



Drainage of purulent wounds of soft tissues (review article)

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Abstract. Wound infection and purulent-inflammatory diseases of soft tissues in surgery are an urgent problem that requires an integrated approach to treatment. One of the key factors to eliminate this pathology is drainage. The purpose of this review is to study the principles and methods of drainage used, in particular those used in the treatment of purulent soft tissue wounds. To study this issue, we analyzed the educational and applied literature, scientific literature from List of HAC, databases SCOPUS, RSCI, ESCI, CAS, PUBMED. We note the results of applying various drainage methods. A surgical operation does not always lead to the complete elimination of the inflammatory process, which can be aggravated by the appearance of exudation, natural necrosis, and the development of pathogenic microflora. To ensure in the postoperative period a complex cleansing of the wound from exudate, necrosis products, microbial flora, different drainage methods are used. After studying the current literature, one can not only be convinced of the need for drainage, but also clearly trace the development of drainage principles that are aimed at combining physical and pharmacological methods of wound cleaning with the maximum possible elimination of the negative iatrogenic factor.

Keywords: drainage of purulent wounds; negative pressure wound therapy; wound dialysis

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Дренирование гнойных ран мягких тканей (обзор литературы)

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Аннотация. Раневая инфекция и гнойно-воспалительные заболевания мягких тканей в хирургии являются актуальной проблемой, требующей комплексного подхода к лечению. Одним из ключевых факторов по устранению данной патологии является проведение дренирования. Целью данного обзора является изучение используемых принципов и методов дренирования, в частности, применяемых при лечении гнойных ран мягких тканей. Для изучения данной проблемы мы провели анализ учебной и прикладной литературы, а также изучили информацию, содержащуюся в научной литературе, включенной в Перечень ВАК, базы данных SCOPUS, RSCI, ESCI, CAS, PUBMED. Отмечены результаты применения различных способов дренирования. Хирургическая операция не всегда приводит к полной ликвидации воспалительного процесса, который может усугубляться появлением экссудации, естественного некроза, развития патоген-

ной микрофлоры. Чтобы обеспечить в послеоперационном периоде комплексное очищение раны от экссудата, продуктов некроза, микробной флоры применяют разные методы дренирования. После изучения актуальной литературы можно не только убедиться в необходимости дренажа, но и четко проследить развитие принципов дренирования, которые нацелены на совмещение физических и фармакологических способов очистки раны с максимально возможным устранением негативного ятрогенного фактора.

Ключевые слова: дренирование гнойных ран; дренирование ран отрицательным давлением; раневой диализ

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INTRODUCTION

Drainage (in medicine) is a manipulation of a therapeutic and prophylactic nature, the purpose of which is to empty the wound channel, pathological and natural cavities from liquid contents [1–8]. The treatment of purulent wounds is an urgent and always topical issue of surgery, standing on three pillars: debridement, drainage and antibiotic therapy. If the use of surgical treatment of wounds and antibiotic therapy is not in doubt, then the use of drainage often raises many questions regarding the effectiveness and safety of using one or another method. Therefore, it is especially important to know the most reliable, clinically favorable and cost-effective drainage methods that are in line with current trends.

The results of a general review of the considered information showed that the problem of drainage of purulent wounds of soft tissues is sufficiently developed and quite well covered in the literature.

CLASSIFICATION OF DRAINAGE METHODS

According to a unified classification, the available drainage methods can be divided according to the principle of the need to pressurize and/or discharge pressure in the wound into passive, active and flow-flushing. Let us consider each of them in more detail.

With active drainage, the removal of wound contents from the cavity is provided using a vacuum unit (synonymous with aspiration drainage). As a standard, closed drainage systems are used, in which the vacuum is pumped with the help of devices that gradually expand after compression. In

addition to removing the wound contents, active drainage helps to reduce the edges of the wound.

With passive drainage, the outflow of wound contents is carried out due to excessive intracavitary pressure and/or gravity.

Flow-washing drainage is carried out by installing two perforated drains into the wound, the drug solution is injected along the lead, and the discharge is drained along the drain. The outflow is carried out passively and/or actively. The main advantages of the flow-flush drainage method are: prevention of the development of a secondary bacterial infection in the wound; complete and rapid removal of wound discharge [9–14].

From the point of view of the practical use of drainage in surgery, most specialists prefer active methods of wound drainage, a huge advantage of which is their effectiveness in complex wound configurations with abundant wound contents. According to practitioners, flow-aspiration drainage makes it possible to accelerate the processes of wound cleansing, thereby significantly reducing its microbial contamination [15].

Currently, most practicing surgeons prefer drainage performed by negative pressure wound therapy and wound dialysis using semipermeable membrane drainage. The scientific publications available to date over the past 5 years have detailed clinical cases and results of successful use of negative pressure therapy – in fact, suction drainage using a programmable pump that maintains a constant vacuum – and antibiotic therapy. Based on the described practical experience, drainage with maintaining a constant local negative pressure in large wounds is an extremely positive and productive procedure in achieving the desired clinical effect. This drainage method reduces the time of wound healing by constantly

stimulating the processes of reparation and reducing the volume of the wound surface, as well as by improving the blood supply to the wound and reducing bacterial contamination.

Among the obvious problems that limit the use of negative pressure drainage is ensuring the tightness of the system at wound surfaces located near fat folds in overweight and obese patients. In addition, a number of authors note the presence of such an unfavorable effect as excessive ingrowth of granulations into a hydrophilic sponge and bleeding of tissues, which are noted during dressing changes [1–14].

Taking into account the implementation of surgical manipulations, including drainage, within the framework of strict regulations for the provision of medical services, it is not surprising that the most common drainage method in Russia is passive drainage of the wound with rubber products. This method has a number of significant advantages, the main of which are the relative ease of installation and maintenance of drainage systems, extremely rare negative effects from manipulation, and an advantageous ratio of price/final clinical result. In some cases, the cost of medical services is reduced due to use of cheap technologies. This is fundamentally different from the modern approach to drainage in Western Europe and America, where there is a steady trend towards the use of active vacuum drainage followed by ultrasonic sanitation of cleaned tissues. Vacuum drainage is performed using programmable pumps that provide constant support for the necessary vacuum for the timely outflow of wound contents, which plays an important role in reducing the bacterial load within the wound and reduces the risk of potential release of endotoxins into the blood.

However, the use of more expensive, efficient and safe drainage systems in Western Europe and America is offset by a reduction in the cost of medical services with a reduction in bed-days of hospital stay.

CURRENT STATE OF DRAINAGE ISSUE

In modern surgery, the relevance of drainage not only has not decreased, but has also increased, since today drains are used for the out-

flow of serous-purulent exudate in inflammatory processes, decompression of hollow organs, administration of fluids, antibacterial and other drugs, diagnosis, control and prevention of possible complications in the postoperative period [13–15]. The leading factor in the timely prevention and treatment of wound infection is radical surgical debridement. However, if this is not possible, active drainage or simultaneous drainage with wound lavage is performed.

It is important to note that passive drainage using gauze dressings and sorbents, despite the high detoxifying and cleansing effect, has significant drawbacks – dressings and sorbents work only for themselves, require frequent timely replacement, and, if used incorrectly, only exacerbate the inflammatory process. That is why the necessary therapeutic minimum in the treatment of wound infection is passive drainage using rubber products [1; 10; 14; 15]. The development and introduction into surgical practice of new effective drainage methods arises in connection with the need to unify medical procedures and the economic component of treatment while minimizing the negative iatrogenic factor [1; 16; 17]. Moreover, the important issue of microflora virulence, which significantly complicates treatment, is on the agenda today [1–8].

A promising method for Russia, which is already actively used in Western Europe and America, is active vacuum drainage using a programmable pump followed by ultrasonic sanitation of cleaned tissues. The second, very promising method is wound dialysis using drainage from a semi-permeable membrane. This method provides continuous detoxification of the wound tissues, dehydration in any desired volume and continuous uniform diffusion of drugs in the patient's tissues. At the same time, optimal conditions are created in the wound for the preservation and activation of the natural mechanisms of antimicrobial protection, purification and regeneration.

The use of dialysis drains allows for local treatment without dressings by replacing the dialysis solution in the cavity of the membrane drainage, which makes the treatment atraumatic and painless. Both of these drainage methods allow solving all the problems described above, however, these methods are very expensive [18–23].

CONCLUSION

A surgical operation does not always lead to the complete elimination of the inflammatory process, which can be aggravated by the appearance of exudation, natural necrosis, and the development of pathogenic microflora. To ensure in the postoperative period a complex cleansing of the wound from exudate, necrosis products,

microbial flora, different drainage methods are used. After studying the current literature, one can not only be convinced of the need for drainage, but also clearly trace the development of drainage principles that are aimed at combining physical and pharmacological methods of wound cleaning with the maximum possible elimination of the negative iatrogenic factor.

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