Study of Role of Nodovenous shunt in Lower limb Lymphedema

Jyotsana Goyal, Maulik B. Mehta**, Pankaj R.Modi***, V F Chauhan**, S Jain*, S Pandey****, R Patel*****

Abstract :

Introduction: Lymphedema caused by an abnormality of lymphatic system leads to excessive accumulation of tissue fluid in form of lymph in interstitial space. InIndia , most cases are secondary due to lymphatic filariasis. The aim of this study was to assess the role of Nodovenous shunt in lower limb lymphedema, in terms of overall reduction in size as a: (i)Sole procedure in grade 1 and 2 lymphedema, (ii)In grade 3 and 4 along with Charles procedure at the same time & (iii) In grade 3 and 4 as a procedure followed by Charles. **Methods :** This study was a prospective case study consisting of case series of 20 patients operated for lower limb lymphedema, at Civil hospital Ahmedabad overa period of one year. Patients were followed up immediately post-operatively for parameters according to the proforma and at 3 months, 6 months, 12 months and examinations were carried out and results recorded. **Results :** Nodovenous shunt procedure in grade 1and 2, and with Charles procedure and before Charles procedure in grade 3 and 4, resulted in significant reduction of limb girth and intraoperative fluid loss in Charles procedure. **Discussion :** Nodovenous shunt procedure, before the Charles procedure has decreased the intraoperative morbidity and results are even better than only pneumatic compression therapy in terms of compliance and long term results. Nodovenous shunt being less morbid, less time consuming procedure, is becoming procedure of choice in lymphedema. We are still evaluating the role, advantage and time interval of doing nodovenous shunt before Charles procedure.

Key Words : Charles procedure, Lymphedema, Nodovenous shunt.

Introduction :

Lymphedema is the condition caused by an abnormality of the lymphatic system leading to excessive accumulation of tissue fluid in form of lymph in interstitial spaces. It is a chronic condition and if left untreated, causes restriction in limb movements and work capacity. India is having 40% of worldwide burden of lymphedema and most of the cases are secondary due to lymphatic filariasis. It is important to diagnose and treat in early course of disease to have better results.Various therapies for lymphedema are based upon a combination of manual and pneumatic massage, elastic garments, prophylactic antibiotic administration for prevention of dermatolymphangioadenitis (DLA) and surgical procedures.[1]

* Senior Resident
** Assistant Professor
*** Associate Professor
**** Resident, Department of General Surgery, B. J. Medical College, Civil Hospital, Ahmedabad, Gujarat, India.
Correspondence : Dr. Maulik B Mehta
E-mail : drmehta79@yahoo.com

Clinical staging

Staging was based on evaluation of the level of edema embracing the limb from foot to groin, and the advancement of skin keratosis and fibrosis. Briefly, Clinical grading[2] was done as per Brunner's as follows:

Grade 1 - oedema pits on pressure & largely disappears on elevation & bed rest

Grade 2 - oedema does not pit & does not significantly reduce on elevation.

Grade 3 and 4 - oedema is associated with irreversible skin changes, i.e., fibrosis, papillae formation, hyperkerotosis.

Aims and Objectives:

To study role of Nodovenous shunt in lower limb lymphedema in terms of

(A) Overall reduction in size as a

- Sole procedure in grade 1 and 2 lymphedema
- In grade 3 and 4 :-
  - Along with Charles procedure at the same time

- As a part of two staged procedure, where first nodovenous shunt followed later on by Charles.

(B) In reducing the morbidity in terms of perioperative fluid loss.

Methods:

A nonrandomised prospective case study consisting of case series of 20 patients operated for lower limb lymphedema, at Civil hospital Ahmedabad was done over a period of one year. There were 10 females and 10 males, out of which 12 were having early lymphedema and 8 had late lymphedema. Early lymphedema included grade 1 and 2 lymphedema out of which 7 were females and 5 were males, and all of them underwent nodovenous shunt procedure. Late lymphedema included grade 3 and 4 lymphedema, out of which 3 were females and 5 were males.4 underwent Charles procedure along with nodovenous shunt and 4 underwent nodovenous shunt followed by Charles procedure after 15 days.

Inclusion criteria:

- cases with slow symptomless development of edema – so-called primary or idiopathic edema

Exclusion criteria:

- congenital genetically transferred lymphedema.
- lymphedema, chronic venous stasis, cardiac and kidney edema, rheumatoid arthritis, and acute inflammatory soft tissue changes.
- edema after lymph node removal and/or irradiation (after hysterectomy, inguinal lymphadenectomy), or saphenous vein harvesting for aorto-coronary bypass.

Study setting : Patients were divided on the basis of grades of lymphedema into two groups:

Group 1: grade 1 and grade 2 lymphedema

Group 2: grade 3 and grade 4 lymphedema

Group 1 underwent only nodovenous shunt procedure

Group 2 underwent nodovenous with charles or nodovenous followed by Charles

Nodovenous shunt was followed by:

Limb girth measurement on post op day 1, 5, 10 and 15. (Standardized circumferential measurements were made during morning hours at three locations on the edematous and contralateral normal limb: dorsum of foot, mid-calf and mid-thigh), crepe bandage application & pneumatic compression therapy.

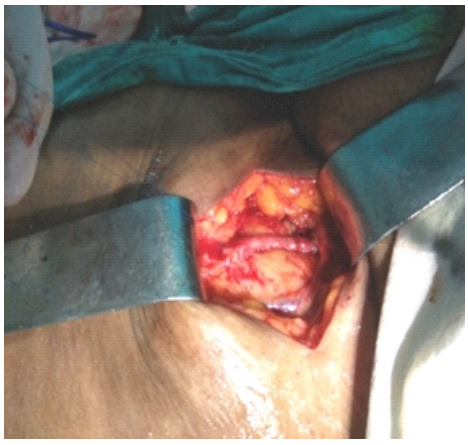
Patients were followed up at 15 days after discharge, then at 3 months, 6 months, and at one year with limb girth measurements.Charles were followed by first STG dressing on post op day 4, then on every alternate day, followed by discharge after 5 STG dressings.

Technique employed:

Nodovenous shunt procedure:

It is an operation involving microsurgical lymphovenous shunts[3] designed for decompressing the lymphedematous limb of the accumulated lymph by directing its flow to the venous system distally to the site of lymphatic obstruction. It is performed using a microsurgical technique, between the limb afferent lymphatics and superficial veins. The groin skin is kept. Then anterior surface of the largest inguinal lymph nodes is shaved off. Then Great saphenous vein is identified, isolated and distal end is cut after assessing appropriate length and proximal end is anastomosed with the shaved off lymph node using double needle 6/0 prolene sutures in continuous manner in two layers - anterior and posterior.

Figure 1: Nodovenous Anastomosis



Charles procedure:

In it, a torniquet is tied. Then it includes excision of all of the skin and subcutaneous tissues down to the deep fascia, with coverage using split thickness grafts.

Figure 2 : Left lower limb lymphedema

Figure 3 : 15 days after nodovenous shunt procedure

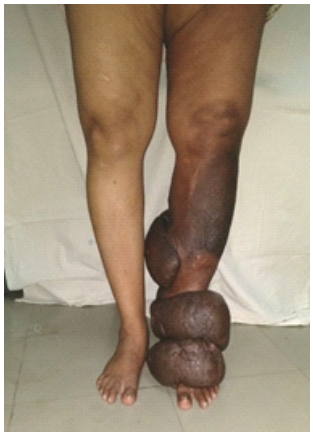


Figure 4 : After excision

Figure 5 : After split thickness skin grafting

Results :

Figure 6: Patients with Lymphedema

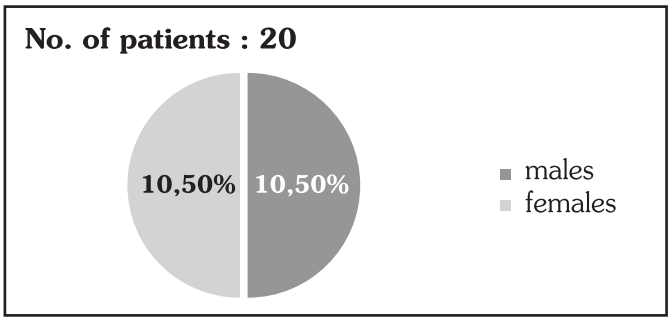


Figure 7: Stages of Lymphedema

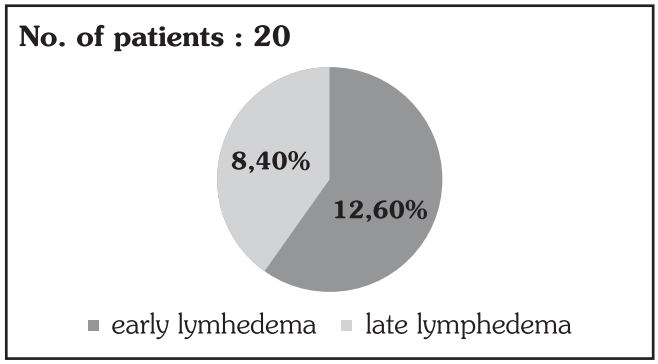
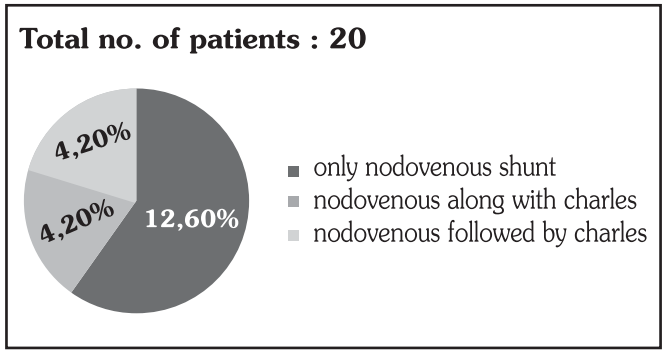


Figure 8: Type of procedure done



Total cases : 16, Patients who underwent Nodovenous shunt as a sole procedure (12) or as followed 15 days by Charles (4)

Table 1 : Average limb girth reduction in patients who underwent Nodovenous shunt as a sole procedure or as followed 15 days by Charles (total 12+4 cases)

Post Op Day	Average Limb Girth Reduction(cm)		
	Mid Foot	Mid Leg	Mid Thigh
1	2	4	2
5	3	7	4
10	4	10	6
15	4	10	6

Thus, Average reduction in limb girth was by 25%. Maximum limb girth reduction was 18cm at mid leg, 7 cm at mid thigh, 7 cm at mid foot, reduction by 33%.

On follow up of patients at the end of 1 year : Total cases: 12 Patients who underwent nodovenous shunt as a sole procedure

Figure 9 : Average limb girth reduction

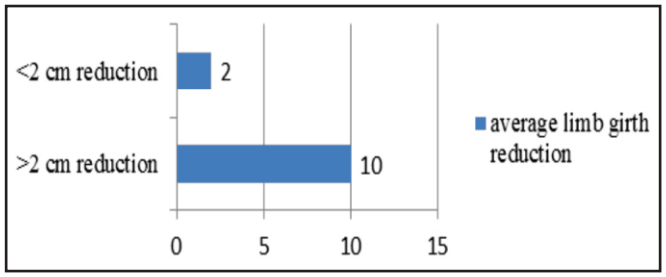
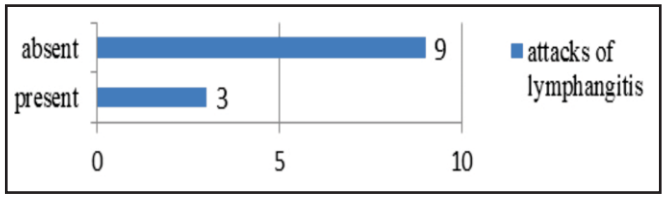


Figure 10 : Attacks of lymphangitis



Thus average limb girth reduction was significant (>2 cm) in 83.3%. And incidence of further episodes of lymphangitis was reduced to 25%.

Total cases : 8 Patients who underwent nodovenous with Charles or nodovenous followed by Charles

Figure 11 : Operating time

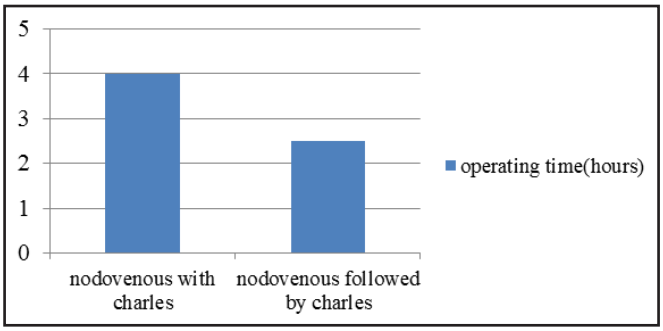


Figure 12 : Intraoperative fluid loss

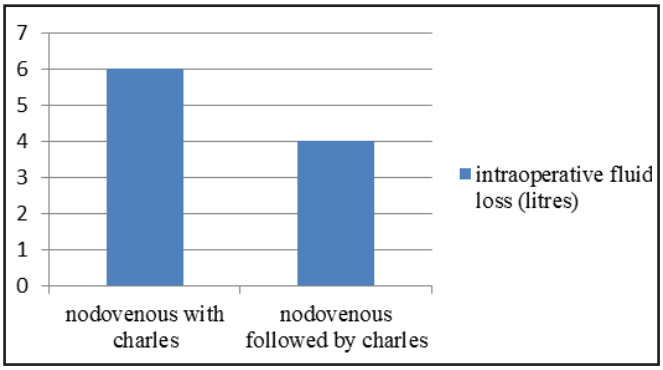
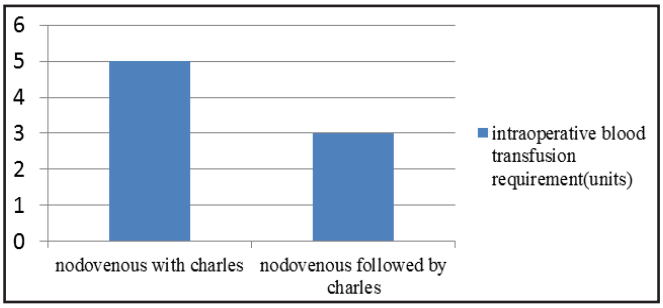


Figure 13 : Intraoperative blood transfusion requirement (units)



Role of nodovenous shunt procedure in patients planned for Charles procedure.

Thus the patients who underwent nodovenous shunt procedure first followed by Charles procedure performed well intraoperatively as compared to those who underwent both procedures simultaneously.However the incidence rate of lymphorrhea in both cases were same.

Case 1:

Figure 14 : Patient with Right lower limb lymphedema

Figure 15 : After excision with skin grafting

Figure 16 : Post-op day 21

Figure 17: Before Nodovenous surgery

Figure 18 : After Nodovenous Shunt

Discussion:

The rationale for performing lymphovenous shunts in the treatment of lymphedema[4] requires an updated knowledge of the pathophysiology of this condition. Lymphedema of limbs develops as a consequence of damage to lymphatic vessels. This is followed by stasis of the tissue fluid and lymph in skin, subcutaneous tissue, muscular fascia and muscles. The kinetics of the process and efforts to control it depend on the causative factors. It is said[5] the lymphatic transport capacity is the product of total cross section of lymphatic vessel system and lymphokinetic forces. So, the treatment should aim at correcting both these defects. Nodovenous shunt[3]and lymphaticovenous anastomosis[6] are designed to overcome the obstruction of lymph flow while excisional surgery[7,8] and external elastic support attempt to correct lymphokinetic forces. The common denominator for all forms of lymphedema is tissue fluid and lymph stasis.Pneumatic compression therapy is frequently used to treat chronic lymphedema. Postulated mechanisms include simulating the calf muscle pump, decreased capillary filtration, and reduced venous reflux.The overall statistics in the pertinent literature point to good and sometimes even excellent results for the lymphovenous shunts. The number of performed operations around the world has reached hundreds of

thousands.In one of the cases, we performed lymphaticovenous anastomosis along with nodovenous shunt,and in of the cases we only shaved off the anterior part of lymph node, and the results were comparable to other cases.In five of the cases, lymphoscintigraphy was done, findings were partially obstructed lymphatic channels with dermal back flow in two of the cases. Results in those cases were less promising in terms of reduction of girth as well in recurrence on follow up of one year. However, due to lack of affordability, we have not included this in our study.We are still evaluating role of lymphoscintigraphy, result of lymphaticovenous anastomosis , and role of pneumatic compression in our setup.

References:

1. Olszewski WL. Lymphovenous Microsurgical Shunts in Treatment of Lymphedema of Lower Limbs: A 45-year Experience of One Surgeon/One Center. Eur. J. of Vasc and Endovasc Surg 2013; 45(3):282-90.
2. Bailey HH and Love RM. Bailey and Love's Short Practice of Surgery. 27th ed. Chapter 58. Lymphatic disorders;2018.pp 998.
3. Jamal S. Nodovenous shunt in the treatment of filarial elephantiasis, presented at the 34th Annual conference of Association of Surgeons of India, Cuttack 1974.
4. Pokrovskij AV, Spiridonov AA, Thkor SN. Indications and technique of creating lymphovenous anastomosis in lymphedema of the extremities. Klin Khir. 1971;9:11-15.
5. Foldi M.: Physiology and Pathophysiology of the Lymph system. In Handbook of general pathology. Berlin -Heidelberg - New York. Springer Verlag 1972.
6. Olszewski WL. The treatment of lymphedema of the extremities with microsurgical lymphovenousanastomoses. Int Angiol 1988;7:312-21.
7. Sistrunk WE.: Further experience with kondoleon operation for elephantiasis. J. of Amer. Med. Asso. 1918;71(10):800-6.
8. Thompson N.: Surgical treatment of chronic lymphoedema of lower limb. Brit. Med. Journ.1962;2:1566.