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Comments on Operations for lower Limb Lymphoedema*

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Summary

Good results have been obtained from surgical operations for lymphoedema of the lower limbs using skin
flaps with a blood supply to cover the muscles following reduction of swollen subcutaneous tissue. The
Charles operation using free skin grafts for cover is reserved for tropical elephantiasis or patients with local
skin in bad condition. A variety of other procedures of physiologic intent have given disappointing results
and been abandoned.

The results of 74 operations are reviewed with a view to improving still further the results. The mortality
rate was nil and there were only minor complications.

These are comments on some of the operations which we have used for lymphoedema of the
lower limbs. Particular attention has been paid to methods of *improving the flap operations.*
Technical details, indications and the physiology of the many different operations available for
the treatment of lymphoedema have recently been described (*Kinmonth* 1972) and will not be
repeated here.

We have, in recent years, done over a hundred reducing operations using flaps. In these the raw
surfaces of muscle and other structures which are left bare after excision of the oedematous
spongey subcutaneous tissues are covered by flaps of skin. Enough subcutaneous tissue is re-
tained in the flaps to carry and maintain the blood supply. These skin flap operations are es-
sentially reducing or excisional operations and must be distinguished from pedicle grafting op-
erations of the *Gillies* type which aimed chiefly at improving the physiology. The results con-
sidered here are from a group of 74 where the records were easily available for review.

In recent years we have favoured some type of flap operation, particularly variations on the
Thompson buried dermis flap.

Table I Lymphoedema of Lower Limbs

Types of Flap Operations			
Thompson,	leg, medial	40	
	leg, lateral	5	
	thigh, medial	10	56
	thigh, lateral	1	
Homans' & variations			12
'Overlap' (without intermuscular burial)			6
		Total	74

The other ("non-flap") operations have different uses and indications:-

The *Charles'* operation utilizes free grafts of skin from distant sites to cover the muscles. It is best reserved for cases of tropical elephanthiasis or others where the local skin condition is bad and precludes its use for flap grafts.

Omentopexy. We did several of these in the 1950s, bringing omentum down into the groin. We failed to find any clinical improvement in the patients. We have never been able to show lympho-venous shunting on post-operative lymphograms in these patients, nor indeed any evidence of lymph circulation from the limb through the omentum.

The *Nielubowicz* lympho-venous shunt, we have also used. We believe that as a physiologic procedure it works, and have postoperative lymphograms showing lipiodol passing into the veins. We have not, however, had as much reduction in oedema with it as we would wish and have abandoned its use.

The *Gillies' pedicle graft* does work but we have found it to be too laborious to be worthwhile.

Our experiences with these operations were described in more detail elsewhere (*Kinmonth*, 1972). All have been abandoned except the Charles' operation for tropical or other elephantiases with bad local skin.

Results of the Flap Operations. In general it may be said that although it may be time consuming and involve harder work, it is easier to obtain improvement and satisfactory results in the severe and grossly swollen cases than in the more moderately affected limbs. We shall therefore concentrate on these less severely affected cases and particularly the early complications and difficulties with flaps and how they may be improved.

The different reducing operations we have done in which flaps were used are shown in Table 1.

Variations on the *Thompson* operation have been the most frequent. There have been more operations on the medial than on the lateral side of the limb. This is partly because we start with the medial side and it is not always necessary to do the lateral. It is also because the lateral *Thompson* for various reasons, particularly greater difficulty in satisfactory burial of the flap between muscles, is not as good as the medial.

We have therefore also used other flap operations including 1. the *Homans'* operation, using simple flaps without any overlap or intermuscular burial of them, and 2. simple overlap of the shaved flap without intermuscular burial. This last being like a *Thompson* operation but with the buried dermis flap lying under the other skin flap and not between the muscles.

In this particular review the flap operations numbered 74.

Complications of Healing

The majority of results have shown considerable improvement and have been good. One object of this review was to survey the less satisfactory aspects of treatment and to see how they might be improved.

The *complications of healing* are shown in Table II.

Primary healing was achieved in somewhat over half of the operations.

Table II Complications of Healing

Operations (all types)	Total 74	
Primary healing	38	(51%)
Delayed healing	36	(49%)
Major necrosis	18	
Minor necrosis	10	
Sepsis alone (without necrosis)	2	
Delayed healing, other	6	

Table III Lymphoedema Operations

Factors in Necrosis

Significant
1. Haematoma, 8 of 18 necrotis,   − 44%
   (Haematoma whole series, 12 in 74, − 16%)
2. Type of operation. Lateral side worse.

   Not Significant
   − attacks of cellulitis prior to operation
   age of patient
   type lymphoedema (primary or secondary)
   obesity
   "poor skin" pre-op.
   ? wt. of tissue excised

Of those with delayed healing 18 had major necrosis (that is a degreee of necrosis of flaps requiring excision under anaesthesia and resuture, with or without skin graft).

Minor degrees of necrosis, which could be removed in the ward without anaesthesia, comprised 10.

Sepsis alone caused delayed healing in 2.

There were 6 others with delayed healing without necrosis.

'Major' necrosis was found to affect either buried or superficial flaps with perhaps parts of the posterior buried flap slightly more often affected. The lower posterior corner of the anterior flap near the ankle was also particularly vulnerable. These were excised under general anaesthesia and resutured. Occasionally the extent of necrosis was such that apposition of skin edges could not be obtained without tension. In such instances free grafts were applied. These were always readily available as it is our practice to preserve the split skin removed during the process of 'shaving' the buried dermis graft in the refrigerator for possible later use in such circumstances.

There is usually much skin to spare in the *Thompson* type of operation because of the over or burying of one flap. Recourse to skin grafting has therefore been necessary on few occasions. The healing after excision of necrotic areas with or without grafting has always been satisfactory and rapid once the dead tissue has been removed.

It was obvious that *necrosis* was the most important complication and cause of hospital morbidity. We analysed the factors causing this (v. Table III). A haematoma had been present in 8 of the 18 patients who got necrosis i.e. 44%. In the whole series there had been only 12 haematomas i.e. 16%. The role of haematoma in producing necrosis is obvious.

The other significant factor was the site of operation. In general the *lateral* side was worse. Probably because this was often a second operation on the same limb with altered blood supply at the bases of the flaps.

Factors that were NOT significant in producing necrosis were:-

1. (Somewhat unexpectedly!) recurrent attacks of cellulitis in the limb before operation.
2. The age of the patient, again perhaps unexpectedly. Older patients did as well, if not better, than the younger.
3. The type of lymphoedema, whether primary or secondary.
4. Obesity, including degrees of local lipodystrophy.
5. "Poor skin" i.e. erythrocyanosis and thin skin OR thick hyperkeratotic skin.
6. The weight of tissue excised. This was of somewhat doubtful significance. Perhaps the larger limbs got a little more necrosis in the flaps.

Measures to avoid necrosis are shown in Table IV.

These aim first at avoiding haematoma formation. In our later operations of the series we have taken even greater pains to secure all bleeding points after release of the tourniquet. The diathermy is used for small bleeders and ligation with fine polyglycolic acid thread ('Dexon') for larger ones. Very many, often twelve or more, fine suction drains are used. These are placed under the buried flap as well as between it and the superficial flap in the modified *Thompson* operation. Avoidance of any tension on the flaps is important. The balance between tissue excised and circulation left in the flaps is delicate. The inevitable reactionary swelling after operation may endanger the circulation if the flaps are under the slightest tension.

The number of stitches is kept to a minimum. Small areas of necrosis have often been observed to occur around sutures. The mattress sutures transfixing the base of the flap originally used in the *Thompson* operation have been abandoned.

The flaps are now cut slightly thicker, particularly at their bases, where they should not be less than one half inch thick.

Table IV Operations for Lymphoedema of lower Limbs

Measures to avoid necrosis:-
Even more meticulous haemostasis
Even better drainage
Little tension
Few stitches
? flaps thicker

Table V Lymphoedema of Lower Limbs

Days in Hospital after Operation

Average per Operation: 29

Lowest:	14 days (F	aet 48	lry oedema)
	17 days (M	aet 52	2ndy oedema)
	13 days (M	aet 62	lry oedema)
	16 days (M	aet 49	lry oedema)
Highest:	74 days (F	aet 14	necrosis both flaps)
	53 days (M	aet 55	sepsis)
	59 days (F	aet 55	necrosis both flaps but 25 lbs removed)

Length of stay in Hospital

Another feature that we have analysed is the length of stay in hospital these patients have had. It often tends to be very long. The average per operation was 29 days.

The lowest were 14 days, 17, 13 (a record) and 16. These low stays were shared by females and males. There was no difference between primary and secondary lymphoedema. Somewhat surprisingly perhaps the older patients seem to have done slightly better.

Amongst the long stay patients the record was held by a female of 14 with 74 days. She had necrosis of both flaps. There was one of 53 days, a male who had wound sepsis and also a female of 55 with necrosis of both flaps who stayed 59 days. She was, however, the patient who held the record for the greatest weight of tissue removed i.e. 25 lbs.

An important lesson learnt in this review is that the time in hospital can be very long. The best way of reducing it is if possible to get as much done in one stay in hospital rather than doing one operation, allowing the limb to heal and bringing the patient back on another occasion.

In the right sort of patient we would now do both legs at the same session or within a few days of one another. We would not, however, do medial and lateral aspects on the same part of a limb without leaving in interval of some months between.

Weight of tissue excised at operation

We also studied the weight of tissue excised during operation. In the 74 operations there has been about 2 lbs excised per operation. It has varied from half a pound up to 16 lbs. Most of
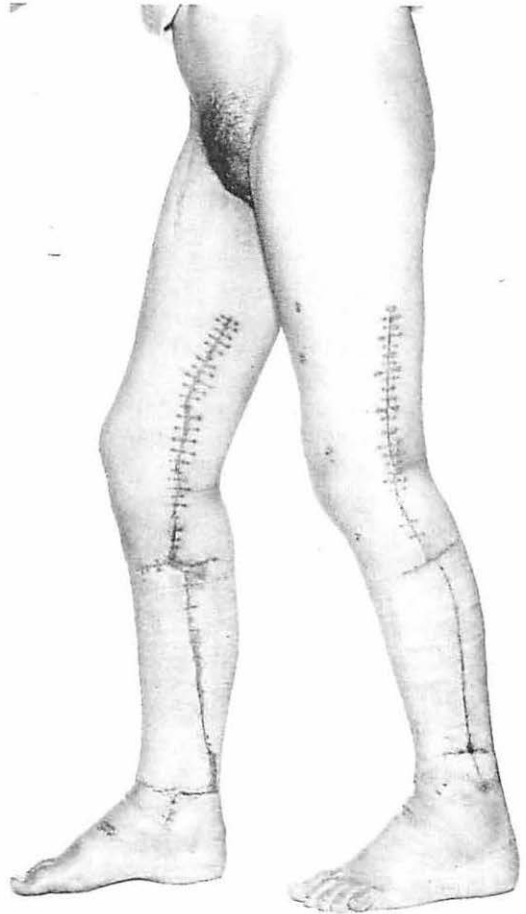
Fig. 1 Pt. K.C.
a) Before further reducing operations. Note in right groin scar of unsuccessful lympho-venous shunt operation done 6 years previously and of buried dermis flap medial side of left leg done 4 years previously.
b) 3 weeks after modified Thompson buried dermis flap operation on right and Homans' operation on left.

Table VI Weight Excised per Operation (Lower Limb Lymphoedema)

lbs	No. of Operations	
0.5	5	
1	40	
1.5	8	
2	10	
2.5	1	
3	5	74
4	1	
5	1	
10	1	
15	1	
16	1	

Average per Operation 2 lbs

Table VII Lymphoedema of Lower Limbs

Results in 74 Operations

POOR:	Leg same size or larger Surgeon doubtful of worth ± Pt. doubtful of worth	13
MODERATE:	Circumference less Pt. pleased. Requests further op. s.o.s. Surgeon pleased	45
GOOD:	Unequivocal satisfaction (mainly very large limbs)	16

the patients have had about a pound of flesh removed. This, of course, tended to be slightly less in the *Thompson* operation than in the *Homans'* because the buried flap retained weight 6, 7 or maybe 8 ozs.

There was only a slight relation between necrosis and the weight excised. Patients with large excisions regularly had some degree of flap necrosis but this was balanced by a number of cases with necrosis after excision of small weights. Possibly those with minor degrees of oedema had flaps thinned to a precarious degree in order to obtain reduction.

Assessment of Results

Lastly we attempted to assess the results, although it was inevitably a somewhat arbitrary matter. We have classified the patients into poor, moderate and good. In the "poor" (13 operations) the leg was the same size as before operation and the surgeon doubted its worth. But on the whole almost all the patients were glad that they had the operation done. They appeared to be less critical than the surgeons. There were very few indeed who said that they thought it was not worthwhile.

This is of course a very arbitrary classification.

Forty five patients were put in the "moderate" class where the major circumference six months or more after operation was less than pre-operative, the patients was pleased and wished for further operation on the contralateral limb or elsewhere on the same limb. In the last group classified as "good" there was unequivocal satisfaction and delight all round. These of course were chiefly patients with very large limbs.

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Transplantation Models Using the Regional Lymph Node

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Summary

Several transplantation models, using the regional lymph node, to study the transplantation reaction in strictly defined and simple conditions were devised. Lymphoid cells were transplanted to inbred rats and mice at the sites drained by one regional lymph node; the experimental design was chosen so as to permit theoretically a one-way reaction, either the host-versus-graft (HVG) or the graft-versus-host (GVH) reaction.

The changes in the lymph nodes draining the site of cell injection (weight increase, histology, lymphocyte activation) were very similar in both transplantation reactions. They were ascribed to a humoral mediator released upon the contact of lymphoid cells from two genetically different individuals. The direct demonstration of a mediator which is capable of activating the regional lymph node in vivo introduces some new aspects into the process of sensitization after transplantation.