Long-Term Outcomes of Plastic Surgery in Patients with Extensive Burns

Resultados de Longo Prazo da Cirurgia Plástica em Pacientes com Queimaduras Extensas

Resultados a largo plazo de la cirugía plástica en pacientes con quemaduras extensas

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RESUMO

Objetivo: As queimaduras extensas têm elevada morbimortalidade imediata, desafios funcionais, estéticos e psicossociais que persistem a longo prazo. Os resultados da cirurgia plástica reconstrutiva em grandes queimados mostraram a alta necessidade de múltiplas intervenções, principalmente por contraturas cicatriciais e cicatrizes hipertróficas, com predomínio de técnicas como enxertos cutâneos e retalhos. Apesar das cirurgias e da reabilitação, as limitações funcionais, a dor crônica e os transtornos psiquiátricos permaneceram frequentes, comprometendo a reintegração social e laboral. Além disso, a mortalidade em longo prazo mostrou-se aumentada, associada a doenças cardiovasculares, câncer e distúrbios metabólicos, sugerindo repercussões sistêmicas e aceleração do envelhecimento biológico. Assim, devem ser consideradas uma condição crônica, exigindo acompanhamento multiprofissional contínuo e desenvolvimento de estratégias regenerativas inovadoras que promovam melhor qualidade cicatricial e de vida.

Palavras-chave: Cirurgia Plástica; Qualidade de vida; Queimaduras.

ABSTRACT

Objective: Extensive burns have high immediate morbidity and mortality, as well as long-term functional, aesthetic, and psychosocial challenges. The results of reconstructive plastic surgery in extensive burns have shown a high need for multiple interventions, particularly for scar contractures and hypertrophic scars, with techniques such as skin grafts and flaps predominating. Despite surgery and rehabilitation, functional limitations, chronic pain, and psychiatric disorders remain common, compromising social and work reintegration. Furthermore, long-term mortality has been shown to be increased, associated with cardiovascular disease, cancer, and metabolic disorders, suggesting systemic repercussions and accelerated biological aging. Therefore, they should be considered a chronic condition, requiring continuous multidisciplinary monitoring and the development of innovative regenerative strategies that promote better scarring and quality of life.

Keywords: Burns; Plastic Surgery; Quality of life.

RESUMEN

Objetivo: Las quemaduras extensas presentan una alta morbilidad y mortalidad inmediata, así como desafíos funcionales, estéticos y psicosociales a largo plazo. Los resultados de la cirugía plástica reconstructiva en quemaduras extensas han demostrado una alta necesidad de múltiples intervenciones, en particular para contracturas cicatriciales y cicatrices hipertróficas, con predominio de técnicas como injertos de piel y colgajos. A pesar de la cirugía y la rehabilitación, las limitaciones funcionales, el dolor crónico y los trastornos psiquiátricos siguen siendo frecuentes, lo que compromete la reintegración social y laboral. Además, se ha demostrado un aumento de la mortalidad a largo plazo, asociada a enfermedades cardiovasculares, cáncer y trastornos metabólicos, lo que sugiere repercusiones sistémicas y un envejecimiento biológico acelerado. Por lo tanto, deben considerarse una condición crónica, que requiere un seguimiento multidisciplinario continuo y el desarrollo de estrategias regenerativas innovadoras que promuevan una mejor cicatrización y una mejor calidad de vida.

Descriptores: Calidad de Vida; Cirugía Plástica; Quemaduras.

Introduction

Extensive burns, affecting 20% or more of the body surface area (BSA) in adults and 10% in children and the elderly, are among the most challenging traumas from a clinical and surgical perspective, due to high morbidity and mortality and profound functional, aesthetic, and psychosocial impacts.[1] Although there have been numerous advances in burn care units and initial surgical management, immediate survival does not end the patient's trajectory, as they often face prolonged complications requiring ongoing rehabilitation and multiple reconstructive interventions, along with multiprofessional support to allow functional recovery.

In this context, plastic surgery plays a central role in the process, aiming to restore affected skin coverage, preserve joint function, and minimize scar deformities, using various operative and postoperative techniques to improve patients' quality of life.[2] However, long-term outcomes are not always satisfactory, as contractures, hypertrophic scars, and chronic pain remain recurring challenges.[1]

Beyond physical aspects, thermal trauma is associated with high rates of mood disorders, such as anxiety and depression. There is a clear relationship between these disorders, self-perception, the extent of burned body area (TBSA), and limitations in returning to work, social, and leisure activities.

Therefore, it is essential to understand the long-term outcomes of plastic surgery in patients with extensive burns to improve therapeutic strategies, develop long-term follow-up protocols, and guide new approaches in bioengineering and regenerative medicine.[1,3]

Objective

This study aims to review the recent literature on functional, aesthetic, and mortality outcomes in patients undergoing reconstructive surgery after extensive burns.

Method

This study consists of a literature review aimed at investigating the long-term outcomes of reconstructive plastic surgery in patients with extensive burns. Articles were searched in the PubMed database using the "Advanced Search" tool. The main search field included the terms: ("Severe Burns" OR "Extensive Burns" OR "Acute Burns") AND ("Reconstructive Surgical Procedures" OR "Reconstructive Surgery") AND ("Long-Term Outcome" OR "Quality of Life").

Initially, 10 articles were identified. Specific filters were then applied to find results that best matched the search, including a publication limit of the last 10 years (2015 to 2025) and selection of articles available in full text. After this selection,

9 studies were obtained, of which, after reading, only the most relevant studies were included. Applying these criteria, 5 articles were selected for the final sample of the review.

Results

The main long-term outcomes of surgery in patients with extensive burns include the need for reconstruction, changes in scar quality, chronic pain, persistent organ dysfunction (POD), and short- to long-term mortality.

Regarding the need for reconstruction and techniques used, a multicenter cohort from the Netherlands found that 27.8% of survivors with burns covering more than 20% of TBSA required reconstructive surgeries after the acute phase – the first 2 to 3 days during which the burn patient's life is stabilized, especially airway management, hemorrhage control, and hypovolemic shock due to fluid and plasma loss. Of these, the average number of procedures per patient was 4.4, with a maximum of 29 procedures in extreme cases.[2]

These procedures were indicated primarily for scar contractures (70.5% of cases) and hypertrophic scars (17.2% of cases), mainly in the most affected areas such as the arms (45% of cases) and head and neck region (41.2%). The main plastic surgery techniques involved flap releases (54.7% of cases) and skin grafts (32.4% of cases).[2]

Regarding scar quality, assessment using the Patient and Observer Scar Assessment Scale (POSAS) showed significantly lower scar quality in patients with extensive burns compared to those with smaller burns, with follow-up persisting up to 15 months longer. Within this scale, patients had a less negative subjective perception than trained observers regarding their scars.[2]

Concerning physical function, despite multiple reconstructions and rehabilitation protocols, major burn patients retained limitations in range of motion, segmental stiffness, and persistent pain, impacting daily and work life, as observed up to five years after the trauma.[4]

Furthermore, the prevalence of POD associated with mortality was 40% on day 14 after trauma and 27% on day 28. Patients with POD had higher in-hospital mortality (23%) compared to patients without POD (2%), along with prolonged ICU and hospital stays and worse quality of life at six months.[5]

Regarding long-term mortality, burn survivors showed an increased risk of death – with an unadjusted odds ratio of 2.65 and an adjusted ratio of 1.59 compared to controls. These deaths were mainly due to cardiovascular disease, cancer, psychiatric disorders, trauma, and metabolic complications. The risk was higher in children with extensive burns and in elderly patients, despite the latter having smaller burns, suggesting the influence of age and physiological reserve on recovery or death.[3]

Discussion

These results highlight the complexity of long-term outcomes of plastic surgery in major burn patients, where immediate survival and initial skin coverage represent only part of a prolonged trajectory marked by functional, aesthetic, and psychosocial challenges.

Although classical techniques of release, flaps, and grafts are important, they do not restore the skin to its original quality. Existing surgical solutions are limited compared to the pathological and biological healing of each organism, as evidenced by the recurrent contractures and hypertrophic scars, especially in functional areas.[2]

Despite multiple surgeries, functional deficits persist because reconstruction depends not only on the procedure but also on intensive and prolonged rehabilitation, provided by systematic multiprofessional follow-up.[2,4] Functional dysfunctions persist alongside difficulties in ensuring quality of life, due to the high prevalence of chronic pain, anxiety, and depression among major burn survivors.[1,4] Early identification of patients with unfavorable trajectories represents progress, enabling intensive monitoring, early reconstructive strategies, and enhanced support during hospitalization.[5]

Moreover, extensive burns can be seen as a chronic condition, as survivors present an increased risk of death even years after hospital discharge. This is likely due to long-term systemic repercussions, possibly associated with chronic inflammatory states and accelerated biological aging – driven by telomere shortening and epigenetic alterations.[3] Continuous clinical follow-up with secondary prevention strategies and early screening for chronic diseases is therefore necessary.

Finally, gaps identified in the reviewed studies include the need for standardized functional, aesthetic, and psychosocial metrics to allow international comparisons; greater representation of low- and middle-income countries with higher burn burdens; prospective trials integrating stress and aging biomarkers into clinical outcomes to expand understanding of thermal trauma and early mortality; and the development of advanced regenerative therapies, such as dermal substitutes and skin bioengineering, to reduce contractures and improve scar quality.[2-4]

Final Considerations

The results of this review show that survivors of extensive burns undergo a complex and prolonged trajectory that goes beyond initial survival and primary surgical coverage. The recurrent need for reconstructive procedures – mainly due to contractures and hypertrophic scars – persistent functional limitations, and significant impact on mental health and quality of life highlight the multifaceted and chronic nature of this condition.

Despite advances in surgical techniques and rehabilitation, functional and aesthetic outcomes remain unsatisfactory in many cases, with profound implications for social and professional reintegration. Moreover, the increased long-term

mortality observed even years after hospital discharge reinforces the notion that extensive burns should be considered a chronic health burden, with systemic repercussions and accelerated biological aging.

In this scenario, continuous and multiprofessional follow-up is essential, integrating reconstructive surgery, physical rehabilitation, psychological support, secondary prevention of diseases, and early screening for comorbidities. Future research should focus on standardizing evaluation metrics, including populations from diverse socioeconomic backgrounds, and developing innovative regenerative therapies capable of significantly improving scar quality and, consequently, the quality of life of these patients.

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