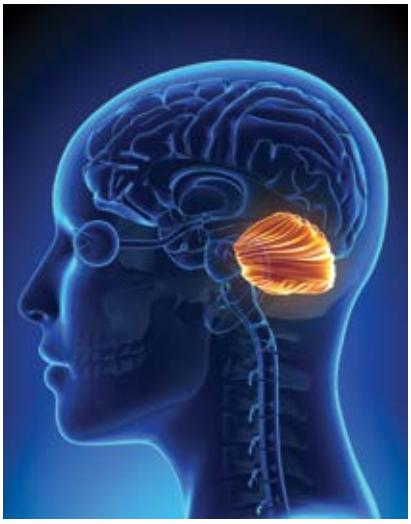
Spinocerebellar ataxia (SCA)

A rare adult-onset inherited condition.

Spinocerebellar ataxia (SCA) is an umbrella term for a group of genetic disorders that result in slowly progressive loss of coordination of gait, causing clumsy and unsteady motion, and often loss of coordination of the hands, speech, swallowing and eye movements . Frequently, atrophy (wasting) of the cerebellum in the brain occurs. The cerebellum is where movement, posture, and balance are coordinated. The symptoms of the condition vary with the specific type of SCA (there are several), and with the individual patient. Signs and symptoms of the disorder typically begin in early adulthood but can appear anytime from childhood to late adulthood, depending on the genetic mutation that has caused this. Early onset forms of the conditions generally tend to be more severe and progress faster.

Over time, individuals with SCA may develop a variety of other symptoms such as cognitive impairment or dementia, numbness, tingling, or pain in the arms and legs (sensory neuropathy); uncontrolled muscle tensing (dystonia); muscle wasting (atrophy), muscle twitches (fasciculations), rigidity, tremors, seizures, tinnitus, vertigo, and involuntary jerking movements (chorea). The condition may be complicated by vision disorders and eye movement paralysis, or have association with heart disease, breathing problems, bone abnormalities and diabetes depending on the type.



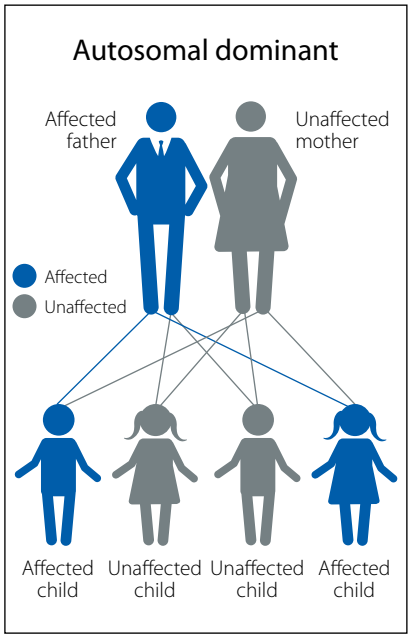
The most precise means of identifying SCA, including the specific type, is through molecular DNA analysis.

Diagnosis

SCA can be misdiagnosed as another neurological condition, such as multiple sclerosis (MS). To obtain a diagnosis, physical and neurological examination, review of family history and exclusion of non-genetic causes is carried out. One means of identifying the disease is with imaging such as an MRI to view the brain. Once the disease has progressed sufficiently, the cerebellum (a part of the brain) can be seen to have visibly shrunk. The most precise means of identifying SCA, including the specific type, is through molecular DNA analysis. Nomenclature and classifications for this condition and its various types has varied over the years and can still cause confusion and debate due to the overlap of symptoms with other conditions.

Causes

Spinocerebellar Ataxia is genetic, which means it is caused by a defect in a certain gene that is present from the start of a person's life. All of us have genes that have little alterations or variations but most of these do not cause disease, when they do they are called mutations. There are various genes that when mutated cause ataxia (see table opposite). What they all have in common is that they make abnormal proteins that affect the function of nerve cells, primarily in the cerebellum and the spinal cord. Some types also cause additional symptoms.



Most SCA is dominantly inherited

Ataxia gene identified in 1993

The first ataxia gene was identified in 1993 for a dominantly inherited type. It was called "Spinocerebellar Ataxia type1 (SCA1)". Subsequently, as additional dominant genes were found they were called SCA2, SCA3, etc. Generally the number behind the SCA refers to the order in which the gene was found. At this time, 36 different gene mutations have been found. In other words, there are dominant ataxia classifications from SCA1 to SCA 36. Genes have also been located for some of the recessive ataxias, the most common being Friedreich's ataxia (FRDA). The most common type of dominantly inherited ataxia is SCA type 3 also known as Machado-Joseph Disease.

Type of Spinocerebellar Ataxia	Gene affected	Clinical features in addition to ataxia
SCA1	ATXN1	Tremors of the hands & numbness in fingers and toes.
SCA2	ATXN2	Relatively common. Involuntary, irregular eye movements that occur when changing focus from one point to another, numbness of fingers and toes.
SCA3	ATXN3	Also known as Machado Joseph Disease. Relatively common. Hand tremors, slowness of movement, involuntary eye movement, drawn back eyelids, numbness, muscle weakness and wasting with muscle twitches.
SCA4	16q22.1	Progressive painless clumsiness, muscle weakness and atrophy.
SCA5	SPTBN2	Early onset but slow progression.
SCA6	CACNA1A	Very slow course, usually adult onset. Relatively common.
SCA7	ATXN7	Damage to the retina with vision loss.
SCA8	ATXN8 / ATXN80S	Decreased sense of vibrations.
SCA10	ATXN10	Occasional seizures. Inherited in recessive pattern.
SCA11	TTBK2	Mild signs.
SCA12	PPP2R2B	Early tremor, late dementia.
SCA13	KCNC3	Short stature.
SCA14	PRKCG	Slow progression of disease.
SCA15	ITPR1	Very slow worsening of gait.
SCA16	SCA16	Head tremor.
SCA17	TBP	Mild mental deterioration.
SCA19	KCND3	Mild ataxia, muscle spasms, mental deterioration and tremor.
SCA21	SCA21	Mild mental deterioration.
SCA22	KND3	Slow worsening of the walk or gait.
SCA25	SCA25	Associated sensory neuropathy.
SCA26	EEF2	Slurred speech.
SCA27	FGF14	Early onset tremor, cognitive deficits.
SCA28	AFG3L2	Nystagmus, ptosis.
SCA29	3p26	Childhood learning deficits.
SCA30	4q34.3-q35.1	Hyper reflexia, adult onset.
SCA31	BEAN1	Normal sensation, adult onset.
SCA32	7q32	Males infertile.
SCA34	6p12.3-q16.2	Skin lesions.
SCA36	NOP56	Tongue atrophy, adult onset.
SCA37	1p32	Abnormal vertical eye movements.

Sourced from https//rarediseases.org/rare-diseases/autosomal-dominant-hereditary-ataxia/

Ataxia results in the degeneration of nerve cells

Eventually the affected nerve cells begin to function poorly and ultimately degenerate. As the disease progresses, muscles become less and less responsive to commands from the brain, causing coordination problems to become more pronounced. Those affected by poor coordination will notice poor balance when walking, inability to run, clumsiness of the hands, a change in speech, or abnormal eye movements.

Treatment and prognosis

There is no known cure for spinocerebellar ataxia and treatments are generally to manage symptoms. SCA is progressive and a person with one of these conditions may eventually require the use of a wheelchair, and need assistance to perform daily tasks. Modification of the home with things such as grab bars, raised toilet seats, and ramps may be necessary. Speech therapy and communication devices such as writing pads and computer-based devices may benefit those affected with slurring speech. Weighted eating utensils and dressing hooks can help maintain independence. Weight control is important because obesity can exacerbate difficulties with ambulation and mobility. Individuals experiencing swallowing difficulties (dysphagia) may suffer significant weight loss and will benefit from seeing a speech language therapist and dietician.

The most common type of dominantly inherited ataxia is SCA type 3 also known as Machado-Joseph Disease.

Other symptoms in addition to the ataxia could include tremor, stiffness, pain, depression, spasticity, and sleep disorders, among others and these can often be treated with medication and/or therapy. Substances that have a neurotoxic effect, including alcohol, are best avoided. People with SCA should be followed by a neurologist annually with visits to physiotherapists, occupational therapists and other specialists as needed. Genetic counselling will be of benefit for patients and families affected by the hereditary ataxias and can be accessed by contacting Genetic Health Services NZ. Ⓡ

References:

http://www.ataxia.org

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