

Sports injuries of the neck*

F. C. DURBIN, F.R.C.S.

Exeter

THE neck, a small mobile area of the body and containing many vital structures, is most vulnerable yet it is remarkable how rarely it is damaged in sport.

The head which is quite a heavy weight is perched in an unstable position on the long slender mobile cervical spine and is only kept in position by the postural control of the muscles supporting it. It is not like the solid Post Office Tower which is stable by virtue of its engineering principles but is more like a ship's mast—a feeble structure intrinsically yet capable of sustaining severe stresses and strains by virtue of the shrouds and crosstrees which stay it. If these should fail as a result of excessive strain then the mast will break. In life the crosstrees are simulated by the spinous and transverse processes of the cervical vertebrae to which are attached the muscles and ligaments which represent the shrouds and stays.

The head and neck are moving almost continuously during our waking hours. We need the movement to see, to hear, to nod in agreement or disagreement during conversation, to hold the head aloof in disdain or to bow it in shame or acquiescence. While most of this movement takes place at the occipito-atlantal joint and at the atlanto-axial joint, yet a surprising amount of movement takes place in the lower cervical spine as can be demonstrated after occipito-axial fusion.

The neck in infancy and early adult life is very mobile and this mobility is one of the reasons why serious injury is uncommon at this age. During this period it is only when there is some congenital defect or when there is abnormal laxity of ligaments that subluxation of the vertebrae with possible injury to the spinal cord is likely to occur.

It is not surprising in view of the excessive use of the neck that wear and tear changes take place in the intervertebral joints and discs and that these may be contributed to by multiple small traumata spread over a long number of years. It has been estimated that in the third decade 13 per cent of males suffer from cervical spondylosis, a prevalence which rises to 100 per cent over the age of 70 which is slightly less in females and which is a little commoner in those with reported injury than in others.

Neck movements

The movements which take place in the neck are flexion, extension, lateral flexion and rotation. Formerly it was believed that flexion and extension injuries were mainly responsible for fracture dislocations of the cervical spine but now it is realized that rotation plays an important part and probably in most injuries it is a combination of forces which cause damage. The injuries may concern the muscles and ligaments or the joints and the bones taking part.

The neck muscles consist of the sternomastoid, trapezius and the anterior, lateral, and posterior spinal muscles. In the upright position the contraction of these muscles is carried out by postural reflexes which thus provide an effective muscle cuirass. The postural control of these muscles can best be demonstrated when an individual takes up an aggressive stance as for instance in boxing. The shoulders are braced by the trapezius muscle and the sternomastoid, and the neck muscles can be seen and felt to contract. It is only when the strong contraction of these muscles is overcome as for instance by a

*Reproduced by kind permission of the Academic Board of the Institute of Sports Medicine.

strong steady force on the neck such as pushing in a rugby scrum or when the muscles are caught off guard by sudden violent force as they are when a person sitting in a car is hit from behind that damage to muscles, ligaments, joints and bone takes place (whiplash injuries).

There are other factors which influence the incidence of injury to the neck. Thus a neck with restricted movement due to cervical spondylosis or ankylosing spondylitis is more likely to be injured than a neck with normal movement. Similarly a neck which is braced by muscular contraction should withstand all but very violent strains and thus so-called whiplash injuries—those caused by strong deceleration and acceleration forces which are seen in road accidents will occur only infrequently.

It is difficult to separate the effects of sports accidents from other accidents and cervical injuries. The head is unstable and any major force may produce serious injury. Nevertheless the sports in which neck injuries commonly occur are:

1. *Diving injuries.* These nearly always occur through the swimmer diving into shallow water. The head strikes the bottom and the neck injury depends on the situation of the point of contact of the head. Facial injuries and a broken nose may be sustained but if the vertex of the skull receives the impact then the neck is violently flexed and dislocation or fracture dislocation of the cervical vertebrae will result.

2. *Rugby football.* Injuries here may occur in the tight scrummage particularly in the front row forward position when the scrum collapses and a player may have his neck fully flexed. Sprains of the muscles and ligaments are not unusual but fracture dislocation of the spine and cord damage can occur. The latter may result in permanent tetraplegia. The neck may also be injured in a flying tackle when the player who is tackling his opponent may have his neck flexed violently forwards and laterally by the force of his tackle. The minimal injury may be a muscle or ligamentous sprain but tetraplegia has been produced. In America 50 to 75 per cent of fatal football injuries involve the head and neck and of these about 25 per cent involve the cervical spine. It is interesting that lateral flexion injuries appear to be commoner than others.

3. *Riding accidents.* Falls off horses are common and if the rider pitches onto his head an injury to the neck may easily occur. The skulls of most riders are protected nowadays by suitable riding helmets so that the brain may escape serious damage. The neck should always be carefully examined in such cases.

4. *Cycling and gymnastics* produce injury of the neck as a result of falls.

Accidents involving cars and motor cycles cause whiplash injuries—severe extension flexion injuries—following violent acceleration and deceleration forces.

Strangely enough boxing injuries only very rarely cause neck injuries, and then they are very minor ones, chiefly because the boxer's neck muscles are tensed at the time of impact.

In all sports, however, a short neck with strong powerful muscles is less likely to be injured than a long willowy neck with weak muscles.

As the direction of the force causing damage and its point of application may have an important bearing on the type of injury, an accurate history of the injury and the position of the patient at the time and his physical state will help considerably in determining the site and extent of the injury. It is interesting that the spinal cord and nerve roots are very liable to be injured in cervical injuries even though there may not be any fracture dislocations especially is this so in hyperextension injury in stiff spines.

Minor twists and strains may result in small joint subluxations—cervical sprains, or muscle sprains. More serious injuries such as are found in diving and football injuries, result frequently in fractures and fracture dislocations in the lower part of the

cervical spine. However, in a road accident, particularly in head-on collisions, the upper part of the cervical spine is involved.

Because the diameter of the spinal canal is twice that of the spinal cord it is possible for the cord to escape serious injury even though there may be major displacement of vertebral bodies caused by fractures and dislocations.

Management of neck injuries

First of all an accurate and detailed history should be taken paying particular attention to the direction of the force. A careful examination should be made noting bruises, abrasions or cuts of the scalp or face indicating the point of impact. Neck movements should be tested and tender spots sought. A neurological examination should be carried out. An x-ray examination must never be omitted and the views obtained should show the atlas and axis and the lower cervical vertebrae and should include flexion and extension views. In doubtful cases oblique views may be helpful. The flexion and extension views will demonstrate instability if the ligaments have been badly torn and subluxation of vertebral bodies will be seen. Fracturing of a spinous process may not be a simple lesion but is frequently caused by violent flexion or extension forces and may be associated with extensive ligamentous damage, which will lead to instability.

It cannot be sufficiently emphasized that any complaint of pain in the neck should be taken very seriously after any head injury as it is possible for fractures and dislocations of the neck to be present without causing any marked pain or abnormal physical signs. Such displacement if undetected may eventually result in long-term disability consisting of pain or cause damage to the long tracts of the spinal cord which eventually produces paraplegia in the legs and perhaps weakness of muscles in the upper extremities.

Patients with neck injuries may be divided into two groups. Those without x-ray signs and those with positive findings.

1. *Without x-ray findings.* These include muscle, sprains and bruises, ligamentous sprains of the intervertebral joints and disc injuries, many of which are often labelled 'whiplash injuries'. There is intense spasm of the muscles of the neck which may affect one or both sides. Sometimes there is root involvement with pain shooting over the back of the head when the upper cervical joints are involved and over the shoulders and upper arms when the lower cervical roots are implicated. The neck is held stiffly, and active and passive movements are much restricted. There may be points of local muscle tenderness. There is sometimes also a diffuse non-specific headache which is felt over the back of the skull and in the mastoid region.

Sprains of the lateral ligaments and stretching of the cervical nerve roots are not infrequently seen in American rugby football following a blow on the side of the head. There is often immediate pain from the base of the neck radiating to the hand with paraesthesia of the arm and inability to use the limb. There is a dull ache in the neck and shoulder.

Treatment. In the initial stages the neck is extremely painful and tender and rest in bed may be necessary. If the pain interferes with rest and sleep, light traction may be applied with a halter, although the discomfort of the latter sometimes is not tolerated. The application of a sponge or felt collar for three or four days will often immobilize the neck sufficiently. When the acute spasm and pain have disappeared, physiotherapy consisting of heat and exercises can be undertaken to regain movement. Tender muscle areas are often helped by injections with hydrocortisone and lignocaine or by massage and friction. When there is cord or root damage or in those patients with severe pain a period of head traction may be required and this is best carried out with skull traction using Crutchfield's tongs. Continuous traction applied by means of a sling cannot be

maintained for more than a day or two without causing severe discomfort or even pressure sores.

2. *Those with positive x-ray findings.* The treatment here depends on the degree of bone damage. Fractures and dislocations must be reduced by skull traction and a period of immobilization of at least six months in a plaster neck support may be required. If a fracture dislocation is unstable a more certain method of treatment is by wiring and grafting which cuts short the time of plaster fixation to three months and during this time only a small collar need be worn. Minor degrees of vertebral instability need only a plaster collar but if the pain continues a bonegrafting operation may be the only method of relieving symptoms. It is possible for patients to return to full activity after a localized grafting operation and to return to their former sports.

The lethal boiler flue

June 30, 1968, was the hottest recorded day in London for seven years. In some places air temperatures reached 90 deg. Fahrenheit and there was no wind. The heat persisted through the night to the next day but by July 3 temperatures had fallen to 65–70 deg. F. and a breeze was blowing. During this hot spell four people died in West London from carbon monoxide poisoning caused by defective coke boiler flues. A fifth man, dead in similar circumstances, had probably died about three months before, which excluded the hot weather factor.

It is not suggested that the heat did more than uncover a state of affairs which is probably dangerously common in districts where large Victorian houses have been converted for multiple occupation.

Free access of air to the fuel and a ready exit for fumes are required for proper combustion in a coke boiler. The pull of the flue plays a large part in this ventilation. Heat in the flue causes the fumes to rise so that air is drawn into the burning fuel. A high chimney enhances this effect. The difference between the atmospheric temperature and that inside the flue is important. If, as on June 30, 1968, the air temperature equals or exceeds that of the flue, the upward flow of gases ceases or may be reversed. If the flue is not gastight poisonous fumes will escape, or they may return into the boiler room through the boiler itself. Failure of a good draught leads to incomplete combustion with excessive carbon monoxide production.

Gavin Thurston, *C.B.E.*, *M.R.C.P.*, *D.M.J.* *The Medico-Legal Journal*. 1968, 36, Part 4. Pp. 191.