

A COMPARATIVE STUDY OF THE VARIOUS METHODS OF PRESERVATION OF HUMAN SKIN GRAFT

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Introduction :

In order to avoid repeated surgery for resurfacing of wounds with skin loss, provision for storage of surplus skin for grafting is the crying need of traumatic and reconstructive surgery. It is known that the cellular death of a skin graft does not take place immediately after taking the temperature at which it is preserved, is one of the most important factors which prolong its viability. Experiments have shown that there is a low rate of metabolic activity at 0°C. Below freezing point the physical effects of freezing and thawing have a grater effect on its viability (Carrel, 1912). The methods of tissue storage may be divided into two main groups depending upon whether the tissue is stored at temperature above or below freezing point. Skin graft has also been stored on donor dermis (Shepard, 1972).

The skin remains viable when stored under certain conditions, but there is no general agreement on the relative merits of different methods and on the period of storage.

Material and Methods :

We have done a comparative study of 45 cases (divided in three series each consisting of 15 patients) drawn from different age and sex groups with different indications for provision of skin cover. The following three methods of skin preservation will be hereafter known as Series A, Series B & Series C.

Series 'A' : The skin graft was preserved over tulle grass spread over a glass plate, in a sterile, chemically clean, tightly stoppered vials with a few drops of normal saline at the bottom and stored in the freezing chamber of the domestic refrigerator at 4°C.

Series 'B' : The graft was placed in 15 ml. Sterile, clean vials and completely submerged in 10 ml. of glycerol and kept in deep freeze at -76°C.

Series 'C' : The graft to be stored was replaced on the donor dermis after the bleeding had stopped.

On the 4th and 8th post operative day wound inspection was done, any raw area

Table I

Showing age and sex distribution of the cases in series A, B and C.

Age group in years.	Series 'A'		Series 'B'		Series 'C'	
	Male %	Female %	Male %	Female %	Male %	Female %
0-25	5 33.3	3 20.0	5 33.3	3 20.0	3 20.0	4 26.6
26-45	3 20.0	3 20.0	3 20.0	2 20.0	4 26.6	3 20.0
46 and above	1 6.7	— —	— —	1 6.7	3 20.0	1 6.7

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detected was resurfaced by grafts stored by the above techniques. In series 'B' the skin graft was first thawed in a water-bath at 37° C. before application. A histological study of the stored graft was made.

Observations and Discussions :

Out of 45 cases taken up for study, 23 belong to 0-25 yrs. of age, 19 belong to 26-45 years of age and 8 belong to 46 years and above.

Table II

Showing the size of the raw area in the beginning of therapy in different series.

Size of raw area in sq. cms.	Series 'A'		Series 'B'		Series 'C'	
	No. of cases.	%	No. of cases.	%	No. of cases.	%
0-100	11	73.3	5	33.3	9	60.0
100-200	1	6.7	5	33.3	5	33.3
201 & above.	3	20.0	5	33.3	1	6.7

The number of cases with raw area taken over (0-200) sq. cm. was 80% in series 'A' 66.6% in series 'B' and 93.3% in series 'C'. Whereas the size of raw area of 201 sq. cms. and above was 20% in series 'A', 33.3% in series 'B' and 6.7% in series 'C'.

Table III

Showing the percentage taken of graft during the initial session of surgery in patients in Series A, B and C.

Percentage take of grafts.	Series 'A'		Series 'B'		Series 'C'	
	No. of cases.	%	No. of cases.	%	No. of cases.	%
More than 80	6	40	1	6.7	15	100
40-80	9	60	12	80.0	—	—
Less than 40	—	—	2	13.3	—	—

The take up of the stored graft in different series was more than 80% in 40 of the cases of Series A, 6.7% of the patient in series B and 100 of the series in series 'C'.

Table IV

Showing the percentage take up of stored graft in relation to storage time in Series 'A'

Percentage take of graft.	4 days.		8 days.	
	No. of cases	%	No. of cases	%
Less than 50	—	—	—	—
50-85	8	53.3%	2	13.3%
86-100	4	26.6%	1	6.7%

Table V

Showing the percentage take of stored graft in relation to storage time in Series 'B'

Percentage Take of Graft.	4 Days.		8 days.	
	No. of cases	%	No. of cases	%
Less than 50	2	13.3%	2	13.3%
51-85	10	66.7%	—	—
86-100	1	6.7%	—	—

Table VI

Showing the percentage take of graft in relation to storage time in Series 'C'

Percentage Take of Graft.	4 Days.		8 Days.	
	No. of cases.	%	No. of cases.	%
Less than 50	—	—	—	—
51-85	—	—	—	—
86-100	11	73.4%	4	26.6%

The tables IV, V and VI shows the percentage take of preserved graft in relation to storage time. In series 'A' and 'B' the take was poorer on 8th day as compared to the 4th day. But there was no change in Series 'C'. The take was 51 to 85% in 53.3% cases in Series 'A' 66.7% cases in Series B and 73.4% cases in Series 'C' on the application of preserved graft on 4th day.

During the study a histopathological examination of skin was conducted on 4th day and 8th day in each series to detect any cellular changes in the stored skin. It was found that in series A in which skin was stored on 4°C, epidermal cellular arrangement was maintained even on 8th day in most of the series and in only 20 per cent of the series the epidermis had slightly thinned out though normal. The dermis was mildly oedematous in 13.3 per cent of the cases and there was evidence of epidermal separation from the dermis in 6.6 per cent of the cases. In series 'P' in which skin cover was stored at 76°C in glycerol acanthotic changes in the epidermis were seen in 13.3% of the cases though cellular structure was maintained. In 86.6% of the cases occasional vacuolated cell in prickle cell layer could be deciphered and dermis showed looseness of texture. In those cases in which skin was stored on donor dermis, epidermis and dermis appeared normal in 73.3% of the

cases and only in 26.6% of cases slight thickening of epidermis could be found.

Summary

(1) A total number of forty five cases were observed divided in three equal series for a comparative study of merits and demerits of storage.

(2) The skin grafts were stored in the freezing chamber of domestic refrigerator in (Series A) in glycerol at 76°C in (Series B) and at the donor dermis in (Series C).

(3) The preserved skin was applied over recipient bed after 4 or 8 days of storage.

(4) Before application a piece of skin was sent for histopathological investigation.

(5) The take of the stored graft was found maximum in cases of grafts stored on donor dermis and minimum in cases of skin stored in glycerol at 76°C.

Bibliography

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