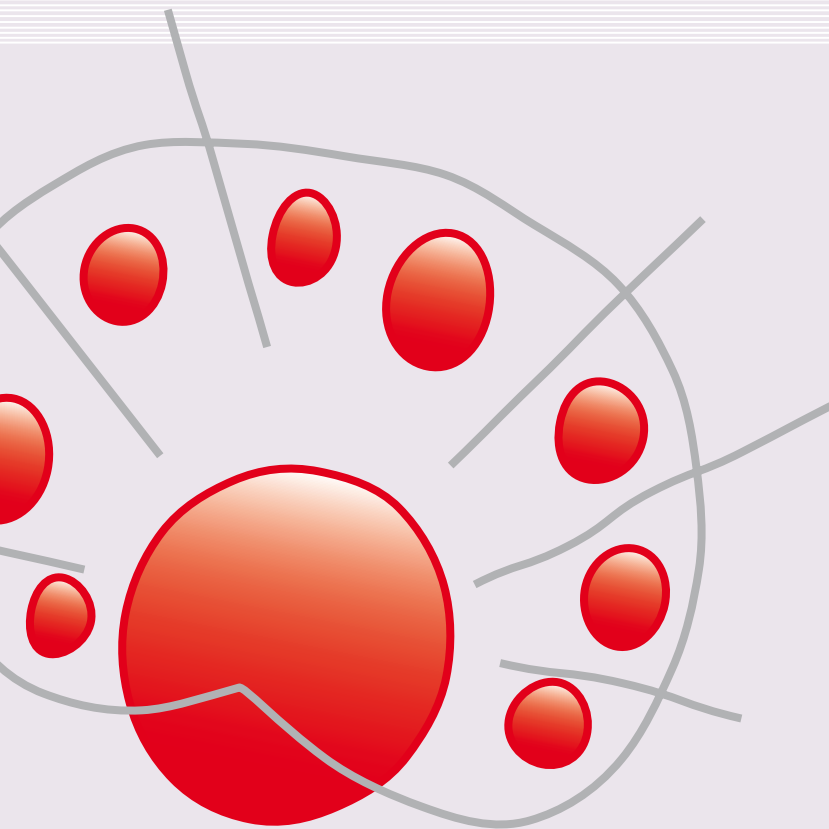


# Hodgkin's Lymphoma (HL)



The diagnosis of a blood cancer can be a devastating event for patients, families and friends. It is therefore vital for everyone to have access to reputable and understandable information to help cope with the illness. Whenever possible our booklets are written in line with national guidelines for the treatment of patients with a blood cancer. The information in our booklets is more detailed than in many others but is written in a clear style with all scientific terms explained for the general reader.

We recognise that the amount and level of information needed is a personal decision and can change over time. Particularly at the time of diagnosis, patients may prefer less detailed information. A number of alternative sources of information are available which complement our publications.

The booklets in this series are intended to provide general information about the diseases they describe. In many cases the treatment of individual patients will differ from that described in the booklets.

**At all times patients should rely on the advice of their specialist who is the only person with full information about their diagnosis and medical history.**

**For further advice contact the clinical information team on 020 7269 9060.**

**Leukaemia Research**

43 Great Ormond Street, London, WC1N 3JJ

020 7405 0101 [www.lrf.org.uk](http://www.lrf.org.uk)

email: [info@lrf.org.uk](mailto:info@lrf.org.uk)

Registered charity 216032 (England & Wales) SC037529 (Scotland)

Series compiled by Ken Campbell, revised 2006. A list of advisors can be found at [www.lrf.org.uk/advisors](http://www.lrf.org.uk/advisors)

The design of this booklet has been produced with kind assistance from Euro RSCG Life.

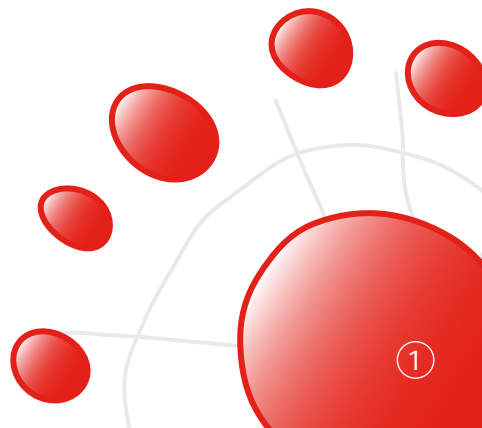
© All rights reserved. No part of this publication may be reproduced or transmitted without permission in writing from Leukaemia Research.

# What is Hodgkin's lymphoma?

**Hodgkin's lymphoma (HL) is a cancer of the lymphatic system – the network of lymph glands and channels which occurs throughout the body. This collects lymph – fluid that bathes all the body cells. The lymphatic system is also a very important part of the immune system which keeps the body free of infection. This is mainly achieved by the cells within the lymph nodes and other lymphatic tissues. These are called lymphocytes and, like other blood cells, are produced within the bone marrow. Lymphocytes can be classified into sub-groups according to their function. The main groups are B cells and T cells. Different types of lymphocytes produce antibodies and directly destroy some infecting organisms, especially viruses. Tumours of the lymphatic tissues are known as lymphomas.**

There are two main types of lymphoma, Hodgkin's lymphoma (HL), and non-Hodgkin's lymphoma (NHL). The defining feature of Hodgkin's Lymphoma is the presence of a distinctive abnormal lymphocyte called a Reed-Sternberg cell. Hodgkin's lymphoma has a very high cure rate, especially in younger patients diagnosed with early stage disease. In this group the cure rate may approach 100%.

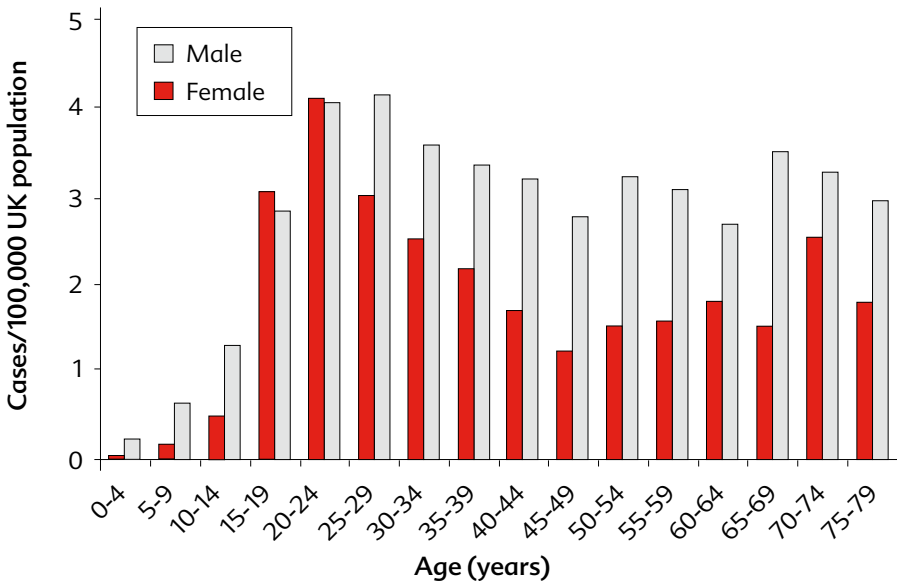
This booklet describes Hodgkin's lymphoma. A separate booklet on non-Hodgkin's lymphoma is available from Leukaemia Research.



# Who gets Hodgkin's lymphoma?

There are about 1,300 new cases of Hodgkin's lymphoma each year in the UK, including 150 in children (0-14 years). There are two peaks in incidence – one in young adults between about 15 and 35 years; and a second above the age of 50 years. The condition is roughly twice as common in males as in females.

### Incidence of Hodgkin's lymphoma in the UK



# What are the types of Hodgkin's lymphoma?

**The different types of HL are distinguished principally on the basis of the appearance of the cells under the microscope. This is called a histological classification. HL is a unique form of cancer because affected nodes typically contain few cancer cells surrounded by much larger numbers of non-cancerous cells. It is estimated that the malignant (Reed-Sternberg) cells make up as few as 1 in 1,000 of the cells within the tumour. The non-malignant cells are the types typically seen in inflamed lymph nodes. The classification is based largely on the types and proportions of the non-cancerous cells.**

Distinction between the different types of HL is mainly of importance for clinical trials and for research studies. The most important factor in deciding on the treatment of HL is the stage of the disease at diagnosis. Certain of the sub-types do differ in their likely response to therapy and outcome of treatment, but these differences are small compared to the differences between early and late stage disease.

An international panel of experts has developed the Revised European American Lymphoma (REAL) classification. With minor modifications this has been adopted by the World Health Organization and is now known as the REAL/WHO classification. It is now the most widely used system for classification of Hodgkin's lymphoma. The current version of the REAL classification recognises five types of HL. Of these five types, four are grouped together based on similarities in clinical behaviour and are known as classical Hodgkin's lymphoma.

## ‘Classical Hodgkin’s’ lymphoma

These are:

- Lymphocyte rich
- Nodular sclerosing
- Mixed cellularity
- Lymphocyte depleted<sup>1</sup>.

The sub-types of classical HL show distinct age profiles suggesting that they are truly different forms of the disease. The nodular sclerosing form predominates in young adults, whilst the lymphocyte predominant form is seen mostly in children, and the lymphocyte depleted form often occurs in older patients.

There is some doubt about whether lymphocyte depleted HL is a true category. Using sophisticated laboratory tests many cases initially diagnosed as Lymphocyte Depleted HL (LDHL) have been shown to be non-Hodgkin’s lymphoma. Patients with LDHL tend to be diagnosed late, with involvement of other tissues, clinically aggressive disease and a poor outlook.

The fifth distinct, type is:

- Nodular lymphocyte predominant

Nodular Lymphocyte Predominant HL (NLPHL) frequently affects one isolated lymph node and tends to be indolent (slow progressing). It is very sensitive to chemotherapy and radiotherapy and tends to have an excellent prognosis. There is some evidence to suggest that surgery alone may be curative in at least some cases. Many of the features of NLPHL are more similar to non-Hodgkin’s lymphoma than with other forms of HL. Many experts consider that this form of HL should be re-classified as a non-Hodgkin’s lymphoma. In a minority of cases NLPHL may transform to aggressive non-Hodgkin’s lymphoma.

<sup>1</sup> Lymphocyte depleted HL is now rarely diagnosed (most cases are classified as either one of the other groups or as non-Hodgkin’s lymphoma).

The overall chance of successful treatment, particularly for younger patients, is high so even the relatively poor prognosis group has a good chance of cure compared to many other blood cancers.

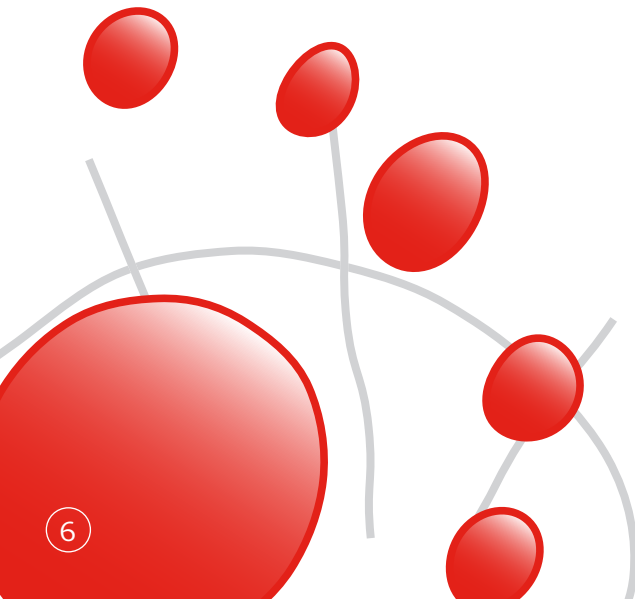


# How is Hodgkin's lymphoma staged?

**In most forms of cancer some form of staging is used to assist in the treatment planning and in assessing a likely prognosis. Staging relates chiefly to the spread of the cancer from its original site. It is very important in all forms of lymphoma including Hodgkin's lymphoma.**

## **The Ann Arbor staging**

As with many other cancers, HL is categorised by the extent of spread of the disease. The Ann Arbor System is the most widely used system for classifying lymphoma. Full details of this system are given in Appendix A.



## What causes Hodgkin's lymphoma?

**The cause(s) of HL are not definitely known but there is very persuasive evidence that at least some cases are associated with specific virus infections. The virus most clearly linked with HL is the Epstein-Barr virus (EBV). This is an extremely common virus; almost all adults in the Western world have antibodies in their blood which show that they have been infected at some time with EBV. In most people who are exposed it causes either no clinical illness at all or a mild flu-like illness called glandular fever or infectious mononucleosis. Virus DNA can be found in the cells in a number of cases of HL suggesting that it might be at least part of the cause of the condition.**

Hodgkin's lymphoma is more likely to occur in patients whose immune system is suppressed. This group includes patients with AIDS, older patients and patients who are receiving immunosuppressive drugs after transplants. The link between Epstein Barr virus and HL is suggestive but not definitive. An association with immunosuppression may explain why EBV related HL is most common in the very young and in the comparatively old, who are likely to have less strong immune responses than young adults. The association between EBV and HL is most striking in cases seen in children and in those patients diagnosed in late life. The majority of cases occur in people between the ages of about 15 and 35 and in this group it seems that EBV plays little or no part.

There is some evidence of clustering of HL. Siblings of HL patients have a higher chance of developing the condition but this may reflect shared environmental exposures. Contact with a patient with HL does not lead to an increased risk of developing the disease.

# What are the signs and symptoms of Hodgkin's lymphoma?

**A significant proportion of patients with HL have no obvious symptoms or signs at the time of diagnosis. Their disease is discovered as a result of investigations carried out for other reasons e.g. a routine chest X-ray.**

The most common reason for a patient with HL to go to their doctor is that they have noticed one or more enlarged lymph nodes (glands) in the neck, collarbone region, axilla (armpit) or groin. Most patients who go to their doctor for this reason will be found to have straightforward, easily treated, infections. This is especially true for children, in whom lymphoma is very uncommon. Nodes usually return to normal within a few weeks or months following infection. Infected nodes are often painful, whereas lymphoma is usually painless. In about 80% of cases of HL the disease only affects nodes above the diaphragm at the time of diagnosis. If affected nodes are large and there are any other suspicious symptoms, the doctor may decide to arrange for an immediate biopsy to permit a definitive diagnosis. If the node(s) are smaller and there is other evidence of infection, it may be preferable to wait and see whether the nodes disappear spontaneously. Although this is a reasonable course of action it is not unknown for lymphoma nodes to shrink and grow. For this reason any patient who experiences repeated enlargement of a particular node or group of nodes should be referred to a surgeon for excision biopsy (removal of a complete node).

At later stages of the disease more generalised (constitutional) symptoms develop. The presence or absence of such symptoms is of considerable importance in staging of Hodgkin's lymphoma. Generalised symptoms are

present in about 20% of patients at the time of diagnosis. The symptoms included for staging are:

- Recurrent fevers (greater than 38°C)
- Night sweats (drenching)
- Weight loss (greater than 10% in less than six months)
- Fatigue (severe and persistent).

Very severe itching may occur but is no longer included in the staging system because of the difficulty in defining what severe itching is. An uncommon but highly significant symptom is pain in the affected nodes on drinking alcohol. This should always be seen as a reason for referral for specialist opinion and biopsy.

Anaemia (low haemoglobin) is common in HL but it is the type seen in chronic disease of any type rather than that associated with marrow failure/ infiltration as is seen for example in leukaemia.



# How is Hodgkin's lymphoma diagnosed?

**When a doctor examines a patient with HL there are no specific signs like the rashes seen in some infections. The physical features, size, and distribution of affected lymph nodes may be strongly suggestive of lymphoma. Hodgkin's lymphoma is not a clinical diagnosis – it requires the results of laboratory tests on a biopsy sample (see below) to confirm the diagnosis.**

The following guidelines have been issued by the Department of Health to indicate when GPs should urgently refer patients as possibly having lymphoma:

- Lymphadenopathy (enlarged lymph glands) persisting for six weeks
- Hepatosplenomegaly (enlarged liver or spleen)
- Constellation of three or more of the following symptoms:
  - ✧ Fatigue
  - ✧ Night sweats
  - ✧ Weight loss
  - ✧ Itching
  - ✧ Breathlessness
  - ✧ Bruising
  - ✧ Recurrent infections
  - ✧ Bone pain.

The accepted procedure for investigation of a suspect lymph node is to take a biopsy of one or more affected nodes. If the node is easily accessible then this can be done under local anaesthetic.

An excision biopsy means that the whole affected lymph node is removed for examination in the laboratory. Sometimes for children, or if the tumour is deeper, a general anaesthetic is given.

An alternative method of sampling tissue is called fine needle aspiration (FNA). This method involves taking a small sample with a needle and syringe and may be acceptable for monitoring response to treatment. The risk of a false negative result (failure to detect the presence of tumour cells), is considered too great for it to be used for diagnosis. Given that the Reed Sternberg cells, which must be seen to make a diagnosis of HL, may be only 1 in 1,000 of the cells present, it is clear that a small sample taken through a needle could easily miss a diseased area.

The larger sample that can be obtained by surgical biopsy also provides much more tissue for specialist tests such as immunocytochemistry (classifying the affected cells). It is particularly important to demonstrate the presence of Reed-Sternberg cells, as this is central to differentiating between HL and non-Hodgkin's lymphoma.

Any patient who is thought to have a lymphoma will have X-rays and CT or MRI scans requested. Chest X-rays will probably be done before the results of the biopsy are available, whereas CT/MRI scans will usually only be done if the results of the biopsy are positive. X-rays and CT/MRI scans are known as imaging studies. The results of imaging studies are particularly important for staging.

Once a diagnosis of HL has been made it is usually necessary to find out if the bone marrow has been affected. In order to do this a bone marrow sample is taken. An exception is patients with early stage disease who are not entering clinical trials. In this group the results of a bone marrow sample are unlikely to influence treatment. A bone marrow sample is usually obtained under local anaesthetic, although children and particularly anxious patients may receive

a general anaesthetic. The bone marrow biopsy is obtained from the pelvis. Bone marrow involvement usually occurs late in the disease.

It was formerly normal practice to perform an operation called a staging laparotomy. The laparotomy involves opening the abdomen, removing the spleen (which is often affected) and taking samples of potentially affected nodes. This is no longer considered necessary or desirable and indeed studies have shown that it results in a lower survival.



## How is Hodgkin's lymphoma treated?

**The dramatically improved success rate of therapy for Hodgkin's lymphoma, particularly in younger patients, has led to an increasing emphasis on minimising late complications of treatment. Elimination of HL remains the first priority, but comparative studies of new treatments are largely concerned with finding the ideal balance between effective control of the tumour and using the minimal necessary treatment to avoid or alleviate long-term side effects. Young patients who have been successfully treated for HL have a long potential life span and it is important to consider quality of life issues as well as treatment effectiveness. In light of this a patient who has been newly diagnosed with HL is likely to be invited to consider participating in a clinical trial<sup>2</sup>.**

The advances in outcome for Hodgkin's lymphoma, and other blood cancers, have depended upon large scale comparative studies of treatment called clinical trials. Patients may well be asked to consider entry to a clinical trial. It is important to emphasise that entry into a clinical trial is entirely voluntary and patients may withdraw at any stage without prejudice to their care.

There are two main forms of treatment for HL, radiotherapy and chemotherapy. Radiotherapy may be used either alone for early stage patients with very localised disease or in combination with chemotherapy. Many patients with early stage disease will receive a combination of radiotherapy and chemotherapy. Chemotherapy for HL normally employs a mixture of drugs to achieve maximum benefit while minimising side effects. The descriptions given of treatment should be regarded as examples only, and there may be large variations from these depending on the exact protocol employed and on individual patient's responses to treatment.

<sup>2</sup> There is a separate publication on clinical trials available from Leukaemia Research.

## Treatment planning

The most important criterion in planning treatment is the disease stage. Many centres take account of whether a patient has bulky disease which is defined by an X suffix in the staging system. In one or two special instances, described separately, the recommended treatment depends on the histological type of HL as well as the stage. Other risk factors may be taken into account for some patients with late stage disease where the mainstay of treatment is chemotherapy, which may be combined with radiotherapy to local sites of disease. Chemotherapy is typically given as a combination of drugs — the most widely used combinations are known by the initials MOPP and ABVD.

Stem cell transplantation is not typically used as a first-line therapy for HL. It is reserved for patients who have had a relapse (their disease has returned). In this case it is usually an autologous transplant (one which uses the patient's own stem cells). This is possible because bone marrow involvement is uncommon in HL except for very late stage disease.

## Radiotherapy

Radiotherapy may be applied in a very localised way for early stage disease or, less frequently, as Total Body Irradiation (TBI) in preparation for a transplant. In HL radiation is usually applied to defined areas.

The exact areas to be included in radiotherapy will vary from patient to patient. Increasingly it is the practice to reduce the extent of radiotherapy to minimise the risk of late secondary cancers. In order to reduce the risk of relapse radiotherapy is combined with chemotherapy.

In patients with widespread, late-stage disease radiation fields may be selected to attempt to ensure that all main areas of lymphoid tissue are irradiated. This is known as total nodal irradiation.

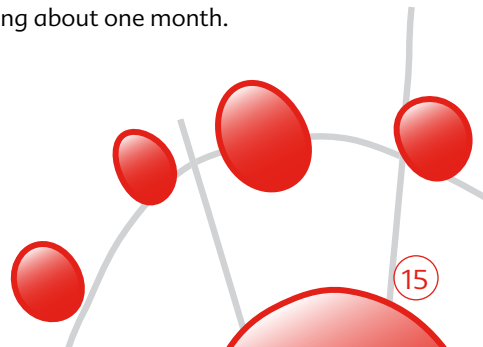
Radiation will damage all tissues through which it passes. This means that there are significant side-effects to this therapy. The radiotherapists will use the minimum necessary dose and seek to minimise exposure of uninvolved tissues.

**Organs that are specifically affected by mantle field irradiation (the most widely used form) are:**

- Lungs – radiation pneumonitis, this is an inflammatory condition which may lead to a mild, dry cough, low grade fever and some difficulty in breathing on exertion
- Heart – there may be inflammation of the pericardium (the covering of the heart)
- Thyroid gland – may be affected, leading to abnormalities of the body metabolism
- All tissues – secondary cancers may occur (including lung and breast cancer).

## Chemotherapy

For a long period of time the standard therapy for HL was a combination of drugs called MOPP (mechlorethamine, vincristine, procarbazine and prednisone). This achieved good success rates but carried a significant risk of leukaemia as a long-term side effect. This has now largely been replaced by ABVD (adriamycin, bleomycin, vinblastine and dacarbazine). ABVD offers an equally good chance of cure but with significantly less serious toxicity. In both cases the drugs are typically given over a period of about six months. Newer chemotherapy regimens are being assessed which may be given over a shorter period. They are normally given in courses lasting about one month.



The amount of time spent as an inpatient is very dependent on the exact protocol and on an individual patient's responses to treatment.

## **Early-stage HL (stages 1 and 2)**

For many years the standard treatment for early stage disease was the use of radiotherapy directed at specific areas, depending on which node(s) were affected. Many centres are now combining reduced intensity radiotherapy with short courses of chemotherapy. This is known as combined therapy and has shown excellent results.

## **Late-stage HL (stages 3 and 4)**

Chemotherapy is the main treatment used for late stage disease, with or without additional radiotherapy, to any areas of bulky disease.

## **Relapsed HL**

Patients who relapse after receiving only one therapy, radiotherapy or chemotherapy, may be candidates for further treatment with combined therapy. If this is not felt appropriate or if they have already received combination therapy then they are likely to receive high intensity therapy followed by an autologous stem cell transplant.

## **Stem cell transplantation<sup>3</sup>**

Stem Cell Transplantation (SCT) is the term now used in place of Bone Marrow Transplantation (BMT). A bone marrow transplant is one form of SCT but for many patients the source of stem cells is the circulating blood. An SCT may be either allogeneic (from a donor) or autologous (the patient's own stem cells). A stem cell transplant involves use of very high dose chemotherapy (and possibly whole-body radiotherapy), to destroy the patient's bone marrow. This is termed myeloablation.

The European Blood and Marrow Transplant Handbook recommendations for use of stem cell transplants in Hodgkin's lymphoma indicates that the only

<sup>3</sup> There is a separate publication on stem cell transplants available from Leukaemia Research.

situation in which transplantation may be considered a routine procedure is the use of autologous transplants for patients who have relapsed. The success rate of autologous transplantation in first relapse of HL is high with disease free survival of about 60%. The major hazard of this procedure is infection during the period when blood cell production is essentially absent. Improved supportive care, especially nursing, during this period has reduced the infection risk and decreased transplant related mortality very substantially.

## Long-term effects of treatment

Many of the treatments employed for HL are likely to impact on fertility and, in women, possibly on ovarian function. Male patients who are awaiting treatment should discuss possible options to protect fertility. If boys are post-pubertal then they should be able to arrange for storage of sperm – this must be arranged before chemotherapy or radiotherapy is commenced.

Female patients have fewer options, at present, for protection or preservation of fertility. It may be possible to participate in a study of storage of ovarian tissue, although this is not yet a routine procedure comparable to sperm banking. Irradiation of the ovaries may cause ovarian failure leading to early menopause and a need for long-term hormone replacement therapy. Female patients should discuss the possible options in detail at the earliest stages of treatment planning.

The long-term effects of treatment depend on the exact treatments used. They will differ according to what, if any, radiotherapy was administered and whether any chemotherapy protocols were applied. The most common serious side effects of radiotherapy have been described above. Two special issues in relation to radiotherapy are thyroid dysfunction and breast cancer screening.

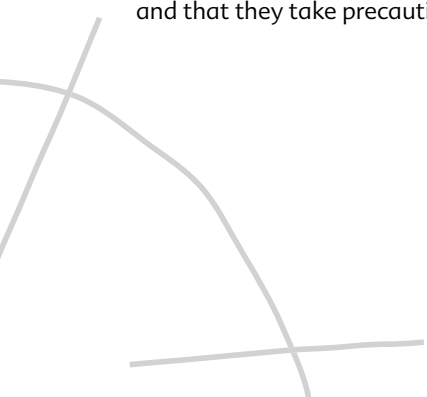
The thyroid is a gland in the neck which regulates the metabolism of the body. If this has been irradiated then patients require regular follow-up to

assess whether the gland is functioning normally. If thyroid function has been adversely affected then patients may require life-long therapy to correct this.

Breast cancer screening is particularly important for women who have received radiotherapy involving the breasts. It may be advisable for males to consider routine screening if there is evidence of a genetic predisposition towards breast cancer.

The MOPP chemotherapy regimen causes significant toxicity. If patients have received MOPP or extensive radiotherapy they may be at risk of sterility or of early menopause. Long-term side effects include a significant risk of developing myelodysplasia or acute leukaemia. It is predominantly because of this that the regimen has been largely superseded by ABVD. Although ABVD has a lower toxicity profile than MOPP it must still be used with care in patients who have heart or lung disease since it may damage these organs. This means that patients who have received ABVD must be observed carefully for any signs of disease in these systems.

Radiation to the mouth area may increase the risk of dental decay. Dentists should be informed of the treatment received and regular check-ups are needed. ABVD has not been reported to cause sterility after long-term follow-up of thousands of patients. Secondary malignancies, although rare, are probably the most serious potential side effect. The group of cancers which may occur depends in part on what drugs are used and which organs are exposed to radiation. Because skin and lung are among the affected sites, it is particularly important that people who have been treated for HL do not smoke and that they take precautions against ultraviolet radiation from the sun.



## Follow-up

**The main purposes of follow-up of patients treated for HL are detection of relapse and detection of treatment complications. Depending on the stage at diagnosis and whether they had bulky disease, between 10% and 30% of patients will relapse. The success rate of retreatment is high, especially for late relapses.**

During the first two years following completion of treatment patients are normally checked every two to three months. Over the next three years checks are normally given every six months and then annually. All patients should carry out regular skin and breast checks. Although breast cancer is rare in males it does occur and radiation to the chest increases the risk.



# Prognosis

**Overall cure rates for HL including all stages and all patients are around 75% to 80%. For young patients with early stage disease the likelihood of cure approaches 100%.**



# Summary

**Hodgkin's lymphoma is a form of cancer which affects cells of the immune system. It is one of the most curable forms of cancer seen in adults. Most cases occur in patients between the ages of 15 and 35 years. Overall cure rates are about 75% to 80% with some groups virtually guaranteed cure.**

Treatment is based on the use of radiotherapy or chemotherapy separately or in combination. Where chemotherapy is used alone it typically extends over about six months. When it is used for early stage disease it is given as a reduced course over about four months. The key factor in deciding treatment is the stage of disease at diagnosis, which reflects the degree of spread within the body.

Stem cell transplantation is not used routinely in the treatment of HL. Autologous transplantation may be offered for patients who have relapsed and has a very high success rate.

The prognosis for Hodgkin's lymphoma varies depending, in part, on characteristics of the patient such as age and other medical problems and, in part, on the features of their disease. Each patient should seek individual advice on their prognosis from their specialist.

The improvement in survival for HL patients achieved over the last three decades ranks alongside treatment of childhood leukaemia as one of the greatest successes in cancer treatment. Much of the current research is aimed at reducing toxicity without compromising the likelihood of survival.

# Appendix A

## The Ann Arbor staging

As with many other cancers, HL is categorised on the extent of spread of the cancer. The Ann Arbor system is the most widely used system for classifying lymphoma.

The Ann Arbor Staging groups are as follows:

Stage	Features
1 ❖	HL is limited to one lymph node group (e.g. neck, underarm, groin, etc.) above or below the diaphragm <sup>4</sup> , or the tumour is in an organ or site other than the lymph nodes (extranodal) but has not spread to other organs or lymph nodes.
2 ❖	HL is limited to two lymph node groups on the same side of the diaphragm or is limited to one extranodal organ and has spread to one or more lymph node groups on the same side of the diaphragm.
3 ❖	HL is in two lymph node groups, with/without partial involvement of an extranodal organ or site above and below the diaphragm.
4 ❖	HL is extensive (diffuse) in one organ or site, with/without disease in distant lymph nodes.

After a HL patient has been assessed for disease stage additional terms may be used to fully define a particular case of HL.

❖ **Additional terms** (which may apply to any stage of HL):

- A – absence of symptoms
- B – presence of symptoms

<sup>4</sup> The diaphragm is the sheet of muscle that separates the chest from the abdomen.

- fever (greater than 38°C)
- drenching night sweats
- unexplained weight loss of 10% or more within the last six months
- E — involvement of a single extranodal (other than the lymph nodes) site that directly adjoins or is next to the known nodal group
- X — presence of “bulky” disease, that is, any affected node whose greatest dimension is more than 10 centimeters in size, and/or a widening of the mediastinum (middle chest) by more than one-third of the width of the chest.

**It is usual to apply both a clinical stage and a pathological stage.**

- CS — clinical stage as obtained by doctor’s examinations and tests.
- PS — pathological stage as obtained by exploratory laparotomy<sup>5</sup> (surgery performed through an abdominal incision) with splenectomy (surgical removal of the spleen).

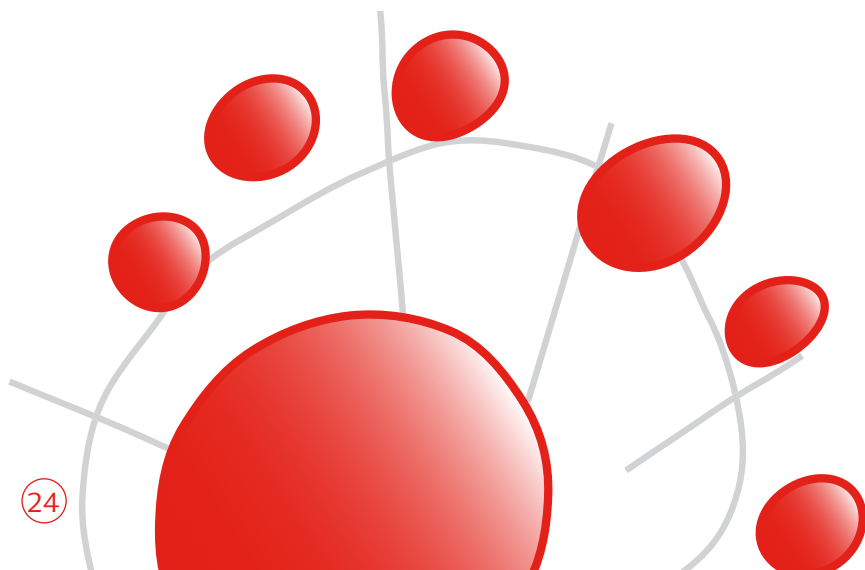
### ‣ **Additional terms (used in pathological staging of HL):**

- **N+ or N-** Lymph node positive or negative by biopsy,
- **H+ or H-** Liver positive or negative by biopsy,
- **S+ or S-** Spleen positive or negative following splenectomy,
- **S+ or S-** Spleen positive or negative following splenectomy,
- **L+ or L-** Lung positive or negative by biopsy,
- **M+ or M-** Bone marrow positive or negative by biopsy or smear,
- **P+ or P-** Pleura or pleural fluid positive or negative by biopsy or by cytological examination,
- **O+ or O-** Bone positive or negative by biopsy,

<sup>5</sup> Although staging laparotomy is not carried out routinely in NHL patients it remains as part of the official Ann Arbour definitions.

- **D+ or D-** Skin positive or negative by biopsy.

An example would be – CS IIA, PS III S+N+H-M- Clinical stage IIA, three lymph node regions involved Pathological stage III with spleen positive, abdominal lymph node positive, liver biopsy negative, bone marrow biopsy negative.



## Typical normal values for blood test results

	WBC x 10 <sup>9</sup> /l	RBC x 10 <sup>12</sup> /l	Hb g/dl	ANC x 10 <sup>9</sup> /l	Platelets x 10 <sup>9</sup> /l
<b>Adult male</b>	3.7 to 9.5	4.3 to 5.7	13.3 to 16.7	1.7 to 6.1	143 to 332
<b>Adult female</b>	3.9 to 11.1	3.9 to 5.0	11.8 to 14.8	1.7 to 6.1	143 to 332
<b>West Indian</b>	2.8 to 9.8			1.0 to 6.5	122 to 374
<b>African</b>	2.8 to 7.8			0.9 to 4.2	115 to 342
<b>Child 2-5 yrs</b>	5 to 13	4.2 to 5.0	11 to 14	1.5 to 8.5	143 to 332
<b>Child 6-9 yrs</b>	4 to 10	4.3 to 5.1	11 to 14	1.5 to 6.0	143 to 332
<b>Child 9-12 yrs</b>	4 to 10	4.3 to 5.1	11.5 to 15.5	1.5 to 6.0	143 to 332

Normal ranges vary slightly between laboratories so you may wish to ask your doctor to enter your normal values below:

--	--	--	--	--	--

WBC	White blood cell count
RBC	Red blood cell count
Hb	Haemoglobin concentration
ANC	Absolute neutrophil count

Separate ranges are quoted for West Indian and African populations as these groups have different normal ranges for white cell counts, absolute neutrophil counts and platelet counts.

This information is adapted, with permission, from *A Beginner's Guide to Blood Cells*, Dr Barbara Bain. Pub. Blackwell, Oxford, 1996.

The following patient information booklets are available free of charge from Leukaemia Research. You can download them from our website or request copies by phone or post (see form inside):

Leukaemia and Related Diseases

Acute Promyelocytic Leukaemia (APL)

Adult Acute Lymphoblastic Leukaemia (ALL)

Adult Acute Myeloid Leukaemia (AML)

Aplastic Anaemia (AA)

Bone Marrow and Stem Cell Transplantation (BMT)

Childhood Acute Lymphoblastic Leukaemia (ALL)

Childhood Acute Myeloid Leukaemia (AML)

Chronic Lymphocytic Leukaemia (CLL)

Chronic Myeloid Leukaemia (CML)

Hodgkin's Lymphoma (HL)

Multiple Myeloma (MM)

Non-Hodgkin's Lymphoma (NHL)

The Myelodysplastic Syndromes (MDS)

The Myeloproliferative Disorders (MPD)

Clinical Trials

Chemotherapy – what do I need to know?

Donating stem cells – what's involved?

Donor Lymphocyte Infusion (DLI) – what's involved

Supportive care

The Seven Steps – Blood & Bone Marrow Transplantation

Young Adults with a blood cancer – what do I need to know?

Jack's Diary: an illustrated children's book to help young patients understand and deal with blood cancers, treatment and life changes

**Leaflets on a range of associated blood disorders are also available**

**Leukaemia Research, 43 Great Ormond Street, London, WC1N 3JJ**

T: 020 7405 0101 • F: 020 7405 3139 • E: [info@lrf.org.uk](mailto:info@lrf.org.uk) • [www.lrf.org.uk](http://www.lrf.org.uk)