

## Original Paper

# Three Paediatric Cases Study with Over 80% TBSA Burn Injury - Surgical Treatment by Using Skin Allografts: A Viable Option for Alternative Cover

Cristina A. Avram<sup>1</sup>, Dan M. Enescu<sup>2</sup>, Dan Ionita<sup>1</sup>

<sup>1</sup> „Grigore Alexandrescu” Clinical Emergency Hospital for Children Bucharest - Plastic Surgery and Reconstructive Microsurgery Clinic

<sup>2</sup> „Grigore Alexandrescu” Clinical Emergency Hospital for Children Bucharest - Plastic Surgery and Reconstructive Microsurgery Clinic, Carol Davila University of Medicine and Pharmacy, Bucharest

## REZUMAT

*Prezentarea tratamentului chirurgical folosind alogrefe tegumentare în 3 cazuri pediatrice cu arsuri peste 80% sc - opțiune viabilă de acoperire tegumentară*

**Introducere:** În arsurile extensive, când acoperirea cu autogrefe este limitată, se pot folosi, ca metodă alternativă și temporară, alogrefele tegumentare.

**Material și metodă:** Sunt prezentate cazurile a trei copii cu vârste cuprinse între 4-15 ani cu arsuri prin flacăra, grad III, pe cca 80- 95% sc, care beneficiază de tratament complex chirurgical atât cu alogrefe, cât și cu alogrefe-autogrefe tegumentare (tehnica sandwich)

**Rezultate:** Defectul tegumentar rezultat în urma escarotomiilor și exciziei precoce a fost acoperit cu alogrefe din Banca de Piele, refrigerate în azot lichid, la -196°C, în prezența unui agent criogenic (glicerol 15%).

**Concluzii:** Alogrefele reprezintă o metodă temporară de acoperire în arsurile în care disponibilitatea de autogrefe este limitată, reducând astfel pierderile masive lichidiene, proteice, hematice și consumul metabolic complex, protejând structurile subdermice (tendoane, nervi, vase) și prevenind infecțiile și degradarea patului receptor până la acoperirea tegumentară definitivă.

**Cuvinte cheie:** alogrefe, autogrefe, arsura, terapie, alternativ, banca de piele

## ABSTRACT

**Introduction:** In massive burn injury, skin allografts can be used as an alternative and temporary cover for the defects, when autografts are not available or limited.

**Material and Methods:** The material presents the case of three children between 4 and 15 years old, with 85-95% TBSA third-degree flame burn, airway burns and burn shock, who received complex surgical treatment with both allografts and autografts-allografts. (sandwich technique)

**Results:** The defect after early excision and escharotomy was fully covered with allografts from the skin bank, refrigerated on liquid nitrogen at -196°C, in presence of a glycerol 15% cryogenic agent. In a small area we used sandwich technique with autograft and allograft.

**Conclusions:** Allografts promote dermal development, prevent receptor layer desiccation, reduce evaporative fluid losses and heat loss and therefore metabolic consumption, prevent exudative protein loss, loss of erythrocytes, bacterial

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**Corresponding author:** Cristina A. Avram, MD  
„Grigore Alexandrescu” Clinical Emergency Hospital for Children Bucharest - Plastic Surgery and Reconstructive Microsurgery Clinic  
e-mail: cristina.a.avram@gmail.com

proliferation and promote healing in partial burns (biological dressing) and early rehabilitation. The major disadvantage of allografts is rejection, generally occurring between 2 and 4 weeks, which makes it a temporary therapy.

**Key word:** skin, allograft, autograft, burn, therapy, temporary, alternative, bank

## INTRODUCTION

Burn is the most severe type of injury that a human being may suffer which can be quantified and evaluated by surface and depth of lesions. Treatment of this kind of injuries needs complex teams, competent and devoted, consistent therapeutic principles, specific conditions of care and specific funding.

In full thickness burns, deep partial burns on important functional area (hand, foot, periarticular regions) and burns up to 40% TBSA, predominantly deep, surgical treatment consists in early excision and grafting, which improve prognosis compared to the burned area and also cosmetic and functional results.

Methods for coverage post-excisional defects use autografts for burns less than 50-60 % TBSA and allografts, as a temporary alternative cover, for burns more than 60% TBSA.

In some cases, concomitant use of autograft with allograft (sandwich technique) after early excision of deep burn area can provide permanent cover of the area where it is used.

Allografts are live tissue, most frequently used in extensive burns. They integrate and gain vascularization in 2-4 weeks, undergo the natural process of non-self tissue rejection and must be removed and gradually replaced by skin autografts when patient's condition improves and his donor sites heal.

Allografts may be fresh, refrigerated (4 degrees C) or cryopreserved in the Skin Bank (in liquid nitrogen at -196 degrees C).

## MATERIAL AND METHODS

We study three patient cases with 85- 95% TBSA third-degree flame burn, who received complex surgical treatment with both allografts and autografts – allografts (sandwich technique).

In all three cases, autologous skin was limited or not available and the cover treatment after excision consisted in using cryopreserved allografts from our clinic's skin bank.

## RESULTS

First patient is a 4 year old child admitted into the emergency room with third-degree flame burn on 90% TBSA, associating airway burn, post-combustion shock and compartment syndrome on both hands and legs.



**Figure 1.** Cryopreserved allografts (in liquid nitrogen at -196 degrees C) from Skin Bank



**Figure 2.** Allografts processing in order to graft post-excisional defects

Emergency surgical treatment consisted in practicing hand and leg escharotomy, excision debridement and dressing. Next day, early excision and grafting was performed, using allografts and sandwich technique for a small area.

Second case is of a 12 years old girl, explosion victim, with second and third degree flame burn on 95%TBSA post-combustion shock, airway burns and compartment syndrome on hands, legs and trunk.

We also performed hand, leg and trunk escharotomy as emergency surgical treatment, early excision and coverage of 18% TBSA with allografts on third day from the accident.

Second excision was made on the fifth day, when we



**Figure 3.** Left hand third degree flame burn with compartment syndrome



**Figure 4.** Emergency escharotomy realising compartment syndrome



**Figure 5.** Third-degree flame burn on 90% TBSA



**Figure 6.** Allografting both legs after early excision



**Figure 7.** Trunk third degree burn flame

used sandwich method on the upper leg.

The third case is about an electrocuted 15 years old boy with second and third degree burns, on 80% TBSA, associating post-combustional shock, left hand compartment syndrome and multiple trauma injuries.

As emergency care, we performed left hand and left superior trunk escharotomy and fasciotomy and found left upper limb muscle necrosis.

Second day from accident, eschar early excision, muscular necrosis excision and grafting were performed. We covered postexcisional defects with allografts on hand surface and autografts on the thorax.

## DISSCUTION AND CONCLUSION

Temporary alternative cover in massive burn injury, use as biological dressing, promotes healing of partial burns. You can use it as temporary coverage of deep wounds after excision until autografting becomes



**Figure 8.** Trunk allografts and sandwich technique on abdominal wall

possible. It prevents infection and further tissue loss.

In our cases analysis, we can say that using skin allograft has both advantages and disadvantages.

As advantages, skin allografts can prevent receptor



**Figure 9.** Second and third degree flame burn on 95% cTBSA at 12 years old child



**Figure 10.** Trunk escharotomies performed in the moment of arrival



**Figure 11.** Second day allografts image after early excision and grafting



**Figure 12.** Fifth day - post-excision allografts



**Figure 13.** Sandwich technique on a small area of the thigh – second excision, two days from surgery



**Figure 14.** Sandwich technique – second excision, five days from surgery



**Figure 15.** Hand escharotomy after electrocution burn



**Figure 16.** Left upper limb muscle necrosis and muscle debridement



**Figure 17.** Coverage with allografts

layer dessication and promote dermal development. The reduction of evaporative fluid losses, heat loss and metabolic consumption is significant, temporarily improving overall patient's condition.

From a biochemically perspective, the use of skin allografts leads to a decrease in proteins and erythrocytes loss. It also improves electrolytic levels.

The protection of exposed subdermal structures (tendons, vessels, nerves) can be seen as another advantage of this technique with major benefits for the patient, one of

which being early rehabilitation.

Although the use of allografts is widely spread, one of the worstes disadvantages is that the graft undergoes natural body rejection, making this a temporary cover



**Figure 18.** Left superior thorax burn eschar with escharotomies



**Figure 19.** Left superior thorax coverage with autografts

solution. First signs of rejection are usually seen in between two and four weeks. To overcome this issue, skin allografts must be replaced gradually with skin autografts, cell cultures in cases of full thickness burns exceeding 80% TBSA.

Another downside in using this type of grafts is that they are difficult to obtain. There is a constant need of donors, which implies ethical, legal and technical preparation, such as skin banks, transplant centers, qualified personnel and all other means for obtaining grafts. All above can lead to increased costs to the healthcare center or hospital.

Yet safe procedure due to proper testing and storage efforts, skin allografts can be a source of contamination when testing or storage are not performed at the highest standards.

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