FIRST SKIN BANK OF COASTAL KARNATAKA: OUR JOURNEY SO FAR

LA PREMIÈRE BANQUE DE PEAU DU KARNATAKA CÔTIER : OÙ EN SOMMES-NOUS?

Pereira C.B.,✉ Thomas J., Pillai S.C.

Department of Plastic Surgery, Kasturba Medical College, Manipal, India

SUMMARY. In India around 7 million people suffer from burn injuries each year, with 140,000 deaths and 240,000 people having some form of residual disability. Human skin allograft is the gold standard for the treatment of burn wounds, hence having an in-house skin bank at a Burn Unit would be ideal. This article presents the efforts to introduce the concept of skin donation after death to the population of Udupi and Mangalore District, the response to this venture, and how our in-house skin bank helps in the management of patients in our burns centre. This study is a descriptive study done at our skin bank at Kasturba Medical College Hospital Manipal. All donor and recipient records of cadaveric allografts from MAHE Skin Bank from inception on 21-8-2021 to date were analysed. From inauguration to date, a total of 23 skin donation calls have been attended and a total of 56,560 sq. cm of skin harvested, with an average of 2570 sq. cm of skin harvested from the back and the bilateral lower limbs. A total of 20 inpatients in our burns unit received 28,475 sq. cm of cadaveric skin from our skin bank, with 3 patients dying due to sepsis (mortality rate - 15.00%). It is feasible to create a skin bank in a community with no concept of cadaveric skin donation, as demonstrated by the successful establishment of Coastal Karnataka's first skin bank at KMC Manipal Hospital.

Keywords: cadaveric skin donation, skin banking, skin donation awareness

RÉSUMÉ. *Environ 7 millions d'indiens se brûlent chaque année, brûlures responsables 140 000 décès et 240 000 handicaps. Dans la mesure où l'allogreffe représente le traitement de référence d'une brûlure, l'existence d'une banque de peau (BP) au sein d'un CTB est l'idéal. Nous présentons nos efforts pour promouvoir le don de peau après décès au sein de la population du district d'Udupi et Mangalore, leurs résultats et les conséquences du développement de cette BP sur la prise en charge des patients dans le CTB du CHU Kasturba de Manipal. Nous avons analysé les données des donneurs et receveurs d'allogreffes depuis l'ouverture de notre BP, le 21/8/2021. Nous avons obtenu 23 dons cutanés pour un total de 56 560 cm² (moyenne 2 570), prélevés sur le dos et les membres inférieurs. Vingt patients ont reçu en moyenne 28 475 cm² d'allogreffe venant de notre BP, dont 3 (15%) sont morts en contexte septique. Ceci montre qu'il est possible de créer une BP au sein d'une communauté n'étant au fait de la possibilité de donner sa peau au moment du décès.*

Mots-clés : *don de peau, sensibilisation, banque de peau*

✉ Corresponding author: Dr Carlsen Bernard Pereira. Email: carlsenpereira87@gmail.com
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Introduction

In India around 7 million people suffer from burn injuries each year, with 140,000 deaths and 240,000 people suffering from disability.[1] Use of human skin allograft is the gold standard for coverage of surgically excised burn wounds. Excision of deep partial thickness and full thickness burn wounds and allografting has been the standard of care for management of burn wounds for the last decade. Due to the logistic issues in procuring cadaveric skin for patients at our burns centre from other skin banks in our country, a need to set up a skin bank at our burns centre was felt.

The Skin Bank at Kasturba Hospital was inaugurated on 21st August 2021 as a joint initiative between Manipal Academy of Higher Education, National Burns Centre Mumbai and the Rotary Club (Manipal Town, Western Henrico County and Central Chester County USA).

This paper analyses the profile of the skin donors over the last 18 months and the pattern of utilization of cadaveric skin for burns patients during this period.

Materials and methods

Skin bank protocols (Euro skin bank protocols)

Euro Skin Bank protocols are followed at MAHE Skin Bank with regards to skin procurement, processing, preservation and distribution under the guidance of the National Burns Centre Mumbai.

After receiving a skin donation call from hospital personnel or relatives of the deceased, the death certificate is analysed for cause of death to rule out exclusion criteria of the donation like malignancy, Hepatitis B, HIV, syphilis and sepsis.

After confirming the call, the skin harvesting team is organized. The team consists of four members; two doctors, one nurse and one house-keeping staff. The team reaches the home or hospital, explains to the family the purpose of cadaveric skin collection, and takes their informed written consent. If the skin harvest is a part of multiorgan harvest from brain dead donors, then consent is taken by Jeevan Sarthakathe Co-Ordinator.

After body examination, and shaving, the skin is disinfected with Savlon followed by povidone-iodine. Skin is harvested from the back, both thighs and legs (*Figs. 1, 2 & 3*) under strict aseptic conditions with a battery-operated dermatome (*Fig. 4*), as strips, which are then stored in a sterile container containing 50% glycerol and added antibiotics (Penicillin: 1,000,000 units and Streptomycin: 1 gram) (*Fig. 5*). The skin is carried to the skin bank by the same team and kept at 4-8°C (phase 1).

Blood sample is collected at the same time for testing for HIV, HBsAg, HCV and VDRL. After getting negative blood reports, within 48h, the skin strips are transferred to 85% glycerol containing antibiotics and kept at 33°C in a shaking incubator (*Fig. 6*) for 3 hours for glycerol lubrication (phase 2). The skin strips are then stored at 4–8°C for further incubation for 3 weeks. After completion of the incubation period, the skin is meshed, quantity is measured in a biosafety cabinet (*Fig. 7*) and transferred to individual conical tubes, and then stored after labelling at 4–8°C (phase 3) (*Fig. 8*).

Fig. 1 - Skin graft donor sites: thighs and legs

Fig. 2 - Skin graft donor sites: thighs and legs

Fig. 3 - Skin graft donor site: back

Fig. 4 - Dermatome

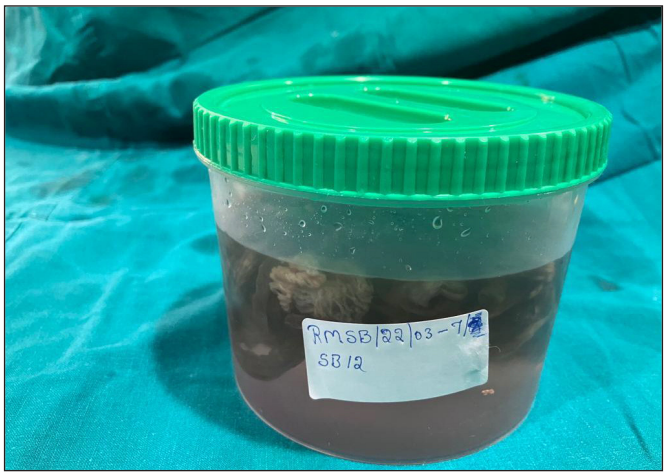

Fig. 5 - Harvested cadaveric skin stored in 50% glycerol containing antibiotics

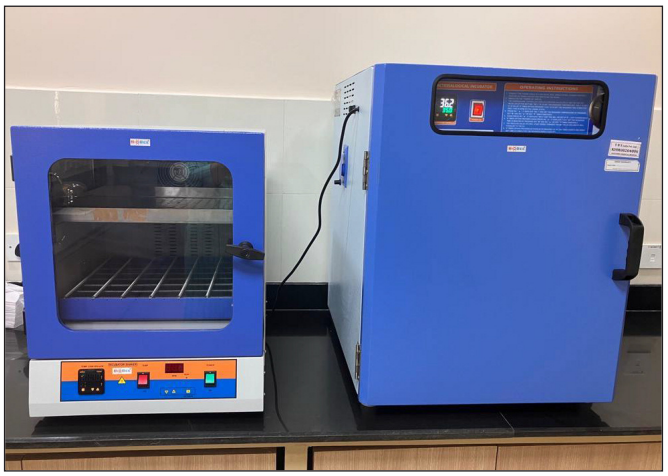

Fig. 6 - Shaking incubator

Fig. 7 - Biosafety cabinet

Skin samples are inoculated and 2 weeks later sent for microbiological testing (bacterial and fungal). If microbiological testing is negative, the skin becomes available to be used as allograft and can be

Fig. 8 - Phase 3

stored for a period of 3 years until use in the walk-in cooler (*Fig. 9*). However, if bacterial or fungal cultures are positive (1st culture) then skin samples are isolated for another 3 months, at the end of which bacterial and fungal cultures are repeated. If negative, the skin can then be used for allografting. If the 2nd culture is positive, then Glycerol change is done and skin samples are isolated for another 3 months, after which bacterial and fungal cultures are repeated. If the 3rd bacterial and fungal cultures are negative, the skin can then be used for allografting. If cultures are positive, then Glycerol change and skin samples are isolated for 3 months and the testing process is repeated. If negative, the skin can be used. If the fourth culture is positive, then the cadaveric allograft is discarded.

Fig. 9 - Walk-in cooler

Analysis of cadaveric skin donor and recipients

Donor profile in terms of age and sex distribution, association with other organ donations, area of skin graft harvested per donor, percentage of positive skin cultures (bacteria/ fungus), and effect of Covid on donor harvest was analysed.

Analysis of allograft recipients in terms of age, percentage of burns area, and outcome in terms of mortality were noted.

Results

The total number of skin donors since inception of the skin bank is 23. Out of these 23 skin donors, 17 (73.91%) were male and 6 (26.08%) were female (*Table I*). Nine (39.13%) skin donors were less than 40 yrs. Twelve (52.17%) skin donors were in the 40-70 years age group and 2 (8.69%) skin donors were over 70 yrs (*Table II*). Twelve (52.17%) skin donations were associated with eye donations, and 8 (34.78%) were part of multiple organ harvest like skin, eye, liver and kidneys. In 3 (13.04%) donors, only skin was harvested as in 1 case the relatives of the deceased were not willing for eye donation, and in 2 cases the cause of death was drowning and was not feasible for eye donation (*Table III*).

Due to the ongoing Covid pandemic, Covid RTPCR was done for the donors. Seven (30.43%) donors had Covid RTPCR negative status. The skin of 1 (4.34%) donor after harvesting had to be discarded as Covid RTPCR was reported as positive. As National Guidelines were changed, routine Covid RTPCR testing was stopped, hence the Covid RTPCR status of 14 (65.21%) donors is not known (*Table IV*).

Out of 23 donors, 9 (39.13%) skin cultures showed no growth, 8 (34.78%) skin cultures showed fungal growth, and 5 (21.734%) skin cultures showed bacterial growth. The culture status of 1 (4.34%) donor is not known as 1 donor skin was discarded (Covid RTPCR Positive) and 1 donor skin sample is undergoing processing (*Table V*).

The total number of recipients of cadaveric skin from our skin bank since inception of the skin bank is 20, with 28,475 sq. cm of skin used.

Out of the 20 skin bank recipients, 12 (60.0%) were male and 8 (40.0%) were female (*Table VI*). Ten (50%) of the skin recipients were in the paediatric age group (<18 yrs.) (*Table VII*).

All 20 skin bank recipients were burn injury victims. Fifteen skin bank recipients had burns with TBSA <30%. Fourteen patients survived and 1 expired. Four skin bank recipients had burns with TBSA 30 to 50%. Three patients survived and 1 expired. One skin bank recipient had burns >50%. She did not survive. Patients with more than 50% TBSA burns are generally managed conservatively in our burns centre (*Table VIII*).

Table I - Sex distribution of donors

Sex	No. of Donors	Percentage
Male	17	73.91
Female	6	26.08
Total	23	100

Table II - Age distribution of donors

Age Groups	No. of Donors	Percentage
<40	9	39.13
40-70	12	52.17
>70	2	8.69
Total	23	100

Table III - Association of donations

Association	No. of Donors	Percentage
Skin only	3	13.04
Skin + eyes	12	52.17
Skin + eyes + other organs	8	34.78
Total	23	100

Table IV - Covid RTPCR status of donors

Covid Status	No. of Donors	Percentage
Positive	1	4.34
Negative	7	30.43
Unknown	15	65.21
Total	23	100

Table V - Culture status of donors

Cultures	No. of Donors	Percentage
Bacterial growth (1st culture)	5	21.73
Fungal growth (1st culture)	8	34.78
No growth	8	34.78
Unknown	2	8.69
Total	23	100

Table VI - Sex distribution of allograft recipients

Sex	No. of Recipients	Percentage
Male	12	60.00
Female	8	40.00
Total	20	100

Table VII - Age distribution of allograft recipients

Age Groups	No. of Recipients	Percentage
<18	10	50
>18	10	50
Total	20	100

Table VIII - Burn extent of allograft recipients and outcome

Burn Extent (%)	<30%	30-50%	>50%	Total
No. of recipients	15	4	1	20
No. of survivors	14	3	0	17
No. of deaths	1	1	1	3
Mortality rate	6.66	25	100	15

Discussion

The first skin bank in India was established in the year 1978 at the Bai Jerbai Wadia Hospital in Mumbai by Dr. Manohar H. Keswani. This skin bank could not achieve its objectives due to lack of monetary support and awareness about cadaveric skin donation. A watershed moment in the history of skin banking in India was reached when Dr Madhuri Gore established the Skin Bank at Sion Hospital in 2000 and RCBN Skin Bank was established in 2009.[2]

Excision of deep partial thickness and full thickness burn wounds and allografting has been the standard of care for management of burn wounds for the last decade in our burns centre. Procurement of skin licence was delayed and was obtained after a period of 1 year in February 2021 due to Covid-related travel restrictions. The Skin Bank at Kasturba Hospital was inaugurated on 21st August 2021 as a joint initiative between the Manipal Academy of Higher Education, the National Burns Centre Mumbai and the Rotary Club (Manipal Town, Western Henrico County and Central Chester County USA) (*Fig. 10*).

From inauguration until today, a total of 23 skin donation calls have been attended and a total of 56,560 sq. cm of skin harvested, with an average of 2570sq cm of skin harvested per donor. In the Euro

Fig. 10 - Inauguration of skin bank

skin bank study, donors should have a body surface area of 1.75m^2 to ensure harvest of 3500cm^2 good quality skin.[3]

The majority of the 23 donors were male (73.91%), and about 52.17% of donors were in the 40-70 years age group, which is similar to the donor profile of the Lokmanya Tilak Municipal Medical College Hospital Skin Bank, reported by Gore et al., where out of 262 donors, 154 (58.78%) were male and 62.21% were over 70 years old.[4]

All 23 harvests occurred within the hospital set up. No home harvest has taken place to date, which is in contrast to the donor profile analysis done by Gore et al., where from 2007 to 2010, the majority of the donations (154/206, 74.76%) took place at the home of the donor.[4]

Skin donations were associated with eye donation in 86.95% of cases, and in only 3 cases cornea harvesting was not done as in two of these cases the cause of death was drowning, and in the other case, the donor's relatives were not willing for eye donation.

Out of 13 donor skin cultures which were positive for bacterial and fungal cultures, 2 skin cultures were negative after 3 months (2nd culture), 7 skin cultures were negative at the end of 6 months (3rd culture), 2 skin cultures were negative at the end of 9 months (4th culture), and 2 donor sample second cultures were not done as they were in inoculation at the time of conclusion of the study.

A total of 20 inpatients in our burns unit received 28,475 sq. cm of cadaveric skin from our skin bank. Nineteen patients who received cadaveric allograft had TBSA <50 %. Three of the total 20 burns patients receiving allograft expired due to sepsis (mortality rate - 15%).

During the first 2 years of operation of Nepal's First Skin Bank at Kirtipur Hospital, the skin bank registered over 200 donor pledges and received 4 allograft skin donations which were used in 6 burn patients with ≥20% TBSA, 4 of whom eventually recovered from their injuries.[5]

Issues faced due to lack of awareness at the time of harvests

No proper awareness among hospital staff (doctors and nursing personnel) about skin donation resulting in inability to identify potential donors.

In medicolegal cases, delay in the police inquest results in inability to harvest the skin within the specific time period.

Ignorance among kin of potential donors with the thought that skin harvest can cause issues during conduct of last rights.

Awareness campaigns for skin donation

Creating awareness among hospital staff (doctors and paramedical personnel) and medical and paramedical students through talks which are currently ongoing.

Creating awareness among the public through write up in print media, talks at religious places, conducting an Organ Donation Rally (e.g. - Vehicle Rally), distributing flyers, electronic display in the patient waiting areas in the hospital, which are currently ongoing.

Educating police personnel about skin donation - awareness programs.

Collaboration with the cornea donation program can provide an additional avenue of spreading awareness about skin donation. When a family is counselled about cornea donation, they can also be counselled about skin donation.

Conclusion

Establishing a skin bank attached to the regional burns centre helps to reduce delays in procurement of skin for the management of burns patients, avoids logistic issues of procuring skin, and reduces the financial burden on the burn patient's relatives. Creating awareness about the skin bank and skin donation in a community with no concept of cadaveric skin donation has allowed us to set up and run Coastal Karnataka's First Skin Bank.

We still have a lot of hurdles to overcome before we are able to supply cadaveric skin to hospitals in our district and neighbouring districts for the management of burns patients. However, with the help of awareness campaigns, NGOs and other organisations, we believe our goal is achievable.

Limitations: Single Centre study.

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