Split Skin Grafts of the Neck—Observations on Their Contraction and Relaxation

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THE skin of the anterior surface of neck and chest is frequently involved in thermal burns and subsequent contractures. After release of contracture, various methods of reconstructing the defect have been used over a number of years e.g. tube pedicle from abdomen (Brown, 1958; Barsky, 1964), tube pedicle from back (Coughlin, 1968), pedicle flap from shoulders (Pinto, 1964), full thickness skin grafts and split skin grafts (Cronin, 1955, 1961). Disadvantages and advantages of various techniques have been discussed in detail by Reed. O. Dingman (1961). The main disadvantage of the split skin graft is its propensity to contract and reproduce the contracture to a certain extent. It occured to Cronin(1955 and 1961) to use moulded splints against the split skin grafts on the neck, Since then the use of split skin grafts for repair of contractures of the neck have been widely used and reported.

We have also used split skin grafts on the neck and applied various types of moulded splints to prevent subsequent contracture. These splints have given very satisfactory clinical results, but detailed measurements of these grafts have brought out certain interesting facts. These are discussed in this paper.

This study is based on a series of 23 cases of split skin graft of the neck, mostly (21) post burn contractures. Medium thickness split skin graft was used from thighs. Graft was stitched to wound bed following release of contracture and laterally to the margin of the wound which was made W-shaped. Graft healing has been uniformly good. 100% in most cases, and at any rate 90%.

Neck Collars :

Skin graft of the neck was kept continuously pressed by some contrivance e.g. bulky pressure with crepe bandages, Cronin type neck collars, or light moulded plastic neck splints. Good results have been obtained as long as the pressure was maintained for a period of 3 months or more.

Behaviour of Split Skin Graft in the Neck

It is well known that split skin grafts contract following surgery. This was the reason that Cronin devised moulded neck splint to prevent graft contraction and recurrence of contracture neck. In the present study, the linear dimension of the graft in vertical and horizontal planes were measured at various intervals to study the effect of moulded splints on degree of graft contracture.

Results of this study are presented in Tables I, II, III in a group of 10 patients

in whom 100% primary healing of split skin graft was obtained.

Table I shows 3 patients in 0-10 years age group. Case No. 1 is a child of 4 years. There has been a contraction of 1.75 cms. In vertical dimension and 10 cms. in transverse dimension in 6 months time. Vertical length of the graft has, however, increased by 0.5 cms. at 2 years, thus showing that maturation of the graft has allowed it to relax and increase in size. This could occur as a result of general increase in height of this 4 years old child.

In case No. 2, one can see evidence of growth/relaxation of skin graft in the period between 6 months and 1 year post-operatively. Subsequent contraction at 2 years is as a result of keloid formation.

Case No. 3 shows evidence of relaxation in the transverse dimension.

In Table II (10-20 Yrs), case 4, evidence of relaxation of the graft is seen between 15th day and 6 months in vertical dimension. Graft contraction is maximum at T2, which is the transverse dimension in centre of the neck. At T1, in the lower part of the neck, there is evidence of relaxation from 15th day to 6 months.

In case 5, evidence of growth/relaxation is seen in vertical dimension and minimal contraction is seen in transverse dimension.

In case No. 6, there is no evidence of relaxation, but contraction is maximum in transverse dimension in the central part of the neck (T1).

In case No. 7, there is no evidence of contraction or relaxation. In this case, the graft was applied on a surgically created wound in the neck.

In Table III (above 20 years), there is a fair amount of contraction in both dimensions in all 3 cases.

Discussion

In healing of the skin graft, many factors appear to play an important role. Firstly it is logical to assume that factors affecting wound healing (nutritional and harmonal factors) play an important part in healing of skin graft. (2) Infection causes

TABLE I

S. No.	Type of contracture neck	Age in Yrs. and Sex	Measurements at operation	Post Oper. Measurements 7th day	15th day	30th day	6th month	12th month	24th month	% contracture
1.	One side of neck	4 Yrs.	V = 16.75			16.0	15.5		15.5	—14%
		F	T = 10.00			9.0	9.0		9.0	—10%
2,	Both sides of neck	8 Yrs.	V = 10.75				10.5	13.5	11.5	+ 7%
		F	T = 10.00				10.0	8.0	8.0	—20%
3	Both sides of neck	6½ Yrs.	V = 8.5			7.5		7.0		—17%
		M	T = 13.0			9.5		12.0		—8%

V = Vertical dimension
T = Transverse dimension

Figures are in centimeters

loss of graft and healing occurs by scar formation. (3) Firm recipient bed and firm sorrounding skin as in forehead and scalp, keep the graft stretched, whereas loose subcutaneous tissue and surrounding skin, as in eyelids, do not give adequate natural support to the graft. (4) Physical characteristics of the skin graft also probably determine the ultimate nature of its healing. Presence of larger

TABLE II

Sr. No.	Type of contracture neck	Age in Yrs. and Sex	Measurements at Operation	Post Oper. Measurements 7th day	15th day	30th day	6th month	12th month	24th month	% contracture
4.	Central web	17 Yrs.	V = 18.0	17.5	16.5		18.0			Nil
		M	T1 = 11.0	10.0	9.0		9.3			—16%
			T2 = 10.0	9.0	8.0		5.9			—40%
5.	Both sides of neck	20 Yrs.	V = 7.5			6.5		9.0	9.0	+20%
		M	T = 12.0			11.0		10.5	10.5	—12%
6.	Both sides of neck	11 Yrs.	V = 17.2	17.0		15.1	14.7			—14%
		F	T = 12.5	11.0		7.0	6.5			—45%
			T1 = 15.0			9.0	7.0			—60%
			T2 = 15.0			14.5	12.5			—16%
7.	Donor site of Flap neck	17 Yrs.	V = 5.0				5.0			Nil
		M	T = 9.0				9.0			Nil

V = Vertical dimension
T = Transverse dimension

Figures are in centimeters

TABLE III

Sr. No.	Type of contracture neck	Age in Yrs. and Sex	Measurements at Operation	Post Oper. Measurements 7th day	15th day	30th day	6th month	12th month	24th month	% contracture
8.	Central web	35 Yrs.	V = 10.5						8.0	—20%
		F	T = 7.5						5.0	—33%
9.	Keloid	33 Yrs.	V = 6.0			4.0		4.5		—25%
		M	T = 15.0			10.4		9.0		—40%
10.	Keloid	25 Yrs.	V = 6.75		6.25	5.0	5.15			—20%
		M	T = 15.75		15.5	10.5	12.0			—24%

V = Vertical dimension
T = Transverse dimension

Figures are in centimeters

quantity of collagen and elastic tissue in the skin graft will probably contribute to better healing and maintenance of natural characteristics of the skin graft. In the present study, no definite control could be exerted over factor (1). However, all patients subjected to surgery were in moderately good state of nutrition, clinically, with a Hb. of 10-11 gms%. Factor (2) has been eliminated by discarding all cases with even minor infection in the graft. Factor (3) is a common factor as the recipient site, neck, is the same in all cases. Factor (4), Variations are minimised by obtaining medium split skin graft in all these patients

In addition to above factors, we used constant pressure with moulded splints to prevent wrinkling and contraction of skin graft.

Skin of the neck is very elastic in the central part and adjoining lateral areas, but is firm in sub-mental area; far lateral areas near the anterior border of Trapezius muscle; and below over the sternum. When the skin graft was stitched in these firm areas, the contraction was minimal, from 0—20% in vertical dimension, as seen in these tables. In transverse dimensions, the contraction was maximal in those central areas where elastic loose skin was present in the lateral neck e.g. case No. 4 (T2), where contraction is 40%; case No. 6 (T1, T2), where contraction is 45% and 60% respectively; No. 8 (T), where contraction is 33%; and case No. 9 (T) where contraction is 40%. In the last case, additional factor of keloidal tendency also seems to play a role.

Evidence of relaxation/growth of skin graft has been shown in a number of patients (Nos. 1, 2, 3, 4 and 5).

Firm skin around the recipient site and use of moulded splints support the skin graft till it matures, that is, till such time growth of collagen and elastic tissue in the grafted skin provide contributory intrinsic support.

Contraction of skin graft has been found to be maximal in patients with keloids (Table III). This is apparently due to existing keloidal tendency in these patients.

Summary

Linear measurements have been obtained in split skin grafts of the neck at operation and at subsequent periods post-operatively. The contraction of the split skin graft is believed to be prevented by (1) Application of moulded splints to support the graft, (2) Support by firm skin surrounding the graft. After maturation, skin graft appears to relax in certain linear dimensions.

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