ENGLISH VERSION

3C Régional d'Hématologie

Information for patients

Further test procedures related to Haematology

GED_GENE-DS-926 A - PAO 01-11

3CR-H
Centre de Coordination en Cancérologie d'Hématologie Région Limousin

CHU
Centre hospitalier universitaire
Limoges

drafted by **Pr Dominique Bordessoule**

Proofread by
Dr Liliane Remenieras, 3CR-H doctor,
Dr Stéphane Moreau, référent douleur,
Corinne Bourdeix, **Catherine Granet**, IDE,
Stéphanie Freidine, quality engineer,
Dr Nathalie Gachard, biologist,
Pr Jacques Monteil, nuclear medicine,
Dr Philippe de Souza, radiologist,
Comité de patients régional d'hématologie du Limousin

Version 2 - december 2015

GED_GENE-DS-926 A - PAO 01-11

Preface

In order to provide the best treatment for your haematological disorder, you haematologist will find it necessary to prescribe so-called additional tests or examinations in order to arrive at a diagnosis, find out the full extent of your illness and factors relating to determining the probable outcome. As your treatment progresses some of these tests may be repeated several times to check how well the treatment is working and that your body is tolerating it and to be aware early of any complications that may arise and to treat any in the best possible way.

Tests that are useful in determining your treatment fall into the following categories :

• **Medical imaging to enable the exploration of organs deep inside your body** that clinical examination, by just looking, feeling or listening, cannot check out on their own. These tests provide information about various internal parts of the body such as your thorax, your abdomen, your head and your neck... The nature of the tests varies according to the organ being explored : waves, in the case of ultrasound, X-rays in CT scans, magnetic resonance as in MRI scans or isotopes in the case of positron emission tomography (abbreviated in French to TEP).

• **Needle extractions (punctures) and biopsies to look for abnormal cells** in the various tissues such as bone marrow, a sample of which can be taken for analysis by puncture and aspiration into a myelogram or by biopsy, such as a bone marrow biopsy (BOM in French) or in the case of other tissues such as the lymphnode (lymphnode puncture) or liquids such as cerebrospinal fluid sampled by lumbar puncture, pleural fluid in the lining of the lungs (pleural puncture) or fluid in the abdomen (paracentesis).

GED_GENE-DS-926 A - PAO 01-11

Other tests may be carried out in the course of your treatment :

- either to check that certain of your organs are functioning properly before the beginning of an intensive treatment or a root cell transplant, such as a heart ultrasound or a test of your breathing function...
- or if symptoms arise, to look for the pathology associated with them; or should there be complications related to an infection, by means of exploring the inside of the bronchial tubes using a bronchial fibroscopy or of the digestive tract using a digestive fibroscopy or a colonoscopy.

This booklet has been designed by those caring for you in the haematology department to support you as you go through these additional tests. The contents of the leaflet have been checked by a pilot group and proofread by the Regional Haematology Patients Committee. You should be aware that it is a written back-up to complete the oral information that will be provided for you by the doctor who prescribes the tests and the nurse... All the tests that are prescribed for you are necessary to ensure that your treatment is of the highest quality. You should not hesitate to ask any additional questions that seem necessary to enable you to have the benefit of these tests with the full understanding not only of how they are carried out but what their purposes are.

GED_GENE-DS-926 A - PAO 01-11

Table of contents

GED_GENE-DS-926 A - PAO 01-11

GED_GENE-DS-926 A - PAO 01-11

1- Medical Imaging

The various kinds of imaging processes are now digitalised in most radiologists' cabinets whether they are private or public, and you will be handed a CDrom on which the images from you test are filed, and can be read by a computer. A few particularly important films may be produced as a hard copy by the radiologist and given to you along with the CDrom. The various radiological tests that could be prescribed for you in the context of your haematological assessment are the following :

1-1- Straightforward X-rays

What is it all about ?

It is a medical imaging technique that uses X-rays. The rays pass through your body and blacken a photographic film except in places where dense compact stop the rays and provide a lighter image. As a test, it is just like having a photo taken and is neither invasive nor painful.

How is the procedure carried out ?

The technician welcomes you, takes you to a changing cubicle and tells you what clothes and/or jewellery to take off. Depending on the nature of the X-ray, you will be X-rayed in a standing position from the front and from the side for a chest X-ray, or lying on a table if you are too fatigued to be able to be X-rayed sitting or standing. You will be placed between the film and the X-ray tube and the machine that digitalises the image. You should follow the instructions of the technician or the radiologist if he asks you to change position (frontal, profile, three-quarters...). A normal X-ray takes less than 10 minutes. If you are having an X-ray for bone density, or of the sinuses or the abdomen, the principle is the same, but the apparatus will move around the zone to be X-rayed.

GED_GENE-DS-926 A - PAO 01-11

Is it painful ?

It is not a painful procedure; if you have difficulty maintaining the pose you are asked to, tell the technician about it.

What are the risks ?

Radiography involves the use of X-rays. As far as radiation of the patient is concerned, no risk to patients has been shown to exist given the very low doses of radiation involved and the precautions that are taken to keep them to the lowest possible levels. Nevertheless, in the case of illnesses requiring repeated X-rays over a number of years, it is important to limit the number of these examinations in case of symptoms. The X-ray dosage you have received is recorded as a matter of course on the report that will be handed to you. To give you an example, the amount of radiation you receive in a simple X-ray is about the same as what you would naturally be exposed to from the sun during a four hour air flight.

Are there any contraindications ?

Yes, you should mention it to the medical team if you are pregnant or believe you might be. If the X-ray is necessary, there are special precautions to be taken.

GED_GENE-DS-926 A - PAO 01-11

1-2- CT scan

When you are having a CT scan (referred to in French as un scanner), it is sometimes necessary to improve the visibility of some hollow organs (stomach or vessels) by filling them with a substance that is opaque to X-rays, which will be injected into a vein, or that you will be asked to swallow just before the scan. So the radiologist may give you an injection or ask you to drink a darkening agent just before or during this radiographic scan.

What is involved ?

This is a medical imaging technique that uses X-rays. The scanner enables the whole of your body or the whole of part of it to be swept by moving around the source of the rays, the sensor and you yourself. A computer reconstitutes the various views of the organs and transforms them into series of photographic images. The scanner provides information about the size of the organs, their volume and their precise location in addition to their blood supply. It should be noted that X-rays pass through hollow organs containing air and water more easily than those that are dense, like bones. An estimate of the dose involved will be included in the report on your scan. The contrast agent will be injected into a vein in the bend of your elbow or into your intravenous line if you have one. This can cause a feeling of heat or a strange taste in the mouth.
In Haematology, a CT scan is prescribed by your haematologist to check on organs deep in your body, most often to ascertain whether the lymph nodes deep in the chest or abdomen are expanded in size, but also to check the size of the spleen or the liver, and how the other deep organs are working.

How is the procedure carried out ?

You will be made comfortable on a table that moves through a ring for a few seconds, generally less than a minute. Thanks to a microphone incorporated into the apparatus, you can communicate with the medical team who watch the progress of your scan from

GED_GENE-DS-926 A - PAO 01-11

behind a glass screen, and can hear your comments if you wish to communicate with them. It is important to follow the instructions given to you, **staying still** throughout the scan and not breathing when you are told, to ensure the images can be interpreted. After the scan, the images are interpreted by the radiologist and a written report will accompany the CDrom which will be forwarded to your doctor.

Is it painful ?

No. At the moment of the injection you may sometimes feel a spreading heat/warmth, but not any pain. If you feel any unusual pain from the injection you should say so. Do not hesitate to mention anything you feel that is not normal.

What are the risks ?

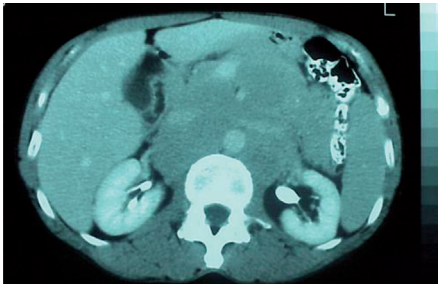
Any previous allergies should be notified to your doctor, as should be any kidney or heart condition, or if you are diabetic. Under these circumstances, the scan can still go ahead, but using different agents in smaller doses. Side effects can occur linked to the contrast agent, which may induce signs of intolerance, allergy or kidney problems. For this reason you should alert the medical team to any possible contraindications so that your treatment can be modified accordingly.

Are there any contraindications ?

Yes, be sure to tell the medical team if you are pregnant or suspect you may be. If it is necessary to carry out the scan special precautions will have to be taken.

GED_GENE-DS-926 A - PAO 01-11

What precautions should be taken beforehand ?



• Mention any allergies you may have if you are to have an injection of a contrast agent.
• It is not necessary to follow any particular diet/regime before this scan.
• **You must not have eaten for at least 5 hours** and have had a recent (full) blood test.
• An injection of iodine based contrast medium is often necessary to optimise the images. This injection may cause side effects, for which premedication may be necessary, e.g. to avoid the risk of an allergic reaction or kidney failure. So you should forewarn your doctor if you are allergic to iodine, if you have a kidney condition or have been treated for diabetes, or have a history of thyroid illness that could contraindicate iodine.

How long does it take ?

The scan takes on average 15 to 30 minutes.

How long before you have the results ?

You may have the results immediately or it may take several days for them to be interpreted, depending on how this is done.

GED_GENE-DS-926 A - PAO 01-11

1-3- Ultrasound

What is it all about ?

An ultrasound scan uses ultrasounds put out by a sensor and aimed into tissues that reflect them to form an image of the region being examined. It can be used in conjunction with a kind of radar to study vessels (doppler).

How is the procedure carried out ?

You will be lying in a darkened room to make it easier to see the images. A gel is applied to the skin to enable the ultrasounds to be transmitted. The scan provides moving images shown on a screen.

Abdominal ultrasound

You must not have eaten for 3 hours before your appointment, but you must continue to take your regular medication in the normal way. The scan will often involve you holding your breath for a few seconds.

Pelvic ultrasound

You are often asked to come with your bladder full; in this instance, do not urinate for 3 hours prior to the scan, or if you have urinated, drink 4 glasses of water one hour before. To enable close contact with the region being scanned and to improve the imaging, you may be asked to allow a sensor covered by a sterile sleeve to be inserted into your rectum or your vagina. On rare occasions the insertion of the sensor may cause the patient to faint. This effect is temporary and is not in any way serious.

Cardiac ultrasound

This examination enables one to explore the heart and how it is functioning generally, including the state of the valves, and the

GED_GENE-DS-926 A - PAO 01-11

cavities and cardiac muscle (the myocardium) and the envelope around the heart (the pericardium). It may be done using a sensor on the chest to detect the waves (ultrasound called Transthoracic echocardiography), finishing with an ultrasound via the oesophagus. In this last case, you will be asked to swallow the sensor – a little device that enables one to get even more precise pictures of the heart function.
Precautions : You must avoid taking any food or drink in the six hours before the examination, which will take place in the cardiology department in a echocardiography room.
After the examination you may feel a prickling sensation at the back of your throat, though this is rare and does not last long. **You must not eat and drink for an hour after the examination**, because of the local anaesthetic spray applied, to prevent food going the wrong way.

Does a transoesophageal echocardiogram carry risks?
It is very rare to have even minor side effects, such as digestive problems or palpitations. Serious complications are exceptional (perforation of the digestive tract 0,02 to 0,03%, arising generally among patients with oesophagus disorders).

Other ultrasound scans

A number of organs may be scanned by ultrasound, e.g. thyroid, muscles... This does not require any particular prior preparation.

Is it painful ?

No

What are the risks ?

An ultrasound is a scan that does not involve the use of X-rays, and there is no radiation. At the ultrasound intensities used in such scans, there is no recorded suggestion of any particular risk to humans.

GED_GENE-DS-926 A - PAO 01-11

Are there any contraindications ?

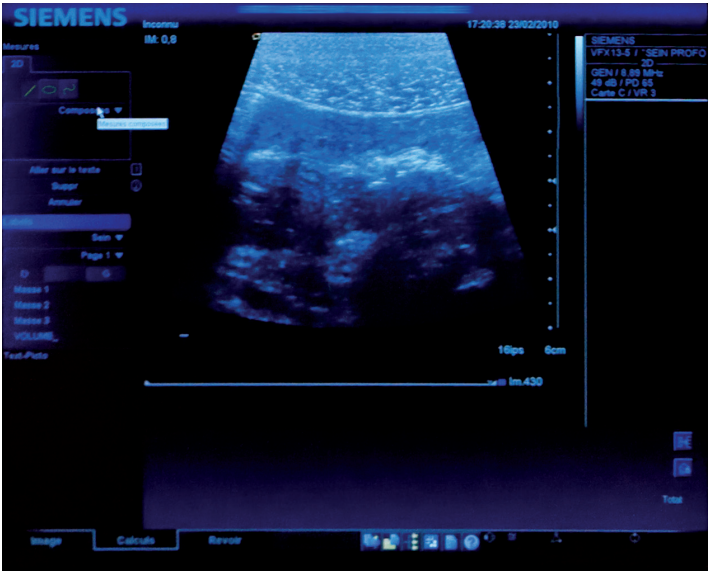
None

How long does it take ?

It lasts 10 to 15 minutes, except in certain cases.

How long before you have the results ?

An initial brief oral report may be given to you just after the scan, but this can only be a first impression, as a written report will be drafted based on the images, which will be made available as soon as possible.



GED_GENE-DS-926 A - PAO 01-11

1-4- Magnetic Resonance Imaging - MRI scans (IRM)

What is it all about ?

It is a different technique for medical imaging which is based on the principle that human body tissues subjected to a magnetic field emit a resonance signal that varies according to the amount of fat and water in each tissue. So each organ resonates differently, which makes it possible to differentiate between them and within the same organ to distinguish between healthy and unhealthy tissue.

How is the procedure carried out ?

The room in which the scan takes place has a powerful magnetic field produced by a magnet. **You will therefore be asked to undress so as to remove any metal object that could move about because of the magnet or create false images.**
Throughout the scan your cooperation is essential as it is necessary for you **not to move**. Be sure to follow recommendations about breathing so that the images retain their focus. You will be lying full length in a fairly tight space which is partly enclosed, and you will hear noises sounding like steel drums or tom toms.

It may be necessary to inject a contrast medium called Gadolinium. Injection of contrast medium specifically designed for MRI scans also makes it possible to examine the blood vessels, so an intravenous line will be set up if you do not have a drip already in place.

GED_GENE-DS-926 A - PAO 01-11

Is it painful ?

This scan is neither painful nor dangerous if the contraindications are observed.

Are there contraindications or risks ?

The magnetic field in the room where MRI scans take place may cause certain objects to be demagnetised - such as credit cards - or move objects containing iron in your body - (shards of metal) or on your person (lighters, buttons, slides).
If you have **a pace-maker, an artificial valve or joint, or surgical clips inside you, you must tell the person performing the scan before you begin.** These things may in certain instances make the scan dangerous and useless, as the images are disrupted by metal parts.

If injection of a contrast medium is necessary, you should avoid having this injection on the same day as a CT scan involving an injection.
If you suffer from claustrophobia, don't hesitate to talk about it before your scan. Treatment to relieve your anxiety can be administered before the scan is carried out.

How long does it take ?

The scan lasts 20 to 30 minutes.

How long before you have the results?

An initial brief oral report may be given to you just after the scan, but this can only be a first impression, as a written report will be drafted based on the images, which will be made available as soon as possible.

GED_GENE-DS-926 A - PAO 01-11

1-5- Positron Emission Tomography

What is it all about ?

This is an imaging examination that is very effective in assessing the extent of certain diseases such as lymphomas. It may be prescribed by your haematologist, depending on your diagnosis, at the time of your initial assessment or to evaluate your response to treatment or in the course of follow-up after treatment. PET combines a scan and an injection of a mildly radioactive medicinal tracer called 18-FDG (fluorodeoxyglucose) which is detected by a high performance camera. FDG is a sugar similar to glucose which is consumed in large quantities by the most active cells. So the malignant cells which are highly active cells, are very greedy for them and take up this tracer in greater quantities than the normal cells. So the 18-FDG accumulates more greatly in the malignant cells, enabling them to be visualised more effectively.

How is the procedure carried out ?

It will take place in the Nuclear Medicine Department, on the 1st level below the ground floor in the CHU. You will be looked taken in hand by the medical personnel there on your arrival, and your stay is likely to last **between 2 and 4 hours**. You will have an intravenous line put into a vein in your arm and the FDG fluid will be injected through this line. You will have a rest in a quiet place **for 45 to 60 minutes. You must strictly rest lying down without talking**, so that the product spreads evenly throughout your body. The intravenous line will then be removed. You will be asked to go and urinate, as your bladder needs to be as empty as possible during the examination. Then you will be made comfortable on the PET table, lying on your back with your head on a rigid support. For 30 minutes the apparatus will capture images. It is absolutely essential that you stay still. The bed will move within the tunnel of the TEP and the sensors will turn around you and will record the radioactive rays that will enable the images to be digitally reconstituted. On your way out of the department you will be asked to go to the toilet to empty your bladder to

GED_GENE-DS-926 A - PAO 01-11

get rid of as much of the radioactive fluid as possible.
The apparatus where the imaging takes place is a hybrid combining a traditional scanner with a scintillation camera which in not enclosed and it is the apparatus which moves around the bed. **For six hours you must not eat or drink anything other than water before the beginning of the scan.** When the PET scan is finished, you can return to your normal activity.

Is it painful ?

The fluid injected is painless apart from the prick of the needle when the intravenous line is put in place, which you may or may not find painful, like any blood test. Is it uncomfortable? The immobility, the position of your arms, the temperature in the room, lying in the same position and the time the scan takes may all contribute to making you uncomfortable during the scan.

What are the risks ?

Although the amount of space for the patient is restricted, feelings of claustrophobia are rare and the scan itself is completely silent. If you are anxious, an anxiety relieving and muscle relaxing medication can be prescribed for you prior to the scan.

Pr Jacques Monteil

The substance that is injected is a sugar similar to that which is absorbed by the body. It does not cause any reaction. The sugar has been modified to enable it to serve as a tracer and carries a radioactive fluor ion that is rapidly eliminated by the body. The risks linked to radioactivity are low; the radiation received is comparable to that of a chest X-ray. There are no side effects. However there are certain precautions to be taken, especially

GED_GENE-DS-926 A - PAO 01-11

prolonged contact with pregnant women and small babies. **Drink a lot, preferably water, to accelerate the elimination of the substance from the body.**

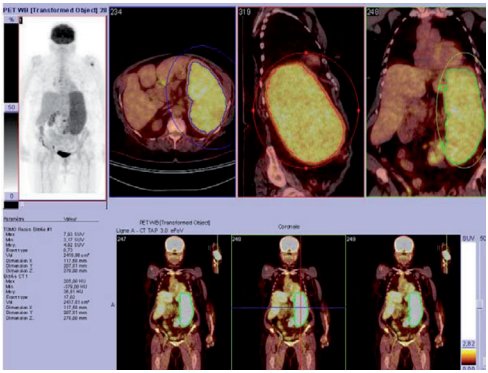
Are there any contraindications ?

None except in case of pregnancy.

What precautions need to be taken beforehand ?

Yes, it is important not to eat or drink from the day before onwards, except that you can drink as much water as you like, and continue to take your usual medicines.
The Nuclear Medicine Department insists on **the importance of arriving on time**, as the medicine used for the examination becomes ineffective rapidly. Additionally, it is recommended you wear clothes that can be taken off easily and avoid wearing jewellery or carrying coins.

How long before you have the results ?



An initial brief oral report may be given to you just after the scan, but this can only be a first impression, as a written report will be drafted based on the images, which will be made available as soon as possible. The results are discussed with the head of the Nuclear Medicine Department, Professor Jacques Monteil and haematologists to arrive at the best interpretation and decide on the procedures to be followed that match your results and the variety of your illness. This happens at the multidisciplinary coordination meetings that take place each Thursday afternoon.

GED_GENE-DS-926 A - PAO 01-11

2- Samples

In a haematology department one is treating blood diseases, and therefore bone marrow, and the immune system, and therefore the lymphatic glands. Before arriving at an initial diagnosis and deciding on the treatment best suited to your case, the haematologists are going to ask you for samples of these organs which for some will be very straightforward and for others more complex. The samples will enable the presence of the illness and its possible extent to be determined.
In the case of all samples that are suggested are taken, the need for them is carefully thought out, and that they will be useful and indispensable for your diagnosis or for a treatment properly suited to your blood disorder. **Your cooperation is essential :** it will contribute to the speed with which the biopsy or puncture is carried out and will reduce the risk of pain or complications. You must not move throughout the whole procedure and you must maintain the position in which you are placed.

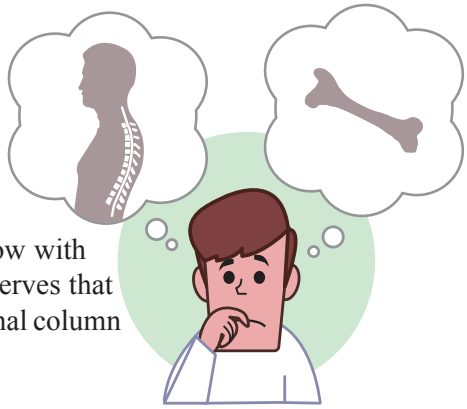
These are the tests :

2-1- Blood tests

These tests may be carried out either at your doctor's appointment or on your arrival in hospital or day hospital. These are blood tests or urine tests. The analyses are carried out in biological laboratories on the ground floor of the CHU by blood disorder specialists. The results are ready within less than 2 hours as a general rule for straightforward tests, but may take several days, or even several weeks, for more complex analyses.

GED_GENE-DS-926 A - PAO 01-11

2-2- Bone marrow aspiration or Myelogram



It is important not to confuse the bone marrow with the spinal cord which is made up of all the nerves that originate in the brain and pass through the spinal column to control the different organs.

What is it all about ?

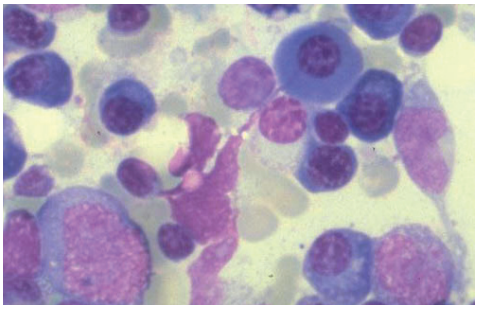
It is the taking of sample cells from the hematopoietic (blood producing) marrow which is considered as being the factory which produces all cells in the blood. The idea is to pierce the bone to suck up the medullary fluid, tucked away inside boney recesses and to put it onto a slide so that it can be analysed in the haematology laboratory. In the laboratory the haematologist biologist will analyse the sample and determine the proportions of the various types of cells in the bone marrow - those that will become white cells, red cells and platelets and the extent they have grown. The myelogram also enables one to detect the presence and percentage of normal cells in abnormally high quantities or abnormal cells, and to confirm or refute the diagnosis of most malignant blood disorders.

How is the procedure carried out ?

• The sample is normally taken in premises of the haematology laboratory situated in the ground floor of A wing, where you will be looked after by department staff. In cases when moving around is not possible or where precautions are being taken against infection it may be performed by a haematologist at your bed within the department.
• The site where the puncture is carried out is usually in the sternum (less often in the iliac crest, a bone in your buttock). For a biopsy where the sample is taken from the sternum you will be lying on your back and after cleaning the skin, the doctor inserts a fine needle specifically designed for bone marrow biopsies into the bone.
• The aspiration is carried out by the doctor who inserts the needle at right angles to the sternum, through the first layer of bone, and then

GED_GENE-DS-926 A - PAO 01-11

draws out a tiny quantity of bone marrow into the syringe. The needle is then withdrawn. **The aspiration of the marrow is very brief.** It is a procedure that takes less than a minute. Sometimes it is necessary to take a larger sample of bone marrow when dealing with abnormalities in chromosomes, a test called «cytogenic», or for marrow culture. Then the doctor immediately takes out the needle and put the drop of the marrow fluid onto a slide, carrying out a marrow smear which when it has been coloured will enable the cells to be examined under a microscope, or will be placed in culture medium for more complex analysis.



Leaflets available on request in the department

Is it painful ?

A local anaesthetic of the skin may be carried our using an EMLA patch using the procedure explained in this document. This is applied one hour in advance. The aim of this patch is to anaesthetise the skin but it will not be effective for when the marrow is aspirated. An injection of anaesthetic used to be used in the days when they used trocars (which were thicker instruments) but this is no longer the case now that finer needles are used. With the fine needles used nowadays the procedure is not very painful. However you may feel some slight pain when the needle is inserted and when the marrow is being aspirated. The sensitivity to this pain varies greatly from patient to patient. So if you are afraid of this test, do not hesitate to talk about it to your doctor. Moreover, he can prescribe a low dose of medicine to relieve your anxiety to be taken half an hour before (see p 40).

Are there any contraindications ?

A myelogram cannot be carried out on the sternum if you have had

GED_GENE-DS-926 A - PAO 01-11

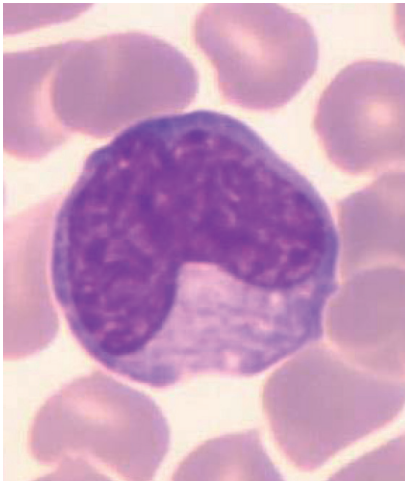
a sternotomy (a scar on the sternum) left over after heart surgery, for instance, or if you have previously had radiation therapy on your chest. In this instance the sample will be taken from your iliac bone (in your hip). The patient lies on his or her side and the procedure is the same.

What are the risks ?

There is only a very little risk involved in this test. Any risk of infection is exceptional if the procedure is carried out in good aseptic conditions. When the level of platelets is not very high a bruise may appear under certain circumstances at the place the needle was inserted and it can be difficult to interpret this as the cells in the bone marrow can be diluted by blood. If the marrow is fibrous, as it is in the case of some disorders, it will not be possible to obtain marrow fluid. If you are very anxious before the bone marrow biopsy procedure, do not hesitate to talk about it to your doctor and to come with someone who can drive you home.

How long before you have the results ?

The result of a myelogram is normally available within 48 hours.



GED_GENE-DS-926 A - PAO 01-11

2-3- Bone Marrow Puncture Biopsy (BOM)

What is it all about ?

This is the removal of a small fragment of bone tissue using a trocar - a hollow needle. Bones are made up of bony cavities filled with hematopoietic marrow, considered to be the factory producing all the blood cells. The idea is to take out a little «carrot» of bone containing the marrow rather than piercing the bone with a needle to aspirate the marrow-rich fluid tucked inside the bony cavities. The sample will enable the cancer pathologist not only to analyse not a larger number of marrow cells coming from several hematopoietic bone cavities but will also provide more information about the general state of the bone marrow and the spongy internal scaffolding of fine bars of bone, known as trabeculae. It provides a larger territory to investigate if the bone marrow is invaded by abnormal cells, it the bone marrow is rich or poor or if the bone is fibrous, to confirm the diagnosis of most malignant blood disorders when the myelogram has not enabled a diagnosis to be made.

How is the procedure carried out ?

• The procedure is carried out by a doctor assisted by a member of the care team in your room. **It is not necessary to go without food or drink beforehand.** You will be lying comfortably face down or on your side, you head on its side. A nurse will offer you pain relief via a mask around you nose and mouth providing a mix of gases (oxygen and nitrous oxide) according to the procedure outlined in this document. Inhaling the gas enables you to be awake but sedated and provides partial pain relief making the carrying out of the procedure easier. So you will not be asleep, you will remain conscious, you will hear what people say to you and you will be able to talk and answer questions. Inhaling the gas will bring a reduction in your anxiety and even a state of euphoria, altering your sensory perception. These effects disappear in minutes after you stop inhaling the gas mixture. It will be up to you to administer the gas with a nurse at your side and you will breathe normally. The

GED_GENE-DS-926 A - PAO 01-11

inhalation of gas starts three minutes before the procedure begins and will continue throughout it, for about 15 minutes.

• The doctor identifies the place where the sample will be taken and carefully disinfects the skin with disinfectant and then carries out a local anaesthetic using a fine needle to inject a substance that desensitises the skin, the subcutaneous tissue and the periosteum (the membrane covering the bone) using Xylocaine®, a local anaesthetic that dentists usually use.

• The doctor then takes a sample from the posterior superior iliac spine (at the bottom of the spine at the level of the pelvis in the upper part of one of the buttocks) after making a small incision to make it easier for the trocar, which is about 3mm thick, to be inserted. The trocar is then withdrawn and the sample of bone marrow about 1-2cm long is sent to the laboratory in a glass container containing a tissue preserving liquid.

What happens after a Bone Marrow Puncture Biopsy ?

When the procedure is completed, pressure is applied for a few minutes to the site of the biopsy to prevent any bleeding and a light compression dressing is applied and will need to be kept in place for 24 hours. **You should not wash this area of your skin for 48 hours (no taking a bath for two days). You are invited to lie on your back so as to continue to exert pressure on the biopsy site for a few minutes.** After that you will be able to move and leave the department on foot.

How long does it take?

This procedure takes about a quarter of an hour.

Is it painful ?

Taking a carrot of bone is painful. So in order to reduce the bad experience of the patient as much as possible it will be organised

GED_GENE-DS-926 A - PAO 01-11

Leaflets available on request in the department

that the biopsy takes place at the same time as the general anaesthetic carried out for the implantation of as implantable port, if there is a diagnosis of a malignant haemopathy and chemotherapy has been offered to the patient after the opinion of the Multidisciplinary coordination committee has been sought.
If on the other hand the bone marrow biopsy is the test that will determine the diagnostic or help decide whether or not chemotherapy is necessary, the biopsy will be carried out by a haematologist within the Haematology department. A policy of preventing pain induced by invasive procedures has been in place for a long time within the haematology department, by using either patches to anaesthetise the skin or subcutaneous injections of anaesthetic using a fine needle, or painkillers administered through a mask, as used for childbirth. Do not hesitate to ask if this is not offered to you.
Moreover, if you are anxious before a biopsy we can also act in anticipation by providing you with anxiety relieving or painkilling medication prior to the procedure.

Are there any contraindications ?

Yes, it is important to advise the doctor **if you are taking aspirin or especially anticoagulants in the days before the procedure**. Your platelet levels will also be checked and if the examination is a

GED_GENE-DS-926 A - PAO 01-11

major one and your platelets are low then a transfusion of platelets may be carried out before or after the biopsy.

What are the risks ?

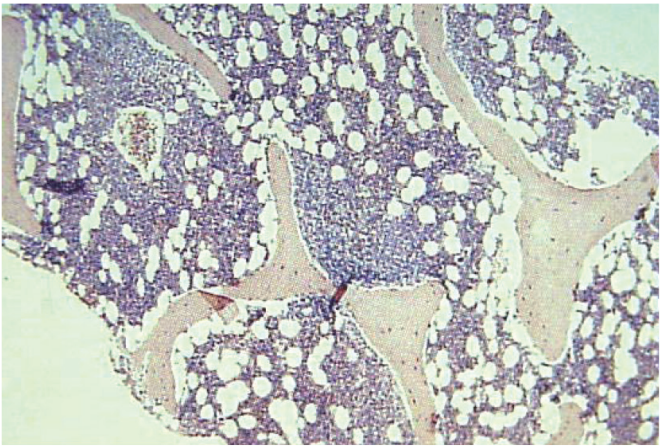
There is no risk directly linked to the procedure. The risk of infection is exceptional after a procedure carried out in good aseptic conditions. Local bruising may occur but this is exceptional. In any case inform your doctor of anything abnormal (persistent pain, fainting, or your temperature rising above 38.5°C in the hours following the procedure).

How long before you have the results ?

The sample will be preserved for analysis and archived if necessary. The carrot of marrow will be enclosed in a block of paraffin wax so it can be cut into very fine slices that will be coloured and examined under a microscope. Most often this sample is also frozen and in very fine slices will be applied to reactive agents based on specific antibodies to analyse more finely the variety of your illness.

Preparing the sample for these different analyses will take some time and obtaining the results of a so-called histological sample (for tissue analysis) requires several days and often the results are only available a week later. If additional colorations are needed this will lengthen the time it takes for the result to come.

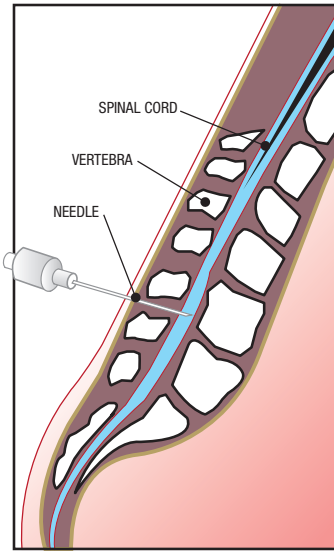
The Histology of a Bonne Marrow Puncture Biopsy



GED_GENE-DS-926 A - PAO 01-11

2-4- Lumbar puncture (PL)

What is it all about ?



This procedure is carried out at the patient's bedside and consists of introducing a needle between two vertebrae at the base of the spine to extract cerebrospinal fluid (CSF) - the liquid in which the brain and the spinal column are immersed. You are awake throughout the procedure and there is no general anaesthetic. This procedure requires admission to hospital and normally involves an overnight stay.

What is the purpose of the lumbar puncture ?

A lumbar puncture is carried out to enable the examination of the cerebrospinal fluid. It enables one to diagnose and treat certain illnesses that may be situated around the spinal cord and the brain. It may be used for diagnosis to look for abnormal cells in the meninges or for therapeutic purposes either as a preventative measure to stop an illness spreading in the meninges, as few forms of chemotherapy will pass through the meningeal barrier, or can work a cure if it is affected. In fact, some forms of chemotherapy have difficulty reaching the zone which surrounds the central nervous system and separates it from the rest of the body (called the neuro-meningeal barrier).

How is the procedure carried out ?

• The procedure takes place with the patient sitting on the bed. A pillow is placed under the knees of the patient so s/he can lean forward with the chin down towards the chest to make for a rounded back. In this position, the space between the lumbar vertebrae

GED_GENE-DS-926 A - PAO 01-11

is enlarged and this allows a fine needle to be introduced into the spinal marrow. A lumbar puncture can also be carried out with the patient lying on their side.

• An anaesthetic patch is applied to the back where the puncture is to be carried out so as to anaesthetise the skin. Once he has disinfected the skin, the doctor carries out the lumbar puncture in the lower back between two lumbar vertebrae.

• Once the needle is in place, the doctor aspirates a few drops of cerebrospinal fluid into several tubes. **It is very important not to move while the samples are being taken**, which lasts less than 30 seconds. The tubes are then sent to the laboratories to be analysed.

• When he has finished taking the samples, the doctor will either withdraw the needle immediately or perform an injection if necessary before removing the needle.

• A sterile compress will then be placed on the point where the puncture was performed to protect you from any risk of infection.

What happens after the puncture ?

It is important to remain lying down for an hour in the bed, without a pillow, so as to avoid complications such as a headache. You have to remain lying down preferably on your stomach or on your back, but without a pillow to avoid getting a headache, an effect that may happen because of the change in the level of spinal fluid. As far as possible, continue to rest until the following morning, but it is not impossible (after resting) to walk and to leave the hospital.

Are there any precautions to be taken before a lumbar puncture ?

There are precautions to take with regard to medicines which will be explained to you by the doctor who has suggested the lumbar puncture to you. **Medication aimed at thinning the blood, i.e. platelet inhibitors or anticoagulants are contraindicated.** If you are following a course of treatment involving one of these medicines, the doctor will tell you what action to take with a view to your interrupting the treatment or possibly replacing it with an alternative medicine. If you have pain during the ten days prece-

GED_GENE-DS-926 A - PAO 01-11

ding the puncture **you should not take aspirin, though you may take paracetamol**.

What are the risks or side effects ?

Apart from the risk of headaches, there is very little risk associated with the procedure. The risk of infection or local bruising is very uncommon after a procedure carried out in good conditions. However, you should tell you doctor of any unusual symptoms (persistent pain, fainting, temperature rising above 38.5°C) in the hours following the procedure. It is very uncommon for a patient to feel pain at the base of his spine at the point where the needle was introduced. This discomfort is slight and usually does not last more than a couple of days.
On very rare occasions when the puncture is carried out, there may occur bleeding in the canal or a nerve may be touched, and the patient may then feel an electric shock or a short-lived pain in one leg. This complication is very unpleasant, but has no long-term effects and is very fleeting.

Can you eat and drink and take your medication in advance of this procedure ?

There is no restriction on eating and drinking before this procedure and there is no need to have an empty stomach. The patient can take his medication unless he is advised not to by the doctor.

How long before you have the results ?

The results of a lumbar puncture are available within 48 hours.

GED_GENE-DS-926 A - PAO 01-11

2-5- Other biopsies and punctures

What is it all about ?

A biopsy is a procedure that is described as invasive as it makes it necessary to extract either a small sample of a zone of the body under suspicion (an abnormal lump or an oversize ganglion...) or of a healthy tissue in order to examine it under a microscope. The biopsy enables a good number of malign blood disorders (lymphomas, leukaemias, myelomas...) to be diagnosed by finding abnormal cells and also to determine the extent of the illness in otherwise healthy tissues.

How is the procedure carried out ?

Tissue or cells can be taken from almost any part of the body. In addition to medullar samples (of bone or other marrow) there are several different ways of performing a biopsy depending on the part of the body involved :

- Surgical biopsy : this is carried out by a surgeon under general or local or regional anaesthetic. The sample is then sent to the cancer pathology laboratory.
- An Endoscopic Biopsy : may be carried out at the time of an examination with an endoscope (a tube which enables anomalies in hollow organs in the respiratory system (bronchial biopsy) or in the digestive tract (digestive biopsy) to be detected.
- Biopsy by needle : carried out by a specialist radiologist and where a hollow needle, sometimes guided by a scanner, takes a sample from a deep placed organ in order to avoid recourse to surgery. Lymph nodes in the stomach or thorax can be sampled in this way. The sample is small in size, but it can still be analysed.
- A fine-needle extraction : may be done by various specialists, either for a normal organ.
  - Lymph node extraction performed by a haematologist, having disinfected the skin, with or without anaesthesia, as the needle is very fine; the fluid extracted will immediately be placed on a slide, then a smear will be made to enable

GED_GENE-DS-926 A - PAO 01-11

the cells extracted to be analysed. The procedure takes less than 30 seconds.
- Pleural aspiration or test for ascites may be carried out to remove an abnormal fluid secreted in the pleura (an envelope surrounding the lung) or in the abdomen. This fluid will be extracted by needle in a few minutes after the skin has been disinfected and anaesthetic. It will be aspirated for analysis in the various laboratories and if necessary - if the fluid is present in quantities that cause concern - will be drained.

Is it painful ?

In the case of an extraction with a fine needle, the amount of pain will depend on the diameter of the needle, which is the same size as one used in a blood test. Such procedures are generally not very painful and are over very quickly in a matter of seconds. However if you are afraid of pain, do not hesitate to talk about it to your doctor, who will either offer you an analgesic patch for the site of the extraction or a gas based anaesthetic that you inhale.

For biopsies involving a scanner, as the needle is larger, you can ask for a premedication and do not hesitate to talk about it to the radiologist carrying out the procedure. The procedure is usually very quick.

Are there any contraindications ?

For a biopsy by needle, there are precautions to take with regard to medicines which will be explained to you by the doctor who has suggested it for you. **Medication aimed at thinning the blood, i.e. platelet inhibitors or anticoagulants are contraindicated.** If you are following a course of treatment involving one of these medicines, the doctor will tell you what action to take with a view to your interrupting the treatment or possibly replacing it with an alternative medicine.
For fine needle extractions, there are no contraindications but speak about it to your doctor who will apply a compression dressing for

GED_GENE-DS-926 A - PAO 01-11

a little longer when the procedure is finished.

What are the risks ?

There is very little risk associated with the procedure. The risk of infection is very uncommon after a procedure carried out in good conditions. In rare cases bruising may appear. However, you should tell you doctor of any unusual symptoms (persistent pain, fainting, temperature rising above 38.5°C) in the hours following the procedure.

Can you eat and drink and take your medication in advance of this procedure ?

There is no restriction on eating or drinking before this procedure and there is no need to have an empty stomach. The patient can take his medication unless he is advised not to by the doctor.

How long before you have the results ?

In the case of a fine needle extraction, the results will be available within 48 hours.
For puncture biopsies, obtaining results requires additional techniques and they will not be available in less than a week.
In some instances the purpose of the test is to look for infectious agents and the results will be obtained in 2 stages :
• rapid identification by direct examination within 48 hours of certain germs or funghi present in large quantities in the sample,
• and on the other hand, very late identification of some germs, made possible only by culturing the samples over several weeks.

GED_GENE-DS-926 A - PAO 01-11

3- Analysis of samples

The cells removed by puncture and the tissues removed for biopsy will be analysed in various specialised laboratories in the CHU.

3-1- The Biological haematologie Laboratory

This is situated on the ground floor and is under the direction of Professor Jean Feuillard. With him work Dr Franck Trimoreau, the specialist in cytology and Dr Nathalie Gachard, who is a specialist in cytogenetics (the study of chromosomes in malignant cells) and in molecular biology (sensors for detecting abnormalities in cells) or the study of clonality, and Dr David Rizzo and Dr Estelle Guérin, specialists in the analysis of cells on cell sorting machines once they have been identified using specialised reagents.


Pr Jean Feuillard

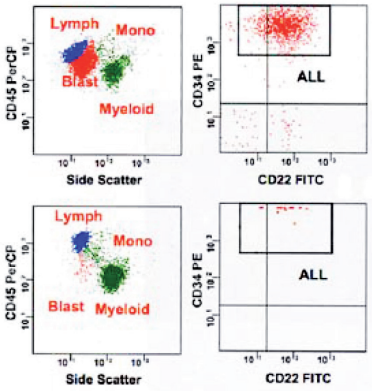

Dr Franck Trimoreau


Dr Nathalie Gachard

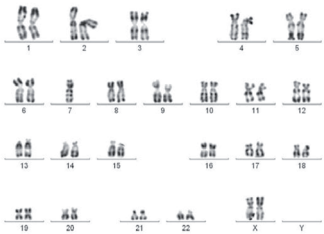
GED_GENE-DS-926 A - PAO 01-11

Dr Magali Donnard works in the cell culture laboratory. She is responsible for the quality control in stem cell samples. She is also responsible for a department involved in cell cultures useful for the diagnosis of myeloproliferative disorders, and for the haemostasis laboratory.

Quality in these biological activities is essential for the treatment of your malignant haemopathy, at one and the same time enabling an accurate diagnosis of your illness in all its sub-varieties, to identify factors giving rise to a risk of recurrence and enabling your response to your treatment to be followed through blood or marrow tests. These very specialised tests of the biology of malignant blood disorders require a strong ability to take on board the constant innovation which is constantly taking place in the treatment of malignant haemopathies, and to react to national and international research protocols. New techniques such as cytofluorometry enable a very large number of cells to be sorted so as to analyse abnormalities. The technical facilities of the Haematology laboratory are very highly efficient and the medical competence and expertise of the biological haematologists is widely recognised. So these biologists take part in your treatment in close collaboration with their clinical haematologist colleagues, even if you know them less well. We are please to present them to you here...



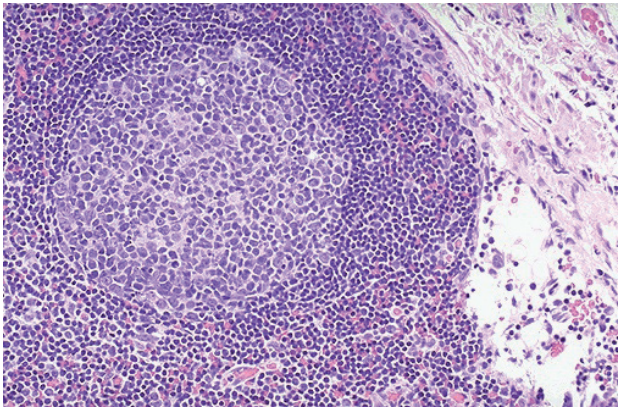
Sorting the cells in cytofluometry



GED_GENE-DS-926 A - PAO 01-11

3-2- The Cancer Pathology Laboratory

Biopsy samples are sent to the Cancer Pathology Laboratory **for analysis** after they have been set in paraffin wax or deep frozen, coloured and tagged with antibodies. This laboratory is on the very front line in the analysis of lymph nodes, bone marrow biopsies and of any other tissue where a haemopathy may be suspected. It is Dr Marthe Delage to whom one turns for diagnosis of these blood disorders. The Cancer Pathology laboratory under the direction of Professor François Labrousse is a member of the national network of lymphoma expert centres recognised by INCa - **the LYMPHO-PATH network**. Samples from patients suffering from lymphoma are subjected systematically to a double analysis and in the rare cases where the analysis is complex, a collective re-analysis by several experts is carried out. In this way, if the sampling that has led to the diagnosis of lymphoma has been carried out by a laboratory outside the hospital, we will systematically ask for samples to be sent to enable them **to be reassessed** not out of spite but out of respect for quality criteria.



Ganglion histology

GED_GENE-DS-926 A - PAO 01-11

3-3- The Immunology Laboratory

This is a laboratory specialised in the analysis of the immune system, both the cells responsible for our immune defence system (lymphocytes) and the antibodies, using electrophoretic tests and immunoelectrophoresis. It is in this laboratory that the diagnosis of myelomas is carried out.

Dr Matthieu Filloux, working under the direction of Professor M. Cogné, the Director of a recognised research laboratory (UMR CNRS 7276), are closely involved in the typing of lymphoid diseases such as lymphomas or myelomas, but also play a major role in the organisation of the seeking out of bone marrow and haematopoietic stem cell donors for patients who need a bone marrow transplant. Haematopoietic stem cells are the little seeds that will provide all the blood cells. All marrow donors from the limousin, who may be members of the patient´s family, or on the contrary volunteer donors, have their HLA typing in this laboratory.

After the transplant, the regular check on chimaerism (how well the donoŕs and recipient´s lymphocytes work together) is carried out by blood tests analysed in the Immunology Laboratory.

GED_GENE-DS-926 A - PAO 01-11

4- A particular case : the pre-transplant assessment

If your illness requires a marrow transplant, it is important, before the decision to carry out this procedure to check that there is no contraindication. There are several kinds of stem cell transplants, either autologous transplantation (where the patient is his own donor) or allogenic transplants (transplants from one person to another).

A patient's tolerance of autologous transplants, even if they are sometimes difficult, does not require an exhaustive pre-transplant assessment, provided that there is no history of intolerance of chemotherapy treatments.

Issues around tolerance of allogenic transplants are much more difficult, even if in the course of the last ten year periods the maximum age for these has risen by about 40 years and now stands at over 65. Nonetheless it is essential to be sure that the various organs are functioning properly before going as far as to recommend an allogenic transplant.

So you will have the benefit of :

- various blood tests to check the state of your kidneys, liver... but also more complex tests such as :
- X-rays of your chest, and sinuses, and a panoramic X-ray of your teeth to check for any latent infections, often involving funghi, together with a specialised doctor's examination,
- Tests of your respiratory function: You will be asked to breathe into tubes to assess your lung capacity...
- An ECG examination, a painless test to check there are no abnormalities in your heart function,
- And depending on your state of health, other specialists will be asked for their comments: gastroenterologist, diabetes specialist, dermatologist...

All these tests will be arranged by the transplant coordination nurse and the results will be communicated to you at the appointment when the diagnosis and your treatment is explained to you, which will be after your case file has been examined in all its detail at the Multidisciplinary Coordination Meeting.

GED_GENE-DS-926 A - PAO 01-11

5- Prevention of pain caused by invasive procedures

Pain is not inevitable... There are a wide range of means to combat it, whether it is the spontaneous pain linked to your illness or to other related pathologies (rheumatism...) or to invasive procedures. Do not hesitate to talk to your haematologist about it.

A person's pain threshold varies from individual to individual, and there is no shame in fearing an examination that a neighbour or other patient tolerates perfectly well. For a long time, the clinical haematology department has put in place different means involving medication or not, to reduce pain, including that of simple repeated blood tests when you haven't a vein.

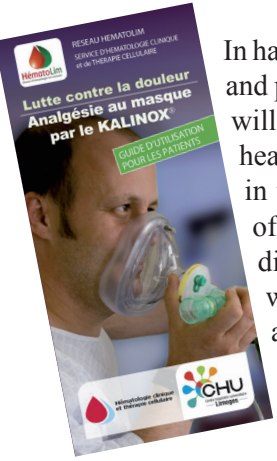
GED_GENE-DS-926 A - PAO 01-11

The various means of avoiding pain caused be invasive procedures that we have available to you are the following :

5-1- The anaesthetic patch

You will be given a leaflet with instructions.

5-2- Pain killers administered through a mask



In haling this gas provides sedation with awareness of what is going on and partial pain relief to make carrying out the procedure easier. You will therefore not be put to sleep, you will stay aware and you will hear what is said to you and be able to answer questions. Breathing in the gas will lessen your anxiety and may bring about a feeling of euphoria and changes to how your senses react. These effects disappear minutes after you stop breathing in the gas mixture. You will administer the gas yourself under the supervision of a nurse and breathe normally. This begins 3 minutes before the procedure is begun, and will continue throughout it - for around 15 minutes.

What is Kalinox®?

It is a pain relieving gas made up of oxygen and nitrous oxide in equal proportions. Kalinox® has a calming effect on pain and anxiety when you breathe it through a mask that you will apply yourself to you face. This technique is used as a habitual practice with children who are afraid of injections and with adults suffering burns prior to their dressings being applied, or for anxious patients at the dentist's...

GED_GENE-DS-926 A - PAO 01-11

Is it effective?

This technique has been used by more than 30 000 patients, with a good ratio of effectiveness to side-effects, and this has led to it being recommended by the Transparence Committee of the ANSM (Agence nationale de sécurité du médicament et des produits de santé) on the 10th July 2002.

It is not an anaesthetic, it is pain relief.

In practice, how it is used ?

Using Kalinox® is very simple :

Talk to the nursing staff before the invasive procedure about using Kalinox®.

Put the mask on your face yourself. The mask the nurse hands you is attached to a bottle of Kalinox®.

From just before the procedure and all the way through it, breathe normally using the mask. The full effects will be felt after three minutes.

Do not hesitate to talk during the procedure, as the gas does not stop you speaking and you will not lose consciousness during the pain relief.

You can stop using Kalinox® as soon as you like. It only takes 5 minutes for its effects to dissipate.

Once the treatment is over, hand the single-use mask back to the nurse to throw away.

You apply it yourself, but a nurse will stay with you throughout the examination.

GED_GENE-DS-926 A - PAO 01-11

What are the risks and contra-indications associated with Kalinox® ?

Some people may experience a state of euphoria, over-excitement, or dreams with extreme sensations (vertigo, intoxication, pins and needles...)
In much rarer cases nausea may occur, or headaches or a light drowsiness. However, the fact that **you are in charge of the mask** means you may stop it at will if you are worried by these effects. These sensations are immediately reversible in a few minutes from the moment you take the mask away.

A leaflet explaining how to use it will be handed to you by the nurse before you begin.

GED_GENE-DS-926 A - PAO 01-11

5-3- Premedication

If you don't fail to tell your doctor that you are afraid of pain, he will make allowances, depending on the nature of the procedure and whether it is being performed in outpatients or in the framework of a hospital admission, and will offer you a premedication that could be straightforward pain relief, or a preventive painkiller that is more powerful. It is therefore recommended that when you come for a test your have someone close to you come with you so you can avoid having to drive if you need treatment of this kind.

Moreover, within the haematology department Dr Stéphane Moreau, who is a haematologist has specialised in pain and is at your disposal if you need him. Do not hesitate to contact him on 05 55 05 80 38. He will make an appointment with you and provide the best possible treatment for your pain.

Dr Stéphane Moreau

GED_GENE-DS-926 A - PAO 01-11

Thanks are due to Mr Richard WARE, member of the Regional Haematology Patient's Committee and also volunteer of Cancer Support France Haute-Vienne, whom we warmly thank for this work.

CANCER SUPPORT FRANCE
CSF
HAUTE-VIENNE

3C Régional d'Hématologie

Information for patients

Centre hospitalier universitaire de Limoges

2, avenue Martin Luther King - 87042 Limoges cedex

Tél. : 05 55 05 55 55

www.chu-limoges.fr

GED_GENE-DS-926 A - PAO 01-11