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HISTOLOGICAL ANALYSIS OF MORPHOGENETIC CHANGES AFTER PERICARD XENOTRANSPLANT IMPLANTATION

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In recent years, biological implants, including pericardial xenotransplants, have been widely used in reconstructive and cardiovascular surgery. They are of great importance in clinical practice due to their high biological adaptability, mechanical strength, and ability to integrate with tissues. In particular, xenotransplants made from the pericardium of cattle or sheep are effectively used in valve prosthetics, vascular plastic surgery, and various reconstructive surgeries (Schoen F.J., Levy R.J., 2005).

After xenotransplant implantation, morphological changes develop in the body, such as a local inflammatory reaction, immune response, fibroblastic proliferation, and new vascularization. These processes determine the biological stability and functional efficiency of the implant. In some studies, calcification, collagen disorganization, and the development of interstitial fibrosis in pericardial materials have been noted (Vyavahare N. et al., 1997).

Morphological changes observed in the perineal tissue serve as a crucial criterion for evaluating implant acceptance and long-term outcomes. In the early post-implantation stages, macrophage infiltration and the formation of granulation tissue are observed, while in the later stages, the regeneration of collagen fibers and fibrosis processes predominate (Bader A. et al., 1998).

In view of the above, the study of morphological changes developing in the peritoneal tissue after the implantation of pericardial xenotransplants is of great scientific and practical importance.

The study was conducted on 20 healthy, clinically stable laboratory rabbits. The experimental animals were divided into 4 groups using the random selection method, and 5 rabbits were included in each group. Morphological studies were conducted based on materials obtained at various post-implantation stages. Tissue samples were fixed in a 10% neutral formalin solution and placed in paraffin blocks using standard histological methods. Slices with a thickness of 5-7 μm were prepared and stained using the hematoxylin-eosin method. Microscopic studies were performed using a light microscope. In the experimental groups, pericardial xenotransplants obtained from various animals were implanted. Specifically, bovine pericardium was used in Group I, sheep's in Group II, and pig's in Group III. Group IV was formed as a control group, and the animals in this

group were not implanted. All surgical interventions were performed under general anesthesia, strictly adhering to the rules of asepsis and antisepsis. During the implantation process, a small-scale surgical incision was made in the subcutaneous area of the rabbit's frontal region, and incisions made from the pericards of various animals were placed in the subcutaneous area. The surgical wound was then sutured in layers, and the animals were kept in standard care conditions during the postoperative period. Experimental observations were conducted on the 3rd, 7th, 14th, 21st, 28th, and 35th days after implantation. Within the specified timeframes, the animals were decapitated under general anesthesia, and tissue material was removed from the implantation site. During the microscopic analysis, inflammatory infiltration, fibroblastic reaction, the state of collagen fibers, and the degree of neovascularization and fibrosis were assessed. The research results were analyzed using morphological methods, and statistical processing was carried out using methods of variational statistics.

Distribution of study groups and observation periods Table 1.

Group	Implanted material	Number of rabbits	Observation periods
Group I	Cattle pericardium	5 items	3, 7, 14, 21, 28, 35 days
Group II	Sheep pericardium	5 items	3, 7, 14, 21, 28, 35 days
Group III	Pig pericardium	5 items	3, 7, 14, 21, 28, 35 days
Group IV	Control group	5 items	3, 7, 14, 21, 28, 35 days

As a result of the conducted experimental studies, gradually developing morphological changes in the peritoneal tissue were identified following the implantation of pericardial xenotransplants. In all experimental groups, a local inflammatory reaction was observed in the early days of implantation, manifested primarily by vascular dilation, interstitial edema, and leukocytic infiltration. On the 3rd–7th day after implantation, inflammatory infiltration consisting of neutrophils and macrophages was detected around the graft. These changes were evaluated as an adaptive and protective reaction of the organism to xenogenic material. During this period, microcirculatory changes and signs of interstitial edema were observed in some cases. By the 14th day, a relative decrease in the inflammatory response and activation of reparative processes were noted in all experimental groups. Microscopic examination revealed the proliferation of fibroblasts, the formation of new capillaries, and the formation of collagen fibers. This indicates that the process of integrating the implant with the surrounding tissues is developing. On days 21–28, an increase in connective tissue elements and an intensification of fibrous processes were observed around the pericardial grafts. In particular, in the groups where the pericardium of cattle and sheep was implanted, an orderly arrangement of collagen fibers

and a relatively low inflammatory response were found. In animals with implanted pig pericardium, it was noted that in some cases inflammatory infiltration persisted longer. By day 35, the fibrous capsule and connective tissue elements formed around the graft were clearly visible. In the group using the sheep pericardium, higher tissue biocompatibility, a relatively lower inflammatory response, and more perfect organization of collagen fibers were observed. Morphological changes in the pericardium of cattle were moderate, while in the groups where the pig pericardium was implanted, some signs of dystrophic and mild inflammation persisted. In the control group, no pathological morphological changes were observed, and the tissue structure remained in a physiological state.

The results obtained showed that the degree of biocompatibility of the pericards of different animals differs from each other. Morphologically, it was found that reparative processes were relatively stable and the inflammatory reaction was less developed in the group with sheep pericardium implantation. This indicates the high efficiency of sheep pericardium as xenotransplant material.

Conclusion: It was established that inflammatory, reparative, and fibrous processes develop gradually in the peritoneal tissue after the implantation of pericardial xenotransplants. In the group with sheep pericardium implantation, biocompatibility was higher, the inflammatory reaction was less pronounced, and collagen fiber formation was better. While moderate morphological changes were observed in the pericardium of cattle, signs of inflammation persisted longer in the pig pericardium group. The results obtained showed that the sheep pericardium is effective as xenotransplant material.