Sickle cell disease (SCD) and other hemoglobinopathies

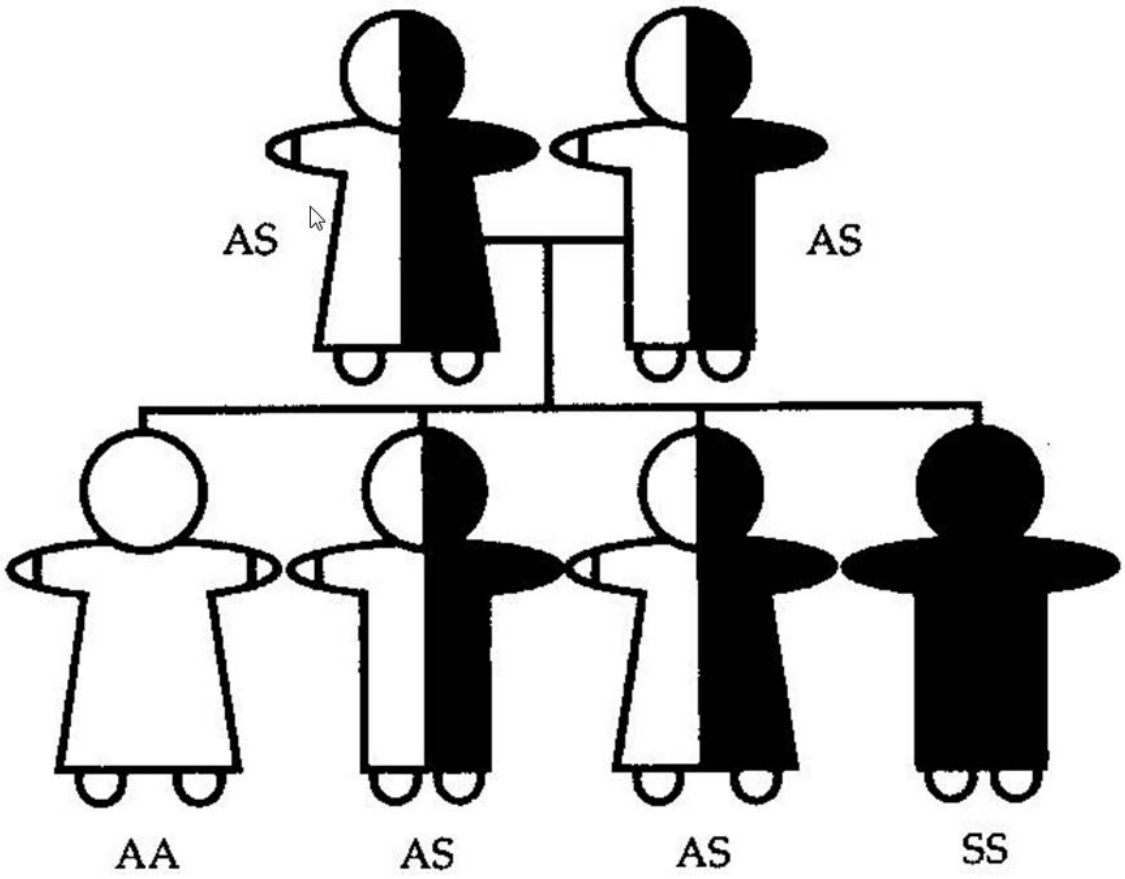
You have received this leaflet, because your child has been diagnosed with sickle cell disease. We can imagine how overwhelming such a diagnosis must be and want to help you as much as possible to understand and manage your child‘s condition. Even though you may already know what SCD is, we would still like to explain it step by step.

What is SCD?

SCD is an inherited blood disorder which can affect any part of your body, any organ, any function. The problem lies in the iron-binding protein inside your red blood cells, the hemoglobin (Hb). Sickle patients’ Hb varies from normal Hb only in a tiny detail, but this difference has serious consequences. Healthy red blood cells look like doughnuts. Their perfectly round shape enables them to flow smoothly through even the tiniest blood vessels. Sickle patients’ red blood cells tend to adopt a sickle-like shape, which causes two problems: the red blood cells tend to get stuck easily in small vessels, and they shred fast. These two shortcomings account for numerous problems. We will look at those further down the line.

How do you get sickle cell disease?

Sickle cell disease is inherited. The normal hemoglobin is called HbA; the “Sickle Hb” is called HbS. There is also HbC, which is very similar to HbS, and a number of other, less common abnormal Hb’s.
A **healthy** person inherits one gen coding for HbA from his mother and one from his father and will thus test HbAA.
A person who has inherited one normal gene coding for HbA and one abnormal gene coding for HbS (or HbC), will test HbAS (or HbAC) and carries the **sickle trait.**
A person who inherited two genes coding for HbS (or HbC), tests HbSS (or HbSC) and has **sickle cell disease**.



Most of the time, this will happen, because the parents were not aware that they both carry the trait. Unless you got tested, you would not know, because you would usually not experience any symptoms. Unfortunately, in this situation, each of your children has a 25% risk of being born with sickle cell disease. This does not mean one out of four children. It means one chance out of four for every child: theoretically, it is entirely possible for a family with four children to have all four children affected – or none.

What problems can sickle patients experience?

Problems are mostly due to the red blood cells' tendency to shred fast (anemia) or to their tendency to "sickle", thus blocking the flow of blood and oxygen to the tissue (occlusive problems).

Below is a list of possible problems. This list does not aim to be complete.
We have not put it together in order to cause you alarm, but in order to alert you to warning signs, so that danger is recognized early and damage can be prevented.

Anemia:
Sickle patients have a low hemoglobin and fewer red blood cells circulating than other people. This is **not** due to lack of iron, but due to the fact that red blood cells constantly go to waste and the body needs to produce new ones. As sickle hemoglobin gives off the oxygen much easier than hemoglobin A most sickle cell individuals can manage as well as people with higher hemoglobin levels. However, their physical endurance is limited. If something is wrong and causes the blood count to drop even further, it can quickly reach a life-threatening low, and the patient may need a blood transfusion immediately.
It is important to know the child's usual demeanor and level of activity and to pay attention to unusual fatigue, pallor and discoloration (jaundice) of the eyes.

Vaso-occlusive episodes:
Blood flow to tissue is hampered by acute sickling. When tissue doesn't get enough blood, it is starved of oxygen and nutrients. This causes severe pain in the affected area (painful crisis). If the situation is not relieved, the tissue dies. Unfortunately, this can happen anywhere in the body. Examples are back pains, pain in arms and legs, abdominal pains, swollen and painful fingers (in small children). Harder to recognize is damage to internal organs like the kidneys. This is why we may ask you to do lab tests at certain intervals.

Splenic sequestration:
This is a dangerous situation which is often prompted by infections. The blood pools in the spleen. The spleen can hold an enormous amount of blood, which is then missing in the circulation. The Hb drops to life-threatening levels. The spleen becomes enlarged, hard and painful. Affected children are pale and listless. Splenic sequestration is an emergency which requires immediate attention at the hospital, iv fluids and blood transfusion. It is important to let your doctor teach you how to feel for an enlarged spleen, and you should make it part of the daily routine (for instance while changing pampers or dressing your child) to assess the spleen.

Acute Chest Syndrome:
A complication comparable to splenic sequestration, but happening in the lungs. Acute chest syndrome should be suspected, if there is chest pain, fever and fast breathing. Cough only develops later.

Priapism:
Parents of boys need to be aware of the possibility of painful, prolonged erections. The mechanism is the same as in the complications listed above: blood pools in the

erectile tissue of the penis due to sickling. Repeated, brief episode must be reported to your doctor, since they may be warning signs that a major episode is about to happen. “Stuttering priapism” needs to be treated in order to prevent a severe episode.

Stroke:
If blood-flow to the brain is restricted, patients may suffer strokes. These can be major strokes, presenting exactly like in an elderly person, but symptoms can also be barely noticeable. Anything unusual, i.e. sudden clumsiness, difficulties with vision or speech, sluggishness, dizziness, needs attention. Miniature or “silent” strokes can happen repeatedly and eventually result in decline of school performance. This should alert parents and teachers.
Patients at risk for strokes or after strokes need treatment to prevent (further) episodes. Transcranial Doppler Sonography helps to identify who is at risk and should consider preventative treatment.

Retinopathy:
After the tenth birthday, every patient with SCD, especially those wit HbSC, need to have yearly, thorough eye exam including fundoscopy (examination of the back of the eyes with fully dilated pupils). Involvement of the retina can lead to blindness, but thankfully, we can prevent this with early diagnosis and treatment.

Infections:
Sickle patients are more susceptible to certain infections. Your child needs to see the doctor if he or she is ill, especially if there is fever higher than 38,5 °C without any obvious explanation. Do not give medicine to lower the fever!! fever is a very precious warning: go and see the doctor. It is vitally important to have your child fully vaccinated.

Others:
Since sickling can affect any organ, there is a wide range of possible complications, including kidney, ENT and abdominal problems. We are not going to list all, since the purpose of this brochure is not to be a comprehensive medical guide, but to simply familiarize you with the most important conditions. Most of these complications may never happen to your child, but you need to be aware of the possibility, so that problems can be treated promptly. The more you know about your child’s condition, the easier it is for you to recognize warning signs.

What can you do to keep your child healthy?

* Keep child well hydrated. Extra fluids especially when sweating, fever or . infections occur.

* avoid getting cold; no swimming in water that is less than 25 °C

* avoid unreasonably rigorous exercise

* see your doctor when child gets sick
* see doctor without delay for unclear pain, especially in abdomen, back and joints

*let your doctor show you how to feel for the spleen. Feel for the spleen every day. Hard, bloated, painful abdomen calls for an immediate doctor's visit

*pain crisis: give pain medication early in the game and give enough. Never run out. Don't let anyone doubt the severity of the pain - it really does hurt. Paracetamol or Ibuprofen will often be enough, but sometimes your child will need stronger pain medication, which your doctor has to prescribe.

*talk to your child's teachers

* If your child has fever, see the doctor. Do not try to lower the fever!
*give Penicillin prophylaxis daily (usually until the 5th birthday.
Some centers recommend it for longer than that.)

*Vaccinate your child with all routine vaccines and against pneumococcus and meningococcus. Vaccinate against influenza every year.

*regular check-ups. It is important for your doctor to see your child when he or she is well. Otherwise, we have no comparison when something is wrong. The recommended schedule is:

Under 6 months: every 4 weeks
6-12 months: every 2 months
1-5 years: every 3 months
5-10 years: every 4 months
Over 10 years: every 6 months.
*Labs and other investigations:
Blood count and reticulocytes every 3-6 months

Liver / kidney values and urine analysis once yearly
After the 5th birthday: yearly abdominal ultrasound
After the 10th birthday: yearly eye checkup, ECHO

* Some medications are contraindicated for sickle patients, because they can cause severe pain crisis or shredding of the blood. Not everyone is aware of this. We need to avoid Rocephin (Ceftriaxon), an iv antibiotic, and steroids given by mouth or in the vein, unless there are special circumstances making it unavoidable. Inhaled steroids for asthmatic patients are not a problem.

Is there a permanent cure?

At this point in time, the only permanent cure for sickle cell disease is a bone marrow transplant. This means, the patient's bone marrow needs to be destroyed, after which he receives bone marrow from a donor.
The procedure is still not entirely satisfactory. It is difficult, risky, not always successful and extremely expensive. We are placing our hopes for the future on the development of gene therapy. Presently, this is not an option – yet. However, for certain patients with serious complications or numerous pain crises, there are treatment options which help to improve their situation. Hydroxyurea, a medication taken by mouth, is one of those options. If the need arises, your doctor will discuss those with you.

We know that this is a lot to take in. Much of the above information may be worrisome. However, we want to reassure you that there is a lot that you can do to prevent complications. Even when things go wrong, there is still a lot that we can do to make it better. In this day and age, most patients with sickle cell disease live a full life. If you have any questions or concerns, please talk to us. We are here to help you.

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