

### What is schwannomatosis?

Schwannomatosis is a rare form of neurofibromatosis that has only recently been defined. Similar to people with neurofibromatosis type 2 (NF2), people with schwannomatosis develop multiple schwannomas on cranial, spinal and peripheral nerves. However, unlike NF2, they do not develop vestibular schwannomas. Additionally, they do not typically develop other types of tumors associated with neurofibromatosis such as meningiomas, ependymomas, neurofibromas or astrocytomas and there does not seem to be an increased risk of developing malignancies. People with schwannomatosis often have problems with pain. In many patients this is their only symptom.

Like NF1 and NF2, not everyone with schwannomatosis will have the same symptoms and the severity can vary between patients.

### How common is Schwannomatosis?

The incidence of schwannomatosis is not known yet. Some estimates are as high as 1 in 40,000 people.

### How do people get schwannomatosis?

While schwannomatosis is a genetic condition, it does not have a clear pattern of inheritance like NF1 and NF2. Also, unlike NF1 and NF2, people may carry a schwannomatosis gene change but not ever develop symptoms. In some families, more than one person has been diagnosed with schwannomatosis. This is called **familial schwannomatosis**. In other families, only one person may be diagnosed with schwannomatosis. This called **sporadic schwannomatosis**. Some people have features of schwannomatosis that are limited to only one part of their body. This is called **mosaic schwannomatosis** or **segmental schwannomatosis**.

A gene called **INI1** (also called **SMARCB1**) was identified in 2007 as one of the genes that can cause schwannomatosis. However, for many people with schwannomatosis, the INI1 gene is not the cause of their condition. As yet, there have been no other genes found to cause schwannomatosis.

### What are the Symptoms of Schwannomatosis

As schwannomatosis is a recently recognized disorder, the full spectrum of symptoms is not yet known. For some people, the first symptom of schwannomatosis is pain. This pain may be in any part of the body and may become very debilitating. Schwannomatosis may also cause numbness, tingling, or weakness due to nerve or spinal cord compression.

Other symptoms (depending on the location of the tumor) may include:

- Difficulty with urinating or bowel dysfunction
- Facial weakness
- Headaches
- Lumps or swollen areas where tumors form under the skin

- Numbness
- Vision changes
- Weakness

Unlike NF2, people with schwannomatosis do not develop vestibular tumors and do not go deaf. They also do not typically develop any other kinds of tumors associated with neurofibromatosis (for example, meningiomas, ependymomas or astrocytomas) and do not have learning disabilities. The schwannomas that form as part of schwannomatosis are benign, with very rare exceptions.

### **How do doctors diagnose schwannomatosis?**

The diagnosis of schwannomatosis is made on the basis of clinical findings. Individuals are considered to have definite schwannomatosis if they meet the following criteria:

1) Two or more pathologically sampled schwannomas

AND

2) Lack of radiographic evidence of vestibular nerve tumor on an imaging study performed after age 18 years.

Individuals are considered to have presumptive schwannomatosis if they meet the following criteria:

1) Two or more pathologically sampled schwannomas without symptoms of eighth nerve dysfunction at age >30 years

OR

2) Two or more pathologically sampled schwannomas in an anatomically limited distribution without symptoms of eighth nerve dysfunction at any age.

Some people may have a segmental form of schwannomatosis, meaning that symptoms are limited to only one part of the body. It is important to distinguish between segmental schwannomatosis and NF2, as the symptoms of both can overlap.

### **Is genetic testing for schwannomatosis available?**

Genetic testing for the INI1 gene is available and can be coordinated for families in which testing would be appropriate. Sometimes genetic testing can involve testing for both the INI1 and NF2 genes, as well as possible staining techniques that can assist with diagnosis. Additionally, it is important to determine whether testing should be conducted using blood or tumor samples, or

both. It is a good idea for anyone with questions about genetic testing and the possible risk of developing schwannomatosis to meet with a genetic counselor to learn more about their individual case and how to arrange for testing that would be most appropriate for them.

### **Can schwannomatosis be passed on in families?**

The genetics of schwannomatosis are not yet clearly understood so it can be difficult in some families to determine who might be at risk of developing symptoms of this condition. In some families, it appears that there is up to a 50% chance of a child inheriting schwannomatosis from an affected parent. In most families, the chance of an affected parent having an affected child appears to be less than 50%.

### **How is Schwannomatosis treated?**

There is no one treatment course that is right for everyone with schwannomatosis, and as of yet there are no medications known to be effective against the schwannomas of schwannomatosis. Management recommendations are based on the specific symptoms that a person develops. It is very important to see physicians that are experienced with schwannomatosis.

Some people with schwannomatosis have no symptoms and are only diagnosed because of the presence of multiple schwannomas. Management for these people can include annual neurologic evaluation and possible imaging as recommended by an experienced schwannomatosis medical care provider.

For people who experience pain related to schwannomatosis, treatment may include multidisciplinary management of pain. Surgery may be considered to reduce pain in certain circumstances where medication and other interventions have failed. However, surgery may not reduce pain and can in some cases lead to an increase in painful symptoms.

Surgery may also be considered for people experiencing neurologic or other organ system dysfunction. Any time surgery is being considered for a person with schwannomatosis, it is important that a neurosurgeon experienced in schwannomatosis care becomes involved to allow for the best possible outcome.

### **What is the prognosis for someone with schwannomatosis?**

Because so little is currently understood about schwannomatosis, it is difficult to determine the prognosis for people who are affected. Most often, a person's prognosis is based on their specific symptoms. It is important for a person with schwannomatosis to be managed by a medical provider or team with experience in schwannomatosis care.