Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/burns

Development of an integrative algorithm for the treatment of various stages of full-thickness burns of the first commissure of the hand

Valentin Yuste *, *Julio Delgado, Alberto Agullo, Jose Mauel Sampietro*

Plastic Surgery Department, Hospital Universitario Miguel Servet, Zaragoza, Spain

ARTICLE INFO

Article history:
Accepted 6 January 2017

Keywords:
Burn
First web space
Contracture
Hand

ABSTRACT

Burns of the first commissure of the hand can evolve into an adduction contracture of the thumb. We decided to conduct a review of the existing literature on the treatment of full-thickness burns of the first commissure in order to develop a treatment algorithm that integrates the various currently available procedures. A search of the existing literature was conducted, focusing on the treatment of a burn of the first commissure in its chronic and acute phases. A total of 29 relevant articles were selected; 24 focused exclusively on the chronic contracture stage, while 3 focused exclusively on the acute burn stage, and 2 articles studied both stages. A therapeutic algorithm for full-thickness burns of the first commissure of the hand was developed. With this algorithm we sought to relate each degree and stage of the burn with a treatment.

1. Introduction

In industrialised countries, burns continue to be a frequent cause of occupational incapacity. Among these injuries, those localised to the hands have special relevance, not only because of their frequency but also because of the serious consequences resulting from these types of burns and, therefore, the high economic cost to the patient and society.

In many cases, a deep burn on the hands may be associated with a more extensive burn [1]. One of the most unfortunate errors is to ignore the treatment of a burned hand and, more specifically, a burn of the first commissure during the initial effort to save a patient's life. When a burn of the first commissure of the hand is not treated properly, it can evolve into an adduction contracture of the thumb. This contracture involves a significant limitation of the correct opposition of the thumb and can thus drastically limit the function of the patient's hand [2].

Given the impact and frequency of burns of the first commissure of the hand, many researchers have focused their work on the treatment of these injuries. These researchers have proposed numerous treatments for both the acute phase as well as chronic contracture, including the use of pedicled and free fasciocutaneous flaps, grafts, and random flaps [3]. Therefore, the plastic surgeon has a wide range of therapeutic options available.

However, published studies that objectively evaluate the results obtained with each of these techniques are scarce. Moreover, there is some controversy regarding the role that each of the different procedures plays at each phase and stage of the burn. While some researchers, such as Hudson and Renshaw, have proposed simple algorithms [4], they focus exclusively on the chronic phase of the injury, they do not focus on the first web space and do not take into account all available procedures, including the postoperative management. They are also based in the experience and opinion of a

* *Corresponding author at*: Hospital Universitario Miguel Servet, Paseo Isabel la Catolica 1-3, CP 50009, Zaragoza, Spain.
E-mail address: Doctor@valentinyuste.es (V. Yuste).

http://dx.doi.org/10.1016/j.burns.2017.01.002

single team of surgeons. Moreover, researchers such as Oguz and Seven disavow the use of algorithms for approaching burns of the hand [5].

For these reasons, the therapeutic arsenal previously discussed does not provide clear indications. Therefore, we decided to conduct a review of the existing literature on the treatment of full-thickness burns of the first commissure of the hand, taking into account and differentiating among the phases of an acute burn and a chronic contracture of the first commissure of the hand. The objective was to evaluate the role proposed by each research group for each of the different techniques, so that we could develop a treatment algorithm that integrates the various currently available procedures and takes chronology, severity, and associated injuries into account.

In this article, we present such a therapeutic algorithm and the methodology followed to develop the algorithm.

2. Material and methods

A search of the existing literature was conducted, focusing on the treatment of a burn of the first commissure in its chronic and acute phases. The MEDLINE, EMBASE, and Cochrane library databases were used for this purpose. Google Scholar was also used as a database of grey literature. All articles published in English, French, or Spanish, with a level of evidence from 1 to 4, published between 1980 and 2015, were included. The keywords used for the search were divided into organ (Hand; Thumb; and First web space) and pathology (Burns and Contracture).

Potentially relevant articles were identified by their title and abstract. Once selected, three different authors evaluated the full articles to determine the inclusion of the studies. Articles that included other injuries in addition to burns of the first commissure were not excluded, provided that patients with this type of injury could be isolated.

Data extracted from the included articles were as follows: the type of procedure used (including postoperative treatment), the evolutionary phase of the burn (acute burn or chronic contracture), the indication for this technique proposed by the author, and the year of publication of the study. In addition, these articles were reviewed in full for any other data that might be considered relevant to the development of the therapeutic algorithm.

The extracted information was integrated into a therapeutic algorithm that will be presented in more detail later in this paper.

3. Results

The search strategy followed for identifying the relevant articles is presented in Fig. 1. After excluding duplicates and non-relevant citations, a total of 29 relevant articles were selected. It should be noted that several of the articles focused on different phases of the burn.

Of the included articles, 24 focused exclusively on the chronic contracture stage, while 3 focused exclusively on the acute burn stage, and 2 articles studied both stages. Eight articles focused on the use of free flaps; 10 focused on the use of pedicled fasciocutaneous flaps; 5 focused on the use of random flaps; 1 article considered the use of skin grafts; 1 studied the use of skin substitutes; 3 articles were on orthopaedic treatments, and 2 were regarding the pollicisation of the index finger. As can be seen, several articles studied more than 1 therapeutic option (Table 1).

3.1. *Skin grafts and dermal matrices*

The selection process yielded 1 article focused on the use of skin grafts for this location and aetiology and another article on the use of skin grafts associated to external skeletal fixators. As for the use of skin grafts, the authors highlighted the high incidence of reintervention and compared the results between partial-thickness and full-thickness skin grafts [31] but found no difference between the two types of skin graft. The latter was focused on the use of external fixators in order to prevent secondary contracture after skin grafting [20], giving good outcomes but using them as a rescue treatment.

Regarding the use of skin substitutes, we found an article focused on the use of dermal matrices on first commissure hand burns. The authors noted that these substitutes require a viable bed and that although the results are promising, further studies and clinical experience are required to recommend the use of skin substitutes, reserving this approach for when no other methods of coverage are available [9].

It is also important to note that the three studies included the use of postoperative splints or external fixators and a subsequent period of rehabilitation or occupational therapy [9,20,31], highlighting the importance of this additional treatment when using skin grafts or dermal matrices.

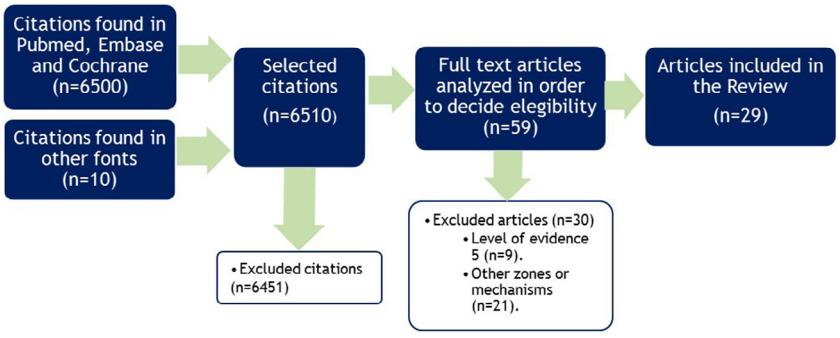

Fig. 1 – Search strategy followed for the review.