Decisions like these may be regarded as wise or unwise, right or wrong. Under our traditional system Parliament may be content to leave the statute as it is, or may decide to amend it. However, should Parliament now wish to "reverse" a decision holding that a statutory provision is inoperative because of conflict with the Bill, it must now add a *non obstante* clause.

If one were to go through the statute book he would doubtless find many provisions which *might* be inoperative. Section 16 of the Criminal Code which requires an accused to show insanity by a preponderance of evidence might be a denial of due process or of the presumption of innocence declared in s. 2(f); and the provisions in the Code[29] for trials in camera might be ineffective because of s. 2(f) of the Bill which requires a public hearing;[30] and s. 5 of the Canada Evidence Act might be an infringement of protection against self-incrimination which is declared in s. 2(d) of the Bill.

The device of trying to secure the enumerated rights and freedoms through the power which the Bill accords to the court has three vices: (1) it is essentially negative, (2) it creates uncertainty, (3) it permits Parliament to evade its responsibility.[31]

—W. F. BOWKER, Q.C.*

29 ss. 427, 428; also 451(j) dealing with preliminary hearings.

30 MacPherson J. in *Benning* v. *A.G. Sask.* (1963) 41 W.W.R. 497 held that the Bill does not supersede the Code.

31 The writer acknowledges with thanks the help he received from a paper *The Indian Act and the Canadian Bill of Rights* by Colin Taylor, a student in second year law at the University of Alberta. He does not associate Mr. Taylor with the views here expressed.

* Director, Institute of Law Research and Reform, The University of Alberta, Edmonton.

"WHIPLASH" INJURIES—A RADIOLOGIST'S VIEW

Whiplash injuries are not uncommon in today's traffic conditions. I understand that a considerable proportion of trial work in connection with motor vehicle accidents involves consideration of this type of injury. Because of possible injury to the bones, the radiologist is invariably called in to assist in determining the nature and extent of the injury. Lawyer friends of mine have often complained that with the high degree of specialization involved, the radiologist, in common with most medical men, tends to lose sight of the fact in reporting that the average lawyer finds some difficulty in appreciating all aspects of a medical report. This article is written in the hope that it will clarify the nature of the injuries, and assist lawyers to reach an accurate assessment of the injuries for which compensation is claimed.

Whiplash can be defined as a condition resulting from a sudden, violent, involuntary, to-and-fro movement of the neck or body, like the cracking of a whip.

If a car strikes another car, it will transmit to the car which has been struck a considerable force. Part of this force is transmitted to the body. The head first snaps back. Next, the head is snapped forward before there is any opportunity to recover. See Figure 1.

In judicial hanging the sudden jerk of the body breaks the neck; in this instance the force applied is that of the body weight only. It is

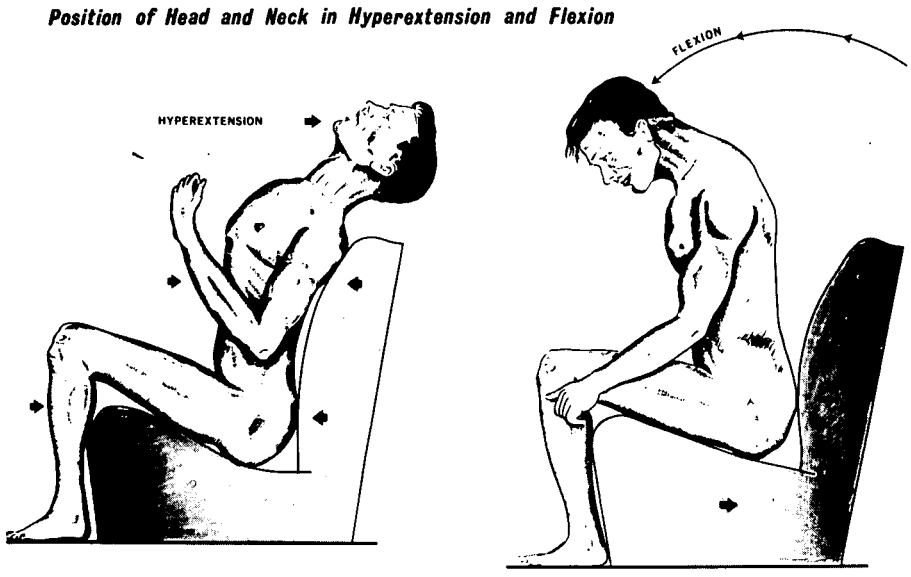


Figure 1. How whiplash is caused. First the head is hyperextended (bent back) and then it snaps forward (flexion).

fortunate that the force in whiplash injuries is applied in a different direction but it will be realized that a considerable force is still applied and that it is not surprising that injuries are often severe.

I propose to outline briefly the anatomy of the neck which is the most commonly involved region.

Figures 2 and 3 are x-rays of the neck, Figure 2 being taken from the side and Figure 3 from the front. In the side view the individual bones (called vertebrae) are numbered. There are seven. In the frontal view the seventh only is numbered.

Starting from the top, the first vertebra is called the Atlas, or Cervical 1. See Figure 4. The name stems from mythology. As can be seen it is in the shape of a ring and forms a base for the skull which moves backwards and forwards on it. In the diagram other relevant anatomical structures are marked.

The second vertebra is called the Axis, as it allows the head to rotate from side to side. See Figure 5. The Axis has a little peg-like projection (odontoid process) on its upper portion. This process may fracture in an accident.

The remaining vertebrae resemble each other and the bottom most one joins with the first vertebra of the chest (the dorsal vertebra). A typical neck vertebra, other than the Atlas and Axis, is the seventh which is illustrated in Figure 6.

Between the vertebrae, there are little spaces (intervertebral foramen—plural, intervertebral foramina) through which nerves pass.

Bands of strong, fibrous tissue hold the various bones together. These are termed ligaments and are named according to the position in the neck and between which bones they run. Little particles of calcium or bone may appear in these ligaments in old age and may be difficult to distinguish from small fractures.

Between the vertebral bodies is a soft, mushy, elastic, yellow substance which is called the nucleus pulposus. It is held in place by a dense, fribrous ring called the annulus fibrosus. See Figure 7. A ruptured intervertebral disc occurs either when the pulpy substance breaks through the ring or when the ring is weakened and bulges. These ruptures may press on nerves and cause pain. Through the spinal canal runs the spinal cord. A disc in the neck region more readily presses on the cord as the cord almost fills the canal. If there is spurring (see later), this reduces the available space—the spurs form ridges and a relatively small, ruptured disc may cause rather marked symptoms and signs.

The muscles around the neck assist in the movements of the head and neck.

Some of the factors affecting the severity of whiplash are:

Figure 2. Sideview (lateral) of the neck (cervical spine).

Figure 3. Frontal view of the neck (cervical spine).

(1) The weight of the head—the average head weighs between 8 to 10 lb. A man's head generally weighs more than a woman's head. If one considers that when a whip is cracked there is no weight at the end of it, the susceptibility of the head to the injury is very evident.

(2) The long, thin neck is more susceptible to whiplash than the short, heavy set neck as it travels a greater distance and has less muscle to protect it.

(3) The direction of the head and position of the person—a person who is tensed for the accident is less likely to have a whiplash injury than if it was unexpected. The position of the head, whether turned left or right, may make a difference. The speed

of the cars and the relative masses will make a difference. For example, the injury to the neck of a driver of a small car struck by a large car is more likely to be severe than the reverse.

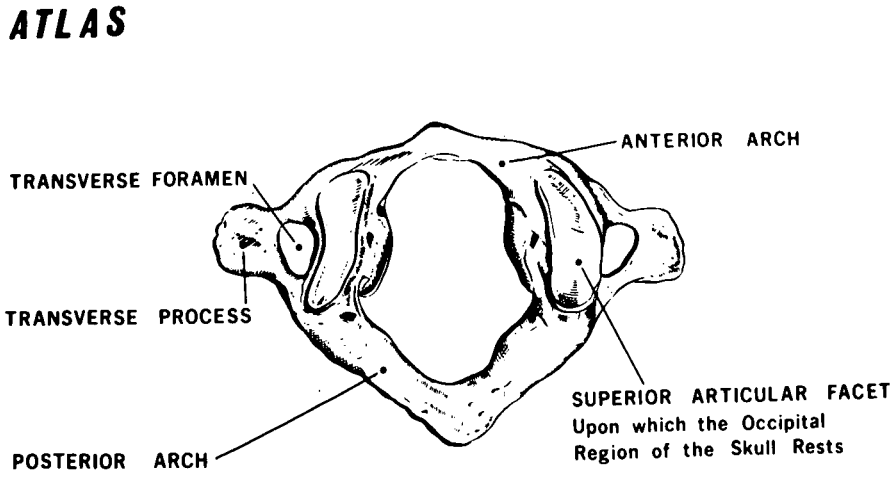


Figure 4. The Atlas Vertebra (C.1).

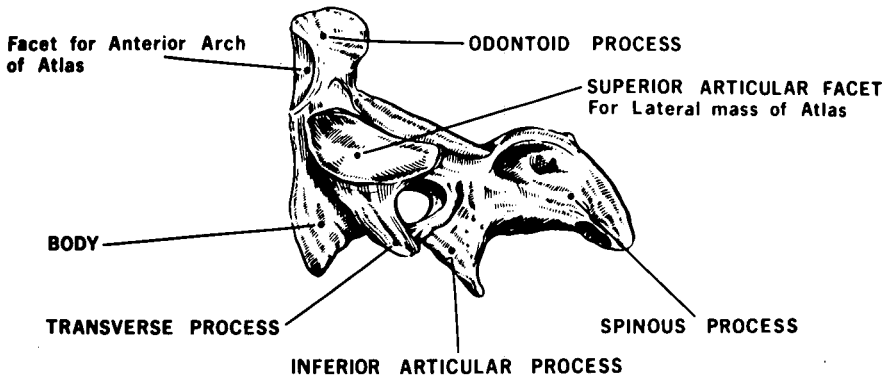
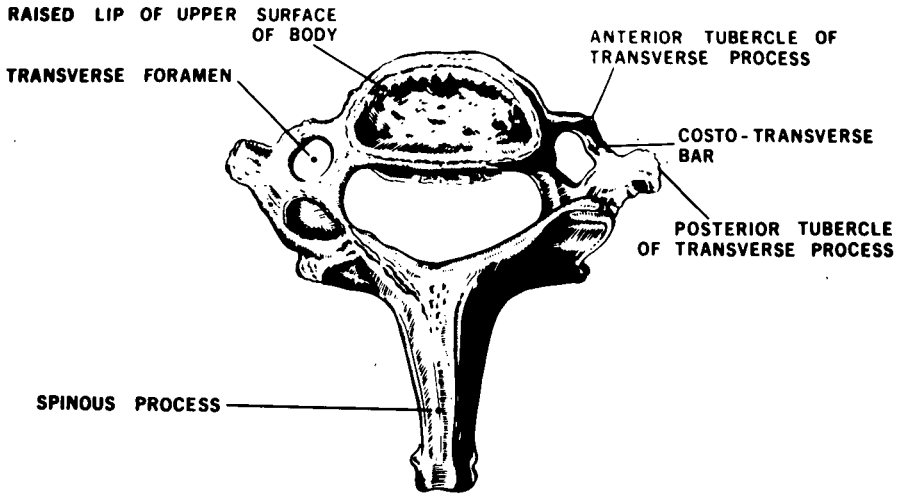
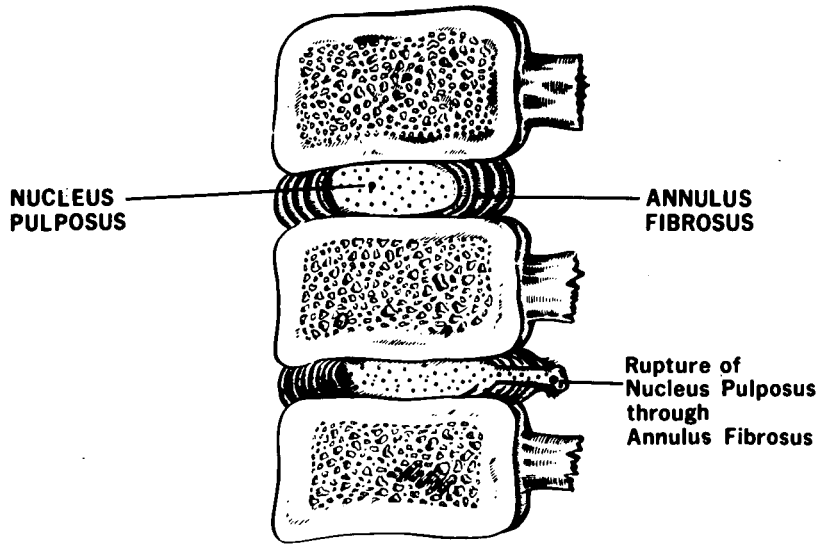


Figure 5. The Axis Vertebra (C.2).



7th Cervical Vertebra

Figure 6. One of the other Cervical Vertebra (C.7).



Cross Section of Cervical Vertebrae

Figure 7. Section (cut view) through three vertebral bodies and two disc. The lower disc has ruptured—note that, as a result, the disc space (distance between the bodies) may narrow.

WHIPLASH INJURIES

(1) Strain—

This is a stretching of ligaments and muscles but there is no actual tear. No permanent damage should result, however, the stretching of neck muscles may cause dizziness and pain. Pain from a simple stretch should not last more than a few hours a day, and persistent pain would suggest a more severe injury than a strain.

(2) Sprain—

Sprain is an actual tearing of soft tissues as opposed to a strain. Ligaments are commonly torn and associated with this there is tenderness (pain on pressure), spasm (muscle cramp not under the control of the will) and diminution of movement. In Figure 8 note the change in

Figure 8. Note change in position of bones in spasm.

position of the bones in spasm. Instead of the normal forward curve there, is in fact, a slight backward curve.

Healing takes place by scar tissue and as scar tissue is less elastic than normal tissue, limitation of movement may become more permanent and scar tissue may become thickened with use. In studies carried out during surgery of whiplash injuries of patients at the Mayo Clinic, it has been shown that these ligaments may have been torn and may not have united after a year or more.

(3) Some sprains have been shown to be due to injury to the small joints on the outer aspect of the vertebrae (articular facets). These may be very difficult to show even on the best of x-ray films.

(4) Nerve Injuries—

The nerves arise from the spinal cord and pass through gaps in the bony spine (intervertebral foramina). The nerve occupies approximately 25% of the space in the foramen. If the bones are moved, for example, by movement of the joints, there is a tendency for the nerves to be pinched and irritated. In older people bony spurs occur at the intervertebral foramina and in these cases, a lesser degree of injury may cause the spurs to press on the nerves. Extension (being backwards) of the head tends to narrow the foramina and may worsen the nerve pinching. When nerves are irritated, they may swell (edema) which causes further irritation, and in some cases, there may be bleeding into the nerve, causing still further irritation.

Stretching of the nerves may cause paralysis or weakness and/or loss of sensation (anaesthesia). In some instances, irritation may cause tingling in the fingers which is referred to as parethesia. Tearing of nerves results in severe paralysis or loss of sensation which may take a year or more even for partial recovery. Complete recovery may never occur.

(5) Bones—

This is more fully described under the section head "What the X-Rays Show."

(6) Head—

Head injuries may occur, such as concussion. Injury to arteries may occur. The vertebral arteries are particularly subject to injury as they lie in a bony canal at the sides of the vertebrae (transverse foramen—see Figures 4 and 6). As these arteries supply the spinal cord with blood, in injury the spinal cord may be deprived of blood with resultant paralysis. There is a widening at the point where the common carotid artery splits in the neck. Stretching of this region (which is very highly supplied with nerves) may cause blackouts, convulsions, drop in pulse rate and drop in blood pressure.

(7) Sympathetic Nervous System—

This nervous system lies in the soft tissues of the neck in front of and to the side of the bones of the neck. These supply the involuntary muscles (muscles not under the control of the will) of the eye, the secretory fibres to the salivary glands, nerves to dilate blood vessels and others. As a result, one may get widening of the pupil (the dark space in the eye), giddiness (vertigo), blurring of vision, deafness, difficulty in swallowing, etc.

DEGENERATION

There is another aspect to "whiplash" and that is its effect on pre-existing degenerative disease. This usually begins in the thirties, and, in the average person over forty years, some marginal spurring is present. Spurs may be larger in labourers.

The pulpy substance between the discs loses its elasticity. Tiny, bony projections (also referred to as spurs, lipping, osteophytes, spondylarthrosis deformans) appear at the ridges on the vertebral bodies and slowly enlarge upwards and downwards. They may, in fact, meet. See Figure 9. Calcium may deposit in ligaments. As age progresses, the bones lose substance and become weaker and may collapse in a wedge

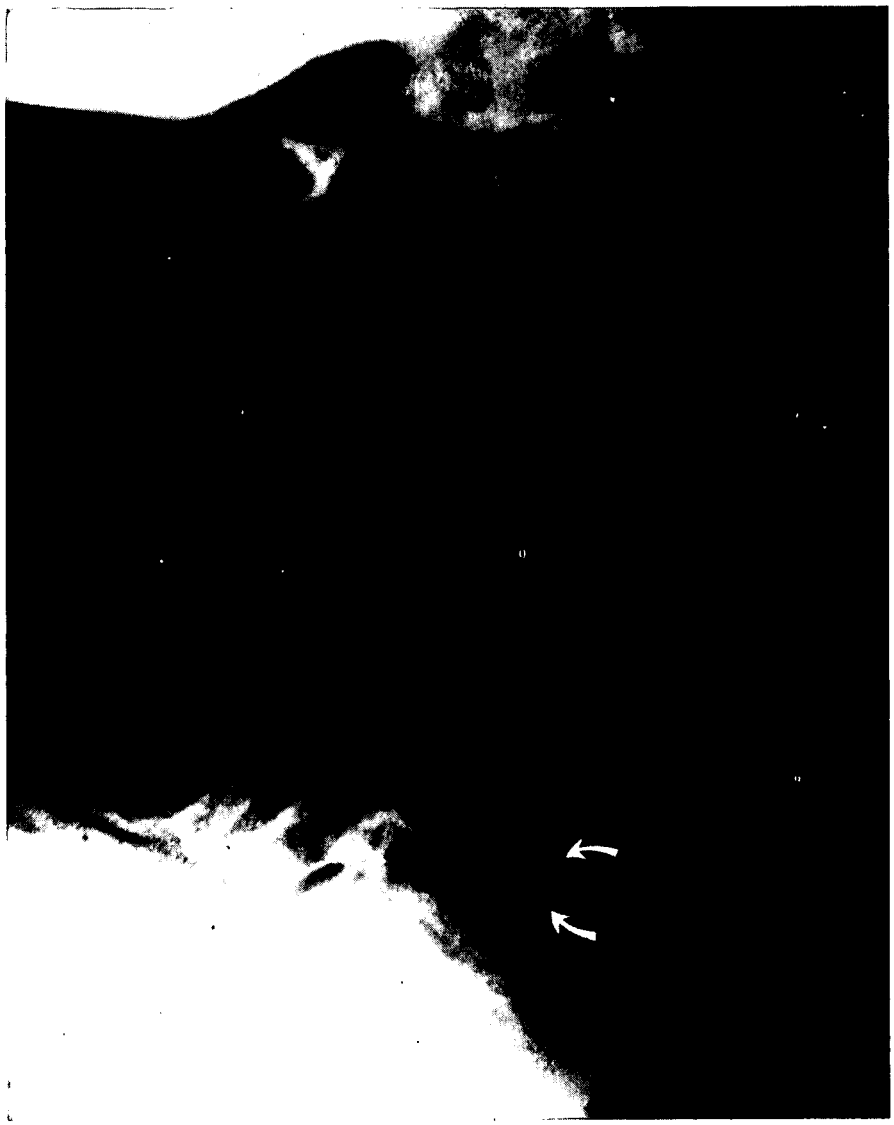


Figure 9. Arrows point to degenerative spurs. The disc is narrowed (between the arrows). This type of degenerative disease may result from injury or be aggravated by injury.

shape. The discs may ultimately calcify or show a streak within them which is due to the production of gas. *This condition may be symptomless (dormant) and only cause trouble when an injury occurs.*

The spurs may project into the foramina or gaps through which the nerves pass, and when injury occurs, cause pain through the pinching of nerves. It is also noted that injuries involving these spurs heal more slowly. Backache extending to the bottom of the spine may be related to irritation of one of the membranes surrounding the spinal cord (dura). The exact method of irritation is not clear. Pain and numbness may also be due to injury to the cord in the neck.

TIME FACTORS

The signs and symptoms of whiplash may appear at once, within a day or so, but may not appear for 6 to 12 months. The symptoms may persist for years. As mentioned above, in longstanding cases, surgical findings have indicated that the tears of ligaments have persisted, unhealed.

DIAGNOSIS

In the clinical examination there may be pain and limitation of neck movements and local pain in the tissues injured. Furthermore pain may be referred to other portions of the head by the action of irritated nerves. These clincal signs may be clarified by x-rays.

(a) Plain X-Rays—

The basic examination by x-ray is the plain film taken from front to back (anteroposterior) and from the side (lateral). An additional view for the odontoid peg may be taken. See Figure 5.

Additional views which may be taken are the lateral view with the head extended and flexed, oblique views, and stereoscopic views.

A special form of x-ray is known as the tomogram. This is used for certain difficult fractures and is taken on a special machine. The exact details of tomograms are too complex to describe in this paper, but it is a method of showing fractures in deeply situated bones which are obscured by overlying bones.

For additional clarification other forms of examination are undertaken e.g. myelograms, discograms.

(b) Myelogram—

In this examination a contrast material is injected into the spinal canal (Pantopaque or similar). This may be displaced by projections (discs) into the canal. At the end of the examination the Pantopoque is generally removed. It very rarely causes any complications. In some countries, air is placed in the spinal canal (air myelogram) to show the spinal cord.

(c) Discography—

In this examination contrast material is injected by means of a fine needle into the disc. This is not a popular method here and some people feel than an injection into a normal disc may injure it.

WHAT THE X-RAY SHOWS

It should be clearly stated at the outset that a normal x-ray does not exclude whiplash injury. Also, some of the fractures may be ex-

tremely difficult to identify even in the best radiographs. At joints, the joint surfaces may be completely separated (dislocation), or there may be partial touching of joint surfaces (subluxation).

Dislocation—these may be forward (anterior) with or without a fracture. On occasion, portions of the vertebra may become locked. The dislocation may occur backwards (posterior dislocation). In this case there may be severe injury to the spinal cord and nerves, but on x-ray no bony abnormalities may be found, the bones having returned to their normal position.

Fractures—the most common fractures of the bones of the neck are:

(1) the peg of C2 (odontoid peg).
(2) C1.
(3) The arch of C3.
(4) Fracture of the body of C5-6.
(5) Spinous process of C7.

If a fracture is strongly suspected and the views taken do not indicate it, additional studies may be instituted by consultation with the radiologist. A certain variety of fracture is known as the hyperextension fracture. This causes very severe extension to the cord but the fracture may be only tiny. These injuries are especially likely to occur if the canal is narrow from birth or if osteoarthritis has narrowed the canal. This will cause a condition called the central spinal syndrome. In this there is paralysis of legs and arms, more markedly in the arms, abnormal function of the bladder and loss of sensation of varying degree below the injury. Recovery is slow and may never be complete. Recovery takes place first in the legs, then the bladder, then the arms. .

Torn muscles or ligaments do not show on x-ray in the way that bones do. However, if there is excessive movement between the segments of the spine shown on the x-ray, a radiologist may suspect that this may be due to a tear. Spasm, however, may occur to hold the torn parts together, and in fact, there may be less movement than normal, or possibly normal movement.

DISC LESIONS

Narrowing of the space between the vertebrae may indicate a ruptured disc. Another finding is the straightening of the normal curve of the neck, (due to contraction of muscles outside the control of the will —also referred to as spasm). See Figure 8. In addition, the neck cannot bend forward or extend as freely as in the normal case. The disc may ultimately calcify. The pulpy substance of the disc may protrude into the canal pressing on the cord or on nerves. On the other hand, a disc may have ruptured but no abnormal x-ray findings may be seen at the time of the accident; later however, after months or years, narrowing of the disc and spurring of the vertebra may appear.

CURVATURES

In the adult the neck vertebrae do not normally line in a straight line up and down, but rather have a gentle curve convex forward.

Spasm (involuntary contraction of muscle, that is a contraction of muscles in response to pain which serves as a protective mechanism to

damaged tissue) may alter the curvature of the spine. *This is an important sign and may be the only sign of injury.*

PATHOLOGICAL FRACTURES

These fractures are fractures of bones, weakened by a disease process. The weakening may be local as in cysts or tumors or general, such as aging and general bone disease.

In Marie Strumpells disease (ankylosing spondylitis) the joints of the spine fuse together with the result that the spine may fracture like a long bone.

CONCLUSION

It should be re-emphasized in conclusion that there may or may not be direct x-ray evidence of injury but that spasm and associated clincal findings may be of great importance.

ACKNOWLEDGMENT

Much assistance in the preparation of this article has been rendered by Mr. H. Shandling who has guided me as to the matters which would be of significance to lawyers in dealing with medical aspects of whiplash injuries and I would like to acknowledge this in the preparation of this article.

—FRANK I. JACKSON*

* M.B., Ch.B., D.P.H., C.R.C.P., Edmonton, Alberta.

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APPEAL TO SUPREME COURT OF CANADA IN BANKRUPTCY MATTERS

It quite frequently happens that a legal question of some nicety, particularly on procedural matters, will be decided in an application or notice of motion. Since matters of this sort are very often concluded from the bench without written reasons, they go unreported and the practitioner goes unenlightened. In a recent application to quash, the Supreme Court of Canada dealt with the right of appeal in bankruptcy matters.

In ordinary civil matters, the appeal lies by right so long as the amount in controversy exceeds $10,000.[1] Under the Bankruptcy Act,[2] however, special leave is required to appeal to the Supreme Court. Section 151 reads:

> "The decision of the Court of Appeal upon any appeal is final and conclusive unless special leave to appeal therefrom to the Supreme Court of Canada is obtained from a Judge of that court."

1 Supreme Court Act, R.S.C., 1951, c. 259, s. 36.
2 R.S.C., 1951, c. 14.