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Experience of successful treatment of an infected soft tissue defect of the lumbar spine region with a perforating skin flap

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ABSTRACT

INTRODUCTION: Surgical site infections following spinal surgery are a major concern. According to the literature, the incidence of surgical site infections is 2.0%–2.5%. These complications are sometimes accompanied by soft tissue defects, which require special treatment, including skin grafting.

CLINICAL CASE DESCRIPTION: The paper presents a clinical case of postoperative wound infection in the lumbar region. Complication management resulted in a 12×6 cm tissue defect. The wound included previously implanted metal screws and pins. To address this issue, the defect was repaired using a perforator lumbar flap. The implants were not removed. The postoperative wound healed properly, the implants were preserved, and the patient has been followed up since 2014.

CONCLUSION: Skin grafting using a perforator flap is an option in soft tissue defect repair due to infectious complications of spinal surgery.

Keywords: infectious complications of spinal surgery; methods of wound closure; perforator flap.

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Опыт успешного лечения дефекта мягких тканей области поясничного отдела позвоночника перфорантным кожным лоскутом

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АННОТАЦИЯ

Введение. Инфекционные осложнения области хирургического вмешательства являются серьёзной проблемой после операций на позвоночнике. Чаще всего в литературе приводится показатель 2,0–2,5% инфекционных осложнений области хирургического вмешательства. Иногда данные осложнения сопровождаются дефектом мягких тканей, что требует особого подхода, в том числе выполнения кожной пластики.

Описание клинического случая. В данной статье описан клинический случай инфекционного осложнения послеоперационной раны области поясницы. В результате лечения осложнения сформировался дефект тканей размером 12×6 см. В ране находились ранее установленные металлические винты и стержни. Для решения данной проблемы выполнено замещение дефекта перфорантным поясничным лоскутом. При этом металлические конструкции не удалялись. Послеоперационная рана зажила хорошо, металлоконструкция сохранена, пациентка динамически наблюдается с 2014 года.

Заключение. Кожная пластика перфорантным кожным лоскутом является одним из вариантов выбора при лечении дефектов мягких тканей при инфекционных осложнениях области хирургического вмешательства на позвоночнике.

Ключевые слова: инфекционные осложнения хирургии позвоночника; методы закрытия ран; перфорантный лоскут.

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INTRODUCTION

Posterior trunk soft tissue defects are a significant complication of spine surgery. Defects with exposed implants and bone are the most challenging. These defects are typically repaired using muscle, musculocutaneous, or free flaps [1]. Perforator flaps have recently become more widely used in posterior trunk soft tissue defects [2, 3]. In 1987, Taylor and Palmer [4] introduced the *angiosome concept*, which served as the basis for the perforator flap technique. In perforator flaps, a perforating artery supplies blood to the tissue with a wide base [1, 5]. The perforator flap technique allows preparing larger flaps and is more effective than the local flap technique in terms of mobility, formability, and viability.

CASE DESCRIPTION

Female patient, 18 years old, with the following diagnosis: Congenital thoracolumbar kyphoscoliosis secondary to abnormal development of the lumbar spine with spinal stenosis. *Spastic paraplegia*. On March 19, 2014, a surgery was performed at the 14th department of the Priorov National Medical Research Center of Traumatology and Orthopedics. The surgery involved dorsal correction with spinal cord

decompression at the stenosis level, with post-laminectomy defect meshplasty using a metal mesh with autologous bone. In the early postoperative period, on day 16 post-surgery, a complication was detected: soft tissue infection and wound dehiscence with exposed implant due to tissue deficiency after correction. The defect size was 12 × 6 cm (Fig. 1).

A microbial culture revealed *Staphylococcus aureus* with a broad susceptibility *spectrum*. Antibiotic therapy was initiated. Implant-preserving skin grafting was scheduled. Prior to surgery, the perforating artery and the skin flap intended for skin grafting were detected using manual Doppler ultrasound (Fig. 2).

On April 21, 2014, grafting was performed in the lumbar region using a perforator flap.

First, necrectomy and wound debridement were performed, and the skin flap bed was prepared. A skin flap of 14 × 6 cm was made. The flap was dissected and elevated on a vascular bundle, which included a perforating artery, from the lumbar artery area. Vascularization was examined, and the flap was turned 90° in the wound area. The highly vascularized flap was adapted and sutured, with tube drainage in place. Tension-free primary linear closure was used for the donor site on the right (Fig. 3).

The drainage was removed on day 3 post-surgery. The postoperative period was unremarkable (Fig. 4).



Fig. 1. Soft tissue defect in the lumbar region with exposed implant



Fig. 2. Planned perforator flap and perforating artery



Fig. 3. Flap rotation to the defect area, adaptation, and suturing. Tension-free primary closure of the donor site



Fig. 4. Surgical outcome on day 12 post-surgery. Suture removal and postoperative wound healing by primary intention



Fig. 5. Surgical site on day 7 after revision surgery (two years after the primary surgery). Suture removal and postoperative wound healing by primary intention

There were no clinical or laboratory signs of infection. Neurological symptoms resolved completely six months after surgery. During a follow-up examination two years after surgery, a pin fracture was detected, necessitating implant reinstallation, which included pin replacement and Th12–L3 ventral fusion using a mesh cage with autologous bone. The revision surgery was unremarkable. The surgical scar healed by primary intention (Fig. 5). The patient has been followed up for 10 years; there are no infections, and the implant is preserved. On a follow-up examination after 10 years, the condition is satisfactory; the skin flap is of normal color, with preserved sensitivity.

DISCUSSION

Posterior trunk soft tissue defects with exposed implant and infection are a significant complication of spine surgery. These complications are accompanied by biofilm formation and implant-associated infections (IAIs), which affect the integrity of implant. The treatment of IAIs can be challenging, particularly in cases where potential implant removal can result in neurological and secondary orthopedic complications. Negative pressure wound therapy (NPWT systems) is one method that can be effective in IAIs while preserving installed implant [6, 7]. Spinal IAIs, like all orthopedic infections, necessitate not only surgical debridement but also adequate antibiotic therapy based on microflora identification and drug susceptibility [8]. Major defects require skin grafting. These defects were previously repaired using muscle or musculocutaneous flaps. Advancements in the perforator flap technique have opened up new possibilities in soft tissue defect repair. The main advantage of perforator flaps is a reduced risk of muscle and donor site injury. Guerra et al. performed an experimental animal study to compare the efficacy of the latissimus dorsi musculocutaneous flap and its perforator counterpart in the treatment of superficial and deep infections [9, 10]. The authors found no significant differences between the two flaps. The regional

perfusion index for both flaps was over 0.6, indicating comparable wound healing potential. Clinical studies on the use of perforator flaps in the treatment of infected wounds and wounds with osteomyelitis support these findings [9, 11]. The type of flap used for repair is less important for the surgical outcome, provided that the flap is highly vascularized and the main debridement, necrectomy, and obliteration protocols are followed [12]. Postoperative color flow Doppler ultrasound provides valuable information on the size and flow rate of all perforating arteries. This information allows surgeons to prepare a flap with the most suitable perforating artery. Perforator flaps have been found to better tolerate subsequent revision surgeries, such as implant removal, compared to muscle flaps [9], as evidenced by this clinical case.

CONCLUSION

Perforator flaps effectively repair posterior trunk soft tissue defects and prevent surgical site infections. They outperform musculocutaneous flaps in terms of esthetic outcomes, mobility, and reduced risk of injury. Based on the published data and this clinical case, this technique can be considered for soft tissue defect repair.

ADDITIONAL INFO

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Consent for publication. The patients gave their written consent for publication of their medical data (April 17, 2024).

ДОПОЛНИТЕЛЬНО

Вклад авторов. Все авторы подтверждают соответствие своего авторства международным критериям ICMJE (все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией).

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