

## LYMPHOEDEMA OF THE EXTREMITIES: A NEW APPROACH TO ITS MANAGEMENT

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The treatment of lymphoedema remains unsatisfactory in spite of the large number of surgical procedures that have been described. The operations fall into two main categories:

- (a) Those designed to encourage lymph drainage from the lymph oedematous limb.
- (b) Those designed to remove the lymphoedematous tissues.

**“Drainage” operations.** Attempts have been made to drain the lymph from the diseased limb into adjacent normal tissues by:

- (i) “Lymphangioplasty” using strands of silk (Handley, 1908), nylon (Ransohoff, 1945) or Teflon (Silver and Puckett, 1976) threaded into the tissues.
- (ii) Bypassing the lymphatic barrier by the implantation of pedicle flaps across it (Gillies and Frazer, 1935; Standard, 1942; Smith and Conway, 1962; and Hirshowitz and Goldan, 1971).
- (iii) Omental transposition (Goldsmith *et al.*, 1967).

Attempts have also been made to drain the subcutaneous lymphoedematous tissue by establishing connections with the deeper lymphatics:

- (i) By excising an ellipse of deep fascia only (Kondoleon, 1912) or combined with excision of the overlying skin (Sistrunk, 1918).
- (ii) By implanting shaved dermal flap into deeper intermuscular compartment (Thompson, 1962, 1967, 1970).

Finally attempts have been made to drain the diseased limb by anastomoses to the venous system by veno-nodal anastomosis (Rivero *et al.*, 1967 and Nielubowicz, 1968) or by direct lymphatico-venous anastomosis (Yamada, 1969; Sedlacek, 1969 and O'Brien *et al.*, 1975).

**“Excisional” operations.** These may take the form of complete excision of the skin, subcutaneous tissues and deep fascia and covering the defect with a split skin graft (Charles, 1912; Dellon and Hoopes, 1977) or a Wolfe graft (Mansoor, 1968).

Alternatively attempts have been made to carry out a staged excision of the subcutaneous tissues and deep fascia with skin (Bunchman and Lewis, 1974; Miller, 1975) or without skin (Fonkalsrud, 1974).

The results of all these techniques have been disappointing. No satisfactory anastomosis between the superficial and deep lymphatic trunks, or in pedicles laid across the barriers has been demonstrated by lymphangiography. Clearance studies using  $I^{131}$  have also not shown any improvement in lymph drainage (Sawhney, 1972).

A critical review of the procedures available reveals that any reported improvement may be the result of partial excision of the lymphoedematous tissue or the prolonged use of elastic compression in the postoperative period.

The value of elastic support to reduce oedema in milder cases and leggings to provide intermittent pneumatic compression and simulate the calf muscle pump (Calnan, 1970) is well known. Radio-isotope clearance studies following elastic crepe compression have demonstrated improvement in lymphatic clearance from the affected limb (Figs. 1, 2).

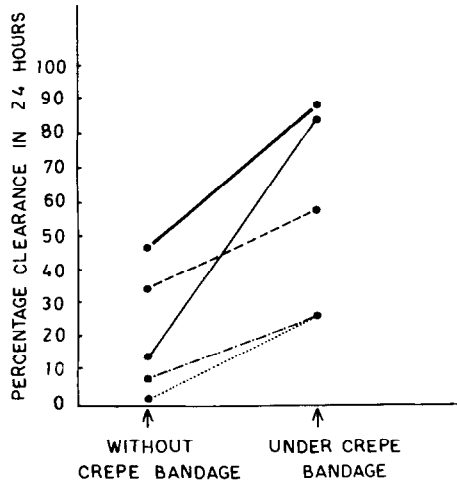


FIG. 1. Improvement in percentage clearance of  $I^{131}$  in 24 hours in a lymphoedematous limb after elastic compression with a crepe bandage.

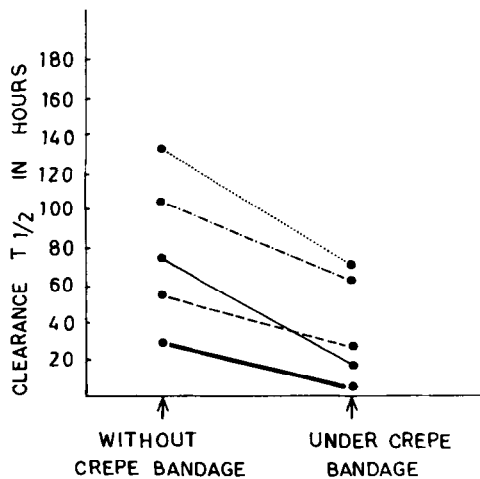


FIG. 2. Improvement in  $T_{1/2}$  clearance of  $I^{131}$  in a lymphoedematous limb after elastic compression with a crepe bandage.

Before we discuss our approach it is pertinent to highlight certain peculiarities about lymphatic drainage in healthy individuals. Extrinsic measures i.e., massage, elevation and muscular activity raise interstitial (extra cellular) pressure and in turn are accompanied by a commensurate rise in pressure within the lymph vessels, with the result that lymph moves centripetally to an area of low pressure (Drinker, 1932).

Skin elasticity acting against the rigid fascial envelope and the pumping action of muscles in the subfascial compartment maintain requisite interstitial pressure for onward flow of lymph. All these factors act against gravity and hydrostatic pressure.

In cases of lymphoedema the following points are worth considering:

1. No lymph logging occurs in the deeper muscular compartment even when there is obstruction of the pelvic lymphatics.
2. The obstruction to lymph flow is never complete.
3. Oedema first appears in the most dependent part (ankle and foot), especially towards the evening or after standing or walking for long hours.
4. Lymphoedema develops slowly and takes a long time to become fully established.
5. Even primary lymphoedema is not present at birth and is generally delayed until adolescence.
6. The incidence of lymphoedema is not high following radical mastectomy.
7. External elastic compression can reduce lymphoedema.

From these observations it may be concluded that there is no absolute blockage to lymphatic drainage and significant lymph flow continues to take place. Lymphoedema develops when the balance between the formation of lymph and its drainage is disturbed. Raising of interstitial pressure and consequently intraluminal pressure will help to drain lymph through partially obstructed lymphatics and this can be achieved by a combination of muscular action, skin elasticity and external compression.

Therefore, our management of the lymphoedema is designed:

- (i) to reduce oedema by selective use of external compression.
- (ii) to excise the resulting redundant, loose skin and subcutaneous tissues, to provide a tight skin envelope and normal skin tension.
- (iii) to maintain this equilibrium by wearing external elastic support continuously.

#### PREOPERATIVE PREPARATION

The patient is admitted a fortnight before operation for strict bed rest. An elastic crepe bandage or Esmarch bandage is applied over the foot only and the leg is kept elevated on pillows. The bandage becomes loose after six hours as the oedema subsides and is then reapplied to give further external compression. This is repeated until sufficient reduction in oedema over the foot is obtained. The compression bandage is then extended higher over the ankle, calf and knee in stages.

In moderate degree of lymphoedema significant reduction is obtained in a week to ten days with elastic crepe bandage. In the more severe cases, a rubber Esmarch bandage may have to be used for effective compression in the earlier stages followed later by crepe bandages.

The reduction in oedema improves considerably the condition of the skin

and warty, papillomatous or eczematoid eruptions gradually subside. The skin becomes softer, appears more normal but it is now loose and redundant. When this stage is reached, operation is carried out.

### OPERATIVE TECHNIQUE

Under tourniquet control an incision is made on the anterolateral aspect of the leg at the junction of anterior 1/3rd with posterior 2/3rd of the lateral half of leg, extending from knee to ankle as far as the lateral malleolus, where it runs medially to the front of the medial malleolus. From the front of the ankle it extends downwards and forwards to the bases of the toes running on the mid dorsum of the foot.

The incision is deepened to the level of the deep fascia. The flaps are raised on either side but do not transgress the mid-line anteriorly and an attempt is made to preserve the cutaneous nerves. The deep fascia is left intact. The flaps are stretched forward to overlap each other, the redundant skin is excised from either side and the flaps are then sutured to exert moderate tension on the underlying structures. There is no need to excise any subcutaneous tissue as its thickness has already been reduced significantly by the preoperative measures. No drains are inserted and a firm crepe bandage is applied. The procedure is completed within one and a half hours and is bloodless. Stitches are removed on the 10th day and walking is started two days later. The skin usually heals well. Occasionally necrosis may occur if tension is great and this complication delays healing significantly.

After healing the patient is advised to wear an elastic crepe bandage continuously. Our patients have now been followed up for a period of 4 years. The results have been entirely satisfactory (Figs. 3 to 9). There is a significant reduction in the size of the extremity and this has been maintained. The skin looks normal in colour and texture. There is no functional or cosmetic disability. No sensory deficit was noticeable because injury to the cutaneous nerves has been avoided. Our patients can now wear normal footwear.

Postoperative radioactive isotope studies carried out in 5 patients have shown an improvement in lymphatic clearance even after follow-up of two to three years (Figs. 10 to 11). However, it was found that if the patient discontinued the use of elastic crepe bandages, the oedema reappeared however short the period for which elastic support has been discontinued.

### DISCUSSION

There is sufficient evidence to conclude that elastic support and compression with or without operation contributes a great deal to the good results reported following various procedures and that the best cosmetic result is achieved by preserving the skin of the affected limb. The technique presented here is based on these principles and differs from earlier techniques in that no selective excision of the subcutaneous tissue is done. The deep fascia is not excised and so there is no interference with the anatomy and function of the muscular "pump". The excision of the redundant loose skin and subcutaneous tissue flap provides a tight skin envelope exerting sufficient tension to maintain adequate interstitial and intraluminal pressure in the lymphatics. This facilitates lymph drainage from the affected limb, supplemented by elastic support worn continuously following surgery.

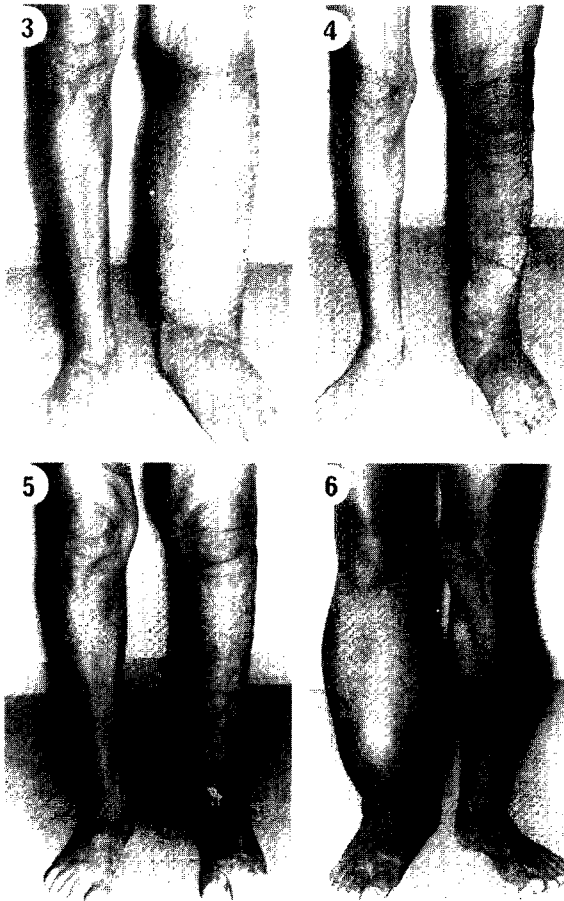


FIG. 3. Case 1. Preoperative view of lymphoedematous leg.

FIG. 4. Case 1. Reduction of lymphoedema by compression with crepe bandage.

FIG. 5. Case 1. Postoperative view after excision of the redundant skin.

FIG. 6. Case 2. Preoperative view of gross lymphoedema of the right leg.

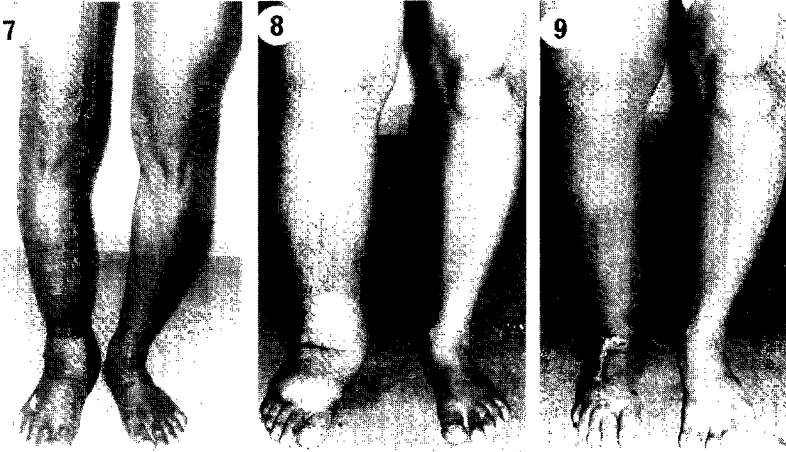


FIG. 7. Case 2. Postoperative view after bandaging and excision of the redundant skin.

FIG. 8. Case 3. Preoperative view of gross oedema of the right leg.

Fig. 9. Case 3. Postoperative view after bandaging and excision of the redundant skin, right leg

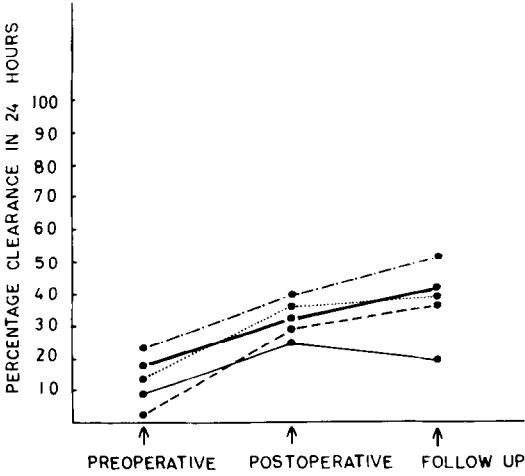


FIG. 10. Improvement in percentage clearance of I<sup>131</sup> after bandaging and surgery.

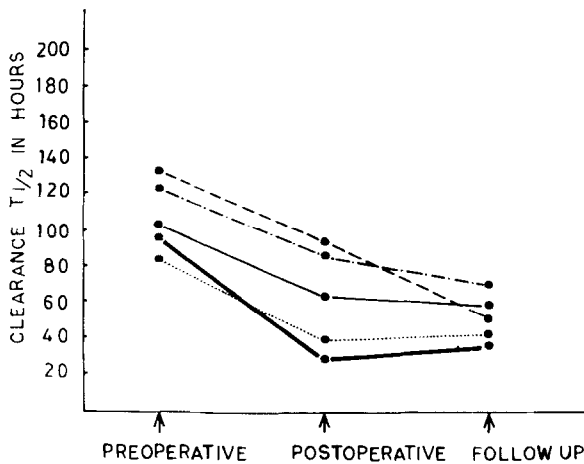


FIG. 11. Improvement in  $T_{1/2}$  clearance of  $I^{131}$  after bandaging and surgery.

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