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## THE SCOPE AND EXTENT OF NECK INJURIES

RUTH JACKSON\*

**T**HE SCOPE—the range of view—of injuries of the neck varies with the interested individuals. The extent of the injuries may run the gamut from a simple strain of joint structures to sudden death. The burden of proof of injury depends on the doctor or doctors who see the patient. The medico-legal aspects of any injury often cloud the issues.

### THE SCOPE

The individual who has been involved in an accident thinks or knows that he has been injured—and, in most instances, through no fault of his own. When his symptoms do not subside within a few days, weeks or months, as he usually has been told they would, he becomes somewhat skeptical and often rebellious—especially if he has been referred to, or requested to see several different doctors. Eventually and often he may bear the label “psychoneurotic.”

The doctor who sees the injured person initially is usually his family doctor, or an intern or resident in an emergency room of a hospital. Such doctor may have the audacity to tell the patient, if his neck has been injured in an automobile accident, that he has had “a whiplash,” which is not a diagnosis and means very little to the patient except by implication. He may be advised to apply heat to his neck and he is usually given a prescription for one or more of the various muscle relaxants. Sometimes a collar is applied to his neck which is, in many instances, improperly designed so that it holds the neck in hyperextension and only serves to aggravate the condition and hence the recovery, except in specific types of injuries such as fractures, dislocations and complete disruption of the posterior ligamentous and capsular structures. If available or convenient, ultra-

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sound treatments are given. When the patient continues to complain, he is referred to a specialist—an orthopaedist, a neurosurgeon, a physiatrist and perhaps ultimately to a psychiatrist. In the interim he has been visited by a claims adjuster who offers him a small settlement or asks him to see “one of our doctors,” or even suggests that he go to a chiropractor. If the claims adjuster does not insult the patient or create a doubt in his mind, he delays securing legal advice. On the other hand, he may have sought counsel, or been sought by counsel, soon after his injury, in which event he avoids contact with the adjuster.

Many doctors who see and/or treat the injured patient, unless they are on the favorite list of the insurance companies, do not wish to be involved in any medico-legal controversy and are, therefore, prone to cursory examinations, and often inadequate treatment or none at all. The injured patient should be the doctor’s first concern and his efforts should be directed toward helping the patient to understand his injury, and to explain the prognosis or what the patient can anticipate in the future from a medical and physical standpoint.

There are so many aspects of the doctor-patient relationship, regardless of the extent of the injuries and the possible residual impairment of function, that it is impossible to relate them all in one short article. One must remember, however, that this relationship is of tremendous importance to the medical, legal and economic solution of the injured person’s problem. It has its effect on the individual, on society, on industry and on government. In fact the scope of neck injuries is almost beyond comprehension. The economic statistics are fantastic, especially when we consider the number of persons who are injured in vehicular crashes, industrial mishaps and other types of accidents.

The patient-attorney relationship is of significance. The attorney may, and often does, have a tendency to magnify his client’s injuries and create an unjustifiable hope for an unreasonable monetary settlement. In some instances the patient’s attorney actually encourages the patient to exaggerate his symptoms and to continue to make complaints so that the treating physician will continue to see the patient and/or treat him, which helps the attorney to secure a larger

award but certainly does not help the patient in his trust of his fellow man. This, fortunately, is not the customary procedure.

The defense attorney has a different view of the injured person. He is concerned only with his client and his protocol has been spelled out for him. His contention is that no one is injured who can walk and talk, and sometimes even if the patient is completely helpless the defense attorney's job is to prove that there is no disability. This is the system and it can only be corrected by medico-legal education of all attorneys for the execution of justice.

#### EXTENT OF INJURIES

An injury of the neck has occurred—perhaps from a fall on the head, neck and shoulder, from a blow to the head or neck, from a blow to the body, or from a vehicular crash. Automobile accidents do account for the greatest number of neck injuries, at least eighty-five percent in the author's experience. Most of these injuries involve only the soft tissue structures which, in the absence of a thorough knowledge of the anatomy and kinetics of the cervical portion of the spine, makes accurate diagnosis difficult.

No matter what the mechanism, be it direct or indirect force, the injury occurs and is continued until the body's response to injury has been exhausted. The residuals of any injury to the cervical spine are variable. The simple *strain* injury leaves no permanent damage, whereas a *sprain* injury of the joint structures does leave residual disability, as do injuries of the bony structures themselves. Certainly injuries of the skeletal structures cannot occur without concomitant injuries of the soft tissue structures. Clarification is necessary for appreciation of these facts.

Let us keep in mind that the ligamentous and capsular structures of joints have a certain amount of laxness, elasticity and tensile strength to allow for motion. When these structures have been torn or stretched beyond their functional capacity, traumatic inflammatory reactions occur. A sprain injury means that the joint or joints have been wrenched apart and this cannot happen without tearing or stretching the structures which hold the bones in their proper alignment. Healing of these injured tissues eventually occurs by the formation of scar tissue which is less elastic and less tensile and, therefore, less functional than they were in their original state. They

function within their limitations and may serve the joints well if no added stress or strain is placed upon them.

The capsules and ligaments are richly supplied with nerves, whereas the bones, the hyaline cartilage covering the articulating surfaces and the fibrocartilaginous discs are poorly innervated, so that the capsular and ligamentous injuries are more painful than bone and cartilage injuries. With continued movement they become thickened and the scarring increases. The amount of scarring varies with each individual and is dependent on many factors, especially the duration of the traumatic inflammatory reaction. Eventually osteophytic changes occur at the margins of the joints, the time factor being variable. Contrary to some writers' opinions, traumatic arthritis is inevitable. These changes so often seen months or years after an injury are not a part of the aging process, but are rather the response of injured joint structures to injury—injury which may continue indefinitely.

To understand the injuries one must understand the chemistry of trauma. The response to injury is a response of every organ and probably every cell of the body. Hemorrhage or bleeding and continued leaking from the venous side of the vascular tree may occur. Cellular infiltration, initiated by the inflammatory response to injury, occurs and proteolytic enzymes aid the cells in removing the damaged residues in the tissues. Fibroblasts enter the injured structures to heal them resulting in scar tissue. Mucopolysaccharides and collagen as hydroxyproline play their part in the healing process, as does the presence of vitamin C.

The glands of internal secretion, the excretory glands, the gastrointestinal system, the respiratory and cardiovascular systems and the autonomic and central nervous systems all—yes—all are involved in the response to injury.

In most cases the traumatic forces exhaust themselves in injury to the soft tissue structures and often there is no initial radiological evidence in the absence of dislocations or gross disalignments; however, the clinical examination can usually reveal the source of local or radiating pain. This does not mean that adequate radiographs are dispensable. Even a slight malalignment of the vertebrae or subluxations are clues in the diagnosis. Accurate interpretation of the radiographs is essential. The bones, themselves, may show

normal structure and contour and are, therefore, in the usual anteroposterior and single lateral views of little diagnostic value as far as soft tissue injuries are concerned.

Where demonstrable arthritic or arthrotic changes are found in the radiographs following an acute or recent trauma it is often presumed that these changes were the producing cause of the symptomatology, whereas these changes serve as character witnesses, one might say, to explain the vulnerability of the cervical spine to external forces. While awaiting radiographic evidence an analysis of the symptomatology must be supported by adequate signs: attitudes and position of the head, limitation of motion, positions of relief and of aggravation, reflex and sensory changes, muscle spasm, and signs of autonomic nerve involvement are all important in making a diagnosis.

The effect which external forces have in the production of painful injuries is beyond calculation because of the unknown and undeterminable factors involved in the mechanism of the forces and the manner in which the body reacts to them. One cannot state positively, in the absence of gross skeletal injuries, and without pre-injury radiographs, that one traumatic experience is the producing cause of the injury; however, one can say with conviction that the trauma was in all reasonable medical probability the producing cause of the symptomatology based on the facts at hand.

It is indeed unfortunate for the victim of an automobile or industrial accident that often times the doctor who first sees the patient concludes from the radiographs only that there has been no injury and sends the patient on his way without an adequate examination. To illustrate, a young male adult was a passenger in a car which overturned. He had immediate severe pain and swelling of his neck. He was taken to a hospital where X-ray films were made and he was transferred to another hospital under the care of an orthopedic surgeon. Other X-ray films were made and two days later the patient was discharged from the hospital. He did receive, during the next few days, heat and massage and intermittent traction. He was then allowed to return to his regular activities as a student in college.

The initial radiographs of this man's cervical spine, as well as the subsequent films made a few days later, showed marked separation

of the spinous processes of the 4th and 5th vertebrae with the inferior facets of the 4th cervical vertebra riding high on the superior facets of the 5th cervical vertebra. Some seven months later he was seen by the orthopedic surgeon again and further X-ray studies were made, and at that time malalignment between the 4th and 5th cervical vertebrae was noted. The patient was then sent to a neurosurgeon who sent him back to the orthopaedic surgeon. Later he saw another neurosurgeon on two occasions but nothing was done for him, although his symptoms continued. A year and a half later the patient was sent to me for examination. X-ray films at that time revealed that the 4th cervical vertebra was markedly displaced on the 5th cervical vertebra, and there was some evidence of nature's attempt to fuse across the bodies of the vertebrae. Fortunately, there were no clinical findings indicating compression of the spinal cord, but the patient did have peculiar sensations in his legs as well as in his arms.

When one reviews the radiographs of this patient and listens to the history, one can only be irate at the incompetency of supposed competent doctors. A few relatively simple modalities of treatment would have restored this boy to a much more comfortable and productive existence. The recognition of even *minor malalignments* is most important for adequate treatment and return of function.

There was another young man who was thrown from a speeding car when the car hit an abutment, following which he was completely paralyzed below the level of the 5th cervical vertebra. Radiographs revealed that there was complete posterior displacement of the 5th vertebra into the spinal canal. Naturally there was compression of the spinal cord. If it had been possible to reduce the displacement immediately, at least some function might have been restored. This was not possible at the small hospital where this patient was taken initially, and after several hours he was transported some two hundred miles to my service. Because of the severe displacement of the 5th cervical vertebra and the marked paralysis a neurosurgical consultant did not wish to do a laminectomy.

The boy lived for several months in the hospital on a special turning frame, with skull traction. There was no money to pay the hospital and the administrator insisted that the patient be sent home

to die. He was sent home and he did die a few weeks later of a genito-urinary infection as revealed by autopsy.

Then there was another young man, an Air Force pilot, who crashed into the side of a mountain causing complete decapitation and instant death. There is still another young man who was pitched headlong from an automobile that crashed and he had no ascertainable injuries and no symptoms.

Thus we see that the extent of the injuries of the cervical spine are variable and are dependent on undeterminable forces. That injuries do occur is an established fact, although there are differences of opinion concerning the extent of the injuries. Radiographic and clinical evidence of gross dislocations and/or fractures leave no doubt that an injury has occurred and is painful. It is the obscure lesions resulting from trauma that create the greatest problems and which the average physician cannot explain and, therefore, cannot localize nor diagnose.

It is all too often assumed when there is radiographic evidence of a pre-existing arthrosis or if there are degenerative changes that the symptoms of which the patient complains are caused by these changes and not by the superimposed trauma. Inasmuch as such changes occurred over a variable period of time and were initiated by a minor or several minor traumatic incidences, often not remembered by the patient, they in all probability caused no symptoms of any significance. Joints showing such changes are unusually susceptible to injury even on slight provocation and they do not withstand injury well.

The defense harps on these changes as being a part of the aging process. What aging process? We begin to age before we are born. No single aging process is known. It is true that the water content of the fibrocartilaginous discs and the articular cartilages decreases with age, but not at the same rate in all individuals nor all age groups. These changes involve the entire spine and not just one or two motor units in the absence of trauma, either single or multiple. The ligamentous and capsular structures lose some of their elasticity with age, but not to the same degree in all people. Certainly many metabolic factors are involved in the so-called aging process.

Radiographs made one or two years after an injury which show osteophytic changes and a narrowed disc, which were not present at



the time of the injury, do not indicate certainly that these changes are the result of the aging process. They *are* indicative of trauma and they *are* injured tissues' response to injury.

The establishment of a specific injury when only the soft tissue structures are involved may be difficult, and is often difficult for the inexperienced and inadequately trained and uninformed doctor, be he general practitioner or specialist. Our surgical speciality training programs are at fault to a great extent. We teach our residents surgical indications and techniques, and we turn out some good technical surgeons; but we often fail to teach them the fundamentals of anatomy and pathology which are so essential for the understanding of soft tissue trauma. Hopefully the situation will change with time.

The most important step in making any diagnosis is the history as given by the patient. Counsel for the defense is prone to make light of the history, which is what the patient tells the doctor. Then one must define subjective symptoms, which are what the patient feels, and objective findings, which are those conditions which can be determined by the doctor. There does exist a difference between interpretation and evaluation of pain. The doctor, of course, has no absolute proof of the existence of pain as such, but he can certainly form an opinion as to the plausibility of the complaints. If he can determine a reasonable cause for the subjective symptoms then objectivity is established, although there are no objective signs to determine the intensity of pain. The electromyograph, if done subsequent to three weeks following the injury, may establish specific electrical potential variations, but this does not represent the patient's own pain image. Certainly the doctor should by the objective findings be able to state whether or not the complaint of pain is or is not compatible with the injury or resulting condition, based on reasonable medical probability.

The objective findings may be minimal or multiple, depending on the individual case, but not always on the severity of the injury. Limitation of neck motion if ascertained by the examiner and not by simply telling the patient to move his head, is an objective finding. The counsel for the defense may question this finding on the basis that motion is limited by pain which is subjective. If the patient actively resists movement the examiner can, if experienced in the act of examination, elicit the resistance and make allowance for this.

Muscle spasm can be palpated by the examiner if he chooses to do so. Certainly muscle spasm is an objective finding over which the patient has no control. If the muscle spasm is accompanied by tenderness then the tenderness, ordinarily subjective, becomes an objective finding.

Sensory changes, usually decreased sensation, are subjective findings. If, however, the changes follow definite nerve root patterns they must be considered as objective findings. Decreased reflexes are certainly objective findings. If elevation of the arm causes obliteration of the pulse at the wrist it is objective and indicates spasm of the scalene muscles over which the patient has no control.

Measured circumference of the arms and forearms is objective. In right-handed individuals a difference of one-eighth to one-quarter of an inch between the dominate and opposite extremities is within normal limits. Anything above this indicates atrophy or shrinking of the muscles, which is objective. A difference of more than five pounds between the gripping muscles of the hands is certainly indicative of involvement of the motor fibers of the nerve roots which supply these muscles; this is objective. Dilatation of one pupil and/or a difference of as much as 10 points in the blood pressure of the arms indicates irritation of the sympathetic or autonomic fibers in the neck which surround the arteries. These fibers supply the pupillary muscles, and, when irritated, cause vasoconstriction of the arteries, themselves and are objective findings. Changes in the deep reflexes of the lower extremities in the absence of an injury or disorder of the lower back are indicative of irritation of, or pressure on, the spinal cord.

These are all objective findings which defense counsel tries usually to disprove. Were these findings present before the alleged injury? The doctor cannot say if he had not examined the patient immediately prior to the accident. Then the doctor must rely on the radiographic evidence, which may be meager, in order to establish a probable causal relationship; however, the doctor must form his opinion on reasonable medical probability based on a hypothetical assumption that the patient had no prior symptoms and on the mechanism of the injury, keeping in mind that the severity of the forces applied to the cervical spine in any accident cannot be determined because of the many variables involved.

Then, too, there are many patients who are involved in more than one accident and the doctor is expected to allocate the symptoms and findings to one specific accident. This is often a very difficult task; however, he can say without fear or trepidation that a neck once injured is vulnerable to re-injury on slight provocation and the residuals can be anticipated to be greater with each accident. The injury may be an aggravation of a previous injury or a new injury at a different level. The jury may have to make the decision, but the doctor should be able to express his opinion. Controversies are inevitable and opinions may vary.

Some patients who are involved in litigation may have a tendency to exaggerate their symptoms, and the doctor may be at a loss to account for the multiplicity of complaints, yet he should not consider the patient mendacious until all the facts are reviewed—the history, the examination, the radiographs. As our clinical and pathological knowledge increases, the number of unexplainable conditions decreases to open the doors of plausibility.

Malingers, out and out prevaricators, are few, and can be detected by an astute doctor. First of all, the malingerer “puts on” when he is being observed. If his attention can be distracted from his complaints he may forget to “put on,” or if he is observed when he does not know it and is noted to behave contrary to his complaints, the clue is established.

A second means of solving the question is to inject a local anesthetic into a point of maximum pain and tenderness which will in any event relieve the pain for the duration of the anesthetic. If the patient denies even temporary relief another clue has been established.

The third clue is the presence or absence of muscle spasm, which is an involuntary contraction of a muscle, a portion of a muscle or a group of muscles. If there is no muscle spasm one must be suspicious of a malingerer, or he must look for some visceral or somatic lesion having cervical nerve root irritation, which might be causing reflexly referred pain.

If the patient assumes an unusual, supposedly antalgic position for weeks or months, from which he never deviates, and the doctor can find no clinical evidence for a cause of such position, he must consider hysteria—an unusual psychological phenomenon. The au-

thor has seen only two cases of frank hysteria during almost thirty-nine years of practice.

The author does not claim to be an authority on neck injuries; however, my interest in this subject was initiated some thirty-five years ago when I was prompted to delve for answers to the symptomatology of cervical spine disorders. The victim of two neck injuries (neither a medico-legal problem) made me more eager to try to find the answers. Did my injuries make me more sympathetic with those other victims of neck injuries, I am often asked. The answer is: "I hope they have made me empathetic and have given me an understanding of the problems of my patients who have suffered injuries of the cervical spine."

A properly prepared physician's medical report is of tremendous importance, as discussed by Robert M. Fox, an attorney, in his book, *The Medical Report*.<sup>1</sup> Often, the medical report will enable the patient's counsel to make a satisfactory settlement out of court, which thus eliminates the expense and often harassing experience of a court trial. The doctor should keep in mind that he has an obligation to his patient, and he should medically counsel him so that the patient can understand his injuries and the residuals thereof.

In conclusion, I repeat, the scope of the injuries varies with the individuals involved. The extent of the injuries varies from a simple strain of the joints of the cervical spine, which leaves no disability, to sudden death from severance of vital structures. The burden of proof of the injuries rests upon the doctor or doctors. The opposing counsel must prove no or little injury. The patient's counsel must prove that an injury has been sustained and the residuals thereof, which he cannot do without the doctor's assistance and his medical counsel.<sup>2</sup>

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1. FOX, *THE MEDICOLEGAL REPORT* (1969).

2. For some useful authorities in the field, see Jackson, *Die konservative Behandlung bei Verletzungen der Halswirbelsäule. Sonderdruck aus Verhandlungen der Deutschen Orthopädischen Gesellschaft*, 50th Congress, Munich, September 19-22, 1962, Stuttgart, Enke, 1963; Jackson, *The Cervical Syndrome*, 5 CLIN. ORTHOP. 138-47 (1955). JACKSON, *THE CERVICAL SYNDROME*, (3rd ed. 1966) (Translated into Japanese, 1967); Jackson, *The Cervical Syndrome as a Cause of Migraine*. 2 J. AMER. MED. WOM. ASS'N 529-34 (1947); Jackson, *The Cervical Syndrome*, INSTRUCTIONAL COURSE LECTURES, VOL. X (1953); Jackson, *Neck Injuries*, 1 TRAUMA, 7-85 (1960); Jackson, *Injuries of the Upper Portion of the Cervical Spine*. 8 LAWYERS MED. CYCLOPEDIA, Supplement, 53-60 (1965); Jackson, *The Positive Findings in Alleged Neck Injuries*, 6 AMER. J. ORTHOP., 178-81, 184-87 (1964). Jackson, *Pre-*

Unusually large awards of settlements which are not commensurate with the injuries are as unjustified as are small monetary payments which are out of proportion to the injuries and their residuals. Justice is the aim of our judiciary system and should be the aim of everyone involved in accident cases.

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*face to Symposium: Disorders of the Cervical Spine*, 24 CLIN. ORTHOP., 9-11 (1962); Jackson, *The Structural Injuries*, 40 ARCH. PHYS. MED., 383-86 (1959); Jackson, *The Syndrome of Cervical Nerve Root Compression*, in ARTHRITIS AND ALLIED CONDITIONS 1216-32 (7th ed. Hollander ed. 1966); JACKSON, UP-DATING THE NECK (1970); Jackson, *Whiplash Injuries of the Neck*, 46 DALLAS MED. J., 502 (1960).