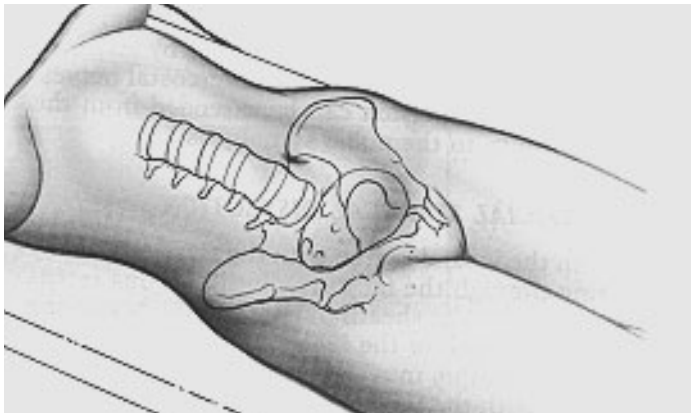
Four



The Hip

The Anatomy of the spine varies form region to region. The cervical spine is light, small, and flexible; the thoracic spine is larger and relatively immobile because of its associated ribs. The lumbar spine, especially lower part, has more mobility than the thoracic spine, but less than the cervical spine. Pathology is seen most commonly in the cervical and lumbar spines, which are the most mobile portions of the axial skeleton; they require surgery most frequently.

It is important to be able to reach the spine surgically through either an anterior or a posterior approach to treat pathology of its anterior and posterior elements. Pathologies such as vertebral body infection, fracture, and tumor often require anterior approaches. There are many anterior approaches to the spinal column; we present the basic ones that allow access to all the anterior parts of the spine.

Posterior approaches are used more often. The midline posterior approaches are the most common, permitting access to all the posterior spinal elements, as well as to the spinal cord and intervertebral discs.

Frequently, portions of the spine must be fused. Because the ilium is the best site from which to obtain bone graft material, this chapter concludes with the anterior and posterior approaches to the ilium that are used in conjunction with spinal approaches.

Posterior Approach to the Lumbar Spine

To treat spinal column injuries properly, the physician must recognize life-threatening injuries and treat them appropriately, provide initial supportive care at the same time diagnostic studies are initiated, and protect the neural elements until definitive treatment can be provided. Whether acting in concert with a team of trauma specialists or alone in the emergency department, an orderly, step-wise approach to assessment and management will eliminate missed fractures and ultimately improve overall outcome. In providing the initial care to the spine-injured patient, the physician must treat them appropriately. In providing the initial care to the spine-injured patient, the physician must treat them appropriately.

1. Excision of herniated discs[1]
2. Exploration of nerve roots[2]
3. Spinal fusions
4. Removal of tumors.

Position of the Patient

The posterior approach can be undertaken with the patient in either of two positions:

1. Once the patient is hemodynamically stable and the fracture diagnosed and classified, the surgeon can prepare a treatment plan based on the fracture pattern, the severity of injury, and the patient's overall condition.

2. trauma management the first priority is to preserve the patient's life: in some cases the threat to life is evident—from hemorrhage, visceral trauma, etc.—but in others it is not. Unstable thoracolumbar fractures are usually high-energy injuries. Anywhere from 40-80% result from motor vehicle accidents, involving drivers and passengers of automobiles, riders of motorcycles, and pedestrians. Other causes of spine fractures include falls from height, penetrating trauma. For both positions, use a cold-light headlamp to illuminate the deepset layers around the spinal cord.

Landmarks and Incision

Landmarks

Common injuries associated with thoracolumbar and thoracic fracture reflect the nature of the traumatic event. Intra-thoracic injuries include: A plain chest x-ray will confirm the presense of a hemo/pneumothorax, diaphragmatic rupture, and may show widening of the mediastinum associated with a great vessel injury. If multiple rib fractures are seen, particularly with first rib and clavicle fractures. Intra-thoracic injuries include: A plain chest x-ray will confirm the presense of a hemo/ pneumothorax, diaphragmatic rupture, and may show widening of the mediastinum associated with a great vessel injury.

Incision

Tension pneumothorax can be rapidly fatal, as can cardiac tampanade. These injuries are often associated with thoracic fractures and fracture dislocations. In providing the initial care to the spine-injured patient.

- quickly assess bilateral breath sounds and heart sounds—should identify either problem;
- tension pneumothorax—breath sounds absent or

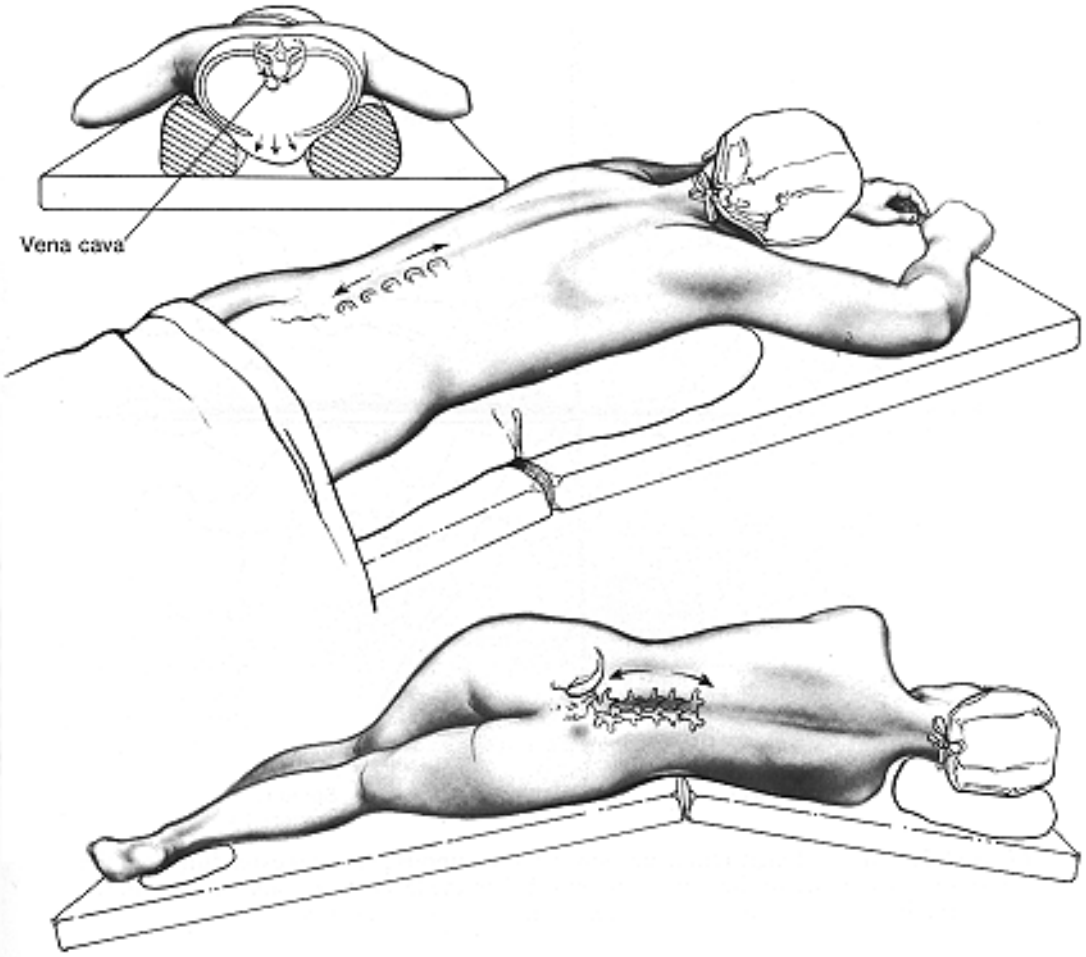


Figure 6-1. (A) The position of the patient for the posterior approach to me lumbar spine. **(B)** Alternatively place the patient in the lateral position with the affected side up.

diminished on injured side—esophagus and trachea displaced towards normal lung;
- cardiac tampanade, indistinct heart sounds—the neck veins will be distended.
- cardiac output will be impaired in either case
- patient will manifest signs of shock and cyanosis.

Rapid placement of a chest tube will resolve the pneumo, or hemothorax, with immediate improvement of oxygenation and cardiac output. Pericardiocentesis will decompress the cardiac tampanade, with rapid improvement in circulatory function.

Internervous Plane

Intra-abdominal injuries are also common in thoracolumbar injuries, and should be carefully sought out in certain fracture types, such as the flexion/distraction or "seat-belt" fracture, (Gumly). Solid viscera may be injured directly when they are compressed between the body wall and a solid object striking the abdomen, or they may be torn from their attachments when the body is suddenly and rapidly decellerated. Hollow viscera may be ruptured, perforated, or torn from their mesenteries. The association of lap-belt abrasions with the classic flexion/distraction fracture should alert the physician to a high likelihood of intraabdominal injury. Because this fracture occurs as the body is flexed forward over the lap-belt, visceral injuries can be found in between 40% and 60% of patients. Obtain a general surgical assessment whenever a flexion/distraction injury is suspected.

Superficial Surgical Dissection

Since most unstable thoracic and thoracolumbar fractures are high-energy injuries, it is not surprising that they are commonly associated with additional skeletal injuries.

Dangers

Hemorrhage from multiple long-bone fractures can be severe, resulting in shock. Injuries to the head and neck

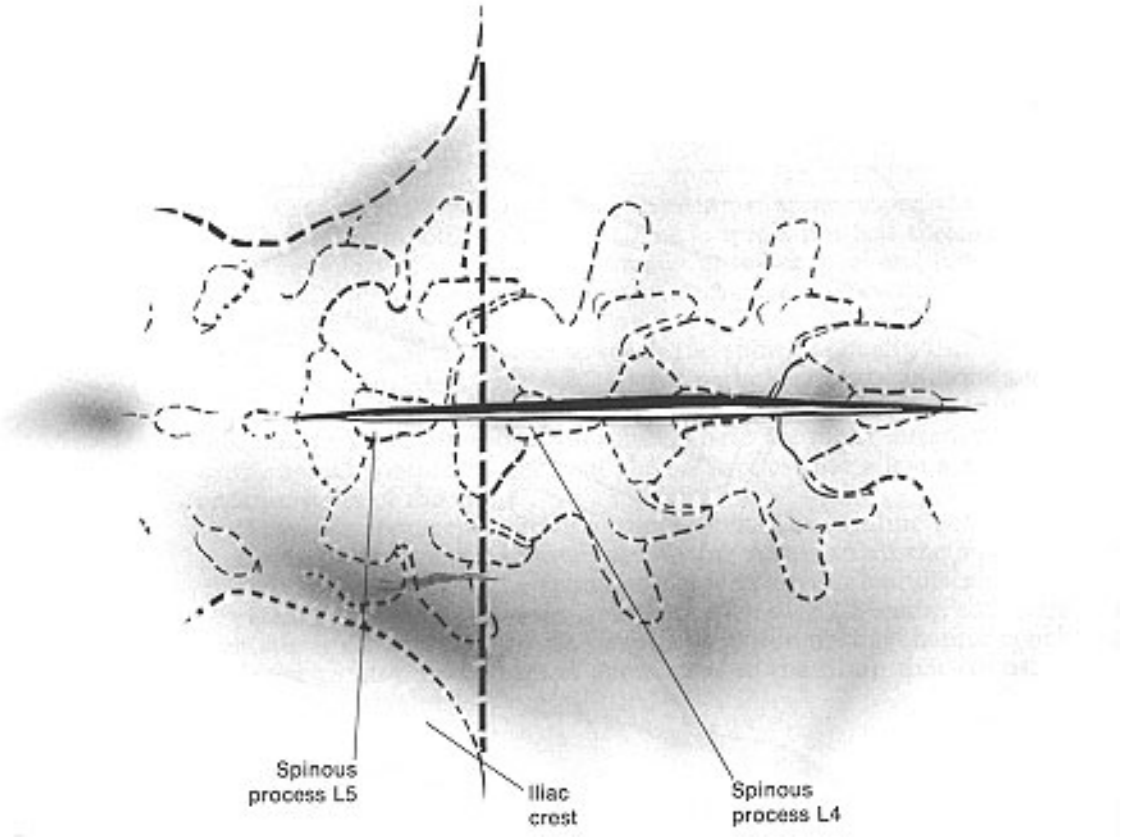


Figure 6-2 Make alongitudinal incision over the spinous processess extending from the spinous process above to the spinous process below process below the level of pathology. A line dreawn across the highest point of the iliac crest is in the L4-5 interspace.

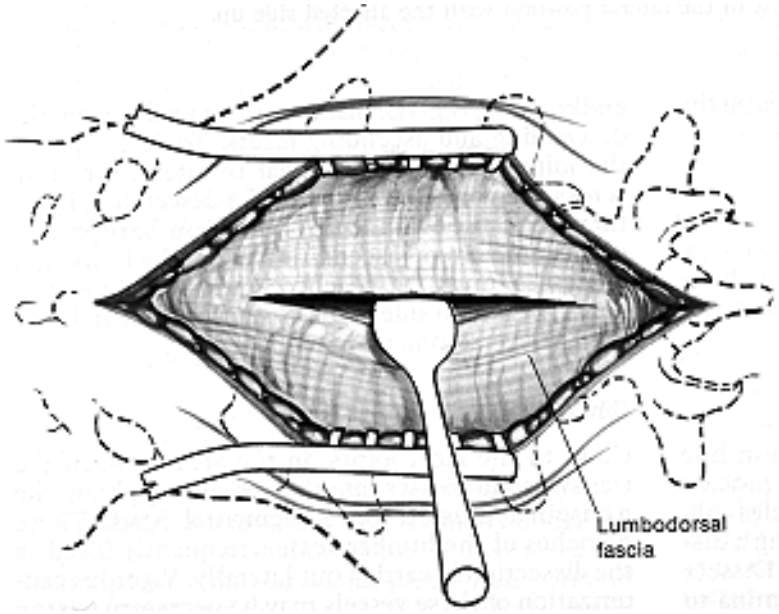


Figure 6-3 Deepen the incision through the fat and fascia in line with the skin incision until the spinous process itself is reached. Detach the paraspinal muscles subperiosteally.

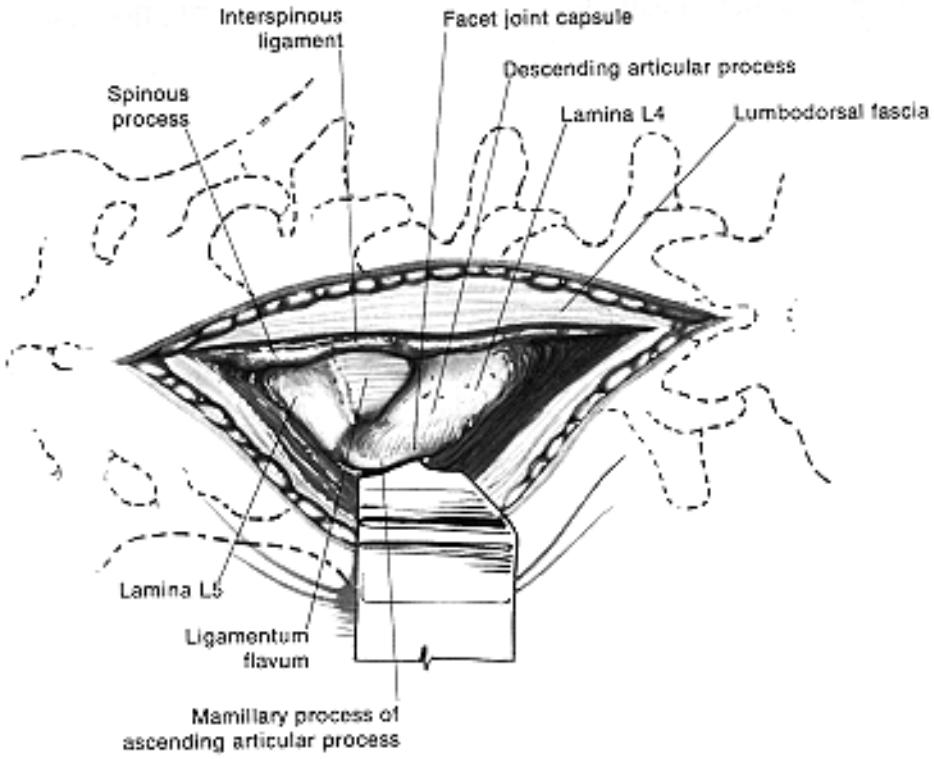


Figure 6-4 Dissect the paraspinal muscles from the spinous process and lamina tot he facet joint. Remove the paraspinal muscles subperiosteally as one unit from the bone.

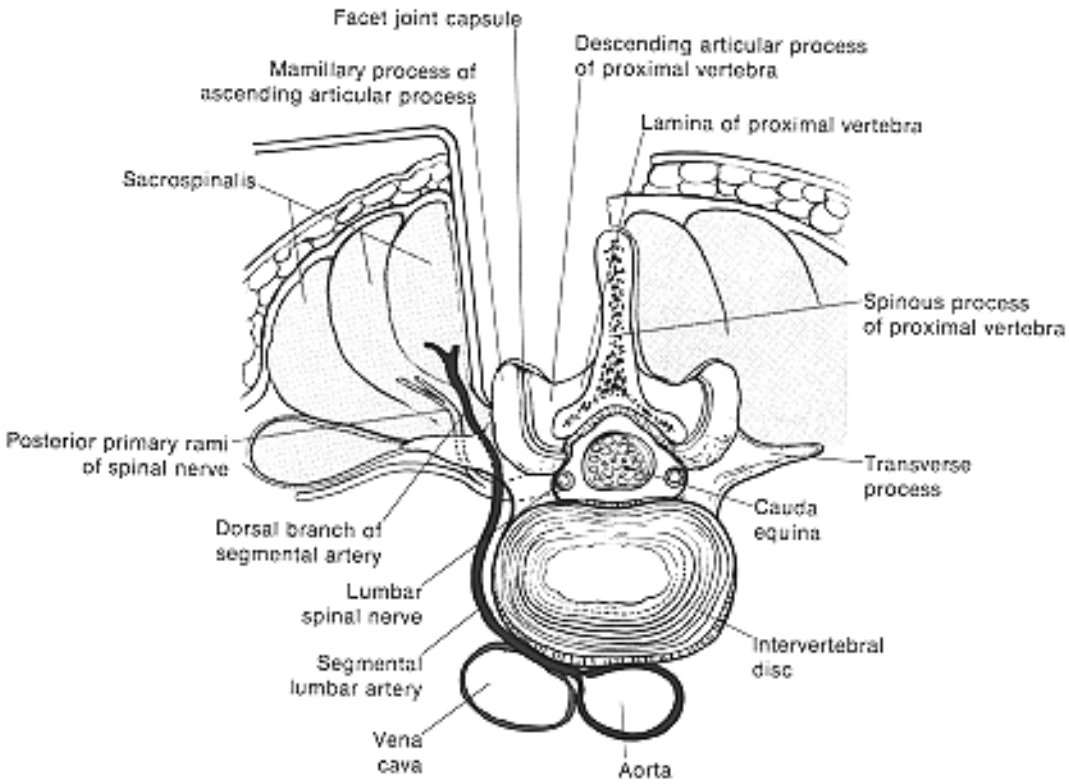


Figure 6-5 Continue dissectiong laterally, stripping the joint capsule from the descending and ascending facets. Place the point of a Taylor retractor on the lateral side of the ascending facet, using it as a fulcrum to allow for greater retraction of the paraspinal muscles. Note the branches of the lumbar vessels that bleed during stripping of the muscles.

should be carefully assessed in the emergency room, and the cervical spine should be protected throughout the initial evaluation and emergency procedures. Unconscious, obtunded, or intoxicated patients cannot provide a dependable history or reliably report pain or numbness, and should be protected as though a cervical injury existed. Plain radiographs will demonstrate the majority of bony injuries, but may not reveal soft tissue disruptions; retropharyngeal hematoma indicates significant soft tissue injury and mandates a formal cervical work-up. Head injuries may be evaluated by MRI or CT prior to anesthesia if surgery is needed, or may be observed if otherwise stable. Plain radiographs will demonstrate the majority of bony injuries, but may not reveal soft tissue disruptions; retropharyngeal hematoma indicates significant soft tissue injury.

1. Young patients manifest tachycardia and peripheral vasoconstriction as primary symptoms; hypotension may not be seen until shock is severe and vascular collapse occurs.
2. Older patients generally don't compensate as well, and tachycardia and hypotension will both appear early on.
3. Place a foley catheter to monitor urine output
4. Rapidly assess common sites of blood loss - open wounds, intraabdominal and intrathoracic hemorrhage, and long-bone and pelvic fractures
5. Institute fluid resuscitation immediately. Neurogenic shock results from loss of normal vasomotor tone. Patients present with:
6. Hypotension and tachycardia, in the face of warm, well perfused skin and peripheral tissues
7. May not respond to fluid bolus.
8. Vasopressors may be needed. Shock may result from any condition that reduces cardiac output, including cardiac tampanade, tension pneumothorax, myocardial injury or infarction. In every case, rapid vascular access and fluid resuscitation are the vital initial treatment for spinal trauma patients.

Deep Surgical Dissection

Once the potentially life-threatening injuries have been addressed or ruled-out, the next priority is to stabilize and protect the patient so that a more formal evaluation and work-up can be carried out without injuring the spinal cord. This is particularly important in the polytrauma patient who may be unconscious, may require anesthesia and surgical care, and must be moved repeatedly in order to manage other life-threatening injuries. Plain radiographs of the cervical spine are manditory before intubating the patient, and if injury is seen or suspected.[3]

Dangers

Unconscious, obtunded, or intoxicated patients cannot provide a dependable history or reliably report pain or numbness, and should be protected as though a cervical injury existed. Plain radiographs will demonstrate the majority of bony injuries, but may not reveal soft tissue disruptions; retropharyngeal hematoma indicates significant soft tissue injury and mandates a formal cervical work-up. Plain radiographs will demonstrate the majority of bony

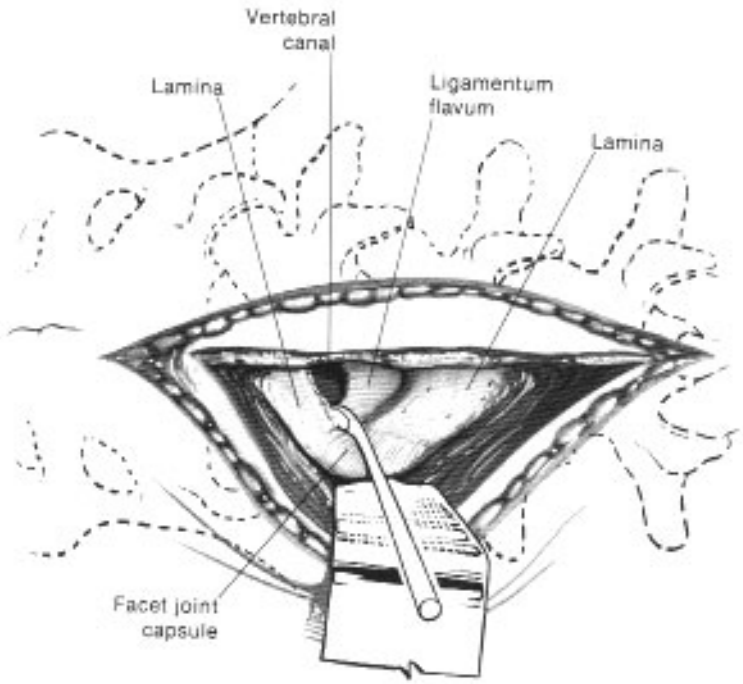


Figure 6-6 Remove the ligamentum flavuum by cutting its attachment to the superior or leadng edge of the inferior lamina.

injuries, but may not reveal soft tissue disruptions; retropharyngeal hematoma indicates significant soft tissue injury and mandates a formal cervical work-up.

Nerves

Transfer of the patient is safest on a spine board or slide board, but should always be carried out with sufficient personnel to make the transfer smoothly and without struggling. When log-rolling the patient, the team must coordinate efforts to see that the shoulders and pelvis move together as a unit. If the patient is hemodynamically stable and does not require emergency procedures, he or she may be transfered to a firm matress and maintained at strict spinal precautions until the work-up is completed. If the patient is hemodynamically stable and does not require emergency procedures, he or she may be transfered to a firm matress and maintained at strict spinal precautions until the work-up is completed.

Vessels

Hydrogen Ion Buffering. If the patient cannot cooperate with the exam, spontaneous movements and withdrawl responses should be carefully observed and noted. A rectal exam should be carried out to assess rectal tone.

Posterior Approach to the Lumbar Spine

Overview

The history should focus on three issues: mechanism of injury, presense or absense of neurological symptoms, and past history of spinal trauma, surgery, or symptoms. In high energy injuries it is often hard to determine exactly what forces acted on the spine to produce fracture, but knowledge of the injury mechanism can help identify associated injuries and provide clues to the level of instability to be expected.

> A formal physical examination and history may not be possible until the patient has been stabilized hemodynamically and has recovered from initial resuscitation. When the patient is alert and cooperative, a formal motor/sensory /reflex examination should be repeated.

A lap-belted patient in an MVA may present with a straight-forward flexion/distraction injury, for instance, while a patient ejected from the vehicle or from a motorcycle frequently will present with a more complex fracture pattern consistent with the combination of torsional and axial loading forces experienced when they struck the ground.

Landmarks and Incision

Landmarks

Spinous Processes. The physical examination for the spinal injured patient centers around a careful, complete neurological assessment. Having examined the musculoskeletal system in the emergency department, the physician carefully reexamines the extremities for tenderness and pain, and examines the back again to determine the level of discomfort, the presense of step-offs or gaps between the spinous processes.

Posterior Superior Iliac Spine and Crest of the Illium. A complete motor and sensory examination should be documented. Each motor group for the lumbar and sacral plexuses should be tested independently and compared to the contralateral group, Motor strength is recorded on a five-point scale:

Older patients generally don't compensate as well, and tachycardia and hypotension will both appear early on.
Place a foley catheter to monitor urine output
Rapidly assess common sites of blood loss, open wounds, intraabdominal and intrathoracic hemorrhage, and long-bone and pelvic fractures
Institute fluid resuscitation immediately. Neurogenic shock results from loss of normal vasomotor tone. Patients present with:
Hypotension and tachycardia, in the face of warm, well perfused skin and peripheral tissues
May not respond to fluid bolus.

Vasopressors may be needed. Shock may result from any condition that reduces cardiac output, including cardiac tampanade, tension pneumothorax, myocardial injury or infarction.

Superficial Surgical Dissection and Its Dangers

When extremity injuries are present, the examiner must make an educated assessment as to whether the

patient is clinically weak or limited in effort by pain. The examiner must also determine whether the pattern of weakness is consistent with a cord lesion, a root lesion, or a peripheral nerve injury.

1. The sensory examination begins at the chest wall and seeks a level of anesthesia root by root down to the sacrum. Patients with thoracic cord injuries will have an anesthetic level at or just below their fracture. If the anesthetic level and the recognized fracture do not coincide, an MRI should be obtained to determine the actual cause of the cord impairment. Sensation in the lower extremities follows a dermatomal pattern.

2. Although stable injuries may all be treated nonoperatively, not all unstable injuries need to be treated operatively. A simple algorithm for treatment would be: After assessing the level of instability, the fracture may be classified according to fracture type and severity. Denis fracture classification provides information on the fracture pattern, the mechanism of injury, and the deforming forces that caused the fracture. If the anesthetic level and the recognized fracture do not coincide, an MRI should be obtained to determine the actual cause of the cord impairment. The differences between severe burst fractures and rotational fracture-dislocations, and severe seatbelt injuries and flexion/distraction fracture-dislocations are subtle.

3. Compression fractures are common injuries, occuring with moderate trauma in young patients and minimal to no trauma in elderly, osteoporotic patients. The anterior column collapses under an axial or flexion load, with fracture of one or both endplates, but the middle and posterior columns are undamaged. These stable injuries are appropriately treated with a removable brace and symptomatic care. Patients with advanced osteoporosis should be observed for progressive collapse, and severe compression fractures may warrant a CT examination to rule out a burst component.

Applied Surgical Anatomy of the Posterior Approach to the Servical Spine

Burst fractures occur when the vertebral body is exposed to higher axial or flexural loads, at a high loading rate. These fractures are commonly the result of motor vehicle accidents, falls from height, or crush injuries. The anterior cortex fails in compression, and either one or both endplates are fractured. The anterior column collapses under an axial or flexion load, with fracture of one or both endplates. The middle column is also fractured, and a portion of the posterior vertebral body is retropulsed backwards into the canal. Depending on the severity of the fracture the posterior elements may be fractured as well. The need for surgical treatment is determined by the extent of vertebral comminution, the extent of canal compromise, and the status of the posterior column structures. Burst fractures may be subdivided by fracture pattern.

Seat-belt fractures may be either one or two level injuries. The classic one level injury is the Chance fracture. The mechanism of injury involves the patient thrown forward across an intact lap-belt, resulting in a hyperflexion force acting around a center of rotation anterior to the spinal column—at the belt itself. This results in distraction forces at all three columns of the spine, tearing apart the posterior elements either through the facet joints or the bone itself, the middle column through either the posterior disc or the posterior vertebral body, and either disrupting the anterior column, in severe injuries, or leaving it as a hinge that cannot resist either flexion or rotational displacement. Plane radiographs demonstrate the gap between the spinous processes, and the disruption of the pedicle in most cases, but may show minimal displacement when the patient is supine, as the fracture tends to reduce in this position.

The violent compression of viscerae between the spinal column and lap-belt can rupture hollow viscera, lacerate solid viscera (liver and spleen), and avulse major vascular pedicles. Unrecognized, any of these injuries can prove rapidly fatal, and it is necessary that any patient with a seat-belt injury be carefully assessed by a general surgeon.

Fracture-dislocations are, by definition, three column injuries. They are highly unstable, usually associated with neurological injury, and often associated with other musculoskeletal and visceral injuries.[1] The neurologically intact patient must be carefully protected during any necessary testing or emergent operative procedures, and the spine must be stabilized at the first reasonable opportunity to allow mobilization and prevent paralysis.

In the patient with neurological deficit, postural reduction may improve alignment and reduce neural compression, and longitudinal traction may allow manual reduction of a displaced fracture-dislocation.2 Neither will reduce neural compression by retropulsed vertebral fragments.

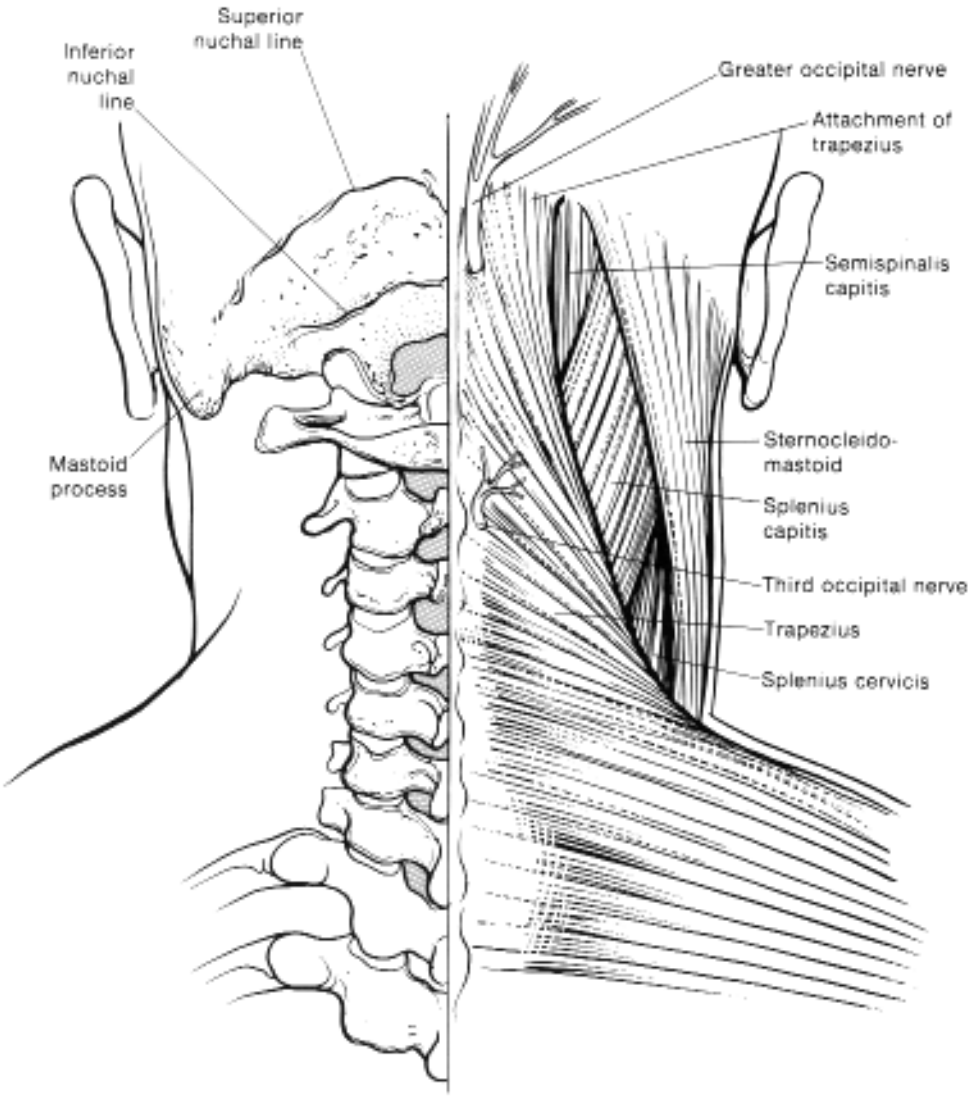


Figure 6-7 The superficial musculature of the cervical spine consists of the trapezius and the sternocleidomastoid muscles. Between these and the deeper levels lies the intermediate layer, the capitis.

Successful fracture treatment begins with a careful and comprehensive initial evaluation. The key to success is, as always, to look at the whole patient—never allowing a single, dramatic injury to distract attention from more subtle, and potentially more dangerous injuries. Once the patient is hemodynamically stable, and the fracture recognized and classified, the surgeon must prepare a treatment plan based on the fracture pattern, the severity of injury, and the patient's overall condition. The options for non-operative and operative treatment are extensive, and the correct choice for any patient must be determined by weighing all the above considerations, as well as the surgeons experience, against the potential risks of treatment.

Transfer of the patient is safest on a spine board or slide board, but should always be carried out with sufficient personnel to make the transfer smoothly and without struggling. When log-rolling the patient, the team must coordinate efforts to see that the shoulders and pelvis move together as a unit. If the patient is hemodynamically stable and does not require emergency procedures, he or she may be transfered to a firm matress and maintained at strict spinal precautions until the work-up is completed. Precautions include strict supine positioning, log-rolling side to side every two hours for skin care, and periodic reexamination of neurological status. Head-injured and combatitive patients may need to be sedated and intubated.

With the patient hemodynamically and mechanically stabilized, attention is returned to the spinal injury assessment. Obtain a complete history, paying close attention to reports of transient paresthesias, acute back or neck pain, or temporary weakness or paralysis at the time of injury. Record the location and radiation of pain symptoms, as well as any radicular symptoms. Any past history of previous injury, fracture, or pain symptoms should be noted. A global examination of motor/sensory function should rapidly focus on any areas of deficit.

A lap-belted patient in an MVA may present with a straight-forward flexion/distraction injury, for instance, while a patient ejected from the vehicle or from a motorcycle frequently will present with a more complex fracture pattern consistent with the combination of torsional and axial loading forces experienced when they struck the ground. If the forces involved in the fracture were rather low, an underlying pathological process must be considered. If the forces involved were very high, and multiple injuries were sustained.

REFERENCES

1. Benson DR; Burkus JK; Montesano PX; Sutherland TB; McLain RF. Unstable thoracolumbar and lumbar burst fractures treated with the AO fixateur interne. Journal of Spinal Disorders, 1992, 5(3):335-43.
2. Bohlman, H.H.: Treatment of Fractures and Dislocations of the Thoracic and Lumbar Spine. J Bone Joint Surg 67A:165-169, 1985.
3. Bone, LB: Management of Polytrauma. in Operative Orthopaedics, Second Edition. Chapman, MW, ed. J.B. Lippincott Co., Philadelphia, 1993.
4. Bracken, MB, Shepard, MJ, Collins, WF, et al: A randomized, controlled trial of methylprednisolone or naloxone in the treatment of acute spinal cord injury. Results of the Second National Acute Spinal Cord Injury Study. N Engl J Med 322: 1405-1411, 1990.
5. Denis, F.: The Three Column Spine and its Significance in the Classification of Acute ThoracoLumbar Spinal Injuries. Spine.
6. Denis, F.: Spinal Instability as Defined by the Three Column Spine Concept in Acute Trauma. Clin Orthop 189:65-76, 1984.
7. Dickson JH; Harrington PR; Erwin WD.: Results of reduction and stabilization of the severely fractured thoracic and lumbar spine. Journal of Bone and Joint Surgery. American Volume, 1978, 60(6):799-805.
8. El-Khoury, GY, Kathol, MH, Daniel, WW: Imaging of acute injuries of the cervical spine: value of plain radiography, CT, and MR imaging. AJR 1995; 164:43-50.
9. Finn, CA, Stauffer, ES: Burst fractures of the fifth lumbar vertebra. J Bone Joint Surg 74A:398-403, 1992.
10. Gertzbein SD; Court-Brown CM.: Rationale for the management of flexion-distraction injuries of the thoracolumbar spine based on a new classification. Journal of Spinal Disorders, 1989, 2(3):176-83.
11. Golimbu C; Firooznia H; Rafii M; Engler G; Delman A.: Computed tomography of thoracic and lumbar spine fractures that have been treated with Harrington instrumentation. Radiology, 1984, 151(3):731-3.
12. Gumley G; Taylor TK; Ryan MD.: Distraction fractures of the lumbar spine. Journal of Bone and Joint Surgery. British Volume, 1982, 64(5):520-5.
13. Holdsworth, FW: Fractures, Dislocations, and Fracture-Dislocations of the Spine. J Bone Joint Surg, 45B:6-20, 1963.
14. Holdsworth, FW, Chir, M: Fractures, Dislocations, and Fracture-Dislocations of the Spine. J Bone Joint Surg, 52A:1534.
15. Keene, JS: Radiographic Evaluation of Thoracolumbar Fractures. Clin Orthop 189:58, 1984.
16. Keene, JS, Goletz, TH, Lilleas, F, Alter, AJ, Sackett, JF: Diagnosis of Vertebral Fractures: A Comparison of Conventional Radiography, Conventional Tomography, and Computed Axial Tomography. J Bone Joint Surg 64A:586 – 595, 1982.
17. McBride, G.G.: Cotrel-Dubousset Rods in Spinal Fractures. Paraplegia 27:440-449, 1989.
18. McBride GG.: Cotrel-Dubousset rods in surgical stabilization of spinal fractures. Spine, 1993 Mar 15, 18(4):466-73. 19.McLain, R.F., Sparling, E., Benson, D.R.: Early failure of short segment pedicle instrumentation for thoracolumbar fractures. J Bone Joint Surg 1993; 75A:162 - 167.
20. McLain, RF, Benson, DR: Thoracolumbar Fractures Treated with Segmental Fixation. Unpublished Data.
21. McLain, R.F., Benson, D.R.: Missed Cervical Dissociation – Recognizing and Avoiding Potential Disaster. J Emergency Medicine, In Press , 1998.
22. Panjabi MM; Oxland TR; Kifune M; Arand M; Wen L; Chen A.: Validity of the three-column theory of thoracolumbar fractures. A biomechanic investigation. Spine, 1995 May 15, 20(10):1122-7.
23. Place HM; Donaldson DH; Brown CW; Stringer EA.: Stabilization of thoracic spine fractures resulting in complete paraplegia. A long-term retrospective analysis. Spine, 1994 1, 19(15):1726-30.
24. McLain, RF, Benson, DR: Thoracolumbar Fractures Treated with Segmental Fixation. Unpublished Data.

Table 1. Clinical Features

	Classic Bartter	Gitelman	Antenatal Bartter
Clinical features	■ Usually presents in infants ■ Polydipsia, polyuria, nocturia ■ +/- salt craving ■ +/- Fatigue, muscle weakness neuromuscular irritability ■ Growth retardation ■ Developmental delay	■ Manifests in adults (often asymptomatic), and school children ■ Fatigue, muscle weakness, vomiting, diarrhea. (Chvostek and Trousseau signs, tremor, fasciculations, tetany) ■ +/- joint pain secondaryto chondrocalcinosis	■ Prenatal presentation with polyhydramnios, premature delivery. In newborn: fever, volume depletion due to polyuria, but tetany is rare ■ Failure to thrive ■ Growth retardation ■ +/- "Typical" facies: triangular face, prominent forehead, large eyes, protruding ears, drooping mouth ■ Nephrocalcinosis, osteopenia
Blood biochemistry	■ Moderate-severe hypokalemia ■ Metabolic alkalosis ■ Very high renin, aldosterone, angiotensin II ■ 20% have hypomagnesemia	■ Moderate-severe hypo ■ Metabolic alkalosis ■ High renin, normal-high aldosterone ■ Marked hypomagnesemia	■ Severe electrolyte imbalance ■ Metabolic alkalosis ■ Slightly low to normal magnesium
Renal/urinary findings	■ High potassium and chloride excretion ■ High prostaglandin E2 ■ Normal-high calcium ■ Nephrocalcinosis uncommon	■ High potassium excretion ■ Normal prostaglandin E2 ■ Hypocalciuria (despite normocalcemia) ■ No nephrocalcinosis and osteopenia ■ Hyposthenuria	■ High potassium and chloride excretion ■ Marked prostaglandin E2 ■ Severe hypercalciuria leading to nephrocalcinosis
Ion channel mutation	■ Basolateral chloride channel (ClC-Kb = type III) of the thick ascending limb of loop of Henle	■ Thiazide-sensitive co-transporter (TSC or Na -transporter or NCCT) of convoluted tubule channel (ROMK = type II)	■ Apical bumetanide-sensitive co-transporter (BSC or Na-K-2Cl or NKCC2 = type I) and inwardly-rectifying of thick ascending limb

Surgical Exposures in Orthopaedics

The Anatomic Approach

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The Anatomic Approach
Third Edition

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York, England

Dedication

To my wife Norma,
my children
Jon-David, Robert, and Stephen,
and my parents Agatha and David,
all in their own special way
have made my life full
and made this book possible.
S.H.

To Suzanne, Katy, James,
and all the other members of my family.
p. deb.

Preface

The expertise of vitreoretinal surgeon is often needed in the management and treatment of the severly injured eye. THe pathophysiology of closed-globe and open-globed injuries results in vitreoretinal pathology that often necessitates surgical management. Since 1973, when Robert Machemer introduced pars plana vitrectomy, there has been a burgeoning of technological and scientific information on the surgical approach to the injured eye Virgil Alfaro and Peter Liggett's textbook, Vitreoretinal Surgery of the Injured Eye, provides a comprehensive and systematic presentation of this information.

Vitreoretinal Surgery of the Injured Eye is written by vitreoretinal specialists with the vast experience in ocular trauma. Alfaro and Liggett have organized an internal team to contribute to the textbook.

The Texbook is organized systematically and includes two chapters on subjects that are often overlooked in similar texts: a historical perspective and counseling of the injrued patient. The other 27 chapters provide in-depth and comprehensive treaties on the management of ocular trauma, with notable contributions by Klaus Heimann, Eugene de Juan, and D. Jackson Coleman. It is beautifully illustrated by Timothy Hengst, providing detail of surgical techniques in the management of the severely injured eye.

Vitroretinal Surgery of the Injured Eye represents a scholarly work dedicated to the understanding and treatment of a clinically important problem. I commend the editors and the contributors of this textbook for their outstanding work.

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To Hugh Thomas,
Vitreoretinal Surgery of the Injured Eye, provides a comprehensive and systematic presentation of this information.

To Ray Coomaraswamy, M.d.,
Vitreoretinal Surgery of the Injured Eye is written by vitreoretinal specialists with the vast experience in ocular trauma. Alfaro and Liggett have organized an internal team to contribute to the textbook.

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Contents