abstract

Leg edema is a common condition among older adults. It increases the risk of ulcers and cellulitis. Edema may be broadly classified as either venous edema or lymphedema. Many conditions associated with leg edema show a substantial increase in prevalence with age. Chronic venous insufficiency (CVI) is the most common cause of chronic leg edema among older adults. Causes of leg edema can be subdivided as acute (<72 h) or chronic and unilateral or bilateral. The acute onset of unilateral leg edema is always suspicious for a deep vein thrombosis (DVT), whereas a more chronic onset would suggest CVI. A careful clinical history can be very helpful and will often suggest the likely etiology. Treatment should be guided by the suspected etiology and can be either pharmacologic, nonpharmacologic, or both.

Key words: *edema, chronic venous insufficiency, lymphedema, deep venous thrombosis*

Leg Edema among Older Adults

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Introduction

Leg edema is a common condition among older adults. It increases the risk of ulcers and cellulitis, and is the source of considerable morbidity in this population.[1–3] Many conditions associated with leg edema show a substantial increase in prevalence with age. Chronic venous insufficiency (CVI) is one of these conditions and is the most common cause of chronic leg edema among older adults. Nonpharmaceutical treatment may provide symptomatic relief for many of these patients.

Pathophysiology

Edema may be broadly classified as either venous edema or lymphedema. Venous edema occurs when capillary filtration overwhelms normal lymphatic drainage, leading to excess protein-poor fluid in the interstitium.[4] Applying pressure to an area of venous edema will cause local displacement of the excess interstitial fluid and the creation of a characteristic "pit," hence the name "pitting edema." Lymphedema (Figure 1) is an excess of protein-rich fluid in the interstitium due to abnormal lymphatic drainage and is a much less common cause of leg edema in general.[4] Lymphedema is sometimes called "nonpitting edema," although pitting may be present in its early stages.

Unlike arteries, veins have bicuspid valves that prevent backward flow of blood. The leg is unique in that it is usually working against gravity to return blood and lymph, and so there are other buffer mechanisms in place to prevent edema. The most important of these prevention mechanisms is postural vasoconstriction, a reflex that can diminish with age and occurs when the leg is in a dependent position. There is also a "calf muscle pump" that works to increase both venous return and lymph flow when the leg is moving. The "calf muscle pump" may play a greater role as people age because older individuals are often less mobile than the general population. The decrease in these two mechanisms can exacerbate an existing edema state or cause edema in otherwise normal legs (dependent edema).

Causes of Edema

It is helpful to subdivide the causes of leg edema by whether the onset was acute (<72 h) or chronic and unilateral or bilateral. The acute onset of unilateral leg edema is always suspicious for a deep vein thrombosis (DVT), whereas a more chronic onset would suggest CVI. A summary of the common causes of leg edema among older adults according to this classification scheme is shown in Table 1.

Chronic venous insufficiency, also known as venous stasis, is a common problem among older adults. In an epidemiological study of the general population of Southern Michigan, the prevalence of venous stasis in people age 60–69 years was 8.6%, rising to 24.2% among those over age 70.[3] Venous stasis also frequently occurs without a known inciting factor such as DVT or surgery.[2] Varicosities may or may not be present.[5]

Heart failure should be considered and ruled out whenever an older individual presents with bilateral leg edema. Its prevalence rises considerably with age, while still remaining less than that of CVI. Based on varying definitions of heart failure, epidemiological data sug-

Table 1: Causes of Leg Edema in Older Adults

	Acute		Chronic	
	Unilateral	**Bilateral**	**Unilateral**	**Bilateral**
More common	DVT	Acute decompensated heart failure	CVI	CVI Heart failure Pulmonary HTN Drugs
Less common	Ruptured Baker's cyst	Bilateral DVT Acute worsening of systemic cause Acute lipodermatosclerosis (if bilateral erythema also present)	Lymphedema External mass causing venous compression Reflex sympathetic dystrophy	Lymphedema Renal disease Liver disease Dependent edema Myxedema

Source: Adapted from Ely JW.[11]

gest that it is present in 8–16% of patients over the age of 75, compared to 0.5–2% of the general population.[6] Liver cirrhosis and nephrotic syndrome can also result in a volume overload state with significant leg edema. However, these conditions are less common than heart failure and more likely to result in ascites or edema in other parts of the body, highlighting the importance of a thorough clinical examination.

Pulmonary hypertension is an under-recognized cause of leg edema that can occur in patients with sleep apnea.[7–9] There are no reliable data on the prevalence of pulmonary hypertension among the older adult population. However, the prevalence of obstructive sleep apnea (OSA) in the general population is estimated to be 5–15%, and the prevalence of pulmonary hypertension among individuals with OSA has been estimated at 20–41%.[9] Older individuals may be at an increased risk of having pulmonary hypertension in the presence of OSA.[10] Other secondary causes of pulmonary hypertension include interstitial lung disease and connective tissue disease.

Many drugs are associated with the development of leg edema. Calcium channel blockers (CCB) are the most common cause in the older population. They not only dampen postural vasoconstriction but likely decrease the pumping action of lymphatic vessels as well.[4] Other drugs known to cause leg edema include beta-blockers, clonidine, direct vasodilators (hydralazine, minoxidil, methyldopa), hormones, nonsteroidal anti-inflammatory drugs (NSAIDs), thiazolidinediones ("glitazones"), and monoamine oxidase inhibitors (MAOIs).[11]

Primary lymphedema that occurs in persons over the age of 35 is called lymphedema tarda (LT). Lymphedema tarda may cause unilateral or bilateral leg edema and is a diagnosis of exclusion. Causes of secondary lymphedema of the leg are usually evident on clinical history and include tumour (invasion or compression), prior surgical resection involving lymphatics, radiation therapy, or severe infection causing lymph node damage.

Diagnosis of Leg Edema in Older Adults

History

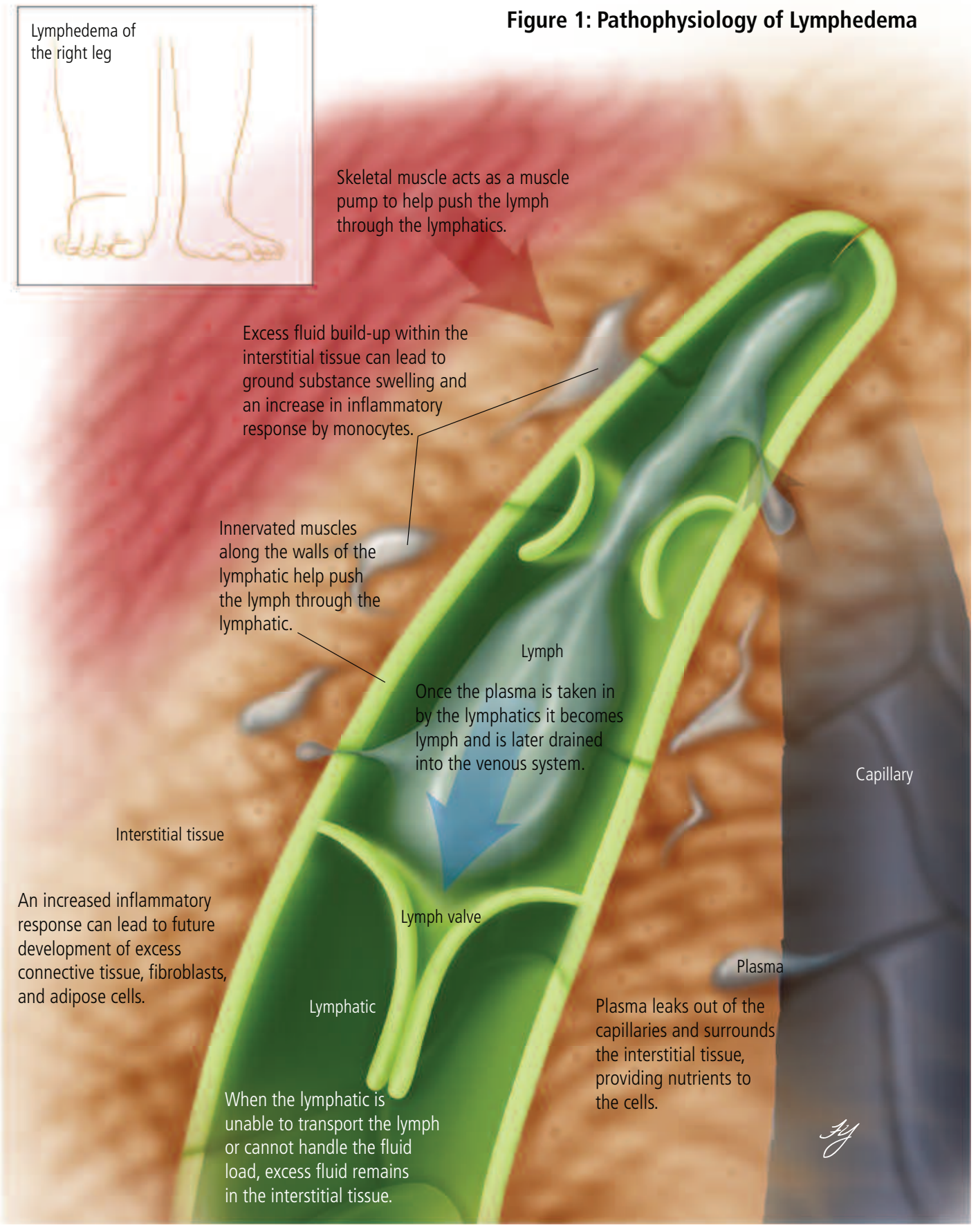
Potential causes of leg edema in older adults are often apparent in the patient's past medical history or medication list. A careful clinical history can be very helpful and will often suggest the likely etiology. Important features to ask about include onset, whether it affects one or both legs, whether it is associated with pain, and whether it improves overnight or with elevation. An acute onset is always worrisome for DVT, and there may be identifiable risk factors in the patient's history (trauma, immobilization, etc.) Pain is often a significant feature of DVT, whereas individuals with CVI may complain of a heavy feeling or aching sensation.[2] Lymphedema is usually painless. Venous edema typically improves with leg elevation whereas lymphedema generally does not.

Further questioning should be directed at ruling out a systemic cause if one is not already known. Individuals with heart failure may complain of dyspnea and orthopnea if there is also left-sided failure. Features of liver cirrhosis include anorexia, jaundice, or increasing abdominal girth. Nephrotic syndrome is often characterized by facial swelling and foamy urine. Those with pulmonary hypertension due to OSA may have excessive daytime somnolence, loud snoring, or morning headaches, and sleeping partners may have noticed apneic episodes.

Physical Exam

A full physical exam including vital signs and jugular venous pressure will help rule out a systemic cause of chronic leg edema. Obese individuals are at higher risk of both OSA and CVI.[8,12] Obstructive sleep apnea should be suspected in persons with a neck circumference >43 cm (measured at the cricothyroid membrane) and/or systemic hypertension.[13]

Figure 1: Pathophysiology of Lymphedema



Physical signs of DVT include erythema, unilateral leg edema (as measured 10 cm below the tibial tuberosity), pitting, calf tenderness, and fever, all of which have considerable overlap with other conditions. Clinical examination has been shown to have reasonable sensitivity but low specificity for DVT. Its utility is in using the Wells predictive rule as a guide toward selecting further diagnostic investigations.[14-16]

The legs should be examined for characteristic skin findings. As mentioned previously, all causes of venous edema are associated with pitting, as is early lymphedema. Chronic venous insufficiency is associated with brownish deposits of hemosiderin, dermatitis, and ulcerations around the lower part of the lower leg (gaiter area). Varicose veins may or may not be present. At its most severe, CVI may result in fibrotic skin changes in the lower leg (lipodermatosclerosis) and a characteristic "inverted champagne bottle" appearance. The skin may be diffusely red in lipodermatosclerosis, and confusion with cellulitis is common.[2,4]

Fluid-filled blisters are sometimes seen in conjunction with leg edema. A retrospective case series suggested that these blisters are generally related to the rapidity of edema formation, and tend to resolve quickly with edema treatment.[17]

Lymphedema has a predilection for the dorsum of the foot, and has a thicker, firmer texture than venous edema. The Kaposi-Stemmer sign is the inability to pinch a skin fold at the base of the second toe, and is predictive of lymphedema.[18] Long-standing lymphedema causes a warty skin texture (hyperkeratosis) and a cobblestone appearance (papillomatosis).[4]

Key Points

- Leg edema is a common condition among older adults and is the source of considerable morbidity in this population.
- Edema may be broadly classified as either venous edema or lymphedema.
- The acute onset of unilateral leg edema is always suspicious for a deep vein thrombosis (DVT), which should be ruled out, whereas a more chronic onset would suggest chronic venous insufficiency (CVI).
- Elastic compression stockings are a mainstay of therapy for CVI and there may be some benefit in patients with lymphedema.
- Chronic venous insufficiency and lymphedema are not volume overload states, and administering a diuretic to persons with these conditions will cause volume depletion.

Investigations

An acute onset of unilateral leg edema always warrants further testing. Clinical examination can help stratify patients into low, moderate, and high probability for DVT.[15,16] The D-dimer test has a very high sensitivity, and a negative result effectively rules out DVT in patients with a low pretest probability.[16] Individuals with a positive D-dimer or with a moderate or high pretest probability should have ultrasound imaging for DVT. Those with a high pretest probability should have a follow-up ultrasound after one week if the first ultrasound is negative for DVT.[16]

A workup for systemic causes of leg edema includes bloodwork for complete blood count, electrolytes, renal function, thyroid stimulating hormone, glucose, and albumin, as well as a urinalysis. Persons with suspected liver disease should have liver and coagulation panels sent. Those with suspected nephrotic syndrome require a coagulation panel and serum lipid profile. A workup for heart failure also includes an electrocardiogram, chest x-ray and echocardiogram. A negative serum brain natriuretic peptide (BNP) is useful for ruling out heart failure in individuals with dyspnea. In centres where this test is available, it may be used before proceeding to echocardiogram.[19]

Treatment

The presence of a DVT necessitates long-term anticoagulation, and systemic causes of leg edema are best treated by addressing the underlying disorder. Lymphedema is usually quite treatment-resistant. The following are more specific therapies for leg edema.

Leg Elevation

Elevating the legs above the heart for 30 minutes, 3–4 times per day reduces leg edema in general and may be all that is required for patients with mild CVI.[2,21]

Elastic Compression Stockings

Elastic compression stockings are a mainstay of therapy for CVI, and there may be some benefit in patients with lymphedema. The stockings should ideally have a pressure of at least 30 mmHg at the ankle with a graded pressure slope up to the knee. However, if adherence is an issue, any compression is better than none. Stockings are most effective if put on first thing in the morning before edema reaccumulates.[2] Using compression bandages or moving to a stocking with a higher slope may be needed if initial results are not sufficient.[20] Compression stockings are contraindicated in patients with arterial insufficiency and unstable heart failure.

Intermittent Pneumatic Compression (IPC) Pumps

More severe CVI disease and obese patients with CVI can benefit from these devices.[2] Arterial insufficiency is again a contraindication.

Diuretics

Diuretics are best used as part of a therapeutic regimen in patients with leg edema secondary to volume overload states (heart failure, liver cirrhosis, renal failure and/or nephrotic syndrome),

rather than patients with CVI or lymphedema. They may also help reduce leg edema associated with pulmonary hypertension, albeit cautiously as these patients already have diminished cardiac output due to decreased preload. A loop diuretic such as furosemide is the best choice once there is evidence of peripheral edema, and a thiazide such as metolazone may be added to potentiate its effect in more resistant disease. Individuals with normal renal function may respond to doses as low as 10 mg furosemide daily.[21]

Chronic venous insufficiency and lymphedema are not volume overload states, and administering a diuretic to persons with these conditions will cause volume depletion. Extended use may result in adverse metabolic effects.[2] Diuretics should therefore be limited to short courses for severe, symptomatic edema in individuals with CVI. Lymphedema is unlikely to respond to diuretics.

Horse Chestnut Seed Extract

This herbal preparation is not recognized by the Canadian Drug Product Database but has traditionally been used in treating CVI, and has more recently been the subject of several double-blind, randomized control trials. A systemic review of these trials showed horse chestnut seed extract to be superior to placebo and likely equivalent to compression stockings in reducing leg edema and symptoms of CVI.[22] Horse chestnut seed extract is a useful alternative to compression stockings when compliance with the latter is an issue.

Conclusion

There are many causes of leg edema among older adults. Determining the etiology can be a diagnostic challenge but is essential in directing treatment at the appropriate underlying mechanism. The importance of a complete history and physical examination cannot be overemphasized if leg edema is to be treated with success.

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