

THE LYMPHATIC SYSTEM

PART 4 – PATHOPHYSIOLOGY

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The final article in this four-part series on the lymphatic system explores common diseases and disorders affecting the function of the system. These can be divided into three groups:

- Oedema and lymphatic obstruction;
- Lymphadenitis;
- The lymphomas.

OEDEMA/LYMPHATIC OBSTRUCTION

Oedema

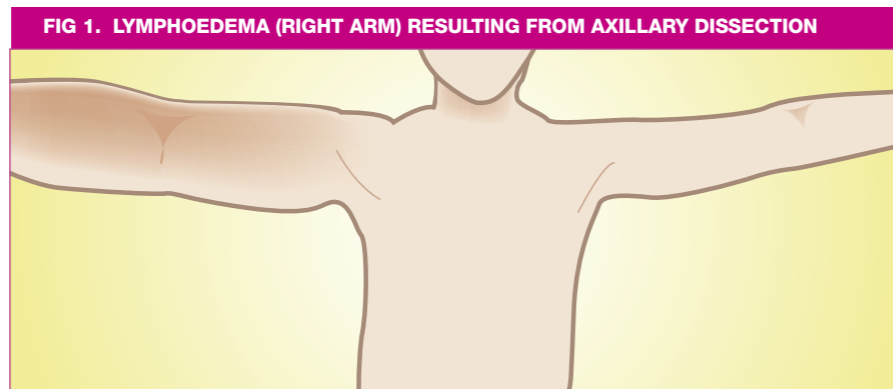
Any disruption in the collection or passage of lymph from organs and tissues into the lymphatic vessels, or leakage of fluid from blood vessels, may result in an accumulation of fluid. This is known as oedema and causes swelling of the surrounding tissue (Watson, 2005).

Since oedema is subject to gravity, it becomes more apparent in dependent parts of the body such as ankles and wrists.

Most is 'pitted' – pressing the area will cause a 'pit' to form as the fluid is pushed away. After several seconds, this pit slowly disappears as fluid returns.

Common causes of oedema include:

- Immobility – sitting or standing for long periods causes an increase in fluid pressure as a result of venous stasis;
- Pregnancy – increased fluid pressure from sodium and water retention (leading to increased blood volume) and slow venous return due to pelvic obstruction, commonly cause oedema and ankle swelling;
- Varicose veins – these enlarged veins usually develop when valves inside the vein weaken or become damaged, which allow backflow and pooling of blood, increasing venous pressure and causing oedema;
- Cardiac failure (venous insufficiency) – increased capillary blood pressure may result from heart failure where there is an increased back pressure in the venous system. This can cause ankle swelling and/or pulmonary oedema, due to increased pulmonary



capillary pressure and therefore greater movement of fluid into the interstitial spaces. Treatment of oedema depends on the cause. Lifestyle changes, such as taking exercise and reducing weight and salt intake, are often recommended. Often elevating the affected areas can help to reduce oedema by promoting venous return, as can surgical stockings. In more severe cases, diuretics may be prescribed. Treatment of pulmonary oedema will involve diuretics, oxygen therapy and possibly bronchodilators.

Lymphatic obstruction

Lymphatic obstruction is due to a blockage or prolonged compression of the lymph nodes or lymphatic vessels.

Causes include tumours, surgery and chronic infections. Often, the lymphatic vessels draining away from an infection site may become infected themselves (lymphangitis) (Anand, 2007). Affected vessels are usually dilated and contain many inflammatory cells.

Lymphoedema

This is oedema caused by lymphatic obstruction and is more common in women. There are two major categories:

- Primary lymphoedema is quite rare and is due to a congenital abnormality where lymphatic vessels are missing (aplasia), or are present in small numbers (hypoplasia) or in high numbers as abnormal, poorly functioning vessels (hyperplasia);
- Secondary lymphoedema occurs as a secondary problem in a variety of conditions.

In western societies, it is most commonly associated with mastectomy and axillary dissection. Since lymphatic drainage of the arm normally passes through the axilla, axillary dissection results in lymphoedema of the arm (Fig 1). Symptoms of this include a heavy, aching limb and weakness.

Left untreated, it may progress to chronic lymphoedema and, in severe cases, the formation of hard fibrotic tissue, which inhibits oxygen supply to the affected areas. Patients become prone to repeated infections and, in more severe cases, skin ulcers that are difficult to heal.

Massive oedema due to almost complete blockage of lymph channels is often known as elephantiasis (Fig 2).

Filarial elephantiasis

In tropical regions, the bites of infected mosquitoes transmit a microscopic, thread-like, filarial worm. These parasites enter the lymphatic vessels and are carried to regional lymph nodes (Cahill and Giles, 2001), where they cause a significant blockage resulting in lymphoedema. Because lymphatic filariasis is predominantly a disease of poor urban and rural populations, the lymphoedema is often untreated, and develops into irreversible elephantiasis (Fig 2). It is believed that 120 million people in over 80 countries are infected with lymphatic filarial worms (WHO, 2000).

Treatments for chronic lymphoedema include: manual lymphatic drainage (MLD), which involves gentle, rhythmic massage to encourage the flow of lymph; complete

FIG 2. A NORMAL LEG (LEFT) AND ONE AFFECTED BY ELEPHANTIASIS



decongestive therapy (CDT), which incorporates therapeutic exercise, short-stretch compression bandages, with skincare and MLD; and sequential gradient pump therapy, which helps to break up fibrotic tissue, re-enabling movement of lymph. Benzopyrones can promote proteolysis (breakdown of protein), permitting fluid to be reabsorbed (Ganong, 2001).

LYMPHADENITIS

This inflammation of a lymph node or nodes is commonly seen in bacterial infections, particularly haemolytic streptococci and staphylococci. It occasionally occurs as a result of viral infections such as the Epstein-Barr virus, which causes glandular fever, or

because of yeast or parasitic infections.

Lymphadenitis may be systemic (affecting large numbers of nodes throughout the body) or restricted to nodes close to a wound or a pool of infection such as an abscess. Inflammation commonly extends into the neighbouring lymphatic vessels (lymphangitis) and is often accompanied by a fever.

Lymphadenitis is characterised by tender, swollen and palpable lymph nodes. Occasionally, inflammation within a group of nodes may be so prominent that the overlying skin may be red and hot to the touch. The condition is often marked by red lines corresponding to the position of the affected lymphatic vessels, and the affected nodes and vessels are extremely painful on palpation.

LYMPHOMAS

Lymphomas are cancers that originate in the lymphocytes when normal lymphoid tissue is replaced by abnormal, rapidly dividing cells of lymphoid origin. This results in the formation of solid tumours of the lymph nodes. The tumours appear firm, immovable and painless, in contrast to lymph node enlargement caused by infection, which often presents as a movable, tender lump. Lymphomas are classified as either Hodgkin's or non-Hodgkin's.

Hodgkin's lymphoma

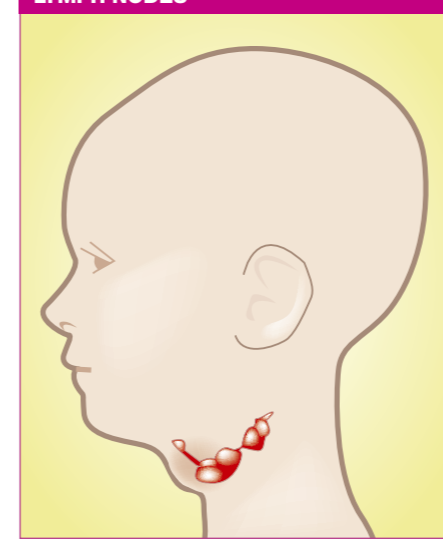
This lymphoma is characterised by the painless and progressive enlargement of one or more lymph nodes. Initial node involvement is often above the thoracic cavity, usually cervical (Fig 3). The presence of abnormal, bi-nucleate cells (Reed-Sternberg) on biopsy gives a definitive diagnosis of Hodgkin's lymphoma. These malignant, highly proliferating cells are of B-cell origin (Porth, 2006).

One-third of patients with Hodgkin's lymphoma exhibit systemic symptoms including pyrexia, night sweats, chills and weight loss. Patients are designated stage A if these are absent, stage B if they are present. Development of these symptoms may indicate a poorer prognosis.

Non-Hodgkin's lymphoma

This classification covers all lymphomas other than Hodgkin's lymphoma. Predominantly seen in middle to later life, they are three times more common than Hodgkin's lymphoma.

FIG 3. ENLARGEMENT OF CERVICAL LYMPH NODES



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Most non-Hodgkin's lymphomas originate from malignant transformation of B cells in the lymph nodes and Reed-Sternberg cells are absent.

Clinical manifestations are similar to those of Hodgkin's lymphoma. Lymph node enlargement is typically seen in peripheral regions but there is frequently extra-nodal presentation, for example in the nasopharynx, gastrointestinal tract and skin.

Non-Hodgkin's lymphomas are classified according to how quickly the cells divide. High-grade lymphomas grow very quickly, while low-grade ones are often asymptomatic but eventually transform into aggressive forms with significant systemic symptoms, and will be fatal if not treated.

Treatment of lymphoma

Treatment depends on several factors, including the scale of symptoms. Often, the localised nature of Hodgkin's lymphoma makes it easier to treat than non-Hodgkin's lymphoma. For both types of lymphoma, irradiation and combination chemotherapy have good success rates, and complete remission can be achieved in 60–80% of cases. The most significant advances in cancer treatment have been in the management of lymphomas. ■

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