CHAPTER 10
Case History Problem Solving: Part I
Spinal Cord, Nerve Root, Perepheral Nerve and Muscle

LESION DIAGRAMS: For each of the following diagrams, indicate the structures involved, the clinical symptoms and signs that would be present and the most likely pathology. That is name the disease or syndrome. Diagrams 1-10 follow.

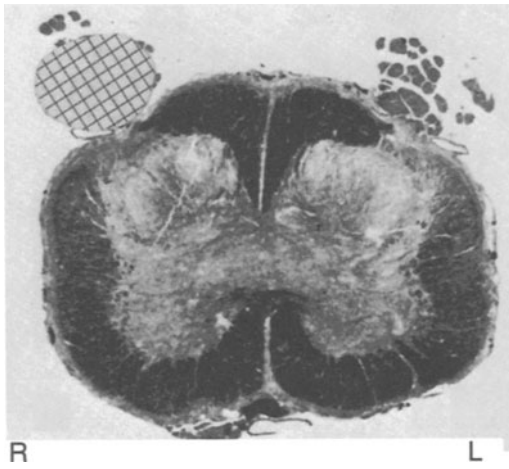


Figure 10-1

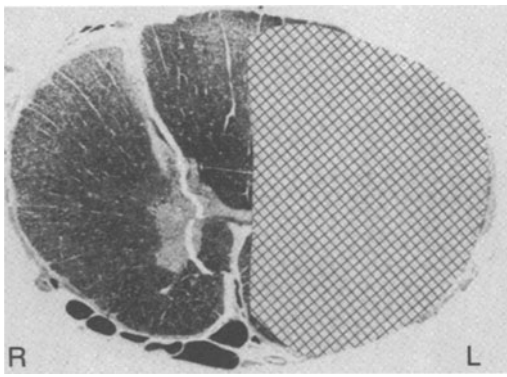
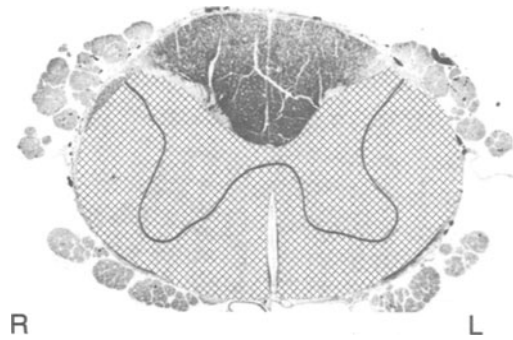


Figure 10-2



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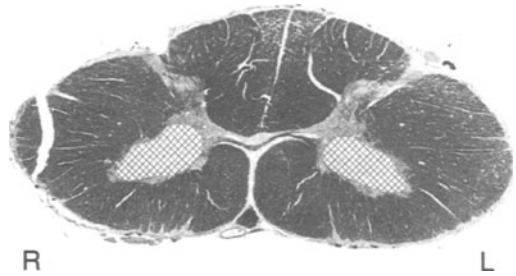

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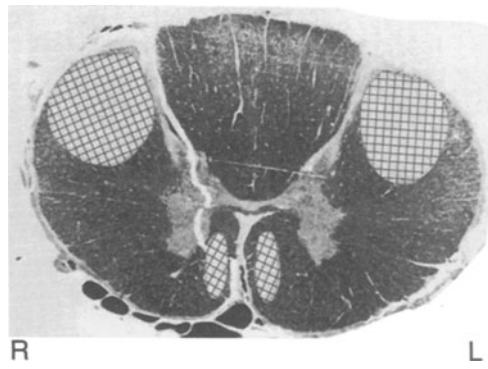

Figure 10-5

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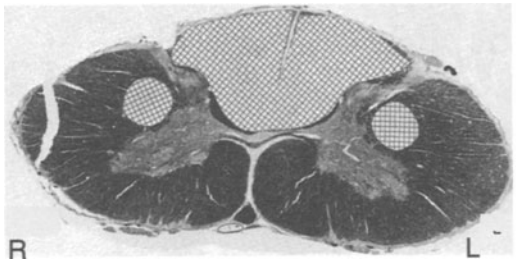

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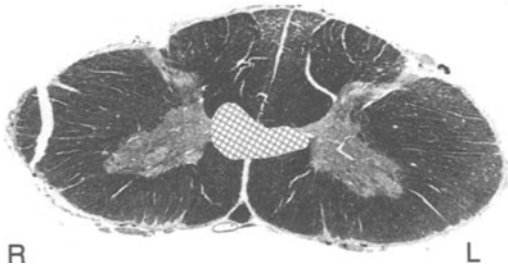

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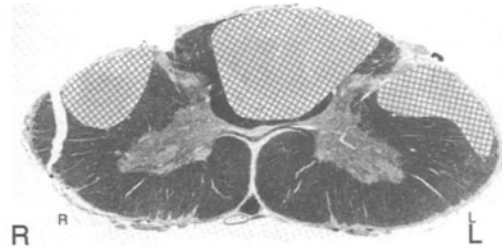

Figure 10-9

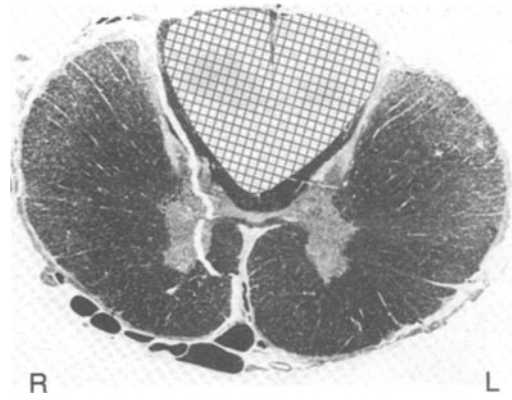

Figure 10-10

CASE HISTORY PROBLEM SOLVING PART I - SPINAL CORD, NERVE ROOT, PERIPHERAL NERVE AND MUSCLE

Each of the following case histories deals with disease at the level of muscle peripheral nerve root and spinal cord. For each case relevant to spinal cord, be prepared to draw a diagram of the lesion indicating the appropriate spinal cord level, the location of the lesion, and the nature of the pathologic process. If disease of the spinal cord is present, decide whether the process is intrinsic or extrinsic and whether it involves a single-level lesion or is a system disease.

CASE 10-1: A 48-year-old white male, while lifting a heavy object, approximately two months prior to neurological consultation, had the sudden onset of pain in the posterior cervical area and radiating into the right shoulder, down the posterior aspect of the arm into the elbow. Coughing or straining at stool resulted in a shooting, burning electric shock-type pain in the above distribution, also extending at times into the index and middle fingers. In association with the pain, he experienced tingling Pins-and-needles paresthesias in the right upper extremity in a distribution similar to that noted above. During this period the patient also noted minor weakness of the right hand. The lower extremities and bladder were not involved. When symptoms persisted, neurological consultation was obtained.

NEUROLOGIC EXAMINATION

Mental status: Intact.
Cranial nerves: II-XII intact.
Motor system:

a. There was significant weakness of the right triceps (50% of normal) with minimal weakness of the right wrist extensor and the finger abductors of the right hand. There was no weakness of the lower extremities.

b. Gait was intact.

c. No definite atrophy was present. Rare fasciculations were noted in the right

triceps muscles.

Reflexes:

a. Deep tendon reflexes

Biceps:	right, 2+; left, 2+
Triceps:	right, 0; left, 2+
Brachioradials:	right, 1 to 2+; left, 2+
Patellar:	right, 2+; left, 2+
Achilles:	right, 2+; left, 2+

b. Plantar responses:

Right flexor, left flexor.

Sensory System:

Minor decrease in pain sensation was present over the right middle finger. Pain, touch, position, and vibratory sensation were otherwise intact.

Neck: There was limitation of neck motion in all directions due to pain. Pressure over the lower cervical spinous processes produced a radiation of pain onto the right upper extremity. There was also local tenderness on pressure over the right supraclavicular area.

QUESTIONS

1. Is the spinal cord directly involved by this lesion? If so, indicate the level. If not, cite evidence against such involvements. Are the anterior roots involved? If so, indicate the level. If not, cite evidence against such involvement. Are the dorsal roots involved? If so, indicate the level. If not, cite evidence against such involvement.
2. What is the localizing significance of the relatively selective weakness of the right triceps muscle?
3. What is the explanation for the occasional fasciculations noted in the right triceps muscle?
4. What is the localizing significance of the selective depression of the triceps deep tendon reflex? Review also the segmental levels involved in the biceps, radial, patellar and Achilles deep tendon reflexes.
5. What is the localizing significance of the distribution of pain and numbness experienced by the patient?
6. What is the localizing significance of the restricted pain deficit in the right hand?
7. Speculate concerning the pathology involved in this case.
8. Why did coughing and straining at stool produce an exacerbation of the pain?
9. How would you manage this problem?
10. Which imaging studies should be obtained and when should these studies be obtained?

SUBSEQUENT COURSE

The patient had a reduction in pain and sensory symptoms following the use of cervical traction. Strength improved and the triceps deep tendon reflex returned.

CASE 10-2: This 58-year-old white housewife presented with a 7-month history of throbbing midthoracic back pain, which at time would radiate to the anterior chest and was aggravated by coughing or by straining at stool. Two months prior to admission, numbness of the right foot was noted, which gradually spread up the leg so that within a 6-week period, a level just below the breast anteriorly and just below the scapula posteriorly was involved. Six weeks prior to admission, a similar ascending numbness of the left foot developed. One month prior to admission, weakness of both lower extremities was noted, the right being weaker than the left. For 2 months, difficulty in control of urination had been present.

GENERAL PHYSICAL EXAMINATION:

Normal.

NEUROLOGIC EXAMINATION:

Mental Status: Intact

Cranial Nerves: Intact

Motor System:

a. Bilateral decrease in strength was present at hip, knees and ankles.

b. Gait was shuffling, possibly spastic.

Reflexes:

a. Deep tendon reflexes were active in the upper extremities, possibly related to a significant degree of anxiety. The patellar reflexes were markedly hyperactive (4+).

b. The plantar response was markedly extensor on the left and borderline on the

right.

Sensory System:

a. Pain and temperature sensation were decreased bilaterally below the xiphoid sternum anteriorly and the T6 spinous process posteriorly. The degree of impairment was greater on the right than the left side.

b. Position sensation was absent at the left toes.

c. Vibratory sensation was absent at the left toes and decreased at the left ankle and knee.

Vertebral percussion tenderness was present over the T3-T5 spinous processes.

LABORATORY DATA:

X-rays: Thoracic spine X-ray was negative. Chest X-ray was negative.

QUESTIONS

1. What is the significance of this selective combination of signs and symptoms:

a. The degree of impairment of pain and temperature sensation was greater on the right side than the left.

b. Position and vibratory sensation was absent at left toes but intact on the right.

c. The plantar response was markedly extensor on the left but borderline on the right.

2. Where is the lesion located? Be specific and indicate basis for your conclusions.
3. Is the pathology intrinsic or extrinsic?
4. Provide a differential diagnosis as to the nature of the pathology and defend your conclusions.
5. What diagnostic studies would you request? When would you obtain those studies?
6. What therapy would you recommend? What type of consultation would you request? When would you obtain this consultation? What results would you expect from therapy?

CASE 10-3: This 16 year old right-handed white female high school student, 7 days prior to admission awoke with a bilateral sensation of numbness and tingling of teeth and gums. Three days prior to admission, she awoke with numbness of the hands and the plantar surfaces of the feet. On the day prior to admission, she began to experience diffuse weakness of all 4 limbs and of her face. This worsened over 24 hours.

PAST HISTORY:

unremarkable, she did smoke 5-10 cigarettes per day.

GENERAL PHYSICAL EXAMINATION:

Blood pressure slightly elevated (140/90), with elevated pulse of 116.Temperature 97.6 dig. (Oral). Respiration 20.There was mild erythema of the pharynx, but no lymphadenopathy.

NEUROLOGICAL EXAMINATION:

Mental status and cranial nerves were normal.

1. *Motor system:* diffuse weakness: right upper extremity 3+-4+/5,left upper 5-/5.

Symmetric weakness in lower extremities in the following muscles: iliopsoas 3/5,hamstrings 4/5,gastrocnemius 4/5,anterior tibials 4/5,extensor hallucis longus 4/5.

2. *Reflexes:* Deep tendon stretch reflexes were everywhere absent. Plantar responses were flexor.
3. *Sensory system:* intact except for a minimal decrease in pinprick over the soles of the feet.

LABORATORY DATA:

1. *CSF:* day of admission: tube #1; 1800 RBC's, 5 lymphocytes; tube #4: 3 RBC's, 1 lymphocyte. Protein normal: 36 mg%, glucose normal: 70.

   CSF: one week after admission: protein: elevated to 92 mg%, no significant cells were present
2. *WBC:* slightly elevated: 12,600
3. *ESR,* and *ANA* were normal.
4. *Monospot and hepatitis A IgM antibody* were positive.

QUESTIONS:

1. Localize the lesion. Is this a problem of spinal cord, peripheral nerve or muscle?

2. How do you interpret the absence of deep tendon reflexes?
3. How do you interpret the CSF findings?
4. Now be more specific as to the type of pathology –assign a clinical diagnosis.
5. What would EMG/nerve conduction studies demonstrate?
5. What would a nerve biopsy demonstrate?
6. How would you manage this case in terms of treatment if clinical findings improved? Note that findings may already have been improving: the bilateral facial weakness of which she had complained was no longer present.
7. What measures should be undertaken if weakness was progressing and respiration was compromised?

CASE 10-4: This 47-year-old white male, inspector of small parts entered the hospital complaining of weakness and numbness in both legs. Five months prior to admission, the patient had noted a burning-type pain extending over the right forearm. Soon thereafter, he became aware of a gradually increasing numbness, pins-and-needles sensation involving his legs; first the right and then the left. This was followed by a weakness of both lower extremities, which increased in severity. Urgency of urination, occasional bowel incontinence, and increasing impotence were also noted.

NEUROLOGIC EXAMINATION:

Mental Status: Intact.

Cranial Nerves: Intact.

Motor System:

a. Strength was intact in the upper extremities but decreased in the lower extremities to 50% of normal. The involvement of the right leg was greater than that of the left leg.

b. A mild degree of spasticity was present at the knees and ankles, with a spastic gait.

c. No atrophy or fasciculations were present.

Reflexes:

a. Deep tendon stretch reflexes at triceps were decreased bilaterally (0 to 1+) compared to biceps and radial periosteal (brachioradialis), which were active (2 to 3+). The patellar and Achilles deep tendon reflexes were hyperactive (3+ to 4+).

b. *Superficial reflexes:* bilateral extensor plantar responses were present (bilateral Babinski signs).
Abdominal reflexes were decreased bilaterally.

Sensory System:

a. Position sense was defective for gross movements of the great toes bilaterally.

b. Vibratory sensation was markedly decreased below the level of the T7 spinous process.

c. Pain and light-touch sensation were markedly decreased below the level of the umbilicus. Sacral segments were involved. There was also a poorly defined band of decreased pain sensation over the upper thorax. Pain sensation was somewhat greater on the left than on the right.

LABORATORY DATA:

1. *Glucose tolerance test* revealed a diabetic-type curve, with a fasting blood sugar of 122, 30 minute sample of 205, 60 minute sample of 218, and 150 minute sample of 142 mg/100 ml.
2. *Lumbar puncture* revealed a partial dynamic block with the head in extension. Cerebrospinal fluid protein was elevated to 80 mg/100 ml (normal 45 mg/100 ml).

QUESTIONS

1. Indicate the level of the lesion in this case and the structures involved in the pathology.
2. Assuming that the pain in the upper extremities early in the course of the disease had some localizing significance, why was the sensory level for pain present only up to the level of the umbilicus (T10) (that is, pain sensation was absent or decreased below the umbilicus)?
3. Was the pathology in this case intrinsic or extrinsic (compressive) to the spinal cord? Cite the evidence for your conclusions.
4. What diagnostic procedures would you undertake prior to surgery?

5. Granted that the patient had, among other findings, posterior and lateral column signs, why is the diagnosis of combined system disease unlikely in this case?

HOSPITAL COURSE

Surgery was performed by Doctor Samuel Brendler. Examination two weeks after surgery revealed some return of pain sensation over the thorax, abdomen and lower extremities. Walking had improved. Evaluation 2 months after surgery indicated continued improvement as regards gait. Position sense had returned to the lower extremities, but vibration sense was still absent.

CASE 10-5: This 73-year-old retired executive was referred for evaluation of paresthesias (pins-and-needles sensation and numbness) involving all four extremities. Approximately 8 months previously, while hospitalized for gallbladder surgery, the patient developed a glove-and-stocking distribution of paresthesias involving all four extremities in a symmetric manner. The level of sensory symptoms gradually ascended over the ensuing weeks and months; in the lower extremities, as far as the perineum; in the upper extremities, to the level of the elbows. In the several months prior to admission, the patient had also noted increasing unsteadiness of gait, primarily when attempting to walk in the dark.

Family History There were several relatives with pernicious anemia but no relatives with neurologic disease.

NEUROLOGIC EXAMINATION:

Mental Status: Intact.
Cranial Nerves: Intact.
Motor System:

a. Strength was intact.

b. Gait was broad-based, with unsteadiness on the turns. The degree of ataxia was increased by eye closure.

c. The patient with eyes open and standing on a narrow base was relatively steady. When his eyes were closed, a significant swaying was apparent (Romberg test positive).

d. Cerebellar tests, such as bringing the finger-to-the-nose, when performed with eyes open, were not remarkable.

Reflexes:

a. Deep tendon reflexes were everywhere absent.

b. Plantar responses were extensor bilaterally (bilateral Babinski signs).

Sensory System:

a. Vibratory sensation was absent at the toes and ankles and markedly decreased at the knees and iliac crests in a symmetric manner. There was also a significant decrease at the fingers, with a lesser decrease at the wrists and elbows.

b. Joint position sense was defective for fine-amplitude movements at the toes but elsewhere was intact.

c.Pain and light-touch sensation were intact.

QUESTIONS

1. **This patient pres**ents a common neurologic syndrome. Indicate the site of pathology. Present a differential diagnosis and indicate the most likely pathology.
2. Does this patient have a single-level lesion or a system disease?
3. Discuss the diagnostic significance of the sensory symptoms and findings.
4. Explain the absence of deep tendon reflexes.
5. What is the significance of a "positive Romberg sign"?
6. Indicate the significance of bilateral extensor plantar responses (Sign of Babinski).
7. Outline what additional tests you would perform to confirm the diagnosis. Indicate the normal values for those tests.
8. What treatment would you undertake? (Be specific)

CASE 10-6: This 21-year-old single white female was admitted to the hospital because of progressive difficulty in walking. Nearly four years before admission, the patient first noted a relatively rapid onset of weakness in the left

hand. Three months later, she noted a throbbing pain in the neck that radiated into the left arm and left hand and was accompanied by some numbness (paresthesias) of the fingers of the left hand. Weakness of the left upper extremity slowly progressed and was accompanied by atrophy. Four months before admission, a more rapid progression of left arm symptoms was noted, and weakness of both lower extremities began, initially on the left and to a greater extent than the right. Just before admission, weakness of the right upper extremity was noted. Bladder symptoms were not present.

NEUROLOGIC EXAMINATION:

Mental Status: Intact.
Cranial Nerves: Intact.
Motor System:

a. Severe atrophy of all muscles of the left upper extremity was present, with flexion (claw-hand deformity) contracture. Fasciculations were present in almost all of the left upper extremity muscle groups. Mild atrophy of the intrinsic muscles of the right hand was also noted.

b. There was weakness of the muscles of the left upper extremity, most marked distally but also involving the shoulder girdle, with a lesser weakness of the muscles of the right upper extremity. Both lower extremities were weak, the left more so than the right.

c. Spasticity was present bilaterally on passive movement at the knees and ankles.
Reflexes:

a. Deep tendon reflexes were depressed in the left upper extremity. The biceps reflex was absent: the triceps and brachial radialis (radial periosteal) reflexes were hypoactive (1+). In the right upper extremity the biceps reflex was depressed (1+), whereas the triceps was 2+. In the lower extremities, the patellar and Achilles were hyperactive to a marked degree (4+).

b. *Superficial reflexes:* Plantar responses were extensor bilaterally. Abdominal reflexes were absent.

Sensory System:

a. Pain and temperature sensation were intact.

b. There was a slight distal decrease in vibratory sensation at the toes.
Cranium and Vertebral Column:
No local tenderness or abnormalities were present.

LABORATORY DATA:

1. *Cervical spine X-rays* showed bony changes: widening of the spinal canal n anteroposterior and lateral diameters was noted.
2. *Thoracic spine X-rays* showed that kyphoscoliosis was present.
3. *Cerebrospinal fluid* protein was increased to 150 mg/100 ml.

QUESTIONS

1. Where is the pathology located (be specific)?
2. Present a differential diagnosis. In this case you will need to consider the radiology findings.
3. What is the most likely pathology?
4. What is your diagnostic approach to this patient?
5. Outline your therapeutic approach to this patient.
6. What therapeutic results are expected?

Case 10-7: This 39-year-old white married airplane mechanic had the gradual onset of muscle weakness approximately 18 months prior to admission. This involved both arms and legs, with greater involvement of the proximal muscles than of the distal muscles. Gradual progression occurred so that 14 months before admission, significant difficulty in walking was experienced. Shortly thereafter, the patient experienced difficulty in swallowing, but this problem improved following his hospitalization the previous year. Weakness of extremity musculature also improved following the use of cortisone. The patient at no time had difficulty in voiding. He had no sensory symptoms; he had had no actual pain or tenderness in the muscles.

NEUROLOGICAL EXAMINATION:

Mental Status: Intact.
Cranial Nerves: Intact.
Motor System: The patient had severe weakness and atrophy of muscles (both proximal and distal) of all four extremities but with clearly more marked involvement of the proximal musculature. The patient was unable to lift his arms above the shoulder and unable to lift his legs off the bed. No fasciculations were present.
Reflexes:

a. Deep tendon stretch reflexes were everywhere absent except at the ankle where normal 2+ reflexes were found.

b. Plantar responses were flexor.

Sensory System: No abnormalities were present.

LABORATORY DATA:

1. *Erythrocyte sedimentation rate* was elevated to 45 mm/hr.
2. *Electromyogram and muscle biopsy* were consistent with the clinical diagnosis.

SUBSEQUENT COURSE:

Following treatment with prednisone in high dosage, the patient had a gradual improvement in strength.

QUESTIONS:

1. Does this patient have a problem localized to spinal cord, nerve root, peripheral nerve or muscle?
2. Present a differential diagnosis of this problem and indicate the most likely diagnosis.
3. Outline the expected findings on electromyography and muscle biopsy.
4. Would any other laboratory data be of help in establishing the diagnosis?

CASE 10-8: This 37-year-old white male was evaluated by Doctor Sandra Horowitz for a diagnosis of upper extremity disability. His neurologic history had begun, 20 years previously with weakness in both upper extremities. An extensive laminectomy had been performed 19 years earlier.

NEUROLOGIC EXAMINATION:

1. Severe flaccid weakness in voluntary movement in the upper extremities, particularly at the shoulders.
2. Spasticity was present on passive motion of the lower extremities.
3. The gait was also ataxic.
4. The deep tendon reflexes were absent in the upper extremities but hyperactive in the lower extremities at patella and Achilles. The plantar responses were extensor bilaterally.
5. Sensation for pain and temperature was selectively decreased over the shoulder and arms .An MRI scan of the cervical spine was performed.

QUESTIONS:

1. What is the significance of the selective decrease in pain and temperature over the shoulders and arms?
2. What would you expect the MRI to demonstrate?
3. Select the appropriate MRI from the group of illustrations below that best corresponds to this case.
4. What therapeutic approaches are possible?

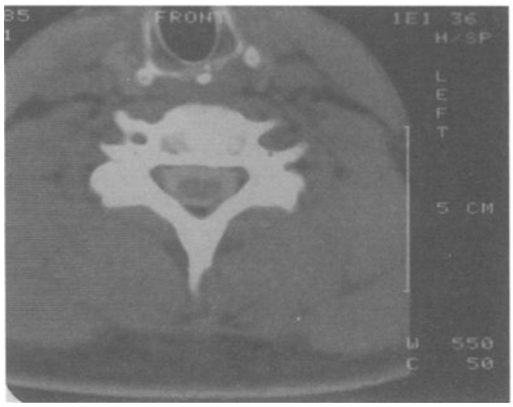

Figure 10-1A

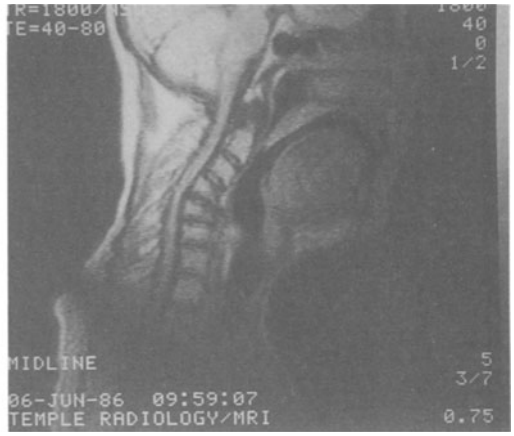

Figure 10-2A

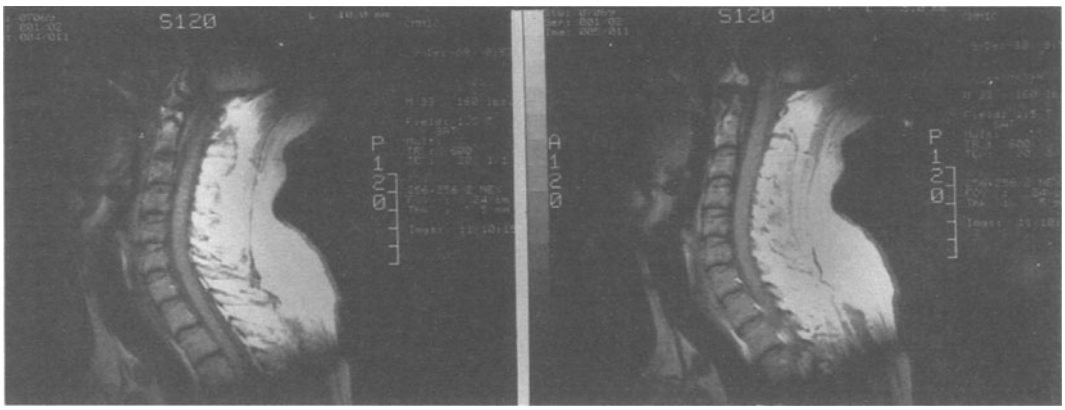

Figure 10-3A

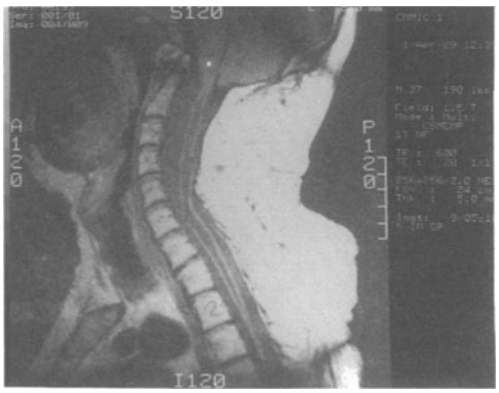

Figure 10-4A