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Microsurgery in Burns

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ABSTRACT

Early removal of burned tissue and skin grafting remains the most effective procedure for most burn patients. However, microsurgical free tissue transfer could be the ideal solution for wound coverage of complex defects in the burn patient, allowing for the preservation of deep burn injuries that would otherwise be insurmountable in a single-stage procedure. Although microsurgery is in increasing use, its use for the reconstruction of primary burns is not very frequent since it presents different types of additional challenges in this environment; because burn patients are prone to developing metabolic imbalances and a systemic inflammatory response that can compromise the free flap. However, as microsurgery has become more widespread, free flaps have been increasingly used in acute burn reconstruction as a means of preserving deep burn injuries that could not otherwise be salvaged with exposure of tendons, nerves, vessels, bones and/or joints after excision of the burn.

KEYWORDS: Microsurgery; Burns; Grafts and flaps; Utility

INTRODUCTION

The use of free flaps in the treatment of burn patients has been controversial for years due to its higher incidence of complications; however, sometimes it may be the only alternative for the coverage of certain defects or for the preservation of a limb. Thanks to advances in the field of Microsurgery, its use has been increasing in recent decades [1]. Regardless of the wide and growing use of microsurgery, its application in primary burn reconstruction is not very common, as it faces a number of additional challenges in this setting. Burn patient cases are prone to developing metabolic imbalances and a systemic inflammatory response that may compromise the survival of free flap reconstruction as a means of preserving otherwise insurmountable deep burn injuries with exposed tendons, nerves, vessels, bone and/or joints after excision of the burn eschar [2]. Early removal of burned tissue and skin grafting remains the most effective procedure for most burn patients. However, microsurgical free tissue transfer could be the ideal solution for wound coverage of complex defects in the burn patient, allowing for the preservation of deep burn injuries that would otherwise be insurmountable in a single-stage procedure [3]. The transfer of vascular flaps in patients burned in the reconstructive surgery service and is one of the most useful tools in the reconstruction rooms. The variability of free flaps and their malleability to each patient and specific case have increased their indications in burn surgery in recent years. The complications of microsurgery in burn patients are higher than those that occur in other types of patients, mainly due to a higher failure rate when performed in the acute phase of the burn with a percentage of

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major complications of up to 19% [4]. The performance of free flaps in patients in the burn unit is infrequent, sometimes it may be the best option or the only alternative for the treatment of deep burns and avoid seriousness in their sequelae. Similarly, the percentage of complications that are recorded is quite high compared to the usual complication rates reported by services with a high volume of microsurgery, if certain principles and perioperative care are taken into account to try to optimize the patient's condition, as well as avoiding, as much as possible, performing surgery between days 5 and 21 after the burn, the chances of success can be increased considerably in terms of Microsurgery indications in burned patients may originate in the acute phase or in the period of treatment of sequelae. Immediate primary reconstruction is considered to be that performed in the first 5 days after the injury, early primary between days 5 and 21, intermediate primary between days 21 and 6 weeks, and from then on it is considered surgery for sequelae; In cases of sequelae, microsurgical flaps are used to release scarring bands that limit the mobility of large joints or to optimize soft tissue coverage of aesthetically or functionally compromised areas (hands, feet, neck, etc.) [5,6].

A systematic review of 552 free flaps in burn patients shows a rate of total necrosis of 12. The treatment of patients suffering from burn injuries poses unique challenges, both in acute and late settings. Acutely, avoiding stages of shock with the emphasis being on ensuring patent airways, ensuring adequate breathing, and optimizing circulation. Essential parameters such as blood pressure, heart rate, urine output, and oxygen saturation, in addition to frequent physical exams, provide invaluable information related to tissue perfusion. This is of the utmost importance as it directly affects future operational management plans, as well as determining the prognosis and overall outcome. When hemodynamic stability is achieved, early excision and coverage of the burn wound is performed. Traditionally, this consists of excision of the devitalized tissue and subsequent coverage with split-thickness skin grafts. In certain cases, however, depending on the extent of the injury, the types of tissue involved, the location of the burn, and the certainty of an unsightly scar, skin grafting (or even local tissue reorganization) may not be a feasible option. In these patients, free tissue transfer, although rarely used in the treatment of acute burns, may provide a viable alternative reconstructive option [7].

When considering free flap reconstruction for burn defects, the context and extent of the wound must be carefully evaluated along with the status of surrounding structures. For example, tissue damage from thermal burns is often very different from that caused by electrical injuries [8].

Burns caused by electric current in the extremities are accidents with a great impact on the patient; This entails a great demand for medical care, coupled with the high morbidity and mortality of the presentation and a rate of limb amputation, which can reach up to 40%. High voltage electrical injuries (>1000 V) account for up to 32% of all burn center admissions; they are considered major burns due to the non-obvious massive tissue damage, which does not correspond to the visible skin lesion of approximately 15% of the total body surface (TBS), known as the Iceberg effect. In large proportion, the entry and exit sites are the extremities, in which the electric current passes, and thus, extensive bone, tendon, muscular and neurovascular damage is produced in them. that requires multiple interventions such as debridement, fasciotomy and amputations, leaving bloody areas that require early reconstruction. Burns due to electrical injuries present in the upper limb, although they cover a small area, have a high incidence; this is considered a special region due to the physical, emotional and work-related sequelae that can be triggered [9,10].

METHODOLOGY

To carry out this article, a bibliographic search was carried out in various databases such as Elsevier, Scielo, Medline, pubmed, ScienceDirect and Ovid, thus selecting original articles, case reports and bibliographic reviews from 2007 to 2022, in Spanish and English. Using MeSH terms: microsurgery, burns, grafts and flaps, utility, and boolean or operators. Thus, including all the documents that will deal with microsurgery in burns, the data found were between 10-35 records, thus using 25 articles to prepare this document.

RESULTS

Although microsurgery is in increasing use, its use for the reconstruction of primary burns is not very frequent since it presents different types of additional challenges in this environment; because burn patients are prone to developing metabolic imbalances and a systemic inflammatory response that can compromise the free flap. However, as microsurgery has become more widespread, free flaps have been increasingly used in acute burn reconstruction as a means of preserving deep burn injuries that could not otherwise be salvaged with exposure of tendons, nerves, vessels, bones and/or joints after excision of the burn [11].

In a study conducted in Portugal, where the medical records of all patients undergoing microvascular free tissue transfer for primary burn wound reconstruction between January 2009 and December 2016 were reviewed, it was found that of a total of 1286 patients admitted In the Burn Unit over an 8-year period, 14 patients required 18 free flaps for acute soft tissue reconstruction (1.1%). Nine of these patients were men, and 5 were women. The mean age was 59.64 years (range 21-94), and the mean total body surface area was 10.5% (2-40%). Most burn injuries were caused by flames (71.4%), followed by electrical contact (21.4%) and scalds (7.1%), concluding that microsurgical free tissue transfer has a small, although valuable role in the reconstruction of primary burns. In the well-selected patient, it allows one-stage reconstruction of complex defects with optimal functional and cosmetic results and low morbidity. Despite the reported higher rate of complications compared to other clinical scenarios, free flaps may reduce the number of surgical procedures required to achieve wound closure and, in selected cases, represent an opportunity for limb salvage [11,12].

Another study carried out in Brazil, where a series of cases of patients with electrical injuries of the extremities in whom reconstruction with microsurgical flaps was previously performed (less than 30 days after the burn event) for skin, soft tissues and coverage was observed. that is. In this, it was found that five microsurgical flaps were made for skin, soft tissue and bone coverage of five patients with electrical trauma of the extremities. The ages of the patients ranged between 12 and 42 years, with a mean of 25.8 ± 12.01 years. Four radial forearm flaps were performed, and one anterolateral thigh flap was performed. The microsurgical procedure was performed between 21 and 27 days after the burn event, with a mean of 24.2 ± 2.39 days. All Arterial and venous anastomoses were performed. from end to end. Regarding postoperative complications, two patients presented partial dehiscence of the wound, which was sutured again. In addition, another patient had postoperative congestion of the flap, and required reoperation to redo the venous anastomosis caused

by venous thrombosis. Hospital discharge occurred between 19 and 35 days after flap surgery, with a mean of 26.6 ± 6.39 days. And they concluded that the early application of microsurgical flaps for patients with electrical burns of the extremities can provide adequate, resistant and stable skin coverage, contributing to the treatment of exposed noble structures and avoiding limb amputation.

In a study conducted in Beirut, a review of all patients who underwent secondary burn scar reconstruction with a free tissue transfer was conducted between January 2015 and January 2020 at the American University Beirut Medical Center. In this work it was found that in the study population there were 6 pediatric patients, who had undergone previous release and skin grafting. Three patients had anterior neck contractures resistant to various treatment modalities such as local flaps, skin grafts, fractional CO2 laser resurfacing, and intralesional injection of 5-Fluorouracil. One of the patients had also undergone surgical release, then staged reconstruction with skin substitute followed by skin grafting. Two patients had volar wrist contracture that prevented wrist extension. These patients underwent tendon lengthening in the same procedure in addition to release and reconstruction. Finally, in one case, the flap was used to resurface a raised, hypertrophic scar on the hemiface. the facial artery was used as the recipient artery in this case. The transverse cervical or superior thyroid artery was used in previous neck reconstructions and the radial or ulnar artery was used in wrist reconstructions. Anterior tibial artery was used in the reconstruction of the foot. The flap of choice in all patients was an anterolateral fasciocutaneous thigh flap. The flap was raised in a standard manner with dissection of the septal or myocutaneous perforators to the main pedicle: the descending branch of the lateral circumflex femoral artery. The size of the flap was adapted to the size of the defect created. Therefore, it was concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. The anterolateral fasciocutaneous thigh flap is a workhorse flap for this. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again the descending branch of the lateral circumflex femoral artery. The size of the flap was adapted to the size of the defect created. Therefore, it was concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. The anterolateral fasciocutaneous thigh flap is a workhorse flap for this. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again. the descending branch of the lateral circumflex femoral artery. The size of the flap was adapted to the size of the defect created. Therefore, it was concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. The anterolateral fasciocutaneous thigh flap is a workhorse flap for this. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again. Concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. The anterolateral fasciocutaneous thigh flap is a workhorse flap for this. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again. concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. The anterolateral fasciocutaneous thigh flap is a workhorse flap for this. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of contracting again [13].

DISCUSSION

Microsurgery, as a plastic surgery technique, is essential in any burn service to guarantee a comprehensive treatment of its patients. Especially in electrical burns that can cause very serious injuries when precious tissue is exposed, this is the first choice for reconstruction. The use of microsurgery in burn patients has increased today, according to [14] describing that the indications for microsurgery in burns can occur in the acute phase or during the treatment of sequelae. Immediate primary reconstruction is considered to be surgery performed within the first 5 days of the injury, early primary reconstruction from 5 to 21 days, intermediate primary reconstruction from 21 to 6 weeks, and subsequent surgery that is considered surgery after surgery. It also reports that: from January 2010 to August 2019, 46 free flap microsurgeries were performed on 41 patients with acute burns. The cause of the burns was fire in 21 cases (45.5%), electricity in 19 cases (41.3%), abrasion in 4 cases (8.69%), contact in 1 case (2.18%) and chemicals 1 case. (2.18%). In all cases, the electrical cause was associated with high voltage, affecting a total of 15 patients, who required 19 lobes to eventually cover the lesions. It should be noted that 15 treated patients were men with a mean age of 36.5 years (range 25 to 64 years). The mean SCQ was 19.5% (between 0.5% and 70%). The most commonly used anterior thigh flap (anterior thigh flap) was used in 9 cases (47.37%), followed by the latissimus dorsi-LD flap in 4 cases (21.05%), the inguinal and rectus femoral flap in 2 cases. (10.53% each concurrent) and thoracic-back artery ventilator (TDAP) and superficial temporomandibular fascia at the same time (5.26% each), The electrical burn microsurgery coverage rate accounted for 41.3 % of all free flaps performed in patients with severe burns, second only to thermal injury by flame. Reconstruction of complex defects associated with electrical burns has been, is and will be a challenge for plastic surgeons dealing with this type of trauma. In the first place, due to the small number of cases found and, secondly, due to the specificity of the patient's trauma and electrical burns. Appropriate debridement, recipient selection, and optimal regeneration timing are the most important considerations. For these reasons, we believe that this type of pathology should be treated in general burn services with highly qualified personnel. In our case, the preservation of these skills is assured, as the same burn team is involved in lower extremity reconstruction at our hospital's trauma and rehabilitation center.

This means doing an average of 25 notebooks a year for the last 10 years, reaching 34 in 2018 and recording 30 in the first 8 months of 2019, success rates are close to 95% for all free lobes and 89, 47% for free lobes in patients with electrical burns [15]. Likewise, Reynoso, describe that the Protocol for microsurgical reconstruction and limb salvage in high-voltage electrical burns is directed towards observation, which allows this protocol to change this control diagram with fasciotomy, debridement of the burn of in a broad way, revascularization of extremities in patients with this type of burns, likewise greatly reduces morbidity and mortality in these patients, long hospital stays and reduction in surgical times. The free flap error indicator for this type of reproduction reported in the document is 20% and depends mainly on the moment of passing from burns to shoulder tongue microsurgery, divided into 4 groups: immediate- within the first 5 days [16-26].

CONCLUSION

The use of microsurgery in burn patients has increased today, it is described that the indications for microsurgery in burns can occur in the acute phase or during the treatment of sequelae. Immediate primary reconstruction is considered to be surgery performed within the first 5 days of the injury, early primary reconstruction from 5 to 21 days, intermediate primary reconstruction from 21 to 6 weeks, and subsequent surgery that is considered surgery after surgery. It was concluded that the role of microsurgical reconstruction in secondary burn defects should always be considered. It is a single-stage procedure that can be performed easily and provides long-term patient safety. aesthetic and functional results. Frees patients from the need for prolonged splinting to prevent contractures. Being well vascularized and elastic, the flap has no possibility of re-contraction. Microsurgery is a technique not widely used, but with great relevance in terms of the treatment of burned patients. In order to reduce the possibility of complications in these cases, it is essential not only to have a high technical level and knowledge, but also to control the factors related to the individual state of the patient and the established perioperative measures, for their full recovery. Although more prospective work is needed to establish more precise guidelines for action. Although microsurgery is currently an infrequent technique in the treatment of burns, it is an essential resource in certain patients who need it, and other treatment techniques cannot be performed.

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