

The Teenager with Sickle Cell

Professor F.I.D Konotey-Ahulu (the Dr Kwegyir Aggrey Distinguished Professor in Human Genetics, University of Cape Coast, Ghana), continues his series on sickle cell disease.

Reading abstracts published in a Nigerian newspaper of my first article (NA, Jan 2001), a lady wrote to me: "I have three children. Both my husband and I are 'AS'. Our daughter is 'SS', her younger brother is 'AA', and our last born is 'AS'. Is there no cure for Sickle Cell Anaemia?"

I shall come to this question after dealing with an Ache/Ache teenager, but first let us see whether you got full marks answering the questions I set you in the test in New African March issue.

Q1: Can an 'AS Trait' suffer from hand-foot syndrome?

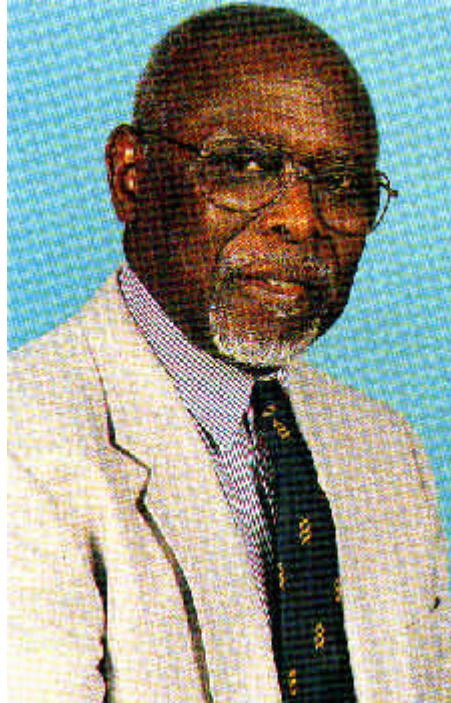
Answer: No [Sickle Cell traits do not have sickle cell crisis. The hand-foot syndrome is a manifestation of sickle cell crisis. Sickle Cell Traits have run at the Olympic Games at Mexico City, 8000 feet high, where the oxygen concentration is thinner than at ground level, and beaten the whole world. So stories about sickle cell traits dying suddenly when exercising on a mountain at 4,000 ft are based on ignorance. (See my website www.sicklecell.md where the subject has been treated in more detail).

The proportion of Haemoglobin 'S' in the Sickle Cell Trait (AS) is less than 39.7%, and can be as low as 20% - not enough at all to change the shape of the cell in the body from round to sickle shape. We shall devote a whole article later to the Sickle Cell Trait. But if someone who was thought to be 'AS' had a real sickle cell crisis from fever, exercise, pneumonia, or flying, then the blood should be checked again and the 'S' and 'A' fractions by haemoglobin electrophoresis quantified.

If S% is greater than A%, then the smaller 'A' has come from a beta-thalassaemia gene, and the patient has sickle-cell beta-Thalassaemia (Ache/Ache), not sickle cell trait. The 'small A' does not come from a normal Haemoglobin 'A' gene (Norm) but from a beta-Thalassaemia gene (Ache). Read that again. Have you got the point?

A true Sickle Cell Trait child (Haemoglobin 'A' greater than Haemoglobin 'S' ie Norm/Ache) cannot have the hand-foot syndrome, but a Sickle Cell beta-Thalassaemia child ('S' proportion greater than 'A' ie Ache/Ache) can suffer from the hand-foot syndrome.

I hope all this is not too complicated. "AS" is NOT a disease; "SF" is a disease; S Thal is a disease. If in doubt, measure the amount of 'S' present.



Q2: Does Sickle Cell Trait mean 'SC' phenotype?

Answer: No. 'S' is an Ache haemoglobin, and so is 'C', so the 'SC' phenotype is Ache/Ache not sickle Cell Trait which is Norm/Ache. Some doctors do not know the difference between Sickle Cell Trait (AS) and the Sickle Cell Disease (SC phenotype), so they call 'SC' Sickle Cell Trait. The reader of this article should be able to correct them. Don't be afraid of doctors or nurses. If they are confused about Sickle Cell Trait and Sickle Cell Disease, help them out.

Q3: Is there such a person as 'SC Trait'?

Answer: No. Don't use the 'S' to stand for 'Sickle' and 'C' for 'Cell'. In 'SC' the 'S' is "Sickle Cell Haemoglobin" and the 'C' is 'Haemoglobin C', so 'SC' stands for "Sickle Cell Haemoglobin C Disease". Certainly not 'Trait'.

Q4: Can malaria kill a Sickle Cell Disease child suddenly?

Answer: Yes, indeed. The rumour that sickle cell disease patients including people with sickle cell anaemia are resistant to malaria is dangerously false.

Q5: What circumstances can cause a stroke in a Sickle Cell Disease person?

Answer: Usually there is a combination of factors like:

- Lack of oxygen, or anything that reduces the amount of oxygen that reaches the lungs - things like infection of the lungs (pneumonia), large tonsils obstructing breathing in the night, high fever which demands more oxygen in the tissues thereby removing oxygen from the blood, flying long distances, severe exercise, under-water swimming, and asthmatic attacks.
- Anything that slows down the blood flow - like fluid loss such as vomiting and diarrhoea, hot weather with much sweating, not drinking all day by a sick child, or when fluids are withheld from someone due for an operation (the 'nil by mouth' notice should see to it that fluids are given through the vein or scalp in the case of a baby, otherwise the operation may be successful only to find the patient ending with a stroke or severe sickle cell crisis from serious dehydration.

Other things that can cause crises but not necessarily a stroke are:

- Being chilled, or caught in the rain.
- Squatting, or curled up in bed or chair for a long time, preventing circulation of red cells from trapped areas into the lungs for oxygenation
- Certain personal idiosyncrasies like (in the case of one diplomat with sickle cell disease) eating oranges, and of another drinking gin.
- Staying up late at night.
- Fatigue.

Q6: Why are painkillers not necessarily the most important requirement for sickle cell crisis when the patient arrives in hospital?

Answer: Because, as usual, the sickle cell crisis has been caused by something, and without finding what this 'something' was the patient's life could be put in jeopardy.

Suppose an acute appendicitis was the cause of the young man's severe joint pains. If painkillers were pumped into him without realising he had appendicitis, the appendix could

Disease

burst, while the patient was quite calm under big doses of painkillers.

Or take a young woman (SS, Ache/Ache) with severe joint and tummy pains. She could have a ruptured ectopic pregnancy, bleeding into the abdomen. "Oh give her painkillers to shut her up", could well be a death sentence. Prompt surgery was vital for her.

Q7. What is priapism?

Answer: Prolonged erection of the penis going on hours and hours without subsiding. This could be the first sign that a boy had sickle cell disease (Ache/Ache). Of course, there are other causes of priapism like leukaemia and spinal cord injury which have nothing to do with sickle cell disease.

Q8: How can snoring affect the wellbeing of the Sickle Cell Disease patient?

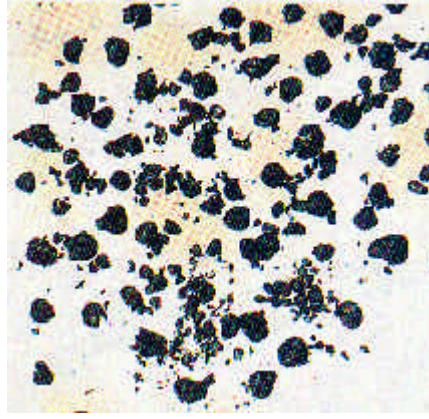
Answer: Snoring reduces the amount of air entering the lungs. Combined with lack of movement in the night, red cells could alter their shape in the blood to sickle shape and precipitate a sickle cell crisis.

Q9: Can a Sickle Cell Trait person have only 20% of 'Haemoglobin S'?

Answer: Yes. Some people used to think that an 'AS' person would have 50% Haemoglobin 'A' and 50% Haemoglobin 'S', but this is not so.

There are three known levels of Haemoglobin 'S' in Sickle Cell Trait - 20-25%, 30-33% and 37-39.5%. With these levels, it is impossible to have a sickle cell crisis in normal life.

Abnormal conditions like an anaesthetist forgetting to turn on the oxygen during an



Gall stones removed from the gall bladder of a sickle cell disease patient. These pigment stones can cause pains in the stomach, and often harbour bacteria which can precipitate sickle cell crisis.

operation can cause death in the Sickle Cell Trait or serious damage to the non-Sickle Cell Trait. The Sickle Cell Trait should always inform the surgeon or anaesthetist about the trait before any surgery is performed so that adequate oxygen is given.

Q10: The Sickle Cell Test on Dr Konotey-Ahulu's mother was positive, but on his father's blood the test was negative. How was it possible for three of their 11 children to have suffered from hand-foot syndrome?

Answer: It requires 'Ache/Ache' to have hand-foot syndrome. If the mother of Dr Konotey-Ahulu supplied one 'Ache' to her children, then his father must have supplied the other 'Ache'. But Rev Konotey-Ahulu (the father) was 'Sickling Negative' which means that his 'Ache' was not 'S'. What other 'Aches' are there? 'Ache-C', 'Ache-beta Thal', 'Ache-D', 'Ache-Korle Bu', etc. In fact Rev Konotey-Ahulu was 'AC' phenotype. As Mrs Konotey-Ahulu was 'AS' - three of their

children were SC, and that was why they had the hand-foot syndrome.

Q11: "Why is there no cure for sickle cell anaemia?"

Answer: Well, you could ask the same question of hereditary high blood pressure, gout, diabetes, the blindness of an albino, or even of hereditary asthma. Why is there no cure for them?

This is because all these conditions "run in families", in other words, they are hereditary. In my tribal language, to treat a disease is the same as to "cure a disease", so "there is no cure" has always been interpreted to mean "there is no treatment", which is quite wrong.

All these conditions are incurable, but they all (including sickle cell disease) can be treated. Even in diabetes, circumstances can mean the difference between life and death. The same is the case in hereditary asthma. The diabetic who often gets drunk (insulin or no insulin) will get his diabetic crisis (coma) and is unlikely to live long. The asthmatic who persists in smoking, will have many asthmatic crises and will die young.

Sickle cell disease patients have fewer crises when they pay attention to circumstances - when they dress properly, carry rain coats and umbrellas on journeys, avoid late nights, get infections taken care of promptly, and drink plenty of water (up to 3 to 4 litres a day, more on hot days).

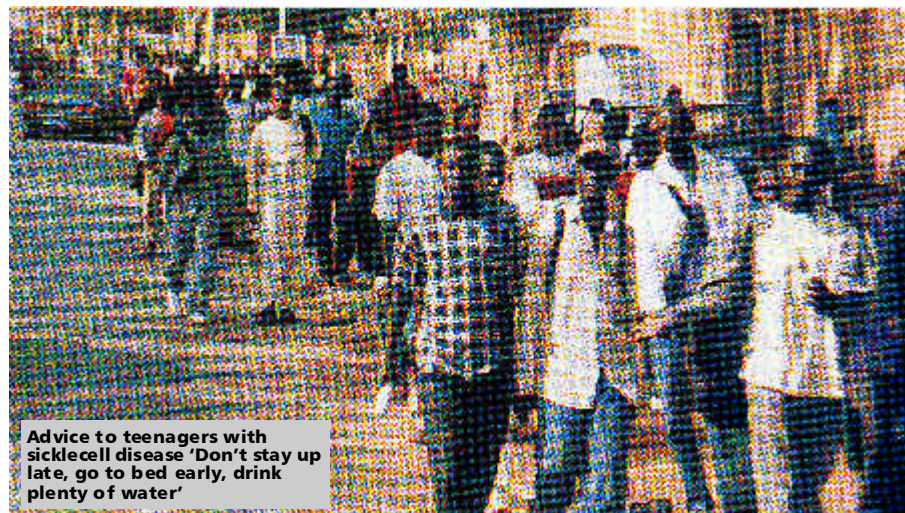
To "cure" sickle cell disease in a person is to change the "blood factory" in the bone - which can be done through bone marrow transplantation. Although it costs not less than \$20,000 (with some degree of procedure mortality), bone marrow transplantation has been able to produce enough normal 'Haemoglobin A' to prevent crises, whilst the patient takes drugs for the rest of his/her life, with the added complication of not having any children. Some people find this satisfactory, others not so satisfactory.

Sickle cell disease patients have been known to control their illness, and achieve great things without resort to drugs like hydroxyurea which has been promoted widely as if it was a cure.

The Ache/Ache teenager

This teenager has sickle cell anaemia (SS) or sickle cell Haemoglobin C disease (SC), or sickle cell beta-thalassaemia (Sb Thal), or sickle cell Hereditary Persistence of Fetal Haemoglobin (SF hereditary).

His parents may not be aware they are carrying the genes passed on to him, and are often surprised at the teenager's illness. Apart from hand-foot syndrome noticed when he/she was young, yellow eyes and a large tummy when the child became older, the parents have also smaller stature with delay in onset of puberty.



Advice to teenagers with sickle cell disease 'Don't stay up late, go to bed early, drink plenty of water'



African doctors and nurses are advised not to treat sickle cell pain with Diamorphine (heroin) or Morphine

Priapism may be troublesome in the boy, and the girls may be worried about delay in onset of periods. Headaches and abdominal pains are common, with complaints of being easily tired.

Some teenagers attain average height and others can be very tall, making them even more distressed when their younger siblings show signs of puberty ahead of them. They should not worry. They may miss classes often, but some use the time at home profitably and outshine their mates when they return to school or college.

'SS' people are more anaemic (short of blood) than the other phenotypes, but they have something in their system that makes them cope well with a low haemoglobin.

The 'SC' phenotype may have a normal blood level (haemoglobin) but if they despise circumstances, they can have even more severe crises than the 'SS'.

The SF and Sb Thal phenotypes also have crises, and may also have hip involvement with a limp like the other phenotypes. This is known as Avascular Necrosis of the head of the femur. The shoulder can also rarely be involved.

Advice

My advice to teenagers with sickle cell disease is as follows:

1. Keep a diary and find out what makes you get a sickle cell crisis.
2. Do not stay up late. I know this is difficult when you feel you have lost a lot of school time, and exams are round the corner, but do not risk it. Go to bed early.
3. Drink plenty of fluids every day - more in hot weather. Coconut juice is better than bottled soft drinks.
4. Anticipate problems and avoid them. If invited by school friends to go camping in

the open air, refuse in case you are caught in a heavy downpour.

5. Know your limitation with regard to exercise tolerance.
6. Dress properly. A raincoat and umbrella will prevent weeks in hospital.
7. Prevent and treat malaria in the tropics, or when you travel from temperate climates to the tropics. Treat sore throats and urinary tract infections.
8. If prone to sore throats and crises, Penicillin 250 mg 4 times a day will help. Pneumovaccine is administered to those who are prone to crises.
9. Folic acid 5 mg daily plus other vitamins.
10. Do not over eat, especially in the evenings. Certain foods like rice and beans eaten late at night are guaranteed to start a crisis at about 3 am - with severe pains in the low back, joints, abdomen, and chest. Abdominal pains that persist need investigating with an Ultrasound to make sure gall stones are not the cause of the problem.

Emergency treatment of sickle cell crisis

I NEVER, EVER GIVE Morphine or Diamorphine for pain in sickle cell crisis because these can suppress breathing and (without oxygen) cause more blood cells to sickle.

A patient who walks into hospital may find himself/herself ending up in Intensive Care Unit when suppressed breathing has developed into a "chest syndrome".

Fluids into the vein (carefully monitored to prevent flooding of the lungs) with pain killers that do not suppress breathing is what I recommend, for example Ketorolac injection or Diclofenac suppositories with Ranitidine

protection of the stomach.

I will address pain control in a future article, but it is important to remember that doctors in different countries approach pain differently. Ghanaian and Nigerian experts never use Morphine or Diamorphine for sickle cell crisis pain and I totally agree with them.

British doctors use both Morphine and Diamorphine (heroin) for sickle cell pain. Doctors in the USA are banned from using Diamorphine for any kind of pain in medical practice. Heroin use is illegal in the USA.

Patients from West Africa visiting the UK need to carry a card indicating how their pain is managed at home, otherwise they may find themselves given Morphine/Diamorphine in the UK and may end up with the so-called acute chest syndrome.

The cause of the crisis must always be tackled - tonsillitis, otitis media (ear ache), urinary tract infection, tooth sepsis, dehydration, appendicitis, infected gall stones.

Painful limbs are kept warm and soothed with liniment. Oxygen is given to help breathing. Patients should not be stuck in bed, but should be up and walking about as they are better even though limbs may still feel sore.

Try answering the following questions:

1. What do the following stand for: AS, SC, SS, AC, SF, Sb Thal?
2. Which of the phenotypes in Question 1 is not a Sickle Cell Disease Phenotype?
3. Why do some people have sickle cell crisis immediately after birthday celebrations?
4. The Krobo/Dangme-Ga word for "cure" is the same as for "treat" (tsa, pronounced cha as in "charcoal"). How do you explain to a Krobo mother or Yoruba mother that although sickle cell disease, like hereditary blood pressure, cannot be cured, it can be treated?
5. Why should we not be surprised that some sickle cell disease patients are brighter than their brothers and sisters?
6. A young student with sickle cell disease (SS, SC, SF, or Sb Thal) wakes up with a severe sore throat. The weather is very hot and he sweats a lot, but he finds it difficult all day long to swallow even a glass of water. What could happen in the middle of the night, and why?
7. When a sickle cell disease patient is being given fluids through a vein during a sickle cell crisis, why should the blood flow be carefully monitored?
8. When a teenager with 'Ache/Ache' is worried about delay of puberty, how can she/he be reassured?

(Readers could send their responses direct to Dr Konotey-Abulu at konotey-abulu@sicklecell.md or his website