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LYMPHOSCINTIGRAPHY AS A DIAGNOSTIC TOOL IN PATIENTS WITH LYMPHEDEMA OF FILARIAL ORIGIN – AN INDIAN STUDY

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ABSTRACT

Lymphedema is a common clinical problem. Filariasis is the commonest cause of lymphedema in India and is a chronic debilitating disease. The purpose of this study is to highlight the role of lymphoscintigraphy in the evaluation of lymphedema. Our study population consisted of 418 patients diagnosed with filarial lymphedema of different clinical stages referred for lymphoscintigraphy of the limbs by the lymphologist at our institution. An analysis of the various studies was done to determine how lymphoscintigraphy can be useful in documentation of the diagnosis, evaluation, as a screening procedure to prevent progression, and to enhance management of filarial lymphedema.

Keywords: filariasis, lymphoscintigraphy, lymphedema

Lymphedema is swelling of the soft tissues caused by abnormal accumulation of lymph. It can be viewed as a low output failure of the lymphovascular system due to an impairment in the lymphatic system and in lymph transport (1). Filariasis is the commonest cause of secondary lymphedema in India and is added to other varied etiologies such as lymphatic malformation since birth, surgical procedures, radiation therapy, other parasitic diseases, lymphangitis, or functional disturbances. Worldwide, the largest number of people both at risk and infected with filariasis live in India (2). Lymphatic filariasis is a vector borne parasitic disease caused by three lymphatic-dwelling nematodes *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*, of which *W. bancrofti* accounts for 90% of the disease (3). According to recent estimates, 1.1 billion people live in endemic areas, and there are 120 million cases of filariasis (3). Filariasis has been identified as one of the diseases which could be eliminated or eradicated because human beings are the only reservoirs (4). Lymphedema is the only morbid manifestation of this hidden disease, and this complication causes long-term suffering, morbidity and also social and economic burden to the individuals because of the chronic progressive nature of the disease.

Filarial lymphedema commonly affects mostly the lower limbs and in decreasing order the genitalia, upper extremity, and other areas (5). The male to female ratio is highly probably due to the differences in dressing (6). Most of the patients are from lower socioeconomic groups, and no age groups are exempt (but more than 50% of the affected individuals are in their 3rd or 4th decade) (7).

For the effective use of lymphoscintigraphy and the management of lymphedema, an understanding of the pathophysiology is essential. In the extremities, the lymphatic system consists of a superficial system that collects lymph from the skin and subcutaneous tissue and a deeper system that drains

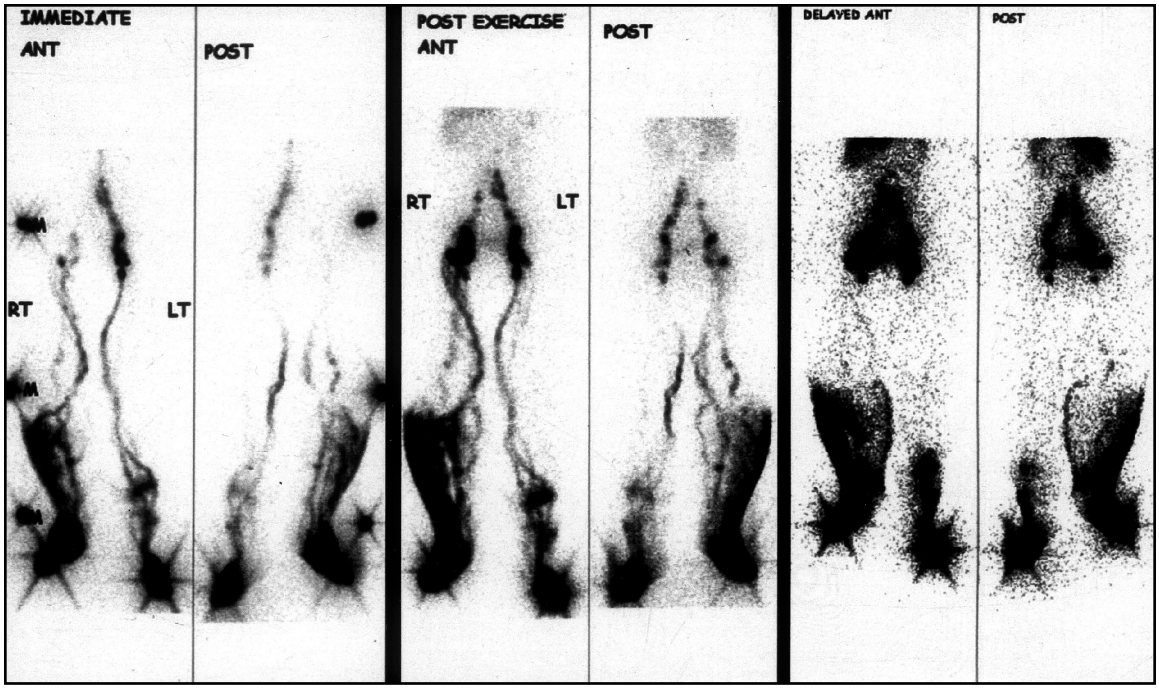

Fig. 1. Lymphoscintigram of the lower limbs in a patient with lymphedema showing multiple channels, tortuosity of channels and dermal backflow.

the subfascial structures. The superficial and deeper system merge within the pelvis for the lower extremity and in the axilla for the upper extremity (8). During lymphatic obstruction, the deeper system participates in the lymph drainage of the skin and also in lymphaticovenous anastomosis.

MATERIALS AND METHODS

Our study population consisted of 418 patients diagnosed with filarial lymphedema of any clinical stage (1) [Brunners clinical classification (9)] by lymphologists at our institution referred for lymphoscintigraphy. They included both sexes in the age group 10-64 years with filarial lymphedema who had not undergone any intervention. Lymphoscintigraphy was performed using an intradermal injection of 0.75 - 1 mCi of Tc-99m labeled Rhenium sulphide into the dorsum of each foot between the first and second interdigital space. Immediate, post massage (30 min.), and delayed sweep images (3 hours) in anterior and posterior views were acquired. Images were interpreted according to the patterns of flow, delay to flow and visualization of lymph nodes, flow through the deeper lymphatic system, and dermal backflow as lymphoscintigraphic staging (*Fig. 1*). From our experience gained in lymphoscintigraphy on filarial lymphedema, we have classified lymphedema into four stages.

Stage I - Flow in multiple lymphatic channels or delayed flow.
Stage II - Stage I with delayed visualization of lymph nodes, visualization of popliteal nodes.
Stage III - Stage II with dermal back flow.
Stage IV - No flow. No nodes even in delayed images.

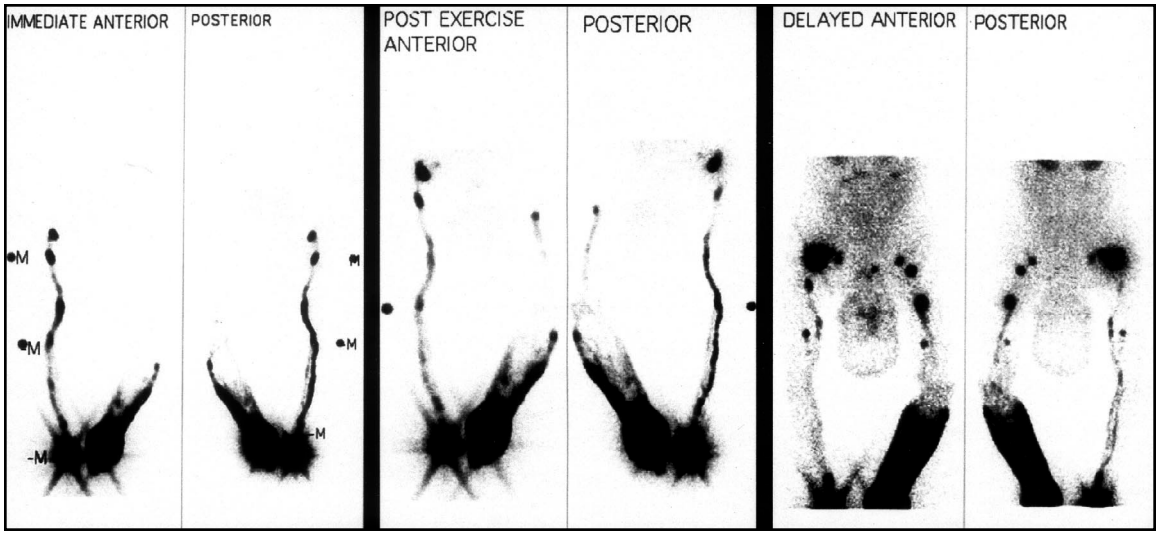

Fig. 2. Lymphoscintigram of a patient with Stage III lymphedema of left upper limb displaying dermal backflow.

TABLE 1
Number of Limbs According to Clinical and Lymphoscintigraphic Staging

	Limbs	Normal	Staging		
			I	II	III
Clinical	Upper Limb	18	13	11	4
	Lower Limb	319	225	147	99
Lymphoscintigraphy	Upper Limb	7	23	12	4
	Lower Limb	136	300	234	120

OBSERVATIONS AND RESULTS

A total number of 418 patients were reviewed in this study (216 females; 202 males). Each limb was counted as one entity so that a total of 836 limbs were studied with 46 (18 females; 5 males) presenting with lymphedema in upper limbs and 790 (211 females; 184 males) presenting with lymphedema in lower limbs. The incidence of females referred for lymphoscintigraphy was higher in our group than expected, and the incidence of clinical filarial lymphedema in the upper limbs was less common (28/836) (*Fig 2*). After lymphoscintigraphy, the clinical staging was upgraded in 7% (60/836) of the total abnormal limbs. This consisted of 18% (42/238) moving to Stage II from clinical Stage I lymphedema, 0.4% (1/238) moving to Stage III from Stage I, and 11% (17/158) moving to Stage III from Stage II *(Table 1)*. Abnormal lymphoscintigraphic findings were seen in 58% (194/337) of the clinically assessed "normal limbs" (11 upper, 183 lower). Of these 194 limbs, 66 % (128/194) had Stage I lymphedema, 32% (63/194) had Stage II lymphedema and 2% (3/194) had Stage III lymphedema.

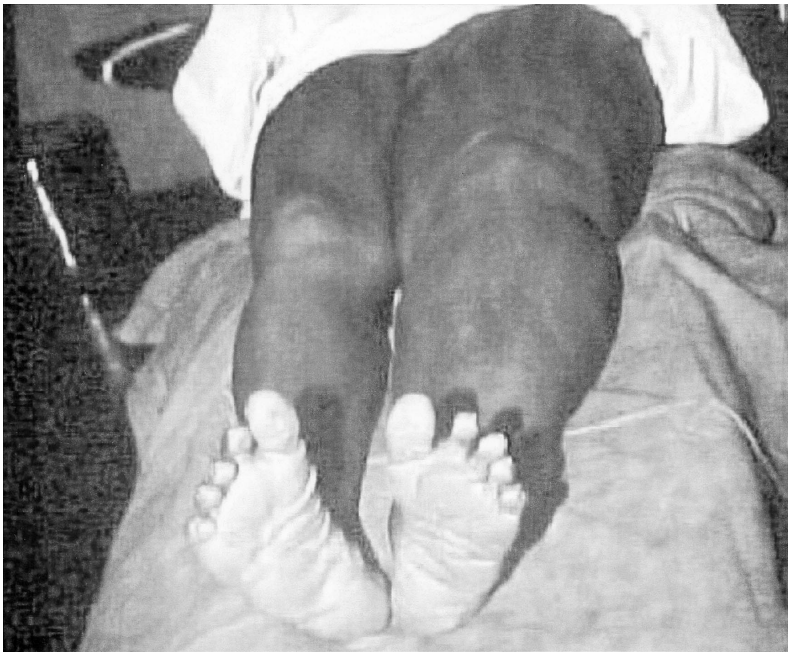

Fig. 3. Stage III lymphedema of left lower limb. Clinically normal right lower limb.

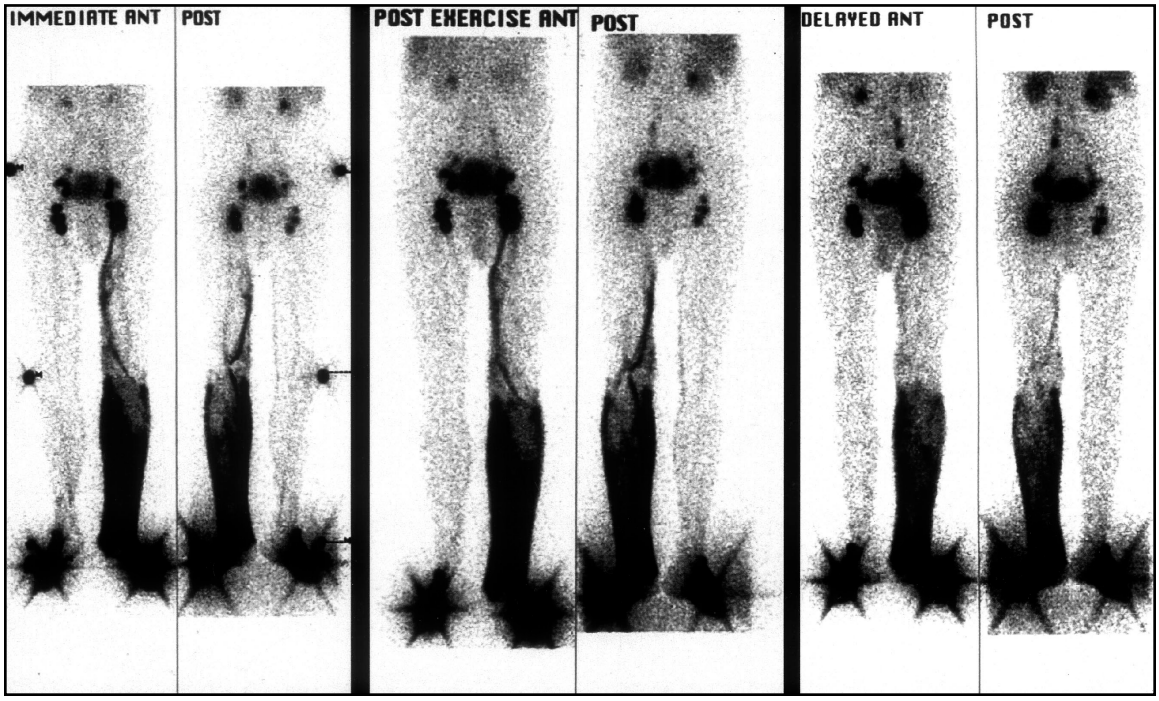

Fig. 4. Lymphoscintigram of a patient with Stage III lymphedema of the left lower limb displaying extensive dermal diffusion below the knee. Normal right lower limb.

Fig. 5. Clinically normal right lower limb with Stage II lymphedema in left lower limb.

DISCUSSION

It is sometimes difficult to diagnose early lymphedema, yet it is important to make the diagnosis of lymphedema as early as possible for monitoring and evaluation of intervening measures in the management. Though a careful clinical history and physical examination is often adequate for diagnosis, lymphoscintigraphy provides a simple diagnostic and screening procedure in patients with preclinical and clinical lymphedema to document the severity and nature of the abnormalities including in lymphatic filariasis (10).

Lymphoscintigraphy is based on the principle that radiocolloids and radiolabeled macromolecules of suitable size and properties introduced into appropriate tissue planes are transported by lymphatics and are localized in draining lymph nodes, thereby providing dynamic and static delineation

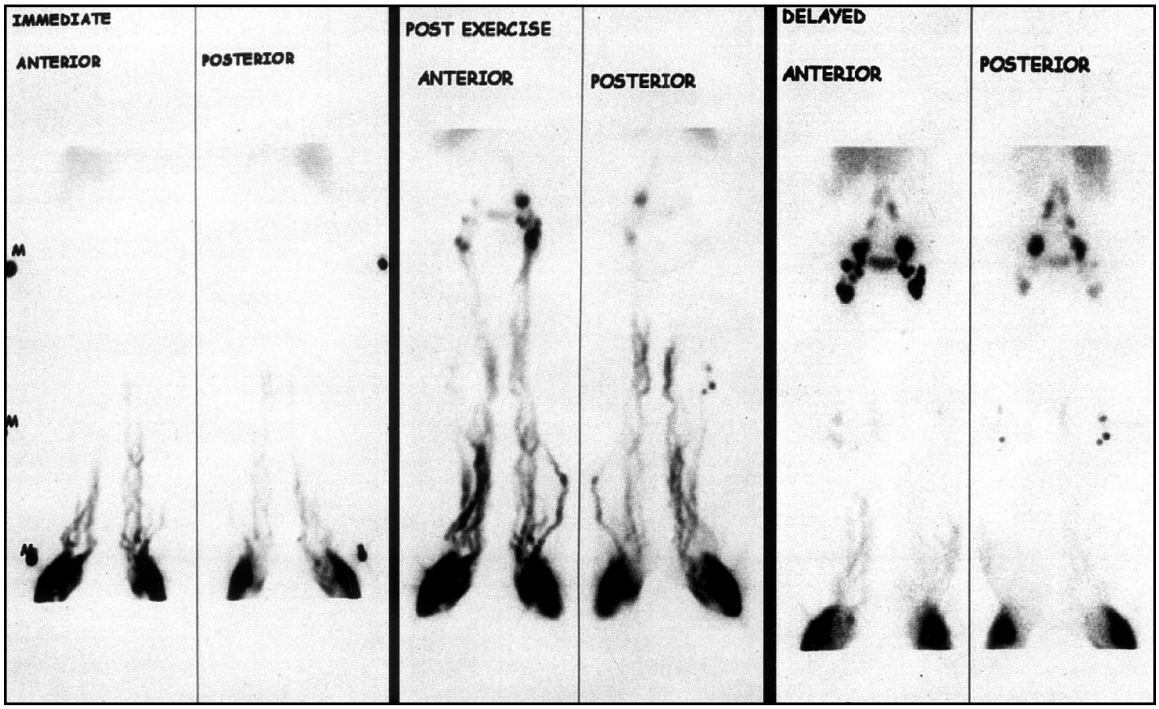

Fig. 6. Lymphoscintigram of a patient with Stage II lymphedema of the left and right lower limbs displaying multiple tortuous channels.

by scintigraphic imaging of the functions and components of lymphatic system under normal and abnormal conditions (11).

Lymphoscintigraphy is a reliable approach to assess the severity of lymphatic dysfunction and to institute appropriate therapy. The technique has replaced contrast lymphangiography, which was technically difficult and more invasive (1). It is safer than blue dye injection because dye injections are occasionally complicated by an allergic skin reaction or anaphylaxis (1).

The incidence of filarial lymphedema has been reported to be greater in the male gender (12,13) and in the lower limbs (5). But from our referrals for lymphoscintigraphy, we found the number of female patients referred was higher than that of male patients. This discrepancy was attributed to cosmetic considerations.

It is well recognized that in the vast majority of patients with lymphedema, the diagnosis can be made clinically. Lymphoscintigraphy helps to document the diagnosis but apart from this, it visualizes the exact pathophysiological process that has taken place in the edematous limb, the extent of involvement, and also involvement of other regions like the scrotum. These points were well demonstrated from our study showing that except for 7% of the limbs, the clinical staging correlated well with the lymphoscintigraphic findings. In this 7%, the pathophysiological damage was greater than the clinical staging i.e., 18% of limbs, were clinically upstaged to Stage II from Stage I, 0.4% to Stage III from Stage I, and 11% to Stage III from Stage II, showing that lymphoscintigraphy can clearly delineate dilatation, kinking, collateral formation and dermal backflow (13).

Lymphoscintigraphy also improves the assessment for correct management *(Figs. 3,4)*. The pathological changes may remain subclinical for a very long time and thus escape clinical detection (14). This delay in diagnosis may allow the changes to progress into a chronic phase and precludes effective early treatment which prevents secondary complications, deformities, functional impairment, psychological impairment and is cost effective. It is evident from our study that 58% of the clinically normal limbs showed lymphoscintigraphic abnormalities (*Figs. 5,6*). The findings in these 194 clinically normal limbs ranged from stage I to III, i.e., 66 Stage I, 32 Stage II, and 2 Stage III, clearly showing definite subclinical lymphedema which would not have been detected. Thus, lymphoscintigraphy promotes early management to prevent a chronic course and associated morbidities.

CONCLUSION

Lymphoscintigraphy is a simple, non-invasive procedures which displays the pathophysiological changes of filarial lymphedematous limb through easily visualized and analyzed functional images of the lymphatic system. It can be used for documenting the clinical diagnosis, the extent of involvement and also deciding management. It is also useful as a screening procedure in endemic areas where early diagnosis of subclinical lymphedema can be made, resulting in prevention of chronic debilities.

REFERENCES

1. The diagnosis and treatment of peripheral lymphedema: Consensus document of the International Society of Lymphology. Lymphology 36 (2003), 84-91.
2. Control of lymphatic filariasis. WHO, Geneva (1987), 13.
3. Prospects of elimination of lymphatic filariasis in India. ICMR Bulletin 32 (2002), 41-54.
4. Lymphatic filariasis. WHO. Reasons for hope. WHO/CTD/FIL/97 (1997), p. 4.
5. WHO. Lymphatic Filariasis: The Disease and its control -Fifth Report of WHO Expert Committee on Filariasis. WHO Tech Rep Ser 821 (1992), 1.
6. Pani, SP, A Srividya: Clinical manifestations of bancroftian filariasis with special reference to grading Indian J. Med. Res. 102 (1995), 114-118.

7. Michael, E DRP Bundy, et al: Reassessing the global prevalence and distribution of lymphatic filariasis. Parasitology 122 (1996), 409-428.
8. Brautigam, P, E Földi, I Scharper, et al: Analysis of lymphatic drainage in various forms of leg edema using two compartment lymphoscintigraphy. Lymphology 31 (1998), 43-55.
9. Russell, RCG, NS Williams, CJK Bulstrode (Eds.): *Bailey and Love's Short Practice of Surgery*. 24th Edition. Hodder Education Publishers, 2004.
10. Witte MH, S Jamal, W Williams, et al: Lymphatic abnormalities in human filariasis as depicted by lymphangioscintigraphy. Arch. Intern. Med. 153 (1993), 737-744.
11. Szuba, A, WS Shin, W Strauss, et al: The third circulation: Radionuclide lymphscintigraphy in the evaluation of lymphedema. J. Nucl. Med. 44 (2003), 43-57.
12. Pani, SP, N Balakrishna, A Srividya, et al: Clinical epidemiology of Bancroftian filariasis: effect of age and gender. Transaction of Royal Society of Tropical Medicine and Hygiene 85 (1991), 260-264.
13. Pani, SP, R Lall: Clinical features, pathogenesis and management of lymphatic filariasis. ICMR Bulletin 28 (1998), 41.
14. Das, PK, SP Pani: Helminthology in India - Epidemiology and Control of Filariasis. VCRC (1981), 425-451.

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