Case Report

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# Infected post-burn contractures and their elimination

## Abstract

This article presents a case of successful treatment of a patient with infected post-burn contractures of both knee joints using sequential closed multistage knee joint redressing and targeted antibiotic therapy.

**Keywords:** contracture, joint, redressing, infection

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## Introduction

Post-burn contractures of joints represent a certain difficulty in treatment for combustiologists, plastic surgeons, traumatologists, rehabilitologists and doctors of other specialties. Restriction of movement, contracture, occurs as a consequence of damage to components of the musculoskeletal system - skin and subcutaneous fatty tissue, ligaments and muscle fibers, nerves and vessels. Statistically, 70% of burns lead to the development of contractures.[1–5]

Typically, contractures occur where adequate burn care has not been applied. There are a number of treatments available to reduce contractures, including intravesical corticosteroid injections, antihistamines, hydrotherapy, dynamic or static splinting, laser therapy, compression therapy, surgical excision and reconstruction; however, it is still unknown which therapy should be chosen to treat a particular contracture, when it should be started and how long it should last or how often they should be continued.[6,7]

The most effective treatment modality for contracture repair is surgical procedure. Indeed, the gold standard for burn scar reconstruction is the use of adjacent skin flaps to minimize differences in skin characteristics. However, achieving a balance between scar reconstruction and minimizing donor site morbidity is a complex problem that depends on the size of the affected area, the region of the lesion, and the availability of uninfected tissue for use as skin flaps.[8,9] The compression-distraction method using external fixation devices has also found application in the treatment of patients with burns and their consequences.[10,11] However, there are no clear indications for the use of percutaneous and extraosseous devices in the elimination of severe post-burn deformities of the extremities. Infected post-burn contractures are a special difficulty, when the hardware method of treatment is not always applicable due to possible infection of soft tissues around the spokes and development of spoke osteomyelitis.[12] Therefore, the use of closed redressing with plaster bandages remains one of the available, effective methods in the treatment of post-burn contractures.[13]

## The aim of the research

To demonstrate on the clinical example the method of sequential closed multistage redressing in the treatment of infected post-burn contractures of knee joints.

## Method of treatment

The authors describe a clinical case of a patient with infected post-burn contractures of both knee joints treated with sequential closed multistage knee joint redressing, local therapy of post-burn wounds and targeted antibiotic therapy.

## Results and discussion

Patient A, 37 years old received deep burns from the flame of a fire on 01.12.2022 and was treated in the district hospital from 07.12.2022. During the period of treatment he underwent stage necrectomies, dressings, autodermoplasty. No contracture prevention measures were performed. He was admitted to the City Clinical Emergency Hospital of Grodno on 11.04.2023 with the following diagnosis: thermal flame burns of the lower extremities, buttocks S 20% (11%) 3A-B stage: flexion contractures of the knee joints 3 stage. Locally, both limbs of the patient were in a 90-degree knee flexion position with post-burn infected wound surfaces on the shins and posterior thighs (Figures 1,2). On 14.04.2023, a surgery was performed: one-stage free skin grafting with a split graft on the area of 10% and more, autodermoplasty with a free split flap of the lower limbs wounds of 11% body surface area (BSA). On 24.05.2023, plastic surgery of burns consequences was performed: autodermoplasty with a free split flap of post-burn wounds of both lower limbs BSA 2%.

**Figure 1** Position of the lower extremities on admission (lateral view).

**Figure 2** Position of the lower extremities on admission of the patient (posterior view).

Diagnostics and verification of burn wound microorganisms were performed during treatment. Seeding, cultivation, identification and determination of antibacterial sensitivity were performed in accordance with the current instruction approved by the Ministry of Health of the Republic of Belarus on 19.03.2010.[14] The sensitivity of isolated strains of microorganisms was determined by the disc-diffusion method or with the help of semi-automatic microbiological analyzer ATV - expression and "Vitek - L compact 30". The studies were conducted using nutrient media, antibacterial disks from HIVEDIA (India) and test systems from BioMerieux (France). In microbiologic examination, Staphylococcus aureus was most frequently isolated from postburn wounds (99% probability), which was sensitive to ciprofloxacin (minimum inhibitory concentration (MIC)1), gentamicin (MIC >=0.5), levofloxacin (MIC 0.25), quinupristin (MIC 0.5), linezolid (MIC 2), clindamycin ( MIC >=0.25), vancomycin (MIC 1), tigecycline (MIC 0.25), rifampicin (MIC >=0.5), trimethoprim (MIC >=10). Resistance was noted only to benzylpenicillin (MIC >=0.5). Thus, Gram-positive cocci (Staphylococcus aureus) were sensitive to most antibacterial drugs, which most likely indicates their out-of-hospital origin. In the department, directed antibiotic therapy was performed using ciprofloxacin and gentamicin in therapeutic doses. After epithelialization of postburn wounds, 3-4 ulcers remained on both limbs with dimensions of 2*2.5 cm. At repeated bacteriologic examination Klebsiella pneumonia ssp pneumonia was isolated (99% probability), sensitive to meropinem (MIC 1), minocycline (MIC 4), tetracycline (MIC 2), tigecycline (MIC1), trimethoprim (MIC 4). Resistance was established to most of the tested antibacterial drugs: ticarcillin/clavulanic acid (MIC>=128), piperacillin (MIC >=128), cefuroxime (MIC >=64), cefixime (MIC >=4), ceftriaxone (MIC >=64), cefepime (MIC >=64), levofloxacin (MIC >=8), chloramphenicol (MIC >=64). Antibiotic resistance of Klebsiella pneumonia ssp pneumonia, when the patient is hospitalized for a long period of time, may indicate its hospital origin, hindering effective treatment.[15] We cannot exclude the fact that the widespread use of antibiotics leads to the growth of antibiotic-resistant strains, since traumatology and combustiology are areas of medicine in which systemic antibacterial therapy is usually carried out for a long time with a combination of drugs in high doses.

Taking into account the above, a decision was made to perform sequential closed redressing of the knee joints with application of antibacterial ointment dressings to the ulcers and fixation of the limbs with circular plaster bandages. Redressing was performed without general anesthesia, maintaining verbal contact with the patient and observing the limb, controlling skin color and pulsation on the a. tibialis posterior. After the first stage of redressing, a wedge-shaped dissection of the plaster cast in the knee joint area was performed, followed by its strengthening with circular rounds to fix the achieved correction. Redressing was performed once a week, ulcers were treated by changing dressings in the accessible areas. Six stages of redressing were performed on the left lower limb and twice a change of circular dressings was required. Extension of the left knee joint to an angle of 170 degrees was achieved (Figure 3).

**Figure 3** Position of the left lower limb after the sixth stage of redressing.

Five stages of redressing were performed on the right lower limb and also twice the circular bandages had to be changed, and knee joint extension up to 160 degrees was achieved. Post-burn ulcers decreased in size to 1.0*1.5 cm. No neurological and vascular disorders were noted during redressing on both lower limbs. The patient is verticalized and learns to walk with the help of a walker.

## Conclusion

Application of sequential closed redressing at infected post-burn contractures of knee joints with the use of circular plaster bandages, despite long treatment periods, allows to eliminate contractures in a sparing way without additional surgical trauma to achieve a positive treatment result.

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None

## Conflicts of interest

The authors declare that there are no conflicts of interest.

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