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Results of Surgical Treatment of Scar Deformations in Patients

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Abstract Post-burn and post-traumatic deformities represent a complex medical problem that requires an individualized treatment approach. This article presents the results of a study evaluating the effectiveness of surgical methods for correcting burn deformities in patients of different age groups. Data from 100 patients treated at a local emergency medical care center were analyzed. Special attention was given to the selection of surgical tactics, rehabilitation features, and long-term outcomes. The key factors influencing successful treatment were identified, including patient age, the extent of tissue damage, and the use of modern techniques such as skin grafting and reconstructive procedures. The results of the study emphasize the importance of an interdisciplinary approach and early intervention to improve functional and aesthetic outcomes.

Keywords Deformity, Post-burn condition, Surgical treatment, Rehabilitation, Aesthetic correction

1. Introduction

At present, the number of individuals suffering from the consequences of burns and injuries continues to steadily increase [1]. The most common outcomes of extensive deep burns and traumatic injuries are severe contractures and limb deformities, which lead to functional impairment and, in some cases, complete disability. Restoration of lost joint function remains one of the main priorities in reconstructive surgery [1]. According to various authors, 35% to 70% of patients who have sustained deep burns require reconstructive procedures [2]. The problem of rehabilitation in patients with post-traumatic and post-burn sequelae remains relevant and is considered one of the most complex and widespread challenges in reconstructive and plastic surgery [3]. At present, as in recent years, surgeons continue to refine existing methods for correcting scar deformities and strive to develop more advanced techniques for operative treatment [4,6]. The principles of the "reconstructive ladder" have been insufficiently developed in relation to post-burn scar deformities and contractures in general combustiology practice [5]. Despite many years of efforts by both local and international clinicians and researchers, much in this field remains unresolved. Therefore, our aim was to explore new approaches and expand current knowledge in this important area of surgical practice. Burns and traumatic injuries remain one of the most common causes of long-term functional disability worldwide. According to the World Health Organization, more than 11 million individuals suffer burn injuries annually, and approximately 6–10% of them develop clinically significant scar deformities requiring surgical correction. The incidence of post-burn contractures remains particularly high in low- and middle-income countries, where access to early specialized care is limited. Post-burn and post-traumatic scar deformities often result in contractures, joint stiffness, and loss of normal limb contours, leading to significant functional limitations and cosmetic dissatisfaction. These complications affect not only physical function—such as grip strength, range of motion, and fine motor skills—but also the psychological well-being and social adaptation of patients. Reconstructive surgery plays a crucial role in restoring lost mobility. Techniques such as Z-plasty, skin grafting, local flaps, and complex reconstructive procedures remain fundamental tools in modern practice. However, despite significant progress, treatment outcomes are influenced by multiple factors, including: the extent and depth of the initial injury, timing of surgical intervention, the patient's age and comorbidities, quality of postoperative rehabilitation, the presence of recurrent scar tissue formation. Clinical studies show that delayed intervention—particularly surgery performed more than 12–18 months after injury—often results in reduced elasticity of surrounding tissues, higher risk of recurrence, and less favorable functional outcomes. In many burn centers, including those in Uzbekistan, Russia, and neighboring regions, surgeons continue to refine treatment algorithms and search for optimal combinations of surgical and rehabilitative approaches. However, the principles of the "reconstructive ladder" are still not fully standardized for post-burn deformities, making the choice of surgical tactics highly individualized. Given these

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considerations, further analysis of surgical strategies and long-term results is necessary. The present study aims to evaluate the effectiveness of commonly used plastic and reconstructive techniques in the correction of post-burn and post-traumatic scar deformities of the upper extremity, with particular attention to functional outcomes, aesthetic satisfaction, and patient-reported results.

2. Materials and Methods

Between 2022 and 2024, a total of 100 surgical procedures were performed at the burn and surgical departments of the Bukhara Branch of the Republican Scientific Center for Emergency Medical Care (RSCEMP). These procedures addressed post-burn and post-traumatic scar deformities of the upper extremity in patients whose injury or burn had occurred 1 to 5 years prior. A retrospective analysis of the accumulated data revealed the following patterns: The highest proportion of cases involved post-burn and post-traumatic deformities of the upper extremity, with hand deformities accounting for the majority (82%). The remaining 18% corresponded to joint contractures of the upper extremity. Post-burn deformities comprised 88% of all cases, while post-traumatic deformities represented a smaller portion of the patient population. The main surgical techniques used included: Z-plasty — 65 cases (65%). Z-plasty combined with autodermoplasty — 22 cases (22%). Free autodermoplasty for large defects — 4 cases (4%). T-shaped plasty for syndactyly — 9 cases (9%).

3. Results and Discussion

The majority of operated patients had scar contractures of grades I–II and II–III (42% and 53%, respectively). Severe deformities of grade IV accounted for no more than 5% of all patients with scar-related consequences of burns and injuries during the analyzed period. In the surgical management of these contractures, preference was given to the simplest plastic techniques, such as Z-plasty, while strictly adhering to the principle of a sparing approach, considering the expected growth of children and other young patients. In cases of large defects following scar excision, free autodermoplasty was performed in 4 patients, yielding highly satisfactory results. Two weeks after surgery, all patients underwent appropriate physiotherapy—ultrasound therapy with hydrocortisone and electrophoresis with hyaluronidase, combined with massage during the rehabilitation period. As a result, a favorable outcome was observed in 89 (89%) of the cases. Satisfactory outcomes accounted for 11%, primarily among patients with joint contractures. The main reason for the less favorable results was the extended interval between the initial injury or burn involving a joint and the day of the surgical intervention.

4. Conclusions

When evaluating the results, not only the correct restoration of anatomical relationships in the affected segment, functional outcomes, and cosmetic appearance from the surgeon's perspective were considered, but also, to a significant degree, the opinions of the treated patients themselves. It was found that in cases of post-burn and post-traumatic scar deformities involving the joints, performing surgery within 6–12 months after the injury leads to significantly better recovery outcomes.

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