CLINICAL APPLICATION OF SKIN HOMOGRAFT FOR EXTENSIVE BURNS

Naki SELMANPAKOĞLU*, Yücel ÖZTAN, Mustafa DEVECİ*, Mustafa ŞENGEZER***
*Gülhane Military Medical Academy, Department of Plastic and Reconstructive Surgery ANKARA
**Army Hospital, Deparment of Plastic and Reconstructive Surgery İZMİR

SUMMARY

Autografts and homografts were used in 8 fresh burn cases who were admitted to Burn Center at Gülhane Military Medical Academy. This procedure was chosen because of the paucity of available donor sites. Homografts were taken from first degree relatives of the patients since cadaver skin grafts were unavailable.

3 patients died postoperatively in whom the procedure was performed. Immunosupression was not undertaken during the use of homografts for temporary coverage in our patients whose avarage total body surface area of burn was 50 %

***Key Words** : Skin homograft, extensive burn.*

ÖZET

GENİŞ YANIKLARDA DERİ HOMOGREFTİNİN KLİNİK UYGULAMASI

1990-1992 yılları arasında GATA Yanık Merkezine başvuran taze yanıklı hastalarımızdan 8 olguda otogreftle beraber homogreft kullanıldı. Yanık organlarının fazla, donor sahanın sınırlı olması nedeni ile bu yöntem seçildi. Kadavra greftinin bulunamaması nedeni ile homogreftler hastaların yakınlarından alındı. Bu uygulamanın yapıldığı 8 olgumuzun üç tanesi posoperatif dönemde öldü. Ortalama yanık oranı % 50 olan hastalarımızda geçici örtü için homogreftin kullanımı sırasında immunosuprasyon uygulandı.

***Anahtar Kelimeler** : Deri homogrefti, geniş yanık.*

Human epidermis has the natural property of being a defensive barrier against the invasion of bacteria and other microorganisms. Following burn injury this natural defensive barrier is lost. In addition, the large amount of necrotic tissue resulting from the burn injury may serve as an excellent culture medium for microorganisms, making burn wound ideal for their proliferation and growth. Infection of the wound not only causes the conversion of a second degree burn into a third degree burn, but is also the significant cause of sepsis and death. Studies about survival rates show that early tangential excision can reduce the mortality rate (1).

The ideal skin replacement after thermal injury is skin autograft which consists of epidermis integrated by means of basement membrane zone to dermis. Functionally epidermis controls evaporative losses and subserves immunologic surveillance while the dermis is principally responsible for Providing durability. Objectionable scarring and wound contraction are inversely related to the dermal thickness. Local wound coverage for large burns from smaller donor areas is limited by two factors: 1) Inability of the dermis to regenerate spontaneously and 2) The paucity of epidermal appendages in deep dermis and appendegal regeneration (2).

It's argued that the optimal management of deep burn is early excision and autografting (3, 4). Improvement in surgical techniques, anesthesia and wide spectrum antibiotics permit excision of burned tissues as soon as possible. Surgeon will face a new problem after the excision of burned tissues in extensive burns which is the coverage of burn wounds.

To deal with this problem, many skin substitutes with different advantages have been introduced. Materials currently in use to cover de epit helized surfaces are:

1. Human allografts (cadaveric or from a living donor).
2. Xenografts.
3. Embrionic membranes.
4. Tissue derivatives.
5. Synthetic skin substitutes.

Early tangential excision of burned tissues followed by coverage with cadaver skin or donor skin from a relative in children with large burn injuries was first reported by Burke et al. in 1975 (5). The excellent survival reported in his series of 11 cases has led to widespread utilization of this technique. Modifications of this approach reported by some authors confirmed similar results with fresh or frozen cadaver skin as coverage for large excision (6, 7, 8, 9). Small amounts of available autograft donor skin were widely expanded and overlaid with homograft which was also used for covering other areas for which autograft was enough (10, 11).

We report tangential excision followed by auto-homografting as life saving procedure for patients with extensive burns. Furthermore, we demostrate that immunosupression is not necessary for homografting, since homografts serve as temporary coverage.

MATERIALS AND METHODS

Eight consecutive patients who were admitted to the Burn Center at Gülhane Military Medical Academy have been treated with tangential excision followed by auto-homografting between 1990-1992. The etiology of the burns were flame in five cases, scalding in two casses and electrical flash in one case. Four patients had clinical evidence of inhalation injury. The size of the burns ranged between 21-77 percent of TBSA, the full thickness burn area were found to be 15-50 percent of TBSA (Table 1).

Two of eight patients were female. Average age was 19 (1-40) The patients have been admitted to the Burn Center between 2-14 days postburn. All wounds were cleansed and silver sulphadiazine or silver nitrate spray were applied two times a day. Wounds were dressed with nitrofurazone or chlorhexidine impregnated tulle-gras if indicated.

Burned patients and donors were operated at the same time. Table II shows the percentages of auto and homografts applied in each patient. When the eschar had softened the process of tangential excision and auto-homografting was performed (Fig.1). A Humby

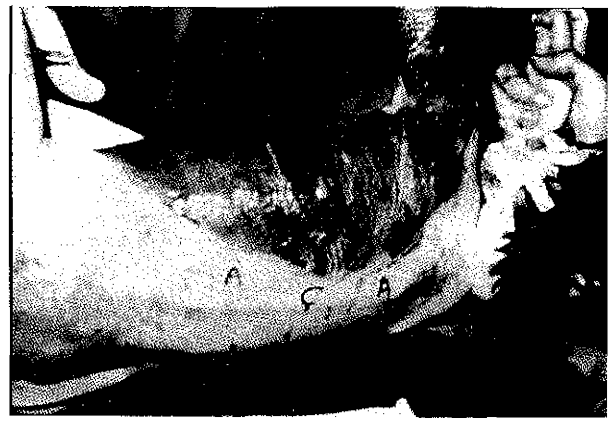

Figure 1. Shows auto-homografting procedure A- Stands for maternal homograft. Ç- Stands for autograft.

blade was used to remove all loose eschar. Both autografts and homografts were cut in strips and grafted to the wound alternately. Auto and homografts were meshed 2:1 and in some patients they were applied on the next day (Fig.2). Stamped autografts were placed into spaces created on homografts in some patients (Fig.3). After the arrengement of auto-homografts, these were covered with one layer of nitrofurazone or chlorhexidine empregnated tulle - gras and compressive dry

TABLE I

CASE	Age/Sex	Cause	% TBSA Burn	3 Burn
BT	1/M	Scalding	21	15
FTK	30/M	Flame	60	25
HT	20/M	Flame	40	36
AP	20/M	Flame	45	37
FS	30/F	Flame	77	50
ZK	5/F	Flame	59	30
AŞ	40/M	Scalding	70	50
MD	6/M	Electric Flash	27	27

Table 1: Shows age and sex of the patients, etiology of burns and width and depth of burns.

TABLE II

CASE	DONOR	% HOMOGRAFT	% AUTOGRAFT
BT	Mother	50	50
FTK	Brother	70	30
HT	Brother	40	60
AP	Brother	50	50
FS	Sister	30	70
ZK	Mother	40	60
AŞ	Brother	70	30
MD	Brother	50	50

Table II: Shows percentages of auto and homografts applied

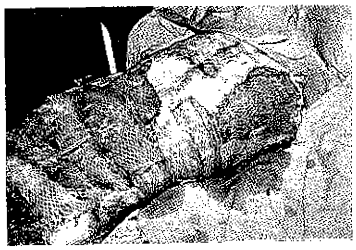

Figure 2. *Shows expanded auto-homograft.*

Figure 3. *Both auto and homografts were applied in a stamped manner.*

gauze. Dressing and immobilization were performed carefully.

Fluid resuscitation was done according to Brooke formula in all patients. Then all patients were given 1500 calories per square meter of total body surface area and 2500 calories per square meter of burn surface every day. Systemic antimicrobial agents were given perioperatively and when clinical signs of sepsis were appearent. Blood cultures and quantitive wound biopsies were obtained serially three times per week and as indicated.

The patients underwent surgery for autografting in 7-20 days intervals which previously applied homografts were replaced by meshed autografts for permanant coverage.

Homograft rejections occurred between 14-38 days (Fig.4a-b) (Fig.5a-b).

RESULTS

Four patients underwent surgery for early tangential excision. Auto-homograft take were observed on third and fifteenth day postoperatively. Homograft take ranged between 20-75 percent. On the other hand, autograft take ranged between 30-50 %.

Two patients required debridment and autografting twice with eventual complete healing. Other patients required autografting more than twice.

Patients were given pressure garment to control hypertrophic scarring. Three patient were followed up for more than six months. Two patients were lost to follow up. Three patients died of sepsis, one being the pseudomonas sepsis.

DISCUSSION

Homografts from live donors, in other words, fresh homografts have some advantages compared to other

TABLE III

CASE	HOMOGRAFTING		AUTOGRAFTING		Hospital
	3 Day Take	15 Day Take	3 Day Take	15 Day Take	Stay
BT	% 50	% 50	% 50	% 40	82
FTK	% 80	% 75	% 95	% 30	57
HT	% 40	% 40	% 90	% 70	73
AP	% 40	% 40	% 80	% 50	120
FS	% 10	—	% 30	—	Ex (6)
ZK	% 20	—	% 30	—	Ex (9)
AŞ	% 20	% 20	% 30	% 30	Ex (24)
MD	% 80	% 75	% 90	% 30	60

Table III: Shows graft take in both homograft and autograft.

A B

***Figure 4** A) Shows rejection of homograft and. B) Subsequent autografting.*

temporary coverage materials. These advantages are as follows (12):

Quick adherence to the wound, impermeability to water and limited permeability to water vapour, decrease heat loss, decrease electrolyte and protein loss, limit microbial colonisation of the burn wound, decrease pain sensation, facilitate physiotherapy, allow painless dressing changes, increase debridment in the wounds and donor sites, have haemostatic properties, improve the well being of the patient.

Epithelization rate is high clinically after autograft take, but epithelization rate decreases after homograft take especially after the beginning of rejection process.

An inflammatory process is seen in rejection areas. In inflammatory areas autograft regeneration is slow. In addition, this type of healing will result in hypertrophic scar. Our choise is to cover burn wounds in the face first. The application of auto-homografts in alternate strips is an easy surgical technique.

It was aimed to decrease the rejection phenomenon by various immunosupressive agents after homograft application. We believe that immunosupressive agents will deteriorate the immune status of patients. Furthermore, these patients have already depressed immunoresponse because of burn trauma. This results in high risk of sepsis.

A B

Figure 5. *A) Shows rejection of homograft and. B) Subsequent autografting in another patient.*

The preservation of open burn wound until healing of autograft donor sites can be managed by homografts taken either from first degree relatives or fresh cadavers by reducing antigenecity of homografts (11). This is an alternative approach to immunosupression of a burned patient.

The results of auto-homografts application on mortality must be discussed with large series of patients. But it is hoped to reduce the mortality rate by coverage of burned wounds.

CONCLUSIONS

1. Harvesting and application of fresh homografts are easier compared to cadaveric homografts. This method is not expensive because storage is not a problem. Storage and sterilization is not required, so it has no infection risk.

2. It is easy to obtain than other materials in our country.

3. Homografts have the same biological properties with autografts. From this point of view, it is superior to the other materials.

4. Immunosupression is not required, because long term survival is not the goal of this approach. In burned patient immune system is depressed and sepsis is still the most significant cause of death. Homograft application without immunosupression for temporary coverage has advantages in this respect.

5. The adverse effects of immunosupressive agents are not seen.

6. Early tangential excision and homograft application will improve morbidity and reduce the mortality rate.

REFERENCES

1. Chih-chun Yang, M.D., Tsi-siang Shih, M.D., We-shia Xu, M.D.: A chinese concept of treatment of extensive third-degree burns. Plast. Reconstr. Surg. 70; 238, 1982.
2. Couno Charles B., M.D., Ph., D., et al.: Composite autologous-allogeneic skin replacement. Development and Clinical Application. Plast. Reconstr. Surg. 80; 426, 1987.
3. Herndon N. David, M.D., Parks H. Donald: Comparison of serial debridement and autografting early massive excision with cadaver skin overlay in the treatment of large burns in children. J. Trauma 26; 149, 1986.
4. Krob Mary Jeanne, M.D., Jordan H. Marion, M.D.: Serial debridement and allografting of facial burns. A method of controlling spontaneous healin. J. Trauma 27; 190, 1987.
5. Burke JF., Quinby WC., Bondoc CC., Cosimi AB., Russell PS.: Immunosupression and temporary skin transplantation in the treatment of massive third degree burns. Ann. Plast. Surg. 182; 183, 1975.
6. Alexander J.W., Mac Millan B.W., Law E., Kittur D.: Treatment of severe burns with widely meshed skin autograft and meshed skin allograft owerlay. J.Trauma 21; 443, 1981.
7. Purdue F. Gray, M.D. et al.: Biosynthetic skin subsitute versus frozen human cadaver allograft for temporary coverage of excised burn wounds. J.Trauma 27; 155, 1987.
8. Clark G.T., M.D., Moon D.J., M.D.: Spesific unresponsiveness to skin allografts in burns. J. Surg. Research 46; 401, 1989.
9. Kreis R.W., M.D., et al.: The use of non-viabl-glycerol-preserved cadaver skin combined with widely expanded autografts in the treatment of extensive third-degree burns. J.Trauma 29; 51, 1989.
10. Frame J.D., Sanders R., Goodacre T.E.E., Morgan B.D.G.: The fate of meshed allograft skin in burned patients using cyclosporin immunosupression. Br. J.Plast Surg 42; 217, 1989.
11. Alsbjörn B.F., Sorensan Bent: Grafting with epidermal langerhans cell depressed cadaver split skin. Burns 11; 259, 1985.
12. Alsbjörn B.: In search of an ideal skin substitute. Scand. J. Plast Reconstr Surg 18; 127, 1984.