

40 Years Ago

Problems of skin cover in injuries of lower limb with tissue loss

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The principles of wound treatment have always evolved out of the material provided by the mass of war casualties. In civilian life, however, the number of casualties are much less but the methods of treatment are based on the experience gained in war. This is true for injuries of lower extremity as well.

The object of this paper is to discuss the problems of injuries of the lower limb with tissue-loss and to evaluate the methods adopted in providing skin cover.

This report reviews 27 cases admitted to the Plastic Surgery Unit of this Institute.

AETIOLOGY

The injuries were caused on the road either by automobiles or by tram cars. Most of the accidents took place while boarding or alighting the vehicles. In some cases it was caused by the front wheel of the automobile grazing the limb of a standing person.

NATURE OF INJURY

All the injuries being street accidents were contaminated by dirt and grease.

Types:- The following types of injuries were noted.

1. Loss of skin and subcutaneous tissue Ten cases had such injury with variable area of loss,
2. Avulsion of skin and subcutaneous tissue- Five patients had different degrees of avulsions.
3. Avulsion with loss of skin.-Four patients had avulsion

with loss of variable area of skin.

4. Major lacerations.--Skin was lacerated into multiple flaps with ragged margins over wide area.

Variable areas of skin abrasions also were present in addition to avulsion and laceration in many cases.

AREA INVOLVED

Foot alone was involved in 15 cases, This included the planter surface. Foot and adjoining areas of leg were involved in 10 cases. The leg and the thigh were injured in 2 cases.

Associated Injuries:- The following additional injuries were present:

- I. Injury to the upper limb-1 case.
- II. Amputation of toes-2 cases.
- III. III. Fracture of (a) one or both malleoli 2 cases, (b) Calcaneum-1 case,
- IV. IV. Injury to the extensor tendons of foot-3 cases.

TREATMENT

All the cases reported to the hospital within a few hours and treatment was instituted within 6-8 hours of injury. Resuscitative, anti-infective and anti-tetanic measures were taken in each patient before subjecting them to surgery. Under general anaesthesia the wound and the surrounding areas were cleaned with Cetavlon solution. The wound was then irrigated with normal saline solution. The opposite thigh was always kept prepared as a donor site for skin graft. Adequate debridement was

done and the wound was cleared of foreign materials as far as practicable.

Primary repair of deeper tissue was not done except for setting fractures. No internal fixation of fractured ends of bones was attempted.

Wound cover was provided by the different methods [Table 1] mentioned below –

1. Primary definitive skin cover: Definitive skin cover was attempted as an immediate procedure. The following methods were adopted

- a) Free skin graft- This was done when bones; joints; blood vessels, nerves and tendons were not directly exposed and when pressure bearing area of foot was not involved. When only a small area of bone or tendon was exposed, they were covered by surrounding soft tissue and free skin graft was applied over them. Medium thickness skin graft was used.
- b) Cross-leg flap- This form of skin cover was given when bone area of skin loss over heel and adjoining parts. The donor site is covered, with free skin graft joint or tendon was exposed over wider area and when pressure bearing area of

Table 1: Shows the nature of injury, type of treatment done with results.

<i>Name of injury</i>	<i>No. of cases</i>	<i>Type of Treatment</i>	<i>No.</i>	<i>Result</i>
Loss of skin and subcutaneous tissue	10	(a) Primary definitive cover	6	
		(i) Free skin graft	1	(i) Good.
		(ii) Cross-leg flap	2	(ii) Flap necrosis-2. Infection in all.
		(iii) Cross-thigh flap	3	(iii) Flap necrosis and severe infection. One death due to tetanus.
		(b) Temporary skin graft with secondary definitive cover	4	
		(i) Cross-leg flap	2	(i) Good.
		(ii) Cross thigh flap	1	(ii) Good.
		(iii) Thigh tube	1	(iii) Small area necrosis, Slough,
		(a) Flap stitched back	2	
		(b) Flap excised and primary definitive cover	2	
Avulsion	5	(i) Cross-leg flap	1	(i) Severe infection and flap separation.
		(ii) Cross-thigh flap	1	(ii) Separation due to necrosis and infection,
		(c) Flap excised and free graft with secondary definitive cover by thigh tube	1	Good.
		(a) Flap stitched back with free graft	1	Flap sloughed and graft took well.
		(b) Flap excision with graft and local flap	1	Partial sloughing of flap with infection. Graft took well
		(c) Flap excised with graft and secondary definitive cover	2	
		(i) Cross-thigh	1	(i) Good
		(ii) Thigh tube	1	(ii) Good
		(a) Local repair; Slough and later-	3	
		(i) Cross-leg flap	1	(i) Infection with partial separation.
Major laceration	8	(ii) Free skin graft	2	(ii) Good
		(b) Temporary graft with secondary definitive cover	3	
		(i) Cross-leg flap	1	(i) Good.
		(ii) Cross-thigh flap	2	(ii) Partial separation with infection-1
		(c) Excision and free graft	2	Good-1
				Good

foot was involved.

- c) Cross-thigh flap- This type of skin cover was chosen for the same nature of wounds as in cross-leg flap but the area was bigger for cross-leg flap. Conventional method was adopted



Figure 1: Showing cross-leg flap as a secondary definitive cover for skin loss over Tendo-Achillis

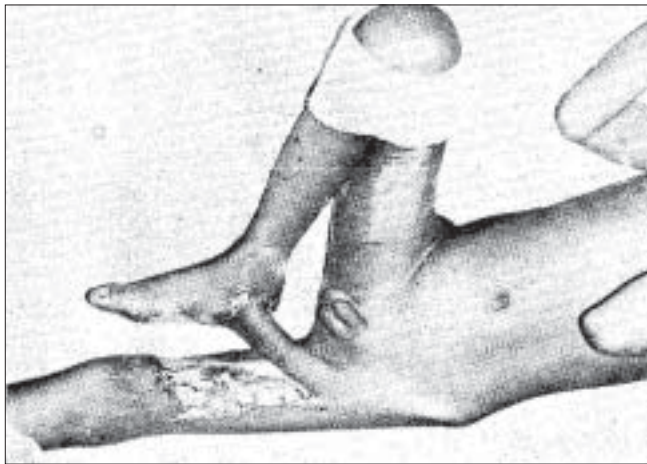


Figure 2: Showing thigh-tube used as a secondary definitive cover for wide



Figure 3: Shows the final results of Figure 2.

for having cross-leg or thigh flaps. Flaps were detached at the end of 3 weeks.

- 2. Temporary free skin graf with secondary definitive cover- This was done when full thickness of skin with subcutaneous tissue cover was indicated. The wound after debridement was covered with thin free skin graft taken usually from the opposite thigh irrespective of whether bone, joint or tendon was exposed. This was removed after 10-12 days at a second operation and definitive skin cover was given by the following means:
 - a) Cross-leg flap [Figure 1].
 - b) Cross-thigh flap.
 - c) Thigh tube [Figure 2, 3]- This was used when the area involved was big enough for cross-leg and cross= thigh flap and in cases of thin and very young subject. The skin tube was prepared usually in the opposite thigh by conventional method. If the tube was long enough, it was



Figure 4: Shows sloughing and partial separation of a cross-thigh flap used as primary definitive cover



Figure 5: Shows necrosis of a replaced avulsed flap of thigh

staged by a bridge which was later tubed, After 3 weeks, the lower end of the tube was detached and was reattached directly to one end of the injured area. After further 3 weeks, the tube was completely detached from the thigh, spread out and the area was conformed up. Opposite ankle was used in cases where the tube was prepared in the same thigh as that of the injured side.

3. Avulsed flap was stitched back after debridement with or without free skin graft depending upon whether associated skin loss was present or not.
4. Avulsed flap was excised and was replaced by medium thickness free skin graft as a permanent skin cover. Additional local rotation flap was taken to cover joint, bone, tendon, blood vessel and nerve when necessary,
5. Local repair- Direct apposition of lacerated flaps after debridement was done.
6. The lacerated flaps were excised and was replaced by medium thickness free skin graft.

DISCUSSION

Twenty seven cases with various types of injuries of the lower limb treated by different methods have been analysed.

It was observed that street injuries were always contaminated and cleansing the wounds to one's satisfaction is extremely difficult if not impossible. Furthermore, dubious nature of the vascularity of the tissues made debridement a problem. It became difficult at times to differentiate dead from living muscles. Skin flaps apparently vascular (noted by colour and bleeding) later became devascularised. Similar observations have also been made by Brown^[1] and Chahal.^[2]

These are further substantiated when the mechanism of injury is analysed. Such injuries are usually caused by different grades of violence over an wide area. The injured area may be divided into two zones -(a) An area subjected to an impact of great violence causing the wound; (b) Surrounding area affected by a blunt impact of lesser violence causing certain amount of crushing of the superficial tissues.

The combined effect of both the factors lead to an altered local haemodynamics. This is frequently evidenced as a local haematoma or vascular thrombosis in the surrounding tissue at operation. So it is not quite justified in

accepting the surrounding tissues, as normal even if they look so.

These problems frequently make primary definitive cover by skin flap a failure. The flap usually gets detached due to the following reasons: (1) Inevitable infection with dead tissue at the depth of the wound, (2) Necrosis of big flap lifted without a delay procedure. (3) Due to necrosis of the skin margin of the wound to which the flap is attached. Pre-existing poor health of the patient further complicates the above factors.

These observations were borne out by the results of 8 cases where primary definitive skin cover were given as shown in Table 1. Only one case with free skin graft had good result, whereas result of the rest of the cases were unsatisfactory [Figure 4].

In view of the problems mentioned, it was decided to provide definitive skin cover after a delay of 10-12 days. The object of this was to allow the infection to settle down and to let that tissues with doubtful vascularity to be obvious. The wound was primarily covered with thin skin graft pending secondary definitive cover to avoid the hazards of an open wound. Ganguli^[3] suggested the use of preliminary skin graft only when primary definitive cover could not be given due to some cause but he did not mention the results of immediate definitive cover. In cases when large area had to be covered with full thickness skin with subcutaneous tissue, a skin tube in the thigh was preferred to abdominal tube so that one end of the tube could be attached directly to the injured area. This reduced a stage of operation.

Ten cases with different types of injuries were treated on this principle [Table 1]. One case of cross-thigh flap had partial separation of flap with moderate infection, whereas the rest of the cases had good result.

All the replaced avulsed flaps necrosed [Figure 5]. Such skin flaps are not only avulsed, they are subjected to some degree of shearing as well, which further interfere with their vascularity.

Local rotation flaps in injured lower limbs do not stand well. This is obvious from Table 1 and are better avoided.

Local repair of major lacerations ultimately dough out. Tissues which show evidence of vascularity (bleeding from the margin) at operation later become dead. This

is due to delayed vascular thrombosis perhaps brought about by the effect of 'concomittant blunt injury to the tissues surrounding the wound. Better results were obtained when they were excised. Analysis of the results of different methods of treatment indicate that lower limb injuries with tissue loss are better covered with temporary thin free skin graft to be replaced by definitive cover with full thickness skin and subcutaneous tissue, where necessary after 10-12 days. This forms a better bed and surrounding for any form of flap. Apparently this process is time consuming. But the initial time loss is compensated in the end by way of early healing and early mobilization with gratifying results.

Summary

Twenty seven cases of different types of injuries of the lower limb with skin loss treated by various means have been reviewed. The various methods of treatment have

been evaluated and the methods giving the best result have been stressed.

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