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Factors influencing response to lymphonodovenous shunt in filarial lymphoedema

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ABSTRACT

Background. Although several studies have been published on lymphonodovenous shunt, there are no objective data either on the outcome of lymphoedema or on various parameters likely to influence the results.

Methods. A trial of lymphonodovenous shunt was carried out in 75 patients with unilateral filarial lymphoedema. The primary aim of the trial was to identify a cohort of responders as against non-responders and to correlate the outcome with various factors such as age, gender, duration and preoperative grade of lymphoedema, number of preoperative attacks of adenolymphangitis, operative impression of the lymph node, effect of venous reflex and type of nodovenous anastomoses. Change in oedema volume was measured objectively by water displacement method using the normal limb as a control.

Results. There was no operative mortality. Predominant postoperative complications included wound haematoma (8.5%), wound infection (13.6%) and transient lymphorrhoea (13.6%). In the immediate postoperative period, a reduction of 25%–50% in the oedema volume was recorded in 46.7% of cases and of more than 50% in 17.3% cases. The difference in response with respect to the type of lymphonodovenous shunt was not statistically significant, although the end-to-side type of shunt showed marginally better results. The response was significantly higher in patients with preoperative oedema volume more than 2 L. There was a significant reduction in postoperative attacks of adenolymphangitis, irrespective of the reduction in oedema volume. Of the 75 patients, 22 showed regression of oedema volume to preoperative or higher levels in the postoperative phase. A majority (21/22) could be identified as non-responders within 3 months of surgery.

Conclusion. The best results of lymphonodovenous shunt were seen in patients with large-volume lymphoedema. The results are better when combined with early excisional surgery. Other factors did not significantly affect the outcome. Non-responders could be identified within 3 months after surgery. Even in patients who did not respond well, a significant decrease in the frequency of adenolymphangitis attacks was observed. Higher initial oedema volume and history of higher frequency (25–50 per year) of adenolymphangitis attacks can be considered as indicators for good response to lymphonodovenous shunt.

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INTRODUCTION

Lymphatic filariasis is endemic in many parts of India. Hydrocele and lymphoedema are the commonest manifestations of the disease. Of the several procedures available for the surgical management of lymphoedema, lymphonodovenous shunt (LNVS) is commonly employed.[1] While several studies have been published about the results of the procedure, there are no data on factors which influence the response to surgery. This study was conducted to quantify the response to LNVS and correlate it with factors such as age, gender, preoperative grade of lymphoedema,

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duration of disease and the number of attacks of adenolymphangitis (ADL). This information would facilitate the selection of patients who are likely to benefit from LNVS.

PATIENTS AND METHODS

Seventy-five patients with grade II, III and IV unilateral lower limb lymphoedema were included in the study. They were graded according to the World Health Organization criteria.[2]

Grade I: Oedema spontaneously reversible on elevation
Grade II: Oedema not spontaneously reversible on elevation, skin normal
Grade III: Oedema not spontaneously reversible on elevation, skin thickened
Grade IV: Oedema not spontaneously reversible on elevation, skin thickened with warty/papillomatous growth

The cases were selected from the Filariasis Clinic of the Vector Control Research Centre and operated upon in the Department of Surgery, JIPMER, Pondicherry between June 1993 and August 1996. The exclusion criteria were (i) grade I lymphoedema, (ii) bilateral limb involvement, and (iii) patients with obvious infection and ulceration of the skin.

All patients were subjected to a detailed examination by the surgeon at the time of inclusion into the study. A detailed history regarding the duration of lymphoedema, frequency of ADL attacks and past treatment was recorded.

Oedema volume (OV) was defined as the difference between the volume of the affected and normal limb. The efficacy of operative therapy was measured by recording the change in OV and reduction in ADL episodes. Using a standard drum, limb volume was determined separately for each limb by the water displacement method with each limb immersed up to the same level. Only patients with unilateral lymphoedema of the lower limb were included in the study so as to facilitate comparison of limb volume between the affected and normal limb of the same patient. The preoperative OV was taken as the denominator for all subsequent calculations.

Volumetry was carried out preoperatively, one week after the operation and subsequently, at monthly intervals for one year. Patients who showed a reduction in OV after therapy, which did not reach the preoperative level until the end of the follow up, were considered as responders. Those patients whose OV returned to preoperative levels or worsened further during the one year of follow up were classified as non-responders.

During the follow up period, detailed history regarding episodic ADL attacks, if any, was recorded. Patients were advised to report to the surgery department in the event of an ADL attack which was managed with antibiotics and anti-inflammatory drugs.

Operative procedure

A vertical incision was made starting from the saphenofemoral junction and extending for about 10 cm along the long saphenous vein. Meticulous dissection was carried out while identifying the long saphenous vein and the lymph node to avoid injury to the afferent lymphatics. The long saphenous vein was divided 7–8 cm from the saphenofemoral junction in case of an end-to-end or end-to-side type of anastomosis. The proximal end was kept unclamped to check for any evidence of reflux. The severity of reflux, if present, was graded as mild in case of slow oozing and severe if bleeding was profuse. The lymph node selected for anastomosis was classified on the basis of external appearance, consistency and feel on cutting as fleshy or fibrotic. A fibrotic node was used only when no fleshy nodes were available. The node was not dissected from its bed to prevent disruption of afferent lymphatics. A raw surface for anastomosis was created by shaving off one-third of the superficial surface of the lymph node *in situ*. Three types of anastomoses between the lymph node and long saphenous vein were carried out: (i) end-to-side (n=64), from the end of the vein to the raw surface on the side of the lymph node; (ii) end-to-end (n=6), from the end of the vein to the cut end of the horizontally transected node; and (iii) side-to-side (n=6), from the side of the vein to the raw surface on the side of the lymph node. The vein was not transected in the side-to-side anastomosis.

Postoperatively, patients were advised strict bed rest for one week and were discharged between 7 and 10 days of surgery. They were instructed to wear an elastic support bandage at home and advised subsequent monthly follow up.

Following LNVS, in 8 patients the lymphoedema resolved to a great extent leaving loose hanging skin and subcutaneous tissue. A modified Charles' operation was performed in these cases—skin flaps were elevated, the underlying subcutaneous tissue was excised and the wound closed after excising excess skin. The mass of tissue excised varied from 1.5 kg to 14 kg.

Statistical analysis

1. Correlation co-efficient using linear regression was calculated to study the relation of reduction in OV at different points of time with age, grade of oedema, preoperative OV and duration.
2. Student t-test was used for independent variables such as OV, reduction in OV and duration of ADL episodes.
3. Chi-square test was done for determining the significance of difference in responders and non-responders.

RESULTS

Among the 75 patients, 31 were men and 44 women; 58 (77.3%) were 20–49 years of age. The duration of lymphoedema varied from 6 months to 17 years. In 26 patients it was less than 5 years, in 27 patients 5–10 years and in 24 more than 10 years. A majority of patients (37) had grade II lymphoedema, 26 had grade III and the remaining 12 had grade IV.

In 3 patients, the saphenofemoral junction showed severe reflux while in 6 the reflux was mild. The remaining patients had no reflux. There was no operative mortality. The complications seen were wound haematoma (8.5%), wound infection (13.6%) and transient lymphorrhoea (13.6%).

The effect of LNVS on OV in the postoperative period is shown in Table I. In the immediate postoperative period, the reduction in OV in 35 patients (46.7%) was 25%–50% and in 13 patients (17.3%) it was more than 50%. However, this declined to 12.5% for both groups at the end of 12 months.

There were 22 non-responders. In most non-responders, the

TABLE I. Effect of lymphonodovenous shunt on oedema volume

Decrease in oedema volume	Postoperative duration			
	Immediate	3 months	6 months	12 months
(%)	*n*	*n*	*n*	*n*
<10	9 (12)	12 (30)	18 (42.9)	18 (56.3)
10–25	18 (24)	10 (25)	10 (23.8)	6 (18.7)
25–50	35 (46.7)	12 (30)	10 (23.8)	4 (12.5)
>50	13 (17.3)	6 (15)	4 (9.5)	4 (12.5)
Total	75 (100)	40 (100)	42 (100)	32 (100)

Figures in parentheses are percentages

OV returned to the preoperative value or exceeded it within 3 months of surgery—within one month in 15 patients and within 3 months in the other 6.

Non-responders also showed a lesser reduction in OV in the immediate postoperative period as compared to responders. There was no statistical relationship between the grade of lymphoedema and response (p>0.05). The reduction in OV was independent of gender (t=37.1; p=0.19), nodal fibrosis (t=1.28; p=0.21), venous reflux (t=0.11; p=0.92) and duration of lymphoedema (r=0.18; p=0.13). The outcome was best when the preoperative OV was more than 2 L. There was a significant positive correlation between OV and oedema reduction (r=0.33; p=0.004).

An interesting relationship was observed between the duration of lymphoedema and OV. Oedema volume was found to increase almost linearly with duration of the disease reaching a peak volume of 2 L in 10 years after which the OV did not increase sharply. It was also seen that an increase in the number of preoperative ADL attacks (up to about 50 attacks) was associated with an increase in OV beyond which it tended to remain more or less static. Both these observations are probably due to increasing fibrosis associated with increased ADL attacks related to preoperative duration of the disease.

In the immediate postoperative period and at 3 months after surgery, the end-to-side type of nodovenous anastomosis yielded a marginally better response compared to the others. However, at 12 months, there was no significant difference between the three types of anastomoses.

The number of preoperative ADL attacks did not influence the outcome of surgery (t=1.35; p=0.18). However, after LNVS, there was a dramatic reduction in the frequency and severity of ADL attacks—0.1 per year postoperatively *v.* 33 per year preoperatively.

Patients in whom the OV returned to the preoperative value (non-responders) at any time in the postoperative phase did not show any improvement later. A comparison between responders and non-responders is given in Table II. The only significant factor was a higher preoperative OV in responders.

Excisional surgery (Charles' operation) was performed in 8 patients who showed good response in terms of reduction in OV resulting in loose hanging skin and subcutaneous tissue. There were no identifiable demographic or clinical parameters which separated this group of patients. In 3 of them hypertrophic scarring, loss of sensation in the overlying skin, exophytic keratosis and ulceration occurred over a period of time.

TABLE II. A comparison of various factors between responders and non-responders

Factor	Responders (*n*=53)	Non-responders (*n*=22)	p value
Mean (SD) age (years)	34.5 (10.8)	35.6 (12.7)	–
M/F	21/32	10/12	0.643
Mean (SD) preoperative oedema volume (ml)	3450.8 (3778)	1517.8 (997)	0.023*
Mean (SD) duration (years)	8.5 (5.2)	8.1 (6.3)	0.83
Average preoperative ADL (annual)	30.9 (34.5)	19.0 (28.8)	0.18
Grade of oedema			
Grade II	23	14	
Grade III	19	7	0.14
Grade IV	11	1	
Operative impression of node			
Fleshy	41	17	0.77
Fibrotic	12	5	
Types of anastomoses			
End-to-end	1	5	
Side-to-side	2	3	0.58
End-to-side	50	14	
Venous reflux	6	3	

* Statistically significant ADL adenolymphangitis attacks

DISCUSSION

Filarial lymphoedema is a major public health problem in many tropical countries. Current estimates suggest that there are 16 million lymphoedema patients, of whom 7 million live in India alone.[3] Nielubowicz and Olszewski introduced LNVS three decades ago for the surgical management of lymphoedema.[4] This technique, though popular, has not been evaluated objectively with respect to factors that influence the outcome of surgery.

In the study by Nielubowicz and Olszewski, it was seen that post-surgical lymphoedema showed better results compared to post-inflammatory or hyperplastic lymphoedema.[5,6] There was no objective volumetric assessment of response which was judged solely by decreased circumference of the leg, improved flexing at the ankle and knee joints besides a decrease in burning sensation in the legs. Jamal reported an overall 31% reduction in OV irrespective of the grade of oedema on the seventh postoperative day.[7–9] In our study, the corresponding figure is 36.1%.

In our study, gender had no effect on the overall outcome, as also noticed by Jamal and Purushothaman.[7] Although there was an apparent relationship between the preoperative grade of lymphoedema and postoperative reduction in OV with a better response in grades III and IV at 12 months, this was not statistically significant. Jamal and Purushothaman reported a 78.8%, 40.1% and 39.6% reduction in OV at 7 days postoperatively for lymphoedema of grades II, III and IV, respectively.[7] The corresponding figures in our study were 28.2%, 32.2% and 52.2%.

As regards the effect of duration of lymphoedema on the outcome of surgery, it was seen that patients with longer duration of oedema (up to 10 years) showed marginally better results. This is probably because there is progressive increase in OV up to about 10 years beyond which the OV becomes constant. It is possible that after this time increasing fibrosis and obliteration of lymphatic channels result in poor response.

Although there was no statistically significant difference between the three types of anastomoses, an end-to-side anastomosis may be better as it involves the least disturbance of the lymph node from its bed and hence, minimal interference with the afferent lymphatic channels.

Patients with an initial OV of more than 2 L had a relatively higher reduction compared to those with less OV. This is contrary to Dhandapat and Mohanpatro's finding that as the initial OV increases, the results are progressively poorer.[10]

An added advantage of LNVS appears to be the protection it provides against ADL attacks. The mean number of preoperative and postoperative ADL attacks per year per patient was 30.9 and 0.03, respectively in responders (t=6.79; p<0.05); and 19.0 and 0.2 respectively in non-responders (t=3.77; p=0.001). Therefore, it appears that LNVS is beneficial in ameliorating ADL attacks even in those who are classified as non-responders as regards reduction in OV.

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