, Proteus and Klebsiella. On day 7 after implantation in rats of 1group the inflammatory changes were observed in the form of swelling, redness and tissue sero-hemorrhagic discharge from the wound. Morphologically in the area of implantation visualized macrophagal infiltration of a small number of lymphocytes. The phenomena necrosis of surrounding tissue, neutrophilic infiltration was absent. In some areas between the mesh and tissues are observed hemorrhages with a loose location of red blood cells. Red blood cells were with intact tinctorial properties. Also in the surrounding tissues observed small focal hemorrhage. Between fiber mesh and on the perimeter is characteristic swelling of connective tissue with easing connective tissue fibers.

On the 14 day of postoperative period net fixed in mature GT, which forms a clearly delimited shaft around necrotic cells. In GT is available with a large number of fibroblasts isolated fibrocytes, a small amount of thin collagen fibers. In areas of implantation available macrophage infiltrates in the thickness of which displays fibroblasts and lymphocytes. Cellular infiltration by macrophages and lymphocytes is a manifestation of immune responses to implant. At the same time as fibroblasts cells with nuclei rounded-oval, containing 1-2 nucleoli, basophilic cytoplasm.

On 21 day after operation a net is fixed in of aponevrosis tissue, which existing collagen fibers of varying thickness, preferably sealed. Among collagen fibers present in small numbers fibroblasts, more fibrocytes, a small number of macrophages and lymphocytes. Toward the necrotic tissue cells visualized tissue by type mature granulation. The last existing capillaries with thick walls, some of them haven't erythrocytes in the lumen.

In experiment material the 2 groups of animals on day 7 in the thickness of granulation tissue also visualized a large number of macrophages, focal - a small number of neutrophil leukocytes. Granulation tissue from the aponeurosis distributed in intramuscular intervals of striped abdominal muscles. Granulation tissue is more mature at 14 days after surgery, compared with 1 and 3 groups of animals. Perifocal the plethora of vessels less pronounced. Also marked single areas of perifocal fibrinoid necrosis, indicating a tendency stop the spread and reduce of inflammatory infiltrate size. In tissue aponeurosis, which borders with focus of necrosis observed mucoid swelling as easing collagen fibers. Perifocal necrosis was available around neutrophilic leucocytes decrease with the increase of macrophages and fibroblasts. Marked increase in the size of granulation tissue at 21 days in a large number of thin-walled plethora vessels between which are available fibroblasts, tissue basophils, macrophages, amorphous substance of connective tissue and a small amount of connective tissue fibers. So, we observed reduction in the size of active inflammatory infiltration with increasing reparative properties in the tissue.

In experimental animals of 3 groups more common skin necrosis in the course of the wound, flushing the wound edges with sero-hemorrhagic, sometimes purulent discharge, small area of colicvation necrosis 7 days after surgery. Granulation tissue forms a clearly delimited shaft like a band for 14 days. In the thick of granulation tissue we detected a large number of fibroblasts with few connective tissue fibers. In 4 cases, purulent discharge was continued from the wound, which led to the rejection of the mesh implant. In the remaining animals around granulation tissue (peripheral from necrosis) focal macrophage infiltration was available. In muscle tissue of striped muscles displays isolated macrophages, lymphocytes. This indicates about trend reduction of zone inflammatory infiltrate at 14 days after surgery. After 3 weeks mesh implant surrounding by connective tissue capsule, which consists of ordered collagen fibers with few outward signs of inflammation.

So, despite the mesh fixation in altered the tissue aponeurosis of abdominal wall hernia infected with, reaction of animals to implantation of polypropylene mesh Linteks-esfil is universal and correlates with literature data [13] and is similar to the general biological response to invading of foreign body [15].

4. Conclusions

1. The reaction of tissue to implant mesh matches with reaction of tissue bordering to necrotic cells, and the presence of an infected hernia does not worsen the conditions of integration polypropylene implant with tissues.
2. Strengthening mesh in tissues observed at 21 day, and the most pronounced effects of fixation - on 90 days after alloplastic hernioplasty of the hernia defect.
3. The results of experimental studies confirm the possibility of using plastic mesh implants for hernia defect in phase of inflammation that often occurs in strangulated hernia.

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