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Sentinel lymph node biopsy

What is the lymphatic system?

In the body there are two main networks of vessels that carry fluid: blood vessels and lymph vessels (the lymphatic system).

Lymph vessels transport milky fluid called lymph, which drains through lymph nodes. Lymph nodes entrap foreign or potentially harmful substances, such as bacteria and cancer cells. Groups of lymph nodes are easily felt around the neck when they become enlarged and sore during a cold or 'flu. Other main groups of nodes are located in the groin (draining the leg), armpits (draining the arm), deep in the chest and abdomen.

What is the role of the lymphatic system in cancer?

Cancer can spread through the body (metastasise) by three common routes:

- Direct invasion of surrounding tissue
- Via the blood vessels
- Via the lymph vessels.

Different cancers tend to spread preferentially by one of these routes. If a cancer is known to spread mostly by the lymphatic system then examining lymph nodes around the site of the primary cancer can help determine the extent of cancer spread (stage). Spread to the nearby lymph nodes may reduce the chance of survival (prognosis), and the cancer may require different treatment.

How can one tell if cancer has spread to the lymph nodes?

If the cancer has spread, the nearby lymph nodes may be obviously enlarged and felt as firm or hard lumps. These cancerous lymph nodes or metastases may be cut out in a procedure called lymphadenectomy or lymph node dissection.

Even if the lymph nodes appear to be normal, the cancer may have already spread to the lymph nodes. So in some cases, patients may be advised to have all draining lymph nodes removed 'just in case' they have collected cancer cells. This prophylactic procedure is known as elective lymph node dissection.

Unfortunately, removing a group of lymph nodes may lead to serious side effects. This is particularly unfortunate if the lymph nodes turn out to be normal. These side effects include:

- Delayed wound healing
- [Lymphoedema](#) (swelling due an accumulation of lymph)
- Injury to nerve fibres, resulting in numbness
- [Cellulitis](#) (bacterial infection).

A biopsy may be advised to remove a single lymph node, or part of it, to see whether the cancer has spread. If there is a lump, a needle aspiration biopsy may be performed through the skin and a small amount of tissue withdrawn by sucking it up a hollow needle. Sometimes biopsy requires a surgical operation.

A pathologist examines the tissue under a microscope and reports the findings to the surgeon. If the biopsy is positive, the surgeon is likely to recommend that all the lymph nodes in the area be removed. If it is negative, this

may not be necessary.

What is sentinel node biopsy?

Sentinel node biopsy is a staging procedure. It involves biopsy of a sentinel lymph node. A sentinel lymph node is the very first lymph node to which lymph from the cancer site is likely to drain. If there is no cancer in the sentinel lymph node, the cancer is very unlikely to have spread elsewhere, so no more lymph nodes need to be removed.

Sentinel lymph node biopsy provides:

- More accurate staging, determining prognosis
- Precise lymph node removal and therefore fewer side effects
- Identification of patients that may benefit from specific therapy

When is sentinel lymph node biopsy used?

Sentinel node biopsy is a technique used by experienced and specifically trained skin cancer surgeons. Very often it is performed in teaching hospitals and is carefully audited as a part of a research programme. It is not available to, nor is it appropriate for every patient with cancer. It is undertaken soon after the diagnosis of the cancer is made.

Sentinel node biopsy is sometimes used for patients with [skin cancer](#).

- [Melanoma](#)
Sentinel node biopsy is most useful when the primary melanoma is of intermediate thickness, i.e. between 1mm and 2mm in depth. It is unnecessary in those with melanoma thinner than 1mm because the chance of metastasis is unlikely. In this group, even those in whom the tumour has ulcerated or the whole skin thickness is involved, the chance of positive nodes is less than 2%. Sentinel node biopsy is also not generally performed in those with melanoma thicker than 4mm because there is a high risk that metastasis has already occurred.
- [Squamous cell carcinoma](#)
Sentinel node biopsy is most likely to be beneficial if the primary cancer is smaller than 4 to 5cm in diameter but deeper than 4 to 6 mm, and has not undergone previous surgery or radiotherapy that may have altered the flow of lymph vessels
- [Merkel cell carcinoma](#)
Sentinel node biopsy is offered in some centres at all stages of Merkel cell carcinoma, because of the high risk of lymph node metastasis. If the nodes are affected, radiotherapy may be offered to the lymph node area.
- [Vulvar cancer](#)
- [Penile cancer](#)
- Rare types of skin cancer

Sentinel node biopsy is also sometimes recommended for patients with other malignancies, particularly breast cancer.

When is sentinel node biopsy unsuitable?

Sentinel node biopsy is not generally used in the following situations:

- If the lymph nodes are enlarged on clinical examination.
- If there is evidence for metastases at other body sites.
- If the patient has previously undergone wide excision of the primary cancer, especially if a [flap](#) or [graft](#) closure has been used. This is because the lymphatic drainage may have been altered making the procedure inaccurate.

- It may be difficult or impossible to perform a sentinel node biopsy when the primary cancer is on the head or neck as there are several lymph node clusters close together. It is particularly difficult if the cancer overlies the parotid gland in front of the ear.
- A radioactive tracer should not be used during pregnancy (blue dye may be acceptable).
- Blue dye should not be used if there is a history of allergy to it.

Sentinel lymph node biopsy procedure

Lymphatic draining patterns vary and it is not always obvious where to explore for metastatic cancer cells.

To find the sentinel lymph node a doctor or technician injects a small amount of either blue dye or radioactive tracer near the original cancer. The success rate is best if both are used.

The radioactive tracer is an isotope of technetium (Tc). It results in less exposure to radiation than that received during a standard X-ray. It disperses over a short time. Often, a scan of all lymph node basins is performed soon after the tracer is injected, using a special camera (lymphoscintigraphy).

Twenty minutes or up to a few hours after the injection, a radioactive scanner (Geiger counter) is held over the skin and makes a noise when it encounters the radioactive tracer. Approaching from the direction of the original cancer, the first 'hot spot' encountered is the sentinel lymph node. A small cut is made into the skin overlying the area and the sentinel lymph node is removed. It is easier to find the node if dye has been injected because it will be stained blue. Sometimes more than one sentinel lymph node is detected in one or more body sites.

Sometimes the sentinel lymph node may not contain cancer while other lymph nodes do. If a surgeon is suspicious during the procedure he may remove other lymph nodes for pathological examination. If the original or primary cancer has not yet been removed, the surgeon will do so after stitching up the sentinel node biopsy wound. In some cases, the primary has been removed previously, but the surgeon performs a wider excision after the sentinel node biopsy. How much extra tissue is removed depends on the nature and thickness of the original cancer.

In most cases, the patient may go home within a few hours of the surgery.

After the procedure the blue dye is excreted from the body in the urine, which may appear green for few days. The stain at the excision site fades away over a few months. The radioactive tracer dissipates over a short period of time.

Pathology

A pathologist examines the sentinel lymph node, sometimes providing a report within an hour or so of the procedure, with the help of frozen sections. However, the report is more accurate if the tissue is fixed and processed in the normal way, which takes at least a day or so to complete. The diagnosis of cancer is not always easy, and special stains and/or other opinions may be required.

If the pathologist finds cancer on frozen section the surgeon may remove other lymph nodes during the same procedure. If it is reported later, this surgery will be rescheduled for another time. These other nodes may or may not also contain cancer cells. If pathology report is negative, metastasis is unlikely so wide excision of the lymph nodes is not necessary.

Complications and risks of sentinel node biopsy

Delayed wound healing, bleeding from the wound, infection and other complications are more likely in patients with diabetes, obesity, heart disease or that smoke.

- The surgeon may be unable to find the sentinel lymph node.
- Allergy to blue dye is rare (less than 1%) but results in [anaphylaxis](#), which is potentially serious.
- The blue dye may result in a longstanding or permanent tattoo at the injection site.
- The node biopsy, like more extensive surgery of lymph nodes, may result in lymphoedema; [compression](#)

[stockings](#) may be recommended after biopsy of the groin nodes.

- Nerve injuries are uncommon but can result in numbness or tingling.
- Cellulitis may also occur, although this is less likely than with full lymph node clearance.
- The test may be a false negative i.e. the sentinel node is reported to be normal but in fact cancer has already spread (about 3% of cases). In that case, the lymph nodes may need to be cut out later on.
- Sometimes, metastases may arise in distant sites of the body without involving the lymph nodes at all.
- It might be a false positive i.e. the pathologist reports cancer, but in fact no cancer was present. This would result in unnecessary surgery and its potential complications from removing the complete group of lymph nodes.

Sentinel node biopsy



Persistent tattoo reaction

Follow-up

It is usual for the surgeon to arrange careful follow-up of all patients with melanoma and other high-risk skin cancers, whether or not the sentinel node biopsy was positive.

However unfortunately there is no effective treatment for melanoma once it becomes widespread. Sentinel lymph node biopsy does not alter the prognosis of this disease and some authors question the usefulness of the procedure.

Related information

References:

On DermNet NZ:

- [Melanoma](#)
- [Squamous cell carcinoma](#)
- [Skin biopsy](#)

Other websites:

- emedicine:
 - [Sentinel Lymph Node Biopsy in Patients With Squamous Cell Carcinoma](#)
 - [Sentinel Lymph Node Biopsy in Patients With Melanoma](#)
 - [The Role of Sentinel Node Biopsy in Skin Cancer](#)
- National Cancer Institute: [Sentinel Lymph Node Biopsy: Questions and Answers](#)

Books about skin diseases:

See the [DermNet NZ bookstore](#)

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DermNet does not provide an on-line consultation service.
If you have any concerns with your skin or its treatment, see a [dermatologist](#) for advice.

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