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DEVELOPMENT OF THE ADHESIVE PROCESS IN THE ABDOMINAL CAVITY USING PLASTIC DEVICES IN LAPAROSCOPIC SURGERY

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РАЗВИТИЕ СПАЕЧНОГО ПРОЦЕССА В БРЮШНОЙ ПОЛОСТИ ПРИ ИСПОЛЬЗОВАНИИ ПЛАСТИКОВЫХ ДЕВАЙСОВ В ЛАПАРОСКОПИЧЕСКОЙ ХИРУРГИИ

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The study examined the risk of developing adhesions in the abdominal cavity using modern plastic devices used in endoscopic interventions. Two equivalent groups were formed out of 80 rats. In the first group, 40 rats were injected with a sterile fragment of classical endoscopic bag through a puncture of the anterior abdominal wall, while in the second one (40 rats) – sterile plastic was used for 3D printing in medicine. The animals were removed from the experiment on the 30th and 90th days. After the macroscopic determination of the development degree of the adhesive process, the parietal and visceral peritoneum was taken out, followed by IHC examination. As a result of the study, it was found that the plastic, which is a part of endo bags and 3D printing plastic, does not lead to the formation of viscero-parietal adhesions associated with the development of the adhesive process. Thus, using various plastic devices for 3D printing in the abdominal cavity is safe. However, additional research is needed.

Keywords: adhesions, abdominal cavity, experiment, endoscopic device, 3D printing, laparoscopy

В исследовании изучался риск развития спаечного процесса в брюшной полости в эксперименте при использовании современных пластиковых девайсов, применяемых при эндоскопических вмешательствах. Из 80 крыс были сформированы 2 равнозначные группы. В I группе – 40 крыс, которым выполняли введение через прокол передней брюшной стенки стерильного фрагмента классического эндоскопического мешка, во II группе (40 крыс) – стерильного пластика, используемого для 3D-принтинга в медицине. Животные выводились из эксперимента на 30 и на 90 сутки. После макроскопического определения степени развития спаечного процесса выполняли забор париетальной и висцеральной брюшины с последующим ИГХ-исследованием. В результате проведенного исследования установлено, что пластмасса, входящая в состав эндоконтейнеров и пластика 3D-принтинга, не приводит к формированию висцеро-париетальных адгезий, ассоциированных с развитием спаечного процесса. Таким образом, использование в брюшной полости различных девайсов из пластика для 3D-принтинга является безопасным. Однако необходимо проведение дополнительных исследований.

Ключевые слова: спайки, брюшная полость, эксперимент, эндоскопическое устройство, 3D-принтинг, лапароскопия

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IHC – immunohistochemistry

SRM – sublay retromuscular

Endosurgical interventions are actively introduced into daily life, associated with low trauma and rapid rehabilitation of patients in the postoperative period [1]. Despite the wide variety of used instruments, there is a question about the effectiveness of various endoscopic devices and the use of which minimizes the risk of adhesions [2]. Modern significant surgical devices that, upon contact, provide a small amount of trauma to the peritoneum and have low ability for fibrinogenesis.

The use of modern technical devices, including 3D printing, expands the possibilities of endosurgical interventions [3]. At the same time, it is crucial to determine the impact on the structures of the abdominal cavity of the used endoscopic instruments and endo bags.

The purpose of the study: to conduct a comparative morphometric analysis of the influence of the use of plastic devices in the development of the adhesive process of the abdominal cavity in laparoscopic surgery.

Material and Methods. The work was carried out based on the experimental laboratory of the StSMU; 80 Wistar rats with a body weight of 187.5±13.3 g participated. 2 equivalent groups were formed. In group I, 40 rats were implanted through a p/abdominal wall puncture in the left hypogastric region with a sterile section of the endo bag (Endopouch, Johnson & Johnson, USA); in group II (40 rats), sterile plastic used for 3D printing in medicine (Petg, Bestfilament, Tomsk, Russia) was introduced. According to the modern postulates of the 3R concept of Russell and Birch (replacement, reduction, refinement), which are used in experimental surgery. Zoletil (tiletamine hydrochloride and zolazepam hydrochloride, 8 mg/kg) was used for anesthesia.

Animals were withdrawn from the experiment on the 30th and 90th days after plastic implantation. After a macroscopic determination of the development degree of the adhesive process, the parietal and visceral peritoneum were taken. Histological sections with a thickness of 5–8 microns were also made. Staining was carried out with hematoxylin and eosin and using unique methods to detect collagen fibers – Mallory staining method and Van Gieson staining method (BioVitrum, Russia). IHC was performed using primary anti-collagen type I and IV monoclonal antibodies (Dako, Denmark).

The scale of Vanderbilt University was used to calculate the severity of the adhesive process. Data analysis was performed with the help of the Mann – Whitney method using the Statistica 10.0 (StatSoft, USA). Differences were considered significant at $p<0.05$.

Results and Discussion. The postoperative period proceeded satisfactorily. The wounds healed by first intention. There were no complications or deaths. Aggressive behavioral reactions were not observed; the weight of the animals did not change (p=0.13). During the visual examination, viscero-parietal adhesion on 30thday was more pronounced in 3 rats in the first group, 2.98 points (p=0.22); in the second group 5.64 points (p=0.81). On the 90th day, the severity of the adhesive process was observed in 7 rats (p=0.04) in the second group. In most cases, visually, the material implantation zone was utterly free from signs of adhesiveness of connective tissue structures in all groups.

IHC revealed that in the second group, the prevalence of adhesions was in 9 rats, which is more pronounced than in the first group (p=0.064). According to the results of IHC in the first group, there was a predominance of type IV collagen and a pronounced proliferation of synthetically active fibroblasts. Type IV collagen is found in the basement membranes of the vascular endothelium. In the second group, the adhesive material was dominated by I-type collagen, which was found on the intestinal loops' structures, and the absence of type IV collagen. The number of differentiated adhesions was more significant in the first group than in the second one (χ^2=21.3; df=2, p=0.001). In all observations, there is a pronounced activity of the connective tissue intercellular structures. Pronounced infiltration by fibroblasts, macrophages, and several leukocyte cells.

This experiment on the study of the adhesive process is mainly consistent with similar studies. The studied activity of the adhesive process was lower than previously reported data when using standard containers or any other mesh material for 3D printing [4, 5]. Many authors believe that the most optimal is stretched polytetrafluoroethylene, which is contrary to the opinion of other authors who use titanium-containing tools. Since the greatest tissue reaction is manifested with PETG rather than titanium-containing mesh, no reliable values have been obtained. This is confirmed by more pronounced and significant indicators of cell apoptosis, trimmers polymorphism, and cell proliferation.

Conclusions. Thus, the result of the study suggests that the use of plastic devices for endoscopic disturbances in the early and late postoperative period does not lead to the formation of significant viscero-parietal adhesions associated with the development of the adhesive process. However, more research is needed to determine the impact of plastic in laparoscopic surgery.

Experimental animal procedures. The study was conducted in accordance with the International Recommendations of the World Health Organization, the International Recommendations for Biomedical Research Using Animals (1985) as well as the national standard of the Russian Federation GOST R-53434-2009 «Principles of Reasonable Laboratory Practice» GLP rules. The experiments were carried out in accordance with the principles of humanity set out in the directives of the European Community (86/609 /EEC) and the Helsinki Declaration. The study protocol was approved by the Local Ethical Committee of StSMU (Protocol No. 47, dated May 15, 2018).

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References

1. Kallinowski F., Gutjahr D., Harder F., Sabagh M., Ludwig Y. [et al.] The Grip Concept of Incisional Hernia Repair-Dynamic Bench Test, CT Abdomen With Valsalva and 1-Year Clinical Results. *Front. Surg.* 2021;14(8):602181. https://doi.org/10.3389/fsurg.2021.602181
2. Minaev S. V., Obozin V. S., Barnash G. M., Obedin A. N. The influence of enzymes on adhesive processes in the abdominal cavity. *Eur. J. Pediatr. Surg.* 2009;19(6):380-383. https://doi.org/10.1055/s-0029-1241847
3. Karpov M. A., Shkurupy V. A., Troitskii A. V. The Study of Efficiency of the Approach to Prevent the Adhesions

in the Abdominal Cavity of Rats. *Bull. Exp. Biol. Med.* 2021;171(4):416-420. https://doi.org/10.1007/s10517-021-05240-1
4. Domen A., Stabel C., Jawad R., Duchateau N., Fransen E. [et al.] Postoperative ileus after laparoscopic primary and incisional abdominal hernia repair with intraperitoneal mesh (DynaMesh®-IPOM versus Parietex™ Composite): a single institution experience. *Langenbecks Arch. Surg.* 2021;406(1):209-218. https://doi.org/10.1007/s00423-020-01898-9
5. Parshikov V. V., Mironov A. A., Kazancev A. A., Alekhin A. I. Intraperitoneal and retromuscular abdominal wall plastic surgery with ultra-light polypropylene and titanium-containing endoprostheses (experimental study). *Pirogov Russian Journal of Surgery.* 2016;(4):40-44. https://doi.org/10.17116/hirurgia2016440-44

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EXPERIENCE WITH HIGH-THROUGHPUT SEQUENCING, BONE MARROW TRANSPLANTATION AND TARGETED THERAPY FOR ACUTE MYELOID LEUKEMIA WITH A POOR PROGNOSIS

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ОПЫТ ПРИМЕНЕНИЯ ВЫСОКОПРОИЗВОДИТЕЛЬНОГО СЕКВЕНИРОВАНИЯ, ТРАНСПЛАНТАЦИИ КОСТНОГО МОЗГА И ТАРГЕТНОЙ ТЕРАПИИ ПРИ ОСТРОМ МИЕЛОИДНОМ ЛЕЙКОЗЕ С НЕБЛАГОПРИЯТНЫМ ПРОГНОЗОМ

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The study presents a clinical case of treating acute myeloid leukemia with an unfavorable genetic prognosis due to genotyping by high-throughput sequencing. The patient underwent related allogeneic bone marrow transplantation with targeted chemotherapy. The disease manifested itself after a new coronavirus infection. Mutations R140Q in the IDH2 gene and