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Balance and tinnitus

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This information has been written to help you understand more about how the human body balances and how it can sometimes go wrong.

Introduction

The control of balance in humans is quite complex, and involves coordination of several sensory systems. These are the musculoskeletal system (**proprioception**), vision and the balance organs in the internal ears. These systems are linked to a centre at the base of the brain - the **vestibular nucleus**. This in turn sends information to, and also receives input from a nearby organ - the **cerebellum**. The coordination of posture and balance is carried out by the cerebellum.

The sensory systems

Let us now look at all the sensory systems which are responsible for balance.

Proprioception

The muscles, bones and joints have sensory nerves which send messages to the brain about muscle activity and movement of the body. The most important joints are those which are involved in weight bearing. These are the ankles, knees, hips and spine. The ankles regulate minor swaying movements, while the knees and hips control larger sway of the body. The muscles of the spine have the function of maintaining the curvature of the spine, preventing people from leaning too far forwards or backwards. They also maintain the head in an upright position.

The sensory nerves travel up the spinal cord, and terminate in the vestibular nuclei and cerebellum.

Vision

The eyes also play an important part in our balance. We are able to keep our gaze on an object during head movements, and also when we

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are moving. We can also shift our gaze between objects; if an object (car, animal) starts moving, we can follow this movement quite easily without any disturbance in our balance.

All these activities are possible because of complex connections between the eyes and vestibular system.

The balance organs

These organs are located in the internal ears and they provide vital information about the body's position in space. One part of the organ detects angular movement such as body tilt, while another section receives signals about linear movement. The organs in the two ears are the mirror images of each other and each sends information to the vestibular nucleus.

Balance disorders

Most balance problems are caused by disorders of the balance organs, or the pathways of balance in the brain.

Damage to the balance organs could take one of many forms. The organ may show increased activity - an irritative lesion. In these cases people often have severe nausea and may even vomit. There is also a sensation of spinning to the same side. This may result in falls to the same side. However, the damage may cause reduced activity - a paralytic lesion. Here, the spinning and falling is to the opposite side, because it is the opposite organ's activity which predominates.

A common cause for a paralytic lesion is viral labyrinthitis or vestibular neuritis. Sometimes this can occur after a cold or 'flu like illness. The symptoms may persist for days or weeks.

A third type of disorder occurs when there is a fluctuation of function in the balance organs. In this condition, which is known as Ménière's Disease, the hearing organ is also affected. Hence attacks of dizziness are often accompanied by nausea, vomiting, hearing loss and tinnitus. The attacks, which may last up to 24 hours are sometimes so severe that people may need admission to hospital.

After this there is a gradual recovery of balance function. This could take several days. However, further attacks may occur during this period, and this may prolong the recovery process.

The initial attack is caused by increased activity of the balance organ, hence the feeling of spinning is to the same side. During the recovery phase there is a tendency to spin and fall to the opposite side.

A condition which is closely linked to Ménière's Disease is vestibular migraine, also known as migrainous vertigo. The symptoms are quite variable. These may be a feeling of spinning (vertigo), or a seasick-type dizziness provoked by head movements. Symptoms of migraine may also occur during attacks, which sometimes last several weeks.

In other cases dizziness could be provoked by head movements. Symptoms commonly occur during bending, looking up, extending the head or turning in bed. This condition occurs due to misplacement of crystals in the balance organ. The dizziness usually subsides after a few seconds. This is known as Benign Paroxysmal Positional Vertigo (BPPV). This disorder is quite common. It usually affects one balance organ; rarely both organs could be affected. Often no treatment is necessary, because the condition clears up spontaneously.

Dizziness may also be caused by disorders of balance pathways within the brain. This frequently occurs in people with poor blood circulation. This occurs due to reduced blood flow in the vertebral arteries and is known as vertebrobasilar insufficiency. Unlike conditions affecting the balance organs, here the feeling of imbalance is more or less constant. There is usually no nausea and the condition does not respond to 'anti sickness' medication.

In many people the sensation of dizziness may cause a feeling of anxiety. Indeed anxiety may be the reason for the dizziness. Those so affected should be made aware of the nature of their condition. They should be offered counselling. Behavioural techniques such as Cognitive Behavioural Therapy could also be helpful.

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Treatment

In most cases there will be a gradual recovery of balance function. This process may be prolonged if there is ongoing anxiety or a lack of mobility. Simple provocation exercises are the best treatment for those with disorders of the balance organs and balance pathways. They should also be encouraged to keep active. This could take various forms such as gardening and going for walks. Sports such as tennis and badminton which require good hand – eye coordination are also excellent for balance rehabilitation. Relaxation Therapy could be helpful in relieving anxiety. This could be carried out on its own, or it may be practised as a part of techniques such as yoga, pilates or tai chi.

Specific treatment measures may be used in the disorders which have been mentioned. Let us look at these in more detail.

Viral labyrinthitis

If the symptoms continue for weeks without improving, exercises which are designed to improve the body's ability to adapt (Cawthorne Cooksey exercises, gaze stabilization exercises) could prove useful.

Ménière's Disease

If the symptoms are severe, conservative measures such as a low salt diet, together with drugs such as betahistine and bendroflumethiazide may be adequate. In more severe cases surgical procedures (intratympanic gentamicin therapy, vestibular neurectomy) may be successful.

Vestibular migraine

This is often triggered off by stress. Hence various forms of stress management (yoga, pilates) may be useful. If the symptoms are severe and persistent, there are several drugs which may provide relief. These include beta blockers, amitriptyline, pizotifen, acetazolamide and sodium valproate.

Benign Paroxysmal Positional Vertigo (BPPV)

In some cases the condition may not clear up by itself. In these patients particular reposition manoeuvres (Epley, Semont) may be necessary. The condition may also improve following certain specific exercises such as Brandt Daroff.

Vertebrobasilar insufficiency

In these cases drugs which tend to improve blood flow (aspirin, clopidogrel) could be very helpful. They may also benefit from Cawthorne Cooksey and gaze stabilization exercises.

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