

Contemporary role of lymphoscintigraphy: we can no longer afford to ignore!

'Lymphoscintigraphic findings: delayed oedema after great saphenous vein harvesting' in this issue of *Phlebology* by C E Q Belczak and J M Pereira de Godoy, *et al.*¹ demonstrates the ability of radionuclide lymphoscintigraphy (LSG) to detect a subtle change in the lymphatic system due to injury following saphenous vein harvest we often consider benign.

With radionuclide LSG,² the authors successfully documented 'acute' lymphoedema after saphenous vein harvest. This article clearly documents the invaluable role of LSG to monitor the often overlooked 'iatrogenic' acute lymphoedema, allowing the opportunity for prevention of progression to 'chronic' lymphoedema, which is too important to ignore as the latter is an irreversible condition.

Indeed, postsurgical lymphoedema³ is a neglected condition surgeons contribute to, despite their knowledge and anticipation of the condition. All surgery involving lymph nodes dissection (e.g. breast/uterine cancer surgery) carries a risk of significant injury to the lymphatic system. Fortunately, not all injuries to the lymphatic system progress to a chronic condition, but such acute condition certainly requires timely measurement to prevent its complications (e.g. infection) precipitating the progression to chronic condition.

Nevertheless, some cases of chronic lymphoedema develop as an inevitable complication of a life or limb saving surgical procedure despite careful planning to prevent or reduce this anticipated damage/condition. Therefore, following the interruption of lymph-collecting vessels, vigilant surveillance should begin immediately as a 'calculated plan of containment' 'to detect any evidence of postprocedure lymphoedema. LSG has such a unique role with its ability to detect subclinical lymphoedema and allow early initiation of treatment.

The role of LSG is therefore indispensable for detecting postprocedure lymphoedema and allowing timely management of 'latent/occult' lymphoedema before it progresses to full blown, chronic lymphoedema. Full understanding of the indications and limitations of LSG is required for the proper study of patients at risk for lymphoedema.

The radionuclide technique of lymphatic imaging was first introduced in 1953 by Sherman and

Ter-Pogossian⁴ using interstitially injected radiopharmaceutical particles. However, its potential value to document functional changes in lymphatic dynamics was unrecognized at the time, being overshadowed by conventional lymphography with oil-based contrast (the gold standard at that time) for many decades.

Conventional lymphography, established by Kinmonth⁵ has remained the gold standard for definitive delineation of the lymphatic system for over 40 years. Three major issues associated with lymphography has limited its widespread utilization; difficulty in cannulating large lymphatic draining collectors through tiny skin lymphatics; risk of damage to the lymphatic endothelial lining by the iodinated oil contrast; and risk of oil (fat) embolism.⁶

Conventional lymphography therefore has fallen out of favour and is rarely used in daily practice these days except for a few specific indications. Renewed interest in LSG has occurred over the last several decades, recognizing its underestimated value as a substitute for conventional lymphography.

LSG has become the new gold standard for assessing the lymphatic system. It is now well proven to be safe, non-invasive, easy to perform and harmless to the lymphatic endothelial lining.

Although LSG is considered a 'functional' imaging modality, it delivers clear, comprehensive and consistent images utilizing intradermally administered Tc-99m labelled sulphur colloid or human serum albumin. LSG can visualize a variety of structural and functional changes in lymphatic flow dynamics. In addition, Tc-99m has a short half-life (6 hours) and is nearly completely decayed within 24 hours.

LSG produces clear dynamic images of lymphatic transport, and the peripheral and central lymphatic structures and function. Its Transport Index Score⁷ allows semi-quantification of peripheral lymphatic radiotracer transport. Delayed imaging demonstrates lymph node uptake, albeit without detailed structural information seen with conventional lymphography.

LSG is easily performed before and after treatment to assess the efficacy of medicines, surgery and physical means to facilitate lymph movement or reduce lymph formation. Clear images of truncal lymph transport and draining nodes can

be routinely obtained for follow-up studies to document functional changes in lymphatic dynamics.

However, LSG has never been fully appreciated for its ability to evaluate the lymphatic system as an independent test or as an adjunct to the patient's history and physical examination. This seems to be partly related to clinician unfamiliarity with LSG or bias against LSG based on the old concept of chronic lymphoedema. Hence, appropriate utilization of LSG requires proper understanding of the new concept of chronic lymphoedema.⁸

A new concept no longer views chronic lymphoedema as a simple condition of static swelling of an affected limb or region following blockage of the lymph transporting and collecting systems as defined by the old concept of lymphoedema. Lymphoedema is now considered to be a progressive condition involving the lymphatic system and the entire skin and soft tissue, where a chronic degenerative and inflammatory process occurs resulting in fibrotic change. It is a condition involving tissues beyond the lymphatics and lymph nodes characterized by recurrent episodes of dermatolymphadenitis.⁹

Such a steadily, progressing condition affecting the entire surrounding soft tissue will eventually result in a disabling and distressing condition associated with numerous complications that include: bacterial and fungal infection, dermatolipo-fibrosis with chronic inflammation, immunodeficiency and wasting phenomenon, and malignancy (e.g. Kaposi sarcoma; lymphangiosarcoma).

Therefore, a more precise method of evaluation and repeated assessment of patients with lymphoedema is required for advanced treatment and care. LSG fills this critical role in the contemporary management of chronic lymphoedema based on this new concept of chronic lymphoedema.

The diagnostic value of LSG is exponentially increased when combined with magnetic resonance imaging and/or Duplex ultrasonography. It not only improves lymphatic function assessment, but it also allows the evaluation of involvement of the arterial and venous systems and provides a framework for subsequent therapy.¹⁰

Recent advances in the understanding of 'phlebolymphoedema' as a combined condition of

chronic venous insufficiency and chronic lymphatic insufficiency requires a new role of LSG for assessment in addition to its primary role in assessing chronic lymphoedema.

Simultaneous assessment of the venous and lymphatic systems will allow identification of the delicate relationship between these two inseparable systems due to mutual interdependency.

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References

- 1 Belczak CEQ, Belczak CVJ, Godoy JMP, *et al.* Lymphoscintigraphic findings: delayed edema after great saphenous vein harvesting. *Phlebology* 2011;**26**:185–90
- 2 Szuba A, Shin WS, Strauss HW, Rockson S. The third circulation: radionuclide lymphoscintigraphy in the evaluation of lymphedema. *J Nucl Med* 2003;**44**:43–57
- 3 Lee BB. Lymphoedema post-surgical: un terme frappe d'interdiction pour les chirurgiens. *Angeologie* 2004;**56**:7–8
- 4 Sherman AI, Ter-Pogossian M. Lymph node concentration of radioactive gold following interstitial injection. *Cancer* 1953;**6**:1238
- 5 Kinmonth JB. Lymphangiography in man: a method of outlining lymphatic trunks at operation. *Clin Sci (Lond)* 1952;**11**:13–20
- 6 Stecke RJ, Furumanski S, Dunam R, *et al.* Radionuclide perfusion lymphangiography: an experimental technique to compliment the lymphangiogram. *Am J Roentgenol* 1975;**124**:600–9
- 7 Baumeister RG, Siuda S, Bull U, Moser E. Evaluation of transport kinetics in lymphoscintigraphy: follow-up study in patients with transplanted lymphatic vessels. *Eur J Nucl Med* 1985;**10**:349–52
- 8 Lee BB, Bergan JJ. New clinical and laboratory staging systems to improve management of chronic lymphedema. *Lymphology* 2005;**38**:122–9
- 9 Lee BB. Current issue in management of chronic lymphedema: personal reflection on an experience with 1065 patients. *Commentary, Lymphology* 2005;**38**:28–31
- 10 Lee BB, Andrade M, Bergan J, *et al.* Diagnosis and treatment of primary lymphedema – consensus document of the International Union of Phlebology (IUP)-2009. *Int Angiol* 2010;**29**:454–70