Extramedullary haematopoiesis (EMH) and bone changes: information for patients and parents

CONGENITAL ANAEMIA NETWORK

What is extramedullary haematopoiesis (EMH)?

Blood cells are normally made in the bone marrow – the spongy tissue inside your bones. Extramedullary haematopoiesis, usually shortened to EMH, means blood cells being made outside the bone marrow: most often in the spleen or the liver, and sometimes in other places entirely.

It sounds alarming, and the name does not help. But it is worth understanding what it actually is, because it is not a new disease and it is not something going wrong at random.

EMH is your body trying to help. It is a response to long-standing anaemia, not a separate illness that has developed on top of it.

Why does it happen?

Before you were born, blood cells were made in the liver and the spleen, not the bone marrow. Those sites were switched off around the time of birth, once the bone marrow took over the job.

In someone with a long-standing anaemia, the bone marrow works extremely hard trying to keep up with demand – and in many inherited anaemias it cannot, because the red blood cells it makes are faulty and die early. When the marrow cannot meet demand, the body falls back on those old sites. The liver and spleen start making blood cells again, decades after they last did the job.

The same pressure causes the bone marrow itself to expand. The marrow space widens, pushing outwards against the bone around it.

What are the bone changes?

Where the marrow expands, the bone around it thins and reshapes. In the skull and face this can produce a prominent forehead – the medical term is frontal bossing – along with prominent cheekbones, a flattened nasal bridge, and changes to how the upper teeth meet the lower ones.

Bones elsewhere can also become thinner and more fragile, which raises the risk of fractures. Your team may monitor this with a bone density (DEXA) scan.

These changes happen in childhood, while the bones are still growing and are at their most responsive to pressure from within. They are a sign that the anaemia has been putting the marrow under sustained strain.

Bone changes that have already formed do not reverse with treatment. This is why treating the anaemia early matters so much – transfusion started in good time largely prevents them from developing in the first place.

We have put that plainly because it is not helpful to imply otherwise. If your child already has these changes, treating the anaemia now will stop them progressing and will help everything else – but it will not undo the shape of the bones that have already formed.

Where else does EMH happen?

The spleen and liver are the usual sites, and both may become enlarged as a result. An enlarged spleen can cause discomfort or a dragging feeling on the left side of the abdomen, or a sense of being full quickly when eating.

Less commonly, collections of blood-forming tissue form elsewhere – in the chest, alongside the spine, or in other places. Doctors sometimes call these masses "pseudotumours". That word frightens people, and it should not: they are not cancer, and they are not growths in the sense that word usually means. They are patches of blood-forming tissue in the wrong place.

Most of these masses cause no symptoms at all and are found by chance on a scan done for another reason. Some show up as a shadow on a chest X-ray and are investigated as something more sinister before the right answer emerges.

The one thing to watch

A mass sitting next to the spine can, rarely, press on the spinal cord.

Seek help immediately – go to A&E – if you develop weakness in your legs, numbness or pins and needles, difficulty walking, back pain that is new or severe, or any problem controlling your bladder or bowels. Tell them you have an inherited anaemia and that spinal cord compression from extramedullary haematopoiesis needs to be excluded. This needs an urgent MRI scan.

This is rare. Most people with an inherited anaemia will never experience it. But it is the one complication where hours matter, because nerve damage that is left too long may not recover – and the people who do well are the ones who came in early. That is the reason we have put this in a box rather than at the bottom of a list.

The reassuring part: when it is caught in time, it usually responds well. Transfusion alone can shrink these masses, sometimes strikingly quickly, because taking the pressure off the bone marrow removes the signal driving the tissue to grow. Very low doses of radiotherapy, medicines such as hydroxyurea, and occasionally surgery are the other options, and the choice depends on the situation.

Who is the most at risk?

EMH is more common in people who are not regularly transfused than in those who are. Thalassaemia intermedia (also called NTDT, non-transfusion dependent thalassaemia) and other non-transfusion-dependent anaemias carry a higher risk of EMH masses than thalassaemia major (TDT, transfusion dependent thalassaemia), precisely because regular transfusion keeps the bone marrow quiet. If the marrow is never allowed to become desperate, it never recruits the backup sites.

EMH is seen in thalassaemia intermedia and major, the congenital dyserythropoietic anaemias, sideroblastic anaemia occasionally in sickle cell disease, and other long-standing inherited anaemias.

Two things raise the risk particularly: **anaemia that has gone untreated or undertreated for years, and having had the spleen removed without regular transfusion afterwards**. If you have had a splenectomy and are not transfused regularly, this is worth asking your team about specifically.

How is EMH diagnosed?

Bone changes are usually apparent on examination. EMH in the liver or spleen is found by feeling the abdomen, and confirmed on ultrasound.

Masses elsewhere are found on MRI or CT. MRI is the test of choice if there is any question of the spine being involved.

A biopsy is usually not needed, and is often specifically avoided: these masses have a rich blood supply and can bleed. The diagnosis is normally made from the scan appearance together with your known anaemia. If someone suggests a biopsy, it is reasonable to ask whether your haematology team has been consulted first.

What is the treatment for EMH?

The treatment for EMH is to treat the anaemia. Almost everything else follows from that.

Blood transfusion is the mainstay. Raising the haemoglobin turns down the signal that drives the marrow to expand and recruit the backup sites. In someone who has not been transfused regularly, starting transfusion can shrink EMH masses considerably.

Hydroxyurea (also called hydroxycarbamide) is used in some conditions to reduce the drive on the bone marrow.

Radiotherapy at very low doses is used for masses causing problems, particularly around the spine, and low doses are usually enough because this tissue is very sensitive to radiation.

Surgery is occasionally needed, though it is often avoided where possible because of the bleeding risk and because the other options work well.

Iron chelation does not treat EMH, but it will be part of your care if you are transfused, or if you have iron overload from the anaemia itself. See our leaflets on iron overload.

If treatment for the underlying condition changes – if you start regular transfusion, for example – expect the EMH to be monitored as part of that.

What can I do to help myself or my child?

Keep up with transfusions and appointments. This is not a condition where feeling well means all is well: EMH develops quietly over years, and the treatment that prevents it is the treatment you may not feel any benefit from day to day.

Learn the spinal warning signs above and make sure your family knows them. If your child is old enough, tell them too, in a way that does not frighten them – "if your legs ever feel weak or funny, tell someone straight away" is enough.

If you have had your spleen removed and are not on regular transfusion, ask your team whether you should be monitored for EMH.

For bone and facial changes, ask about dental and orthodontic review. Changes to how the teeth meet are common, treatable, and easy for everyone to overlook while attention is on the blood.

The appearance changes are worth naming honestly. They are visible, they affect how people see themselves, and children in particular can find them hard – especially in adolescence. This is a reasonable thing to ask for psychological support about, and it is not vanity to mind. If it matters to you or your child, say so; it is one of the things your team can help with, and one of the things others with the same condition understand without needing it explained.

EMH is common, usually harmless, and treatable. The serious form is rare – and it is one of the few things in an inherited anaemia where getting help the same day genuinely changes the outcome.

When to seek medical advice

Get help immediately – go to A&E – if you have:

- Weakness in your legs, or difficulty walking
- Numbness, tingling or loss of sensation
- New or severe back pain
- Any difficulty controlling your bladder or bowels

Contact your team soon if you notice:

- Pain, fullness or a dragging feeling in the upper abdomen
- Increasing tiredness or breathlessness
- A change in the shape of your child's forehead or head, or in how their teeth meet

Can we help?

CAN (Congenital Anaemia Network) is a charity specifically for patients with inherited anaemias. It was started by a group of patients and doctors, working together to tackle some of the problems of having an inherited anaemia – the lack of information and the loneliness of not knowing anyone else with your condition. We run events for patients to meet each other, as well as provide some additional information, support and services for patients who need that extra bit of help.

If you want to know more visit www.togetherwecan.uk or email us: info@togetherwecan.uk

Do you know your care should involve a specialist centre for inherited anaemias? These conditions are rare enough that few doctors see many of them and all patients with rare inherited anaemias should be under the care of a haemoglobinopathy specialist. Please read our 'How red cell services are organised in England' information sheet. If you don't know who your specialist service should be, please get in touch with us so we can help you find out.