

Facial Reconstructive Burn Surgery, Types and Efficiency

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Abstract: Facial reconstruction is considered as one of the most important surgeries in cosmetic and reconstructive surgery especially after burn accidents. In this review, we describe the present challenges in reconstructive burn surgery. Describe one of the most suitable therapy techniques and methods for facial burn injury types and identify the appropriate usage, advantages, and disadvantages of facial composite tissue allotransplantation. We conducted narrative review by searching published literature in the following databases: MEDLINE/PubMed, PsycINFO, for all studies concerning with types of Facial reconstructive burn surgery through “December, 2017”. Much progress has been made in the initial therapy of big and complicated burn injuries, causing the survival of a multitude of patients with considerable deformities. The remarkable advancements of plastic and reconstructive surgery over the past century have enabled a lot of techniques to considerably improve the expectation of these patients. In spite of these advances, we still do not have the capability to perfectly recover patients to their preinjury state. Research in a wide variety of locations consisting of regenerative medication, composite tissue allotransplantation, and prosthetics along with improvements in flap surgery and wound healing approaches are most likely to yield enhancements for these patients.

Keywords: Facial reconstruction, Burn Surgery, cosmetic, burn injuries, plastic and reconstructive surgery.

1. INTRODUCTION

Cutaneous burns proceed to cause considerable morbidity and mortality throughout the world, with advanced burn care significantly enhancing the survival and reducing the morbidity of big burns. Skin-related complications decrease flexibility via joint contractures, create discomfort from inflammatory mediators, and bring about significant disfigurement from extreme scarring. Due to the fact that burns take place on any anatomical site, virtually every reconstructive procedure and innovation has been proposed to deal with these devastating problems. Thankfully, as nations develop, regulations for hot water systems, heating systems, and electrical equipment all have reduced the occurrence and severity of thermal burns, which has converted into numerous fewer large burns to deal with. In the United States, there are an estimated 450,000 burns each year that need clinical therapy, 3500 fatalities, and 45,000 admissions to health centers [1]. In contrast, in much of the developing globe, open fires in proximity to big numbers of youngsters add to an ongoing high rate of burns. For instance, in India, with a population over 1 billion, it is approximated that there are around 700,000 hospital admissions each year for burns [2].

Cosmetic issue is the primary problem of these patients [3]. Hence, the primary objective of reconstruction surgery is substitute of the scar with healthy skin, having great structure, thickness, and shade with the most similarity to the area around the scar. In this way, we could optimize the practical and aesthetic end results, so that the patients can go back to their previous status [4]. Up to currently, numerous research studies have been carried out on the surgical treatment of burn scars on the face and neck, specifically in adults, [4] using skin grafts, locoregional flaps, remote flaps, and free flaps. Amongst these options, locoregional flaps seem to be the very best.

However, absence of similar skin is the main issue in these cases. Other troubles consist of facial skin features, its' anatomical and functional features making it difficult to reconstruct [5]. As a result of the restricted nearby donor tissue to the burn mark location, full-thickness skin grafts and distant flaps are typically made use of for repair of extensive scars of the face and neck [6]. Nonetheless, as a result of the noticeable differences between the donor and recipient site tissues, these procedures rarely pertain to desirable results [7].

Over the past 50 years, several advances in acute burn treatment have additionally reduced the demand for reconstructive treatments. Patients dealt with initially with early excision and meticulous grafting methods frequently recover without significant joint contractures. As very large burns consistently survive, a reconstructive plan for practical and aesthetic locations such as the hands and face must ideally be developed early after the injury.

In this review, we describe the present challenges in reconstructive burn surgery. Describe one of the most suitable therapy techniques and methods for facial burn injury types and identify the appropriate usage, advantages, and disadvantages of facial composite tissue allotransplantation.

2. METHODOLOGY

We conducted narrative review by searching published literature in the following databases: MEDLINE/PubMed, PsycINFO, for all studies concerning with types of Facial reconstructive burn surgery through “December, 2017”. Reference lists of other relevant publications were screened to identify additional potentially relevant studies that were not identified by the first method of literature searches. One main term was used in our search; “Facial reconstructive”, “repair burn surgery”. We restricted our search for only English published articles with human subject, and we included all study types RCTs, reviews, systematic reviews, meta-analysis, except for case reports studies we excluded this from our search.

3. DISCUSSION

• Pathophysiology of burn injuries:

The depth of the burn is related directly to the quantity of scarring that will certainly create and essentially determines the optimal reconstructive treatment of a specific injury. Jackson explained 3 areas of injury that initially border a burn: necrosis, stasis, and hyperemia [8]. These zones are foreseeable based on the temperature of the burning process and the length of time that the warm touches with the skin [9]. Macromolecules exist within a slim temperature level circulation, and an altitude in outright temperature (gauged in kelvins) of over 3 percent over regular body temperature can trigger irreparable conformational modifications (denaturation) that can cause loss of biological function. Skin is an excellent insulator; therefore, unless it is exposed to high temperatures for extended periods, many thermal injuries are constrained to the epidermis and component of the dermis. Elderly patients and infants, both with thinner skin, tend to establish burns that are deeper and harder to treat. Burns extending right into the subcutaneous fat, muscle, or bone generally require prolonged direct exposure (minutes) to occur. The final deepness of the burn injury hinges on just how the patient is dealt with over the following several hrs. Optimum fluid resuscitation, adequate oxygenation, and avoidance of burn wound sepsis will prevent the deepening of the burn with conversion of the zone of stasis to an area of necrosis.

Superficial burns that involve simply the epidermis and superficial dermis could commonly heal with minimal scarring. As an example, patients that go through superficial laser resurfacing will restore the ablated skin. Fractional laser ablates multiple deep narrow columns right into the skin, leaving large locations in between, similarly allowing healing with minimal scarring. In an experimental incisional model in people, Dunkin et al. located that an incision in the upper third of the dermis, or 0.56 mm in depth, did not reveal a noticeable scar on healing [10].

Normal, hypertrophic, and keloid scarring:

A burn wound that heals in less than 10 days has a really reduced probability of developing a hypertrophic scar (70 percent) [11]. Hypertrophic scars could possibly establish in any type of private however are more common during adolescence, in specific body locations, and in those with certain ethnic backgrounds. The danger of development is associated mainly to local wound problems (i.e., mechanical pressures), wound hydration (either also dry or too wet), international body response, allergy, and infection. Keloids, on the other hand, are even more based on hereditary influences. Both conditions have many similarities in their fibroproliferative response. Pathologists identify keloids from hypertrophic scars mainly by the absence of thick eosinophilic collagen bundles in hypertrophic scars, although this attribute is not completely reliable. Along with the supporting evidence that they share the histologic characteristics of accumulation of fibroblasts and collagen items, hypertrophic scars and keloids might be 2 phenotypes of the same pathologic entity rather compared to different problems [12]. A current study on single nucleotide polymorphisms recommends a hereditary predisposition for keloid formation [13]. A separate research study exposed the interesting observation that keloids were rarely discovered on the parietal area or the anterior lower leg, even in patients who had numerous keloids on their body [14]. These sites are likewise seldom based on skin stretching/contraction. This recommends that a mechanical signal is required to initiate keloid formation. Keloids could be considered as a multifactorial disorder with a genetic influence that tends to be influenced by local factors, such as mechanical force. At this phase, it is still difficult to distinguish keloids from hypertrophic scars naturally.

• Plastic Surgery Options for Burns:

If your wound is serious, you may have to undergo debriding, which is the removal of dead tissue, before reconstructive surgery. When that is done, there are a number of kinds of wound therapies plastic surgeon may suggest [15]:

- **Skin grafts.** This is often utilized for burn patients; skin is removed from one area of the body and transplanted to another. There are 2 types of skin graft: split-thickness grafts where simply a few layers of outer skin are transplanted and full-thickness grafts, which entail all of the dermis. There is typically long-term scarring that is visible.

- **Microsurgery.** Applied if patient lost finger, toe, ear or also a lip. Microsurgery may permit for those to be re-attached. Simply mentioned, it is a treatment where the surgeon uses a microscope for surgical support in reconstructive treatments. Using a microscope, the surgeon can in fact sew tiny blood vessels or nerves, permitting him or her to fix damaged nerves and arteries. This may additionally be a technique to relieve facial paralysis or reconstruct busts. Microsurgery is frequently used with various other surgical procedures such as the free flap treatment.

- **Free flap procedure.** A free flap treatment is typically performed during breast reconstruction or following surgery to remove head or neck cancer. Throughout the procedure, muscle, skin, or bone is transferred together with the original blood supply from one location of the body (donor site) to the surgical site in order to reconstruct the area. The treatment typically involves the usage of microsurgery. Healing of the surgical site could be slow and require frequent injury care. Overall recovery might take six to eight weeks or longer.



Figure 1: Free flap. Anterior neck reconstruction using a bipediced groin flap [27].

- **Tissue expansion.** Tissue expansion is a clinical treatment that enables your body to "grow" extra skin for use in reconstructive procedures. This is accomplished by placing an instrument recognized as a "balloon expander" under the skin near the area in need of repair. Over time, this balloon will be progressively filled with saline option (seawater), gradually creating the skin to stretch and expand, much the same way a woman's skin stretches while pregnant.

- **Facial Burns reconstruction:**

Skin grafting is offered for facial burns; nonetheless, nose, ear, periorbital, and perioral areas need to be evaluated separately. The forehead or prefabricated flaps need to be utilized for deep nasal burns needing lining and framework reconstruction or overall reconstruction. Ear reconstruction need to be performed in extensively burned patients primarily for practical reconstruction of the auriculotemporal sulcus, so that a mask or glasses might be worn. Auricular appearance is affected largely by cartilage material cellular lining, so avoidance of auricle cartilage defect is necessary. Direct thermal injury of auricle skin and succeeding chondritis should be treated early. Direct closure with a chondrocutaneous development flap is useful for small wounds [16]. Postauricular skin, such as Dieffenbach's flap, [17] can be made use of to reconstruct much larger problems.

In the periorbital area, if the contracture is related to mild disorder of eye closure, minimal incision for releasing contracture and wound closure with local flaps could be performed. If conjunctiva and middle lamella are undamaged yet there is severe disorder of eye closure, skin grafting need to be used. Neighborhood flaps are likewise made use of for partial contracture. Split-thickness skin grafts for the mobile upper eyelids and full-thickness skin grafts for the lower lids have been utilized consistently. Full eyelid loss from burn is unusual; nevertheless, commonly the conjunctiva and/or center lamella can be harmed. In this situation, skin grafting or local or free flaps should be chosen on a case-by-case basis according to the requirement of suitable product transfer such as cartilage and fascia.

In the perioral area, contracture with mild dysfunction of mouth movements should be reconstructed with minimal scar release and with full-thickness skin grafts or local flaps. Contracture with serious dysfunction without commissure contracture should be reconstructed with full-thickness skin grafts according to the aesthetic units/ subunits theory. If contractures are partial however the commissure is contracted, both full-thickness skin grafts and regional flaps should

be utilized for total launch of contracture and reconstruction of the commissure. If the contracture is extensive and the commissure is also contracted, extensive launch and reconstruction with flaps such as a pedicled regional flap, a free flap, or a prefabricated flap should be chosen on a case-by-case basis. For male patients, beard and mustache reconstruction utilizing flaps harvested from beard or scalp regions could be taken into consideration [18].

A comprehensive method including presculpted and "prepatterned" free flaps could be utilized to produce an extra functional and aesthetic outcome [19].Pedicled vascularized temporoparietal fascia flaps could be utilized for a selection of facial defects [20].Facial allograft with immunosuppressive medications is a topic of extreme facial reconstruction that merits extra discussion concerning security due to the problem of infection in burn reconstruction [21].

- **Transplantation:**

For very considerable deformities that arise from injuries to extremities and the face, transplantation supplies a service that can restore substantial aesthetic and functional systems in a solitary operative procedure. Composite tissue allotransplantation is currently taken into consideration experimental, and we are currently getting substantial initial experience that will certainly allow clinicians to finest select the most effective patients for these treatments. The possible high danger of life time immunosuppression remains a considerable barrier to implementation of this technology [21].

When is FCTA(facial composite tissue allotransplantation) indicated in burns?

Burn patients are optimal candidates for facial composite tissue allotransplantation, as they typically existing with serious facial deformities including the peri-oral and peri-orbital areas [23].Although there is, since yet, a paucity of scientific proof, we recommend that FCTA is suggested in serious facially disfiguring burns, with peri-oral and peri-orbital disruption, in an emotionally secure, healthy, compliant, socially-supported and knowledgeable patient. As Pomahac guaranteed, in the adhering to decades, face transplantation could become the treatment of option in general for patients with severe facial disfigurements that stand for significant functional and social disability [23].Each patient will provide with a unique defect that brings a specific collection of challenges and problems. Complete face burn defects involving cutaneous and bony tissue with serious disfigurement may be a clear indicator for FCTA. The same panorama, however with just skin affection, might likewise be repaired using FCTA or conventional surgical strategies, depending on the grade of useful impairment, basically.

When managing burned kids, we suggest not to suggest this treatment as easily at today minute, awaiting amelioration of immunosuppressive routines with the prospective arrival of stem cell therapy and tissue engineering techniques [23].Nonetheless, due to that these strategies are still very novel, study is still continuous, and the wait could be also long for a significantly imperfect child. For that reason, every prospect needs to be carefully studied, with all ethical and medical problems being strictly evaluated with the correct authorities, making an individually-based decision.

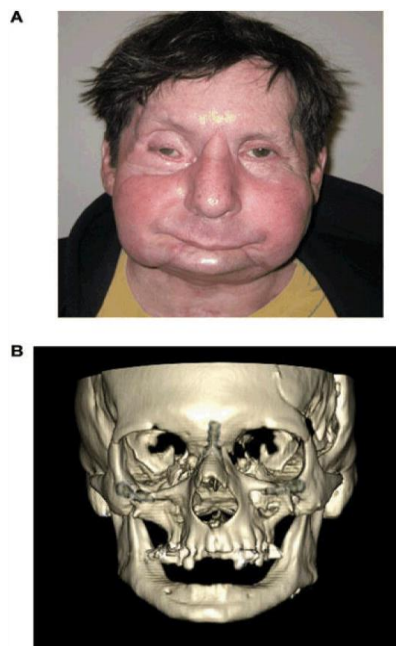


Figure 2: FCTA after severe disfigurement from burn injury: Results at 1 year after face allotransplantation, clinically (A) and radiologically (B) [26].

Disadvantages of FCTA in burns:

Severely disfigured facial burn patients that strategy to undertake a FCTA should concur to carry out day-to-day and life-long mild- to severe risks, consisting of minor side results, opportunistic infections, malignancies, and fatality obtained from present immunosuppression routines [24]. Various other threats consist of being rejected, acute graft-versus-host disease, and any type of other potential risks of a technique still in the pioneering stage, with just brief follow-up durations on document as of yet [25]. Furthermore, throughout the transplant procedure and peri-transplant days, there is likewise an additional threat of technical complications, such as venous thrombosis and partial or overall flap necrosis, with the best threat being an immediate need for a second face transplant and cross-match [23]. Additionally, the complex surgical strategy of the treatment, the pre-operative research and option of the appropriate patient, the requirement for precise conformity with several drugs (immunosuppression therapies and infection prophylaxis), possible difficulties, and the requirement for periodic clinical visits, make this procedure extremely expensive. Another particular issue particular to the burn patient population is the high frequency of psychological comorbidity and medicine misuse, as well as high danger of septic complications [23].

Nonetheless, if we take into account the expense of numerous previous reconstructive surgeries that a burn patient might have undergone over a lengthy period of time, with several admissions, and the professional, personal, and social breakthroughs achieved so far by the few patients that have gone through facial transplants, we would most likely be inclined to perform even more FCTAs.

Advantages of FCTA in burns:

On the other hand, the high top quality achieved with this kind of reconstruction (FCTA), in only one surgical step and with durable outcomes, encourages us to conclude that FCTA is occurring as a promising new surgical approach in order to help badly damaged facially burned patients, becoming the gold standard of major facial reconstruction [23]. In fact, facial transplantation represents an instead ideal type of reconstruction by "replacement" of "like with like" tissue rather of "reconstruction" [23].

Due to the versatility of the graft, which may include only soft cells or additionally bone frameworks, it applies to the treatment of numerous various flaws. Furthermore, the technique is becoming more accessible thanks to the increasing opportunity for specialists to educate their transplant-related dissection skills with cadavers and the basic spread of microsurgical skills [22]. When as compared to healing by secondary intention, grafts, or local and free flaps, FCTA represents a significant enhancement in terms of appearance, cosmesis, and sensory and motor function healing. These physical and useful enhancements result in the resolution of psychosocial distress and a state of satisfaction, happiness, and gratefulness that just such patients of such unique situations may really understand.

4. CONCLUSION

Much progress has been made in the initial therapy of big and complicated burn injuries, causing the survival of a multitude of patients with considerable deformities. The remarkable advancements of plastic and reconstructive surgery over the past century have enabled a lot of techniques to considerably improve the expectation of these patients. In spite of these advances, we still do not have the capability to perfectly recover patients to their preinjury state. Research in a wide variety of locations consisting of regenerative medication, composite tissue allografting, and prosthetics along with improvements in flap surgery and wound healing approaches are most likely to yield enhancements for these patients.

Face composite tissue allotransplantation is currently a possible therapeutic approach able to reconstruct extreme facial disfigurements, and it might end up being the new gold criterion for full-face reconstruction. Although there are associated ethical, social, surgical, technical, and immunological problems, the favorable results demonstrated by the FCTAs performed until now motivate lots of patients that suffer from chronic devastating facial sequelae (as a result of burns, trauma, tumors, or congenital malformations) to keep their hopes high. The possible high threat of life time immunosuppression stays a significant obstacle to implementation of this technology.

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