

Original article

Lymphoscintigraphy in limb lymphoedema: Current methodology and interests

La lymphoscintigraphie du lymphœdème des membres : méthodologie et intérêt actuels

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Abstract

Lymphoscintigraphy is a physiological method for the assessment of the lymphatic system. Routinely used for the localisation of sentinel nodes, it is not commonly performed to explore lymphoedema. We report the practical interest of lymphoscintigraphy in the study of limb lymphoedema from a population of 100 patients investigated during an 18-month period. After recalling the pathophysiology of lymphoedema and describing our acquisition and interpretation protocol, we present the practical interest of lymphoscintigraphy from the analysis of response to questions raised by the requesting physician. In our experience, lymphoscintigraphy was useful for the diagnosis of lymphoedema in clinically doubtful cases, the discussion of oedema pathophysiology, for the identification of the lymphatic component in lymphovenous oedema, and for the management of lymphoedema. The quality of information provided by lymphoscintigraphy depends on the rigour of the protocol, the overall data analysis and the integration of clinical data.

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Keywords: Lymphoscintigraphy; Lymphoedema; SPECT/CT

Résumé

La lymphoscintigraphie est une méthode physiologique d'étude du réseau lymphatique. Utilisée en routine dans la localisation du ganglion sentinelle elle reste sous-utilisée dans le bilan du lymphœdème. Nous rapportons l'intérêt pratique de la lymphoscintigraphie dans l'étude du lymphœdème des membres à propos de 100 patients vus sur une période de 18 mois. Après un rappel de la physiopathologie du lymphœdème, une présentation de notre protocole d'acquisition et d'interprétation des images, nous rapportons l'intérêt pratique de la lymphoscintigraphie en analysant la réponse aux questions posées par le médecin demandeur. Dans notre expérience, la lymphoscintigraphie a aidé à diagnostiquer le lymphœdème dans les cas cliniquement douteux, à discuter la physiopathogénie de l'œdème, à identifier la part lymphatique de l'œdème lympho-veineux, et à orienter sa prise en charge. La qualité des informations obtenues dépend de la rigueur du protocole, de l'analyse synthétique des informations et de l'intégration des données cliniques.

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Mots clés : Lymphoscintigraphie ; Lymphœdème ; TEMP/TDM

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1. Introduction

Lymphoscintigraphy is a physiological technique used to study the lymphatic system. Although the method was developed several years ago and is widely used to detect sentinel nodes, it has not been widely used in nuclear medicine to study extremity lymphoedema [1].

The diagnosis of lymphoedema is basically clinical. It can however be a challenging task in many situations: absence of a known cause, recent onset, no associated fibrosis, context of chronic venous insufficiency with trophic disorders, lipoedema [2]. Lymphoscintigraphy has proven performance for the diagnosis of lymphoedema [3–7].

Good knowledge of the lymphatic system, combined with a rigorous protocol and careful interpretation, is necessary for a successful lymphoscintigraphic exploration. Certain scintigraphic anomalies, particularly those involving the interstitial tissue and deep structures, may be difficult to interpret on planar images and can benefit from the contribution of hybrid single photon emission computed tomography/computed tomography (SPECT/CT) imaging [8,9].

The purpose of this work was to report our experience from a retrospective analysis of 100 consecutive patients with lower limb lymphoedema who underwent exploratory lymphoscintigraphy.

2. Pathophysiological background

The lymphatic system starts in the interstitium at the microcirculatory unit composed of the arteriole, the venule and the blood capillary. It begins by a network of loose lymphatic capillaries bound to collagen by anchorage filaments. The lymphatic capillaries extend into the superficial dermis parallel to the epidermis. Capillary loops form arcades interconnecting the lymphatic capillaries that feed into precollectors then the superficial valvulated lymphatic trunks. The precollectors run

along the superficial aponeurosis and are interconnected with the deep lymphatic trunks [10] (Fig. 1).

The lymphatic system plays a well-known role in the immune process and is also an important route for eliminating proteins and water from the interstitial tissue.

Lymphatic insufficiency can be divided into two categories, mechanical and dynamic. Mechanical insufficiency of the lymphatic system generates protein-rich lymphoedema: there is a normal amount of lymph but the system's drainage capacity is reduced. Dynamic insufficiency of the lymphatic system generates protein-poor lymphoedema: there is an excessive amount of lymph overriding the system's drainage capacities. This is the situation in venous insufficiency where the capillary-venule pressure is increased and lymph flow is high [11].

Untreated venous disease has an impact on the lymphatic system, potentially reducing its drainage capacity due to infectious or inflammatory phenomena; lymph flow is increased, but with protein-rich oedema. This is lymphoedema associated with chronic venous insufficiency.

Streptococcal infections are a classic complication of lymphoedema, worsening the phenomenon. The retention of high-molecular-weight protein in the interstitial sector stimulates fibroblasts generating cutaneous fibrosis.

The diagnosis of lymphoedema is often obvious when the swelling is located in the upper limbs. Lymphoedema of the lower limbs can be more difficult to identify; Stemmer's sign, a thickened fold of skin at the base of the toe that cannot be lifted due to fibrosis, is classically described [12–14].

The International Society of Lymphology describes four stages of lymphoedema. Stage 0 lymphoedema is preclinical, latent, but impaired lymph transport can be demonstrated by lymphoscintigraphy. In stage I lymphoedema, the swelling subsides when the limb is elevated. The protein content of fluid in the soft tissue is higher than in venous oedema. Stage II lymphoedema is unaffected by limb elevation. In its late form, it becomes fibrous. Stage III lymphoedema is a stiff swelling associated with skin disorders (acanthosis, papillomatosis,

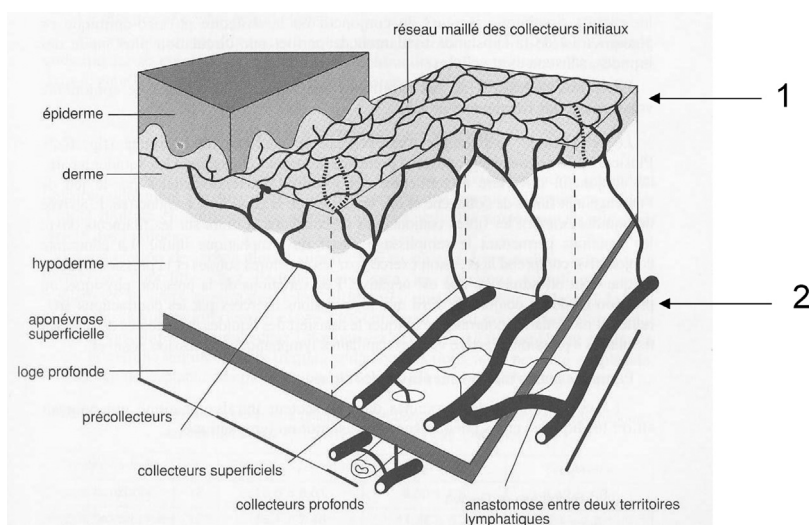


Fig. 1. Structure of the lymphatic system of the limbs, according to S. Kùbik. 1. Intra-dermal injection site. 2. Sub-cutaneous injection site. Structure du réseau lymphatique des membres selon S Kùbik. 1. Site de l'injection intra-dermique. 2. Site de l'injection sous-cutanée.

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