WHIPLASH INJURIES

THE CERVICAL ACCELERATION/ DECELERATION SYNDROME

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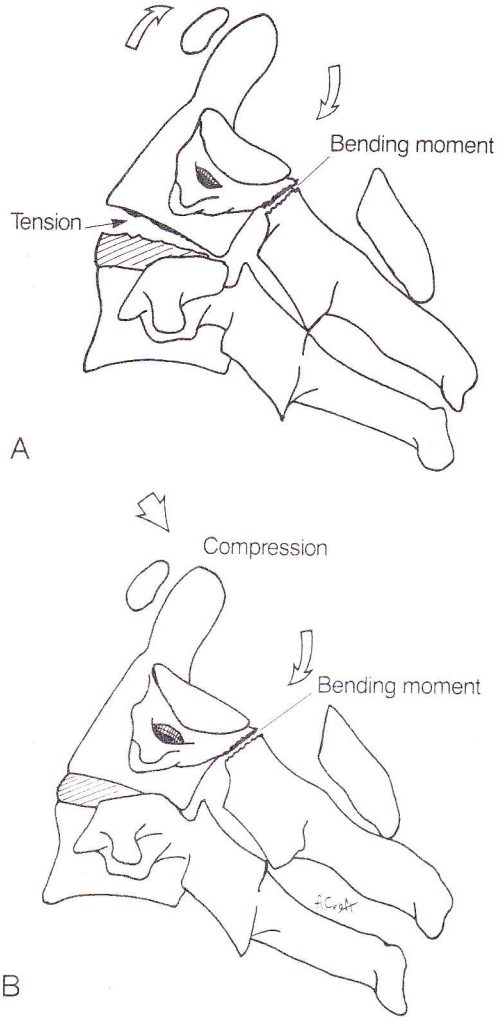

Figure 1.40. A. Typical forces encountered with judicial hanging. These forces result in traumatic spondylolisthesis or the so-called hangman's fracture. B. The hangman's fracture, which is produced by the typical rear-end impact motor vehicle accident, results from a similar bending moment, but instead of tension at the anterior aspect of the axis there is compression. (Adapted from Panjabi MM, White AA: Physical properties and functional biomechanics of the spine. In White AA, Panjabi MM (eds): *Clinical Biomechanics of the Spine*. Philadelphia, WB Saunders, 1978, p 139.)

only in extremes of subluxation, and the diagnosis should, therefore, be one of degree. The ADI may, in fact, be normal.

Several types of subluxation have been described by Fielding and Hawkins (98). These are defined in terms of relationship of the atlas upon the axis and include: type I, rotary fixation with no anterior displacement (the odontoid acts as a pivot); type II, rotary fixation with an anterior displacement of 3–5 mm (one lateral articular process acts as a pivot); type III, rotary fixation with an anterior displacement of more than 5 mm; and type IV, rotary fixation with posterior displacement (Fig. 1.45). With the exception of the bilateral posterior subluxation that usually results from hypoplasia, absence, or fracture of the dens, all are clinically stable in the absence of neurological deficit. When neurological symptoms are present, however, this lesion should be considered clinically unstable until proven otherwise.

Rotary subluxation can generally be treated conservatively, with manipulation and other noninvasive measures. In all cases of trauma, however, the degree of instability must be carefully evaluated. Lateral flexion AP open mouth views and rotation AP open mouth views can be taken with standard x-ray equipment, but cineradiography should also be used. Both plain film radiography and cineradiography are useful in evaluating the dynamics of the lesion. Computed tomography (CT) scanning, as well as providing more detailed information about bony and soft tissue structures, allows more precise evaluation of the static lesion. Instability may be a contraindication to manipulation. Rotary subluxation without instability is not.

Trauma and Instability of the Lower Cervical Spine (C3–C7)

As in the case of the upper cervical spine, the more severe acceleration/deceleration-related trauma may result in vertebral fracture. The degree of injury may not be clinically apparent, and correlation between clinical findings and x-ray examination is crucial. Many times, a fracture is not readily visualized on standard cervical x-ray studies, and special views are necessary. In some cases of fracture, the only easily visible finding may be retropharyngeal space widening from extravasation of blood.

Fracture, dislocation, and radiographic technique are discussed in greater detail in Chapter 6. The discussion here is limited to

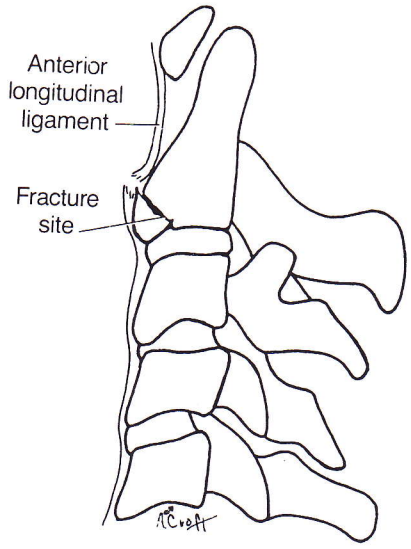

Figure 1.49. The extension teardrop fracture is seen following severe hyperextension injuries. Because the anterior longitudinal ligament is ruptured, this injury is stable in flexion but unstable in extension.

tion, force and vector of injury, and prognosis is an area in which further research is needed. This lesion should be considered clinically unstable, and the patient with this lesion should be treated with a flexible cervical orthosis and the appropriate physical therapy modality for 3–6 weeks. Later on, mild traction should be instituted along with light manipulation to reduce scar formation and restore normal spinal biomechanics. This should be accompanied by muscle strengthening and range of motion exercises.

Bilateral facet dislocation is the result of severe hyperflexion of the neck and is a highly unstable condition even after reduction. It has been shown that in order for this amount of displacement to occur, all of the following must be ruptured: both facet joint capsules, the posterior longitudinal ligament, the interspinous ligament, and the disc (109). Surgical stabilization is usually necessary to achieve ultimate stability.

SUBLUXATION

Subluxation is a term that defies casual explanation and precise definition. Its use, therefore, is highly controversial and hotly debated and probably will remain so. In medical dictionaries, subluxation is defined as, simply, "less than a luxation," but in chiropractic, its very essence perhaps encompasses one of the most fundamental principles of chiropractic theory. By most conventional schools of thought, it is considered not so much a static finding on x-ray but rather a dynamic joint dysrelationship usually requiring manual manipulation for reduction.

Several definitions have been adopted; perhaps none are universally acceptable. Thus for discussions of clinical instability in this text, *subluxation* is defined as a state of dysrelationship between contiguous vertebrae, due to either disease, injury, or both, that is demonstrable on plain film radiography of the cervical spine. (This x-ray evaluation must include flexion and extension views.) Subluxation is not the result of fracture but rather is the result of joint laxity which, in turn, may be the consequence of degenerative or other disease or traumatic ligamentous stretching or rupture. Both can and often do coexist.

In speaking of subluxation of the spine, the usual convention is to describe the upper vertebral unit and its relationship to the vertebral unit immediately below it. For

Table 1.10.
Stability in Cervical Spine Fractures[a]

Stable	Unstable
Simple wedge fracture	Flexion teardrop fracture
Posterior neural arch fracture (atlas)	Extension teardrop fracture (stable in flexion, unstable in extension)
Pillar fracture	Hangman's fracture
Uncinate process fracture	Jefferson fracture of atlas
Clay shoveler's fracture	Type II dens fracture
Transverse process fracture	
Type I dens fracture	
Type III dens fracture	

[a]Adapted from Harris JH Jr: *The Radiology of Acute Cervical Spine Trauma.* Baltimore, Williams & Wilkins, 1978, p 41.

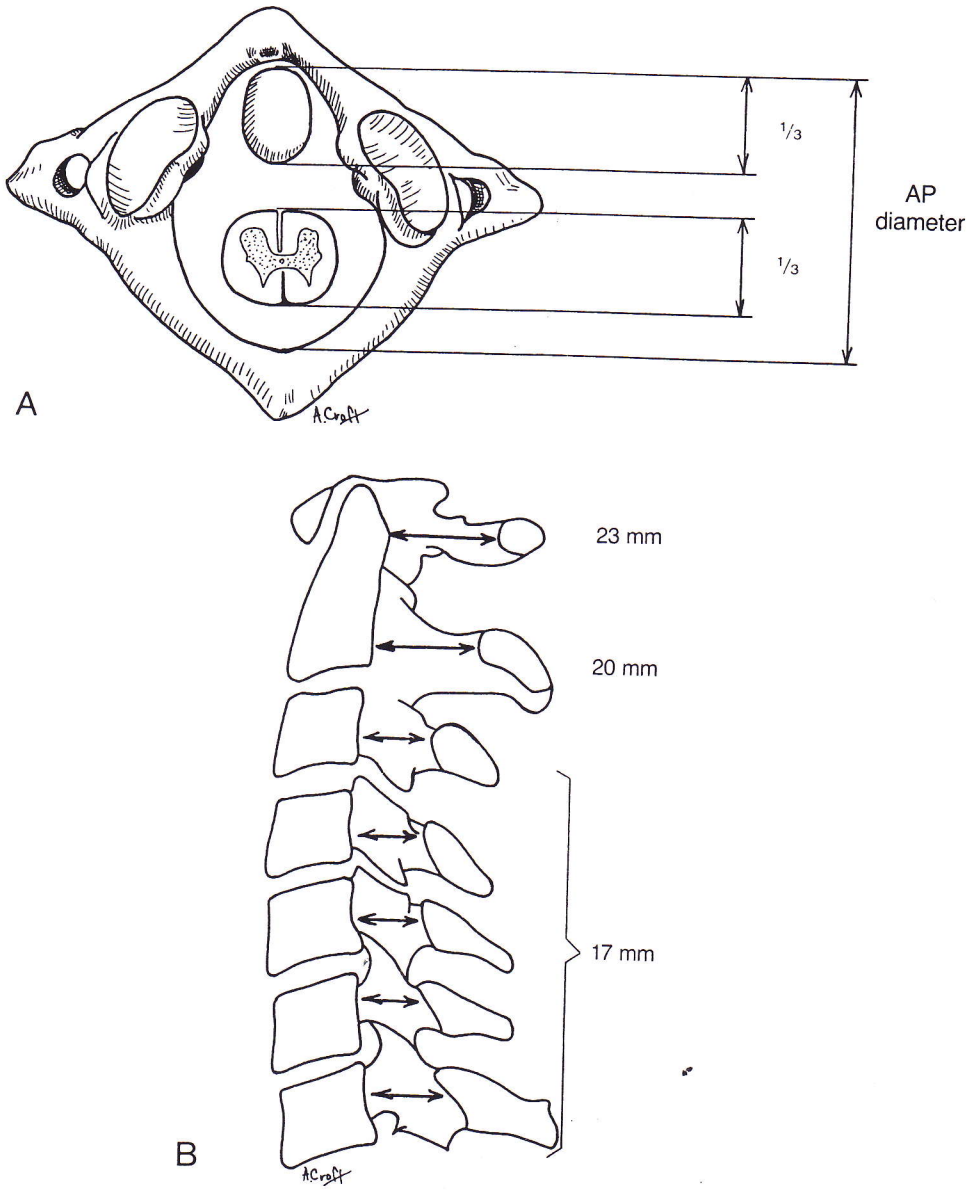

Figure 1.50. **A.** Steele's rule of thirds. One third of the AP inside diameter of the atlas is occupied by the cord, one third is occupied by the dens, and the remaining third is potential space. **B.** Average AP inside diameters at subsequent cervical levels when films are exposed at the standard distance of 72 inches. (Actual measurements are slightly less when adjusted for geometric distortion.) (Adapted from Panjabi MM, White AA: Physical properties and function biomechanics of the spine. In White AA, Panjabi MM (eds): *Clinical Biomechanics of the Spine*. Philadelphia, JB Lippincott, 1978, pp 132 and 199.)

example, the condition in which C2 has moved forward in relationship to C3 (+z axis) is described as an anterior subluxation of C2 on C3 or, simply, anterior subluxation C2-C3. Other forms of subluxation have been described in chiropractic and medical literature, but the description and management of these are beyond the scope of this textbook.

The amount or degree of subluxation is significant. I have stated that subluxation may be a normal finding in children (pseu-

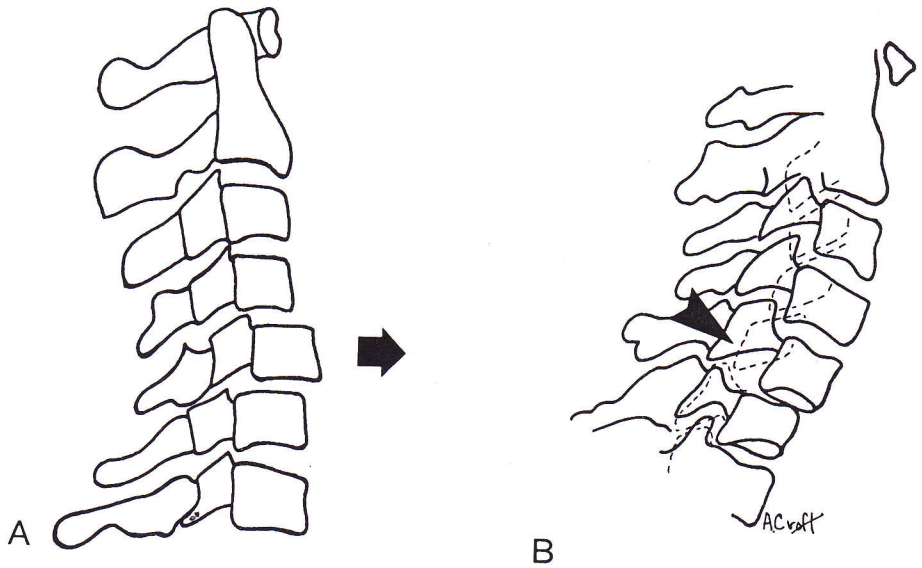

Figure 1.51. Illustrated appearance of unilateral facet dislocation on x-ray. **A.** Anterior translation equal to or less than one half of the AP diameter of the vertebral body is suggestive of unilateral facet dislocation (*arrow*). **B.** Unilateral facet dislocation may be seen as an overriding or disrelationship of normal facet overlapping (*arrowhead*). (Adapted from Harris JH Jr: The normal cervical spine. In: *The Radiology of Acute Cervical Spine Trauma.* Baltimore, Williams & Wilkins, 1978, p 63.)

dosubluxation) which may, in fact, be a contradiction in terms and all the more reason to define the word in a dynamic rather than a static sense. I, therefore, discuss the criteria for anterior subluxation only as it relates to trauma and posttraumatic sequelae.

INSTABILITY

In general, clinical instability in addition to other clinical findings is manifested by subluxation. I define clinical instability as any interruption in the normal smooth transitional vertebral biomechanics as evidenced by incomplete, jerky, or excessive spinal movements. This may be demonstrated by flexion and extension x-rays, cineradiography, or both and is often (but not always) associated with chronic or intractable pain syndromes and neurological symptomatology. Clinical instability usually precedes the subsequent accelerated development of spondylosis or degenerative disc disease at the same levels. These findings must occur during passive movements within normal physiological ranges of motion and under normal physiological loading (Table 1.11).

Radiographic Evidence of Instability

Instability of the upper cervical spine may be appreciated on plain films or by cineradiography of the neck, usually by ranges of motion that when adjusted for the age of the patient may be considered excessive (see Tables 1.7 and 1.8). The most reliable x-ray evidence of instability in the lower cervical spine is the anterior subluxation. Its presence is significant because the incidence of delayed instability is said to be 21% (112). This condition is severe and may require surgical stabilization. When anterior subluxation does not increase when there is change from the neutral to the flexion position, however, the amount of soft tissue damage and the likelihood of delayed instability are less (113).

The x-ray findings associated with anterior subluxation include: (*a*) a fanning of the spinous processes from damage to the posterior element, (*b*) a narrowing of the anterior disc space and a widening of the posterior disc space, (*c*) a loss of cervical lordosis or a kyphotic angulation at the level of the lesion equal to or more than 11° more than that found at adjacent levels, (*d*) a lack of parallelism of the facet joints, and (*e*) a

Table 1.11.
Score Card for Clinical Instability of the Cervical Spine

Findings	Point Value[a]
Positive stretch test	20
Spondylosis or degenerative disc disease developing within 3 years of injury	20
Plain x-ray evidence of instability	15
Cineradiographic (fluorovideo) evidence of instability	15
Any documented cervical spine fracture (not counting healed fractures)	15
Spinal cord or nerve root irritation subsequent to injury (especially with progressive worsening)	15
Initial neurological symptoms lasting longer than 1 week	5
Intractable pain resulting from injury	5
Spondylosis or degenerative disc disease present at the time of injury	5

[a] ≥30 means definite clinical instability; ≥20 means clinical instability probable; 10–15 means clinical instability possible; and ≤5 means clinical instability unlikely.

forward translation of one vertebra over another. These do not all need to be present, especially the last. White and Panjabi (70), using motion segments from cadavers, have conducted experiments on the stability of the cervical spine. They have suggested that 2.7 mm (3.5 mm on lateral x-ray) is the upper limit of the normal translational movement. Green et al. (71) have stated that 1–3 mm of movement should be considered subluxation and that 3.5 mm or more is only seen in frank dislocation, fracture, or pseudosubluxation. Others have suggested 1–2 mm as indicating subluxation. Scher (72) studied normal cervical spine x-rays and found that in none had there been seen more that 1 mm in translation. He stated that the 3.5 mm criterion suggested by White and Panjabi is seldom seen clinically. Figure 1.52 illustrates these x-ray findings which are summarized in Table 1.12.

I have stated that cineradiography is important in the evaluation of ligamentous instability. Although several studies have indicated the importance and sensitivity of cineradiography in the evaluation of soft tissue lesions of the neck. I am unaware of any published accounts of specific normal fluoroscopic biomechanics of the cervical spine and am currently engaged in this research. Until more data are available, I believe that the protocol described in Table 1.13 should be followed.

Table 1.12.
X-ray Findings in Anterior Subluxation

Decreased anterior disc height (at involved segment)
Increased posterior disc height (at involved segment)
Nonparallel facet planes (at involved segment)
Fanning of spinous processes (at involved segment)
Kyphotic angulation of ≥ 11° (at involed segment)
Anterior translation of superior segment over inferior segment of 1–2 mm (at involved segment) (measured from the posterior inferior corner of the body of the superior vertebra to the posterior superior corner of the inferior vertebra)

Table 1.13.
Protocol for Cineradrographic (Fluorovideo) Analysis of the Cervical Spine

AP view
Cone in on upper cervical spine
Nodding (flexion and extension) with mouth open and closed
Rotation to left and right with mouth open and closed
Lateral flexion to left and right with mouth open and closed
Lower cervical spine
Rotation to left and right
Lateral flexion to left and right
Lateral view
Cone in on upper cervical spine
Nodding (flexion and extension)
Rotation to left and right
Lower cervical spine
Flexion and extension
Rotation to left and right
Oblique view
Cone in on upper cervical spine
Nodding (flexion and extension)
Lower cervical spine
Flexion and extension

As pointed out in Chapter 2, many signs or symptoms of trauma may be occult on initial presentation. One must search carefully for signs of nervous system trauma, soft tissue injury, and occult fracture before proceeding on to treatment. Many times, the patient is in pain at the initial examination, and performance of some tests may not be appropriate or even possible. For example, range of motion tests and certain other orthopaedic tests should not be performed in cases of cervical spine trauma in which fracture or dislocation is possible. If any test is omitted, a note should be added to the patient's chart and this test performed as soon as it can be tolerated or performed safely. Pain can also alter the outcome of certain tests, thereby confusing the clinician, who is wise to assume the worst until proven otherwise. Again, test results that are equivocal should be noted and then the tests repeated as often as necessary until satisfactory results are obtained.

The human body is a dynamic organism, and after injury it may experience several stages of change or reaction. Initially, protective muscle spasm guards and stabilizes damaged structures. Only later may ligamentous instability become apparent. Along with this instability, secondary changes such as nerve root irritation may occur. The patient's condition thus needs to be constantly reassessed during the treatment period.

A potentially serious complication of hyperflexion injuries is *delayed instability* (2, 3). Green et al. (4) reported a 20% incidence of delayed instability in hyperflexion injuries when the posterior ligament complex (ligamentum nuchae, interspinous ligament, ligamentum flavum, and capsular ligament) was disrupted, producing an anterior subluxation of the cervical spine. Even after rigid immobilization of these injuries, severe kyphotic deformity often resulted, sometimes necessitating surgical fusion. Cheshire (5), in an analysis of 257 conservatively treated acute cervical injury patients, found a similar incidence of delayed instability (21%), most commonly seen following initial anterior subluxation (6). Anterior subluxation is considered one of the most unstable of all cervical injuries (5) (Fig. 3.1).

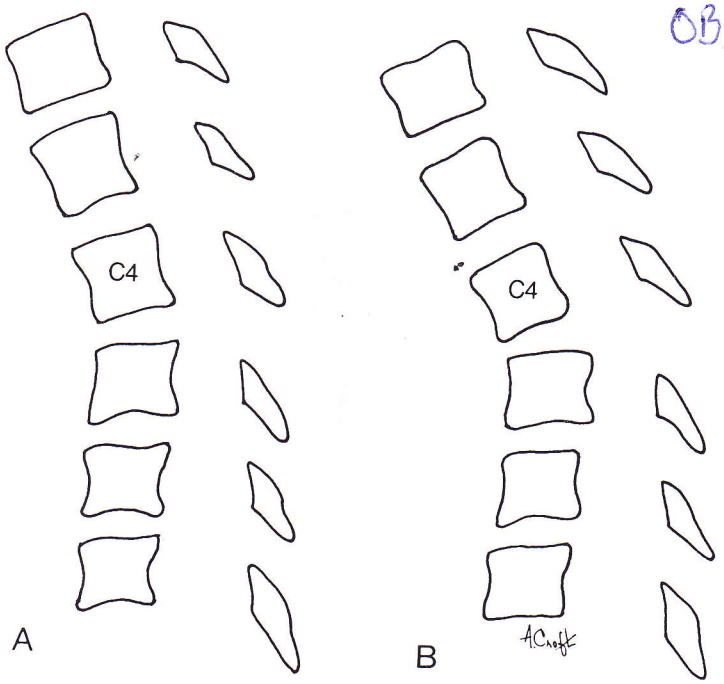

Figure 3.1. Example of delayed instability with anterior subluxation of C4 on C5 after an acceleration/deceleration injury. **A.** Drawing of initial lateral x-ray. **B.** Drawing of neutral lateral x-ray 3 months later, demonstrating delayed instability.

1. Excessive medical charges accumulate in an attempt to relieve those symptoms that will not resolve.
2. Attorneys request large monetary settlements in an attempt to pay medical charges. Generally, there is a lack of objective data to prove the patient's injury.
3. Insurance carriers deny payment and force the claim to litigation.

The need for an accurate prognostic scale has been evident for years, and a numerical scale has been developed that allows the physician to render a prognosis on the day the injury occurs. The advantages of using such a scale include the following:

1. The physican can predict, with some accuracy, the approximate length of treatment and the probability of future problems.
2. The attorney can monitor the patient's progress, knowing in advance the approximate degree of probable improvement.
3. The insurance carrier can establish accurate settlement reserves and decrease the number of litigated cases.
4. The patient can better understand what future problems may result from the injury.

CLASSIFICATION SYSTEM OF FOREMAN AND CROFT

The exact degree of injury and the probability of future pain in patients who have suffered cervical acceleration/decleration injuries are often difficult to ascertain. It may take years for the physician to acquire the sufficient clinical experience needed to render an accurate prognosis. Foreman and Croft have developed a numerical scale with which to classify whiplash injuries objectively. The findings on physical examination provide the information needed for the patient's initial classification into a major injury category (MIC). The radiographic examination and a patient questionnaire provide the data from which are obtained the clinical modifiers to this system.

Categories

MIC 1. MIC 1 is used for patients who present with symptoms directly relating to their injury. On physical examination, however, there are no objective findings to the patient's complaint(s).

MIC 2. Patients who present with a decreased range of motion of the cervical spine in addition to MIC 1 symptoms are placed in MIC 2. A measurable increase in cervical diameter may also be expected. MIC 2 patients do not present with neurological signs.

MIC 3. MIC 3 patients present with MIC 1 and MIC 2 symptoms plus objective neurological loss (either sensory or motor).

Norris and Watt (21) classified a series of 61 patients according to this system and found a significant relationship between the category and the presence of residual pain. Fifty-six percent of patients in MIC 1, 81% in MIC 2, and 90% in MIC 3 suffered residual pain. Typically, the symptoms that remained were neck pain, headache, and paresthesias.

Each patient, after the physical examination, should be classified into the appropriate MIC group. Each group is self-explanatory, and each is discussed below in relation to point values.

The work done by Norris and Watt (21) demonstrated the efficacy of this system of classification, but they did not address a multitude of individual "modifiers" that might affect the prognosis. Patients differ anatomically and in the amount of degenerative changes that may be present. Each of these factors should be considered when determining the patient's final prognosis.

Modifiers to Prognosis

A wide variety of problems can influence the patient's recovery. Some significant variations were studied and were found to be valuable in the evaluation of the patient (19, 21). Those found to be the most significant modifiers to prognosis are considered next.

Canal Size of 10–12 mm. The narrow spinal canal has been found to be associated with a higher incidence of neurological damage (9, 10). An absolute stenosis (15) of 10 mm magnifies the effects of minor trauma and subjects the patient to neurological deficits when posttraumatic degeneration occurs.

This modifier has been given the largest value because of its potential for causing cord pressure. In combination with degenerative changes, it can produce neurological symptoms that are reversible only with surgery.

Canal Size of 13–15 mm. Relative stenosis (15) will have many of the same effects as absolute stenosis. There is slightly more space within the canal, but the prognosis still includes the possibility of future neurological deficit.

Straight Cervical Spine. The loss of the normal lordotic curve may be caused by either muscle spasm, ligamentous damage, or both (Fig. 11.8). The weight of the head usually rests primarily on the articular facets rather than on the vertebral bodies. The loss of the normal curve causes an uneven distribution of weight within the cervical area. The loss of the curve has been found in patients who experienced residual pain and stiffness on final examination (21).

Figure 11.8. Lateral cervical spine view demonstrates a loss of the normal cervical curve after a "whiplash" injury.

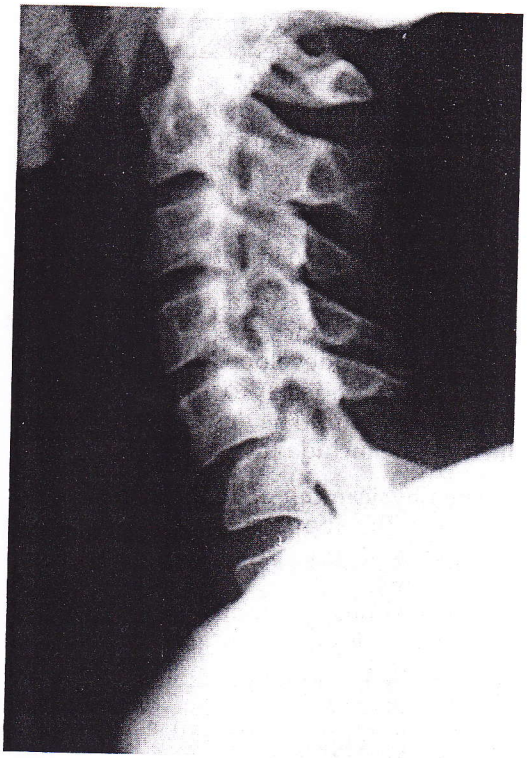

Figure 11.9. Acute kyphosis of the cervical spine at C5-C6 is demonstrated. This change is secondary to tearing of the interspinous ligament between C5 and C6.

Kyphotic Cervical Curve. A sharp reversal or kyphotic curve is typically seen in association with posterior ligament damage (Fig. 11.9). There is a significantly higher incidence of degenerative changes in patients who have a kyphotic curve.

Care should be exercised when a kyphotic curve is being evaluated during the initial examination. Further angulation deformity can be expected if the posterior ligaments are totally disrupted. Disruption of these ligaments causes the most unstable type of cervical spine injury (25, 38, 39).

Fixated Segments. Fixated segments, whether congenital, as in Klippel-Feil syndrome, or caused by surgical or degenerative changes (Fig. 11.10), may exacerbate the patient's injury. Chronic changes include increased spur formation at the levels above and below the fixation (25).

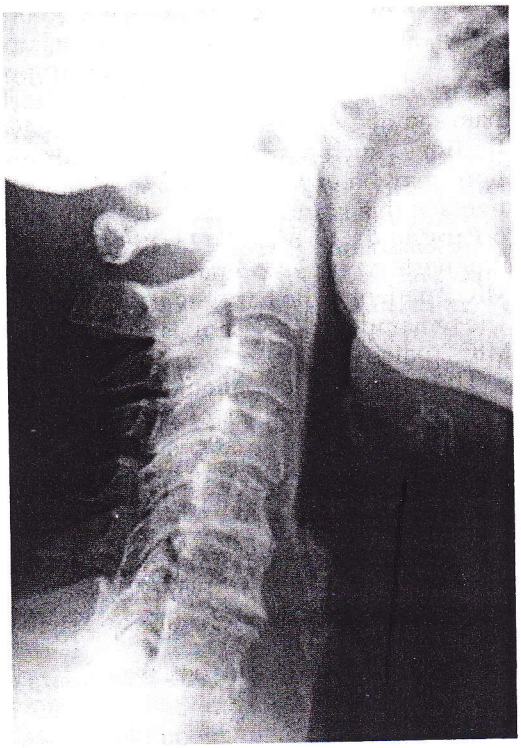

Figure 11.10. Fixation of the lower cervical spine at C5–C7 is demonstrated. Intervertebral osteochondrosis has effectively fused the area.

Hohl, in his study (19), found that those with fixated segments at one level had a poorer clinical recovery and a significantly higher incidence of degenerative changes. Sixty-three percent of those with fixations developed degenerative changes.

Preexisting Degenerative Changes. Degenerative changes, as previously discussed, may enhance the effects of the injury, due to the arthropathy of the joints and the ligamentous laxity associated with the conditions. Preexisting degenerative changes, "no matter how slight," adversely affect the prognosis (21) (Fig. 11.11).

Loss of Consciousness. A patient who strikes his or her head during the accident may lose consciousness for a brief period of time. The impact to the head is, essentially, a second, separate accident. Therefore, the structures of the cervical spine are subjected to a second trauma and have almost twice the amount of posttraumatic degeneration. Hohl (19) studied, as a subgroup, those patients who had lost consciousness during the accident; he found that 64% experienced degenerative changes within the study period.

Point Values Assigned by Category

The patient who has suffered a cervical acceleration/deceleration injury should be evaluated and placed in one of the MIC groups. Each MIC group has been assigned a numerical point value.

MIC 1. MIC 1 has been assigned a value of 10 points, since there are no objective findings to verify the patient's symptoms. Some modifiers have been assigned a higher point value than that for MCI 1, but the significance of these modifiers is dependent on the initial injury.

MIC 2. MIC 2 has been assigned a value of 50 points. The loss of motion in patients in this group represents objective evidence of injury.

MIC 3. MIC 3, with its neurological deficits, has been assigned the highest point value of 90.

Figure 11.11. Lateral view of the cervical spine demonstrates a loss of the cervical curve and early degenerative changes at C5–C6.

Point Values Assigned by Modifier

After the physical examination and categorization of the patient, the physician should evaluate the radiographs and patient history for the presence of modifiers. Modifiers are cumulative; i.e., their value may be added together. The cumulative points from these factors are added to the points from the patient's assigned MIC group.

Modifiers	*Point Value*
Canal size of 10–12 mm	20
Canal Size of 13–15 mm	15
Kyphotic curve	15
Fixated segment of flexion and extension films	15
Loss of consciousness	15
Straight cervical curve	10
Preexisting degeneration	10

Interpretation

Based on his or her point total, the patient is placed in one of five categories. Although the point total determines the patient's initial prognosis, the factors outlined are subject to modification during the course of treatment.

Prognosis Group 1 (10–30 Points). Prognosis group 1 is composed of MIC 1 patients who may have one major (high-point) or two minor (low-point) modifiers. The prognosis for patients in this group is excellent because patients have no objective findings and few modifiers. The residual problems, if any, are typically occasional, mild muscle pain and/or occipital headaches.

Prognosis Group 2 (35–70 Points). Prognosis group 2 is composed of either MIC 1 or MIC 2 patients. The MIC 1 patients in this group have more modifiers than do patients in prognosis group 1. Some modifiers may have been preexisting, but they still have a bearing on the future outcome of the case. The increased number of modifiers places the patient in a higher risk position.

The MIC 2 patients in this group may have fewer modifiers but are classified in prognosis group 2 because they sustained a higher level of injury. The prognosis for patients in this group is generally good, and future neurological deficits are unlikely. Residual symptoms, consisting of occasional to intermittent, moderate neck pain may be expected. Residual objective findings, such as restricted cervical motion, may be expected in some of the patients in this group.

Prognosis Group 3 (75-100 Points). Prognosis group 3 is primarily composed of MIC 2 patients who have several modifiers. The remainder of the group is composed of MIC 3 patients.

The prognosis for patients in this group is poor, and a number of these patients develop neurological deficits. Because the MIC 3 patients in this group have few modifiers, most of their initial neurological deficits may resolve.

Residual symptoms in this group, as well as in prognosis groups 1 and 2, include areas of numbness or, on rare occasions, muscle weakness.

Prognosis Group 4 (105–125 Points). Prognosis group 4 is composed of MIC 2 patients who have many modifiers and MIC 3 patients who have few modifiers. The probability of future or persistent neurological deficits is likely, so prognosis for patients in this group is guarded.

Neurological damage may cause symptoms such as significantly decreased grip strength, muscle atrophy, radiculitis, and myelopathy. There is a fair probability that surgical intervention will be necessary in the future.

Prognosis Group 5 (130–165 Points). Prognosis group 5 is composed of patients whose prognosis might best be termed "unstable." This is not to be confused with an unstable fracture; rather, it represents the patient's unstable clinical picture.

Patients in this group have suffered neurological deficits and have most of the modifiers in the scale. Their clinical picture is not likely to improve much, and future surgical intervention will probably be necessary. Radiculopathy and myelopathy are the primary complications.

CASE STUDIES

Example 1

ARW presented with posttraumatic changes after his car had been hit from be-

hind a few hours previously. Physical examination revealed pain upon palpation of the anterior cervical muscles. Range of motion was restricted on extension and within normal limits in all other directions.

Radiographic examination revealed a straightening of the cervical curve. There were no other radiographic abnormalities. The patient's history was unremarkable. No periods of unconsciousness were reported.

Rating. Physical examination revealed soft tissue changes and a restriction of cervical motion. These findings place the patient in MIC 2, with 50 points.

Radiographic examination revealed the presence of one modifier—a straight cervical curve (10 points).

With a combined total of 60 points, ARW should be placed in prognosis group 2. A good prognosis is indicated.

Example 2

JBS, an elderly gentleman, was involved in an accident in which his car was struck from behind. The impact forced his car into the vehicle directly ahead of him. Physical examinations revealed cervical muscle swelling, decreased motion on flexion and extension, and weakness of the right deltoid muscle.

Radiographic examination revealed a kyphotic curve, degeneration of the disc at C4-C5, C5-C6, and C6-C7, and a spinal cord that measured 14 mm. The spinal cord measurements were the result of spondylotic changes.

Rating. Physical examination revealed a neurological deficit, placing the patient in MIC 3, with 90 points.

Radiographic examination revealed the presence of the following modifiers: preexisting degeneration (10 points), narrowed canal (15 points), and a kyphotic curve (15 points), for a total of 40 points.

With a combined total of 130 points, JBS should be placed in prognosis group 5; he presents an unstable clinical picture. His degenerative changes may continue to progress, and he could need surgical intervention at a later time.

DISCUSSION

In their clinical experience, Foreman and Croft have found the prognosis scale to be valuable in dealing with both insurance carriers and attorneys. Predictions based on the scale have been quite accurate despite the variability in healing rates and other factors not considered in the scale. (Other factors that affect a person's prognosis have been identified but were not consistent enough to be included in the scale). Foreman and Croft believe that the scale is of great value and will allow an accurate prognosis despite variations in patients and treatment responses.

Summary

1. All patients may be categorized into MIC 1, 2, or 3 according to their presenting symptomatic and radiographic picture. These groups are known to correlate with levels of residual pain.
2. Other factors, such as degenerative changes, loss of cervical curve, and loss of consciousness, have been identified as being significant modifiers to the long-term prognosis.
3. The combination of the MIC groups and the individual modifiers may be utilized to determine the long-term prognosis of the patient.
4. Proper utilization of the prognosis scale will allow the treating physician to prepare the medical documentation needed at the end of the case, while at the same time rendering proper care to the patient.
5. Use of the prognosis scale will encourage a proper workup of the case to deal with later legal concerns.