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LITERATURE REVIEW METHODS FOR PROSTHETIC MESH FIXATION IN SURGICAL REPAIR OF INGUINAL HERNIAS

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***Vladimir Akimov*[1], *Dmitry Krikunov*[1], *Dmitry Parshin*[2]✉, *Behruz Radzhabov*[1], *Vladimir Senko*[3]**

[1] *I.I. Mechnikov North-Western State Medical University, Saint Petersburg;*
[2] *Astrakhan State Medical University, Astrakhan;*
[3] *L.G. Sokolov Clinical Hospital No 122, Saint Petersburg, Russia*

✉ *parshin.doc@gmail.com*

ABSTRACT — The article is devoted to the evolution of fixation methods for synthetic mesh endoprostheses in surgery of inguinal hernias. We have analyzed the data on failures and complications of synthetic implants. We paid a special attention to available techniques, such as endoprostheses fixation without sutures as well as to the fixation using various types of glue. Our review is based on its own experimental and clinical data as well as the data from world's best hospitals. We found that the use of fibrin glue frequently leads to formation of seromas and hematomas, whereas albumin-glutaraldehyde glue may result in abscesses and pyogenic inflammatory infections of surgical sites. The authors pointed out the importance of further research for the optimal fixation of the prosthetic mesh in hernia repair.

KEYWORDS — inguinal hernias, hernia prosthesis, mesh implants, methods of fixation, postoperative complications, surgical glue, surgical hernia repair.

INTRODUCTION

In the conditions of modern inguinal hernia surgery, there is a tendency to focus on the methods of surgical interventions and types of mesh implants without considering the multiple disadvantages of conventional methods for mesh fixation. Dozens of experiments carried out over the past 20 years proved the existence of a pronounced inflammatory process along the periphery of implanted prosthesis (Graft-versus-Host disease), which onset can reach 5–10 years after hernioplasty [1]. As a result, there are many complications emerging after inguinal hernia repair (acute and chronic pain, sense of discomfort, paresthesia, neuralgia, up to the inflammation of the implants and their failure) [2].

At the end of the twentieth century, a lot of studies were published, where the analysis of the causes of recurrence after hernia repair was carried out. The main reason for their development was the migration of the implant, so the need for secure fixation of the mesh was reported [3]. In the literature, there are several reasons for the migration of implants — mechanical (primary) and those caused by dystrophic changes in the tissues surrounding the implant (secondary) [4]. Primary ones arise mainly because of inadequate fixation of the mesh implant [4].

In terms of modern hernia repair technologies, many questions come up about the possibilities of sutureless fixation and their advantages compared to traumatic (penetrating) fixation. The method of sutureless fixation was introduced into clinical practice of premises of our department in 2015; however, the experimental study of this technique had been conducted in the United States and European countries since the beginning of the second decade of the 21st century and has been continued up to the present day [5]. The possibilities of body tissues connection still causes much discussion, and the scientific search is going on [6].

Chronic pain after hernioplasty occurs in addition to many external factors, from the body's inflammatory response to the implant and the involvement of sensory nerve endings up to a psychoemotional state of the patient. However, the leading cause of neuralgia, pain, and paresthesia after inguinal hernia repair is the involvement of sensory nerve endings in the suture area or in inflammatory tissues after placement of hernia implant [7].

METHODS

We selected the published data, including PubMed and Web of Science databases on the influence of the method of fixing mesh prostheses in the surgical treatment of hernias. 118 sources were analyzed from 2003 to 2020, and 27 sources included in the article.

RESULTS OF SELECTION AND CONTENT OF THE REVIEW

Among all the methods of sutureless fixation, ParieteneProGrip implant (Sofradim, France) can be

pointed out. It consists of a mesh with micro-grips represented by polypropylene fibres and resorbable polylactic acid micro hooks on its lower surface, thanks to which it is fixed ("Velcro") [8]. The results of the first experience of using this type of mesh in the Russia by Protasov A.B. are very positive: the number of complications decreased by sixfold and duration of the operation declined by 1.4 times [9].

There is also a number of rigid meshes with shape-memory features, for example Hertramesh (Herniamesh, Italy), which, according to the authors, do not require any fixation. However, during the studies the authors noticed significantly more frequent development of various kinds of complications (chronic pain, foreign body sensation, neuralgia and paresthesia) in comparison to lightweight meshes [10].

The use of adhesive compositions for mesh fixation during the inguinal hernia surgical repair can be particularly highlighted [11]. Before the start of our first publications (Chair of Surgery named after N.D. Monastyrskiy) on the use of adhesive compositions [12, 13] there were few publications on this issue in the Russia, and most surgeons had no idea about the use of this method of fixation. With the beginning of development and the first demonstrations, several dozen publications appeared dealing with the use of various kinds of glue mesh fixation methods.It confirms the value and need for further development of this method of fixation in our country. According to the foreign literature data, the inflammatory process in the mesh area after the use of adhesive compositions is much less obvious at the edges [14, 15]. In the modern world, there are various types of glue used for inguinal hernia repair; the most common is Fibrin glue that is used in traditional methods of inguinal hernia repair. However, there are reports of the possibility of its use in endovideosurgical methods of hernioplasty [16].

In 2014, The European Hernia Society did not include direct instructions on the use of adhesive compositions for mesh fixation in the EHS Guidelines for the Treatment of Inguinal Hernia, but it was mentioned that this technology can lead to a decrease in the risk of chronic pain development, but there is not enough studies on this subject [17].

The use of cyanoacrylates for inguinal hernia surgical repair is of great interest [21]. In 2007 Austrian authors carried out an experiment demonstrating the undesirability of using cyanoacrylates in hernioplasty, as, in their opinion, the glue was not resorbed and it caused persistent deformation of the anterior abdominal wall in the area of its application. In the next experiment that was carried out more than 5 years later, the complete safety of cyanoacrylate use and their complete resorption after 40–50 days from application was proved; the authors associate the unsatisfactory results of the Austrian colleagues with applying too much glue [22]. Up to date, two works have been published concerning the use of cyanoacrylate glue (Switzerland, Finland, 2011). The first study compares the use of lightweight meshes and cyanoacrylate glue in traditional hernioplasty with the same lightweight meshes and absorbable sutures. The results indicated 2 times higher percentage of recurrences but at the same time 2 times lower level of chronic pain while using the glue fixation method [23]. The second study, published 5 years later, showed an identical level of recurrence and chronic pain development; however, the authors noted the presence of wound suppuration while using glue fixation — in 3.4% of cases.

CONCLUSION

Based on the experiment data, it can be concluded that:

— the use of traumatic fixation methods (for example, sutures), reduces mesh contraction in the postoperative period [18];

— the use of fibrin glue is associated with fewer postoperative complications such as seromas or hematomas [19];

— the use of albumin-glutaraldehyde glue causes formations abscess and other pyoinflammatory diseases in the prosthetic mesh area [20].

Considering the above, it is rather difficult to estimate the possibility and safety of using glue fixation methods for hernia repair; this issue requires further study and a series of experiments to make any conclusions [24]. Of course, it is necessary to conduct further research on this issue and major clinical experimental studies [25].

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