The Positive Findings In Neck Injuries

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This author analyzed 5,000 patients with disorders and found the following:

1) 90% of neck disorders are caused by trauma.

2) Of the trauma cases, 85% are caused by motor vehicle collisions.

3) [This means that 77% of those with disorders of the cervical spine are caused by motor vehicle collisions.]

THIS AUTHOR ALSO NOTES:

In a head-on vehicle collision, or when a vehicle collides with a stationary object, the “resistance of the muscles and the capsules and the ligaments of the cervical spine stop the forward motion of the head and neck, but not without some degree of injury to them.” [Important]

When a vehicle is struck from the rear, the resulting acceleration of the vehicle with the body of the occupant will cause injury to the cervical spine because of Newton’s Laws, noting that when the cervical spine structures are “forcibly stretched beyond their functional capacity they suffer injury of variable degree.”

“The forces which are imposed on the cervical spines of the passengers of colliding vehicles are tremendous, and if one attempts to calculate mathematically the amount of such forces, the results are unbelievable.”

“Inasmuch as rear-end collisions outnumber by far other types of collisions, the greatest percentage of neck injuries are of the acceleration type.”

“The damage to the vehicles involved in collisions is no indication of the extent of the injuries imposed on the passengers.” [Very Important]

Motor vehicle collision injuries to the cervical spine often “go unrecognized or ignored for many months.”

THE INJURIES

STRAINS:

When joints motion is slightly beyond normal passive mobility, a strain occurs “which leaves no permanent damage.” These injured joints may be painful for a few days to 3 weeks.
SPRAINS:
“Joint structures suffer sprain injuries when they are forced so far beyond their passive range of motion that they are stretched, torn or avulsed from their attachments.”

“Hemorrhages and traumatic inflammation occur.”

“Healing of sprained ligamentous structures takes place by the formation of scar tissue which is less elastic and less functional than normal ligamentous tissue.”

[Very Important, the Fibrosis of Repair]

“Sprains result in some degree of permanent injury.” [Very Important]

DISLOCATIONS:
Dislocations occur when the joint structures are “completely disrupted” and these injuries of joints “leave severe residual damage.”

FRACTURES:
COMMON HYPERFLEXION FRACTURES NOTED:

1) Vertebral Body Compression Fractures
2) Facet Avulsion Fractures
3) Compression Cartilaginous End-Plate Fractures

COMMON HYPEREXTENSION FRACTURES NOTED:

1) Compression Fractures of the Interarticular Isthmus
2) Vertebral Arch Fractures
3) Superior and Inferior Facet Fractures
4) Disruption Cartilaginous End-Plate Fractures
5) Odontoid Process Fracture
6) Posterior Arch of Atlas Fracture
7) Facet on the lateral Masses of the Axis and Atlas Fractures
8) Spinous Process and Laminae Fractures

DISC INJURIES
“Injuries of the intervertebral disc structures are frequent and they may vary from a slight rent in the annulus fibrosis to a complete avulsion of the disc from its attachments.” [Important]

“Any injury of the disc causes a disturbance in the dynamics of the motor unit of which the disc is a part. This leads to degeneration of the disc and the proximate joints.” [Very Important]

INJURIES OF THE NEURAL STRUCTURES:
Contusion or compression of neural structures occurs frequently.
The nerve roots, the cervical sympathetic nerves and the spinal cord may suffer injuries of varying degrees.

The brain may be injured from hitting the inner table of the skull.

Tension or stretching may cause injury to the cranial nerves.

INJURIES TO THE VASCULAR STRUCTURES:
The vertebral arteries in the transverse foramina may be contused or stretched.

“Trauma of the arteries initiates vasospasm which may extend well beyond the site of trauma and give rise to vascular insufficiency of the spinal cord and posterior portion of the brain.”

MUSCLE INJURIES
The muscles most injured include:
1) Intertranverse muscles
2) Interspinous muscles
3) Suboccipital muscles
4) Vertebro-cranial muscles
5) Intervertebral muscles (longus cervicis)
6) Scalene muscles
7) Pharyngeal muscles

SYMPTOMS
The symptoms after a motor vehicle collision are usually immediate, within a few hours or within a few days.

Noted descriptions include:

“I thought my neck was broken.”

“I felt like I had been hit in the back of the neck with a sledge hammer.”

“I thought the top of my head was coming off.”

Approximately 70% of patients complain of headaches that start at the back of the neck and radiate to the ears, the crown, or to the temple ears.

THE PRINCIPLE SYMPTOMS FOLLOWING WHIPLASH INJURIES ARE:
1) Neck-shoulder-arm-midsternal-interscapular pain
2) Neck-arm paresthesias
3) Neck-shoulder-elbow-wrist-finger stiffness
4) Neck-shoulder-elbow-wrist-grip weakness, dropping things from hands
5) Dazed
6) Blurring of vision, inability to focus
7) Loss of balance
8) Tinnitus
9) Hearing deficit, even transitory deafness
10) Difficult swallowing
11) Nausea
12) Vomiting
13) Dysphasias [inability to speak or understand words because of brain injury]
14) Impaired memory
15) Lack of coordination
16) Dysphoria [a state of dissatisfaction, anxiety, restlessness or fidgeting]
17) Pain behind the eyes
18) “A few patients may complain of pain in the lower back and pain, weakness and paresthesias of the lower extremities”

**CLINICAL EXAMINATION FINDINGS**

Cervical ranges of motion should be done passively by the examiner.

“The location of the [segmental] motion and the amount can be verified by lateral radiographs of the cervical spine made with the neck in maximum flexion.”

During cervical compression testing (including left and right lateral bending), “if the pain is confined to the neck, injury of the joints is indicated; if radicular pain occurs, nerve root irritation is present.”

If the shoulder depression test increases radicular pain, “it indicates that there is irritation or compression of the nerve roots, adhesions about the dural sleeves of the nerve roots and the adjacent joint structures, or foraminal encroachments are present.”

Deep tenderness indicates localized injury, and is usually noted at the posterior facet joints, over the spinous process, in the interspinous ligaments, in the occipital area, and in the interscapular region.

Muscle spasm may be noted in the anterior neck muscles, the suboccipital muscles, the suprascapular muscles, the rhomboid muscles, and the trapezius.

Muscle spasm can be caused:
1) By injury to that muscle.
2) To protect an injured joint.
3) From irritation or compression of a nerve root.
4) From irritation of the spinal cord.

Upper extremity deep tendon reflexes may be hyperactive immediately following neck injury, but after a few days they may become hypoactive. These changes may be transient or permanent, or change week to week.
Superficial sensation may initially be hyperesthesia, but after a few weeks may become hypoesthetic.

Upper extremity muscle weakness should be tested, especially grip strength, which should be measured by a dynamometer. The dynamometer should be performed 4 times in sequence to look for muscle fatigue. Normally each of the 4 readings should be essentially the same.

The circumference of the arm and forearm should be measured at their mid-portion, and atrophy watched for. It is normal for the dominant extremity to be up to 1/4” larger than the non-dominant extremity. It may take 2 or 3 weeks for atrophy to develop.

Unilateral dilation of the pupil “indicates irritation of the sympathetic nerve supply or in some instances, involvement of the third cranial nerve or of the mid-brain.”

A complete interruption of the sympathetic supply to the eye (Horner’s syndrome) gives rise to constriction of the pupil on the involved side.

Whiplash-cause partial deafness may be improved with cervical traction, which also establishes its etiology.

“Irritation of the cervical sympathetic nerve supply may give rise to vasoconstriction of the arteries which are supplied by the sympathetic fibers.” Blood pressure in the two arms often varies as much as 10 – 20 points following neck injuries. This is a completely objective finding. [Important]

RADIOGRAPHIC FINDINGS:

“An adequate radiographic examination of the cervical spine is essential for diagnosis.” [Important]

“Gross [spinal] derangements sometimes give rise to minimal symptoms and clinical findings, and minimal derangements may cause severe symptoms and clinical findings.” [Important]

Pre-existing pathological conditions of the cervical spine, when injured, “result in more damage than would be anticipated in a so-called ‘normal’ cervical spine.” [Very Important]

The inflammatory response to trauma “leads to post-traumatic fibrosis and adhesions.” [Important, the Fibrosis of Repair]
Dr. Jackson recommends the following x-rays be exposed following whiplash trauma:

1) AP open mouth
2) AP cervical with cephalic tube tilt
3) AP cervical with a “caudad-angled view.” This view “may show fractures of the laminae and of the inter-articular isthmuses which may not be demonstrable in any other view.”
4) Upright neutral lateral cervical. This view may show “subluxations,” and “forward curve of the cervical spine may be obliterated.” [loss of lordosis]
5) Upright maximum flexion lateral cervical
6) Upright maximum extension lateral cervical
7) Left cervical oblique
8) Right cervical oblique

“The guy [stability] ligaments of the upper cervical spine are very vulnerable to injury and lateral subluxations of the head, atlas and axis are not unusual.”

“Lateral views made within an **hour or two** after any injury may show **nothing of** significance other than pre-existing conditions.” “However, **subsequent radiographs may be very revealing.** Any segmental instability, any segmental restriction of motion, and any segmental angulation may indicate severe injury.”

Oblique x-rays that show normal intervertebral canals may still have foraminal encroachment as the result of “hemorrhage, swelling, or hyperplasia of the proximate capsular and ligamentous structures.”

“All radiographs should be **repeated periodically.** Subsequent findings may be very revealing.”

**SUMMARY**

“The greatest percentage of neck injuries occur in crash accidents of motorized vehicles.”

“The extent of damage to the vehicles is in **no way** proportional to the extent of damage imposed upon the cervical spines of the passengers.”

**[Very Important]**

To ascertain injuries, an “adequate radiographic examination is essential.”

**[Important]**

“Repeated physical and radiographic examinations are necessary for final analysis.”
KEY POINTS FROM DAN MURPHY:

1) “The forces which are imposed on the cervical spines of the passengers of colliding vehicles are tremendous, and if one attempts to calculate mathematically the amount of such forces, the results are unbelievable.”

2) “The damage to the vehicles involved in collisions is no indication of the extent of the injuries imposed on the passengers.” [Very Important]

3) “Healing of sprained ligamentous structures takes place by the formation of scar tissue which is less elastic and less functional than normal ligamentous tissue.” [Very Important, the Fibrosis of Repair]

4) “Sprains result, therefore, in some degree of permanent injury.” [Very Important]

5) “Injuries of the intervertebral disc structures are frequent and they may vary from a slight rent in the annulus fibrosis to a complete avulsion of the disc from its attachments.” [Important]

6) “Any injury of the disc causes a disturbance in the dynamics of the motor unit of which the disc is a part. This leads to degeneration of the disc and the proximate joints.” [Very Important]

7) The nerve roots, the cervical sympathetic nerves and the spinal cord may suffer injuries of varying degrees.

8) The vertebral arteries in the transverse foramina may be contused or stretched.

9) “Trauma of the arteries initiates vasospasm which may extend well beyond the site of trauma and give rise to vascular insufficiency of the spinal cord and posterior portion of the brain.”

10) The location of segmental motion problems can be verified by lateral radiographs of the cervical spine in maximum flexion and extension.

11) Upper extremity deep tendon reflexes may be hyperactive immediately following neck injury, but after a few days they may become hypoactive.

12) Superficial sensation may initially be hyperesthesia, but after a few weeks may become hypoesthetic.

13) Grip strength should be measured by a dynamometer, and should be performed 4 times in sequence to look for muscle fatigue. Normally each of the 4 readings should be essentially the same.

14) Unilateral dilation of the pupil “indicates irritation of the sympathetic nerve.”
15) Whiplash-caused partial deafness may be improved with cervical traction.

16) “Irritation of the cervical sympathetic nerve supply may give rise to vasoconstriction of the arteries which are supplied by the sympathetic fibers.” Blood pressure in the two arms often varies as much as 10 – 20 points following neck injuries. This is a completely objective finding. [Important]

17) “An adequate radiographic examination of the cervical spine is essential for diagnosis.” [Important]

18) Pre-existing pathological conditions of the cervical spine, when injured, “result in more damage than would be anticipated in a so-called ‘normal’ cervical spine.” [Very Important]

19) The inflammatory response to trauma “leads to post-traumatic fibrosis and adhesions.” [Important, the Fibrosis of Repair]

20) Dr. Jackson recommends 8 x-rays be exposed following whiplash trauma, including an AP cervical with a “caudad-angled view.” This view “may show fractures of the laminae and of the inter-articular isthmuses which may not be demonstrable in any other view.”

21) The alar ligaments of the upper cervical spine are very vulnerable to injury.

22) Initial x-rays may be normal, but subsequent x-rays may reveal multiple problems; therefore, repeat x-rays are essential.

23) X-rays showing “any segmental instability, any segmental restriction of motion, and any segmental angulation may indicate severe injury.”

24) The intervertebral foraminal may suffer from encroachment as the result of “hemorrhage, swelling, or hyperplasia of the proximate capsular and ligamentous structures,” even in the presence of normal oblique x-rays.

25) “All radiographs should be repeated periodically. Subsequent findings may be very revealing.”

26) “The extent of damage to the vehicles is in no way proportional to the extent of damage imposed upon the cervical spines of the passengers.” [Very Important]

27) To ascertain injuries, an “adequate radiographic examination is essential.”

28) “Repeated physical and radiographic examinations are necessary for final analysis.”