POSTOPERATIVE BONE CHANGES FOLLOWING LUMBAR DISC REMOVAL

E. C. SCHULTZ, M.D.

Department of Neurosurgery, University of Tennessee College of Medicine, Memphis, Tennessee

(Received for publication September 3, 1957)

Since the surgical technique for the removal of protruded lumbar discs has been perfected and most aspects have been standardized, many thousands of victims of sciatica have been relieved of their misery. Fortunately, serious complications of disc surgery are rare. After more than four thousand operations performed at this clinic, there have been no deaths and when infections occurred they have been superficial. In our recent survey in which the patients were followed from 1 to 20 years, 97.6 per cent stated they were benefited by operation. A commonly accepted but unexplained fact is that far too many patients complain of pain in the back and extremity for weeks and frequently months following the most simple of disc procedures. Extenuating circumstances, such as a desire for compensation and emotional factors, are probably all too often blamed in the absence of other known causes. The pain is usually not severe, improves steadily and in most instances the patient is grateful for his operation. However, we have upon five occasions among our entire group of patients encountered painful postoperative complications of such severity as to require prolonged therapy and weeks in bed. That this complication may be postoperative inflammatory disease in the lumbar disc space, as described by Turnbull,6 has been recognized. Since the causes of osteomyelitis are multitudinous, the papers of Ghormley et al.,2 Harbin and Epton,3 Mayer,4 Smith,5 and Ford and Key1 may describe this condition adequately. However, our patients did not present the clinical picture of an acute inflammatory process. They rapidly improved once the nature of their illnesses was recognized and treatment begun. Two were reoperated upon and no evidence of infection was noted. Bacteriologic studies were negative, and upon reviewing sections of tissue, no evidence of infection was discovered. The following are short summaries of these cases.

Case Reports

Case 1. #299298. A.C.H., a 59-year-old white female, was seen in consultation with the late Dr. Willis C. Campbell on Feb. 29, 1940. She complained of pain low in the back with left sciatic radiation of 6 weeks’ duration.

Examination. Neurologic findings were typical of a ruptured lumbar disc—spasm of muscles in the lower part of the back, extreme pain on straight leg raising, hypoesthesia and hypalgesia over the lateral aspect of leg and foot, and diminution of the
Achilles reflex. Roentgenograms of lumbosacral spine and pelvis were normal (Fig. 1A). Blood and urine were normal.

Operation (Francis Murphey). On May 19, 1940, a typical ruptured 5th lumbar disc on the left side was removed by pituitary forceps and curette.

Postoperative course was uneventful until the 5th day when excruciating pain occurred low in the back. The slightest spinal motion accentuated the pain. Large amounts of sedation were required and a body cast was applied without improvement. A daily rise in temperature to 100°–101°F. (37.8°–38.4°C.) occurred for almost 3 weeks. Repeated counts of blood cells, however, were normal.

Roentgenogram of the spine on June 17, 1940 (29 days postoperatively) disclosed a destructive lesion involving the 5th lumbar joint (Fig. 1B). The adjacent vertebral surfaces were affected by an osteolytic process.

2nd Operation (Francis Murphey). On June 24, 1940, the wound was reopened. The intervertebral space was almost empty of material and no signs of infection were encountered. Only a small amount of cartilaginous material could be removed from the intervertebral space. Biopsies were taken from the vertebral bodies.

Microscopic Examination. The biopsy material was reviewed by Dr. Frank W. Foote, Jr. There was no evidence that the lesion was inflammatory. The lesion suggested a chordoma, but no definite conclusions could be reached.

Postoperative Course. Pain continued unabated. On June 29, 1940, roentgenologic therapy (300 r) was administered to the involved spine. After three such treatments her pain ceased. A total of 1500 r was given in five treatments. She was discharged from the hospital free of pain on July 27, 1940.

Follow-Up. On Sept. 19, 1940, 4 months after her original operation, an almost complete bony fusion of the lumbosacral joint was seen on roentgen-ray examination (Fig. 1C). The patient has remained asymptomatic. When last heard from in 1954, she felt she had been benefited 100 per cent by her operations, she no longer experienced pain in the back and only occasionally was there discomfort of the extremity. She had done all of her own housework since surgery.

Fig. 1. Case 1. (A) 5-15-40. Preoperative view. (B) 6-17-40. Narrowing of lumbosacral joint space with irregularity of opposing vertebral surfaces, 1 month postoperative. (C) 9-19-40. Bony fusion of lumbosacral joint, 4 months after first operation.
Case 2, #100635. J.E.R., a 52-year-old white male, was admitted to the Baptist Memorial Hospital on Dec. 20, 1951. Ten months previously he had fallen, injuring the lower part of his back. Two weeks later right sciatic pain developed. Pain persisted despite prolonged therapy.

**Examination.** He walked with a marked limp. There was bilateral spasm of the paravertebral lumbar muscles. Bending was restricted. The lumbar lordotic curve was reduced. Straight leg raising on the right was painful at 150 degrees. This test on the left caused no pain. Sensation for superficial pain and touch was diminished over the 5th lumbar dermatome on the right. Both patellar reflexes were reduced. The Achilles reflexes were normal. There was narrowing of the 4th lumbar disc space seen on roentgenograms (Fig. 2A). There were no abnormalities of the urine or blood.

**Operation** (E. C. Schultz.). On Dec. 21, 1951, an extruded 4th lumbar disc was removed, using spinal anesthesia without difficulty. The interspace was curetted.

**Postoperative course** was uneventful. Penicillin, 400,000 units, was administered daily for 5 days. Because catheterization was necessary, Gantrisin (3,4-dimethyl-5-sulfanilamido-isoxazole) was administered in 1.0 gm. (15 gr.) doses three times daily for 3 days. His highest temperature was 101.2°F. (38.4°C.) on the 2nd day. At his insistence he was discharged 5 days after operation to convalesce at home.

2nd **Hospitalization.** One week later he returned to the hospital because of severe pain in the back, abdomen and suprapubic region which followed an upper respiratory infection accompanied by frequent coughing. He also complained of urinary frequency and dysuria.

**Examination.** Except for marked abdominal and particularly suprapubic tenderness, the findings were normal. The incision had healed normally. Bending was restricted by pain in the back. There was no pain in the extremity. Straight leg raising bilaterally caused marked pain in the back at 100 degrees. Reflexes and sensation were unchanged. Urine was normal. The peripheral blood contained 14,600 white blood cells, 66 per cent segmented neutrophils, 1 band cell, 29 lymphocytes, 2 monocytes and 2 eosinophils. Hemoglobin was 19.0 gm. (oxyhemoglobin method). Tem-

---

**Fig. 2. Case 2.** (A) 12-20-51. Preoperative film, showing narrowing of 4th intervertebral disc space. (B) 2-5-52. Absorption and sclerosis of bone, 6 weeks after surgery. (C) 8-4-52. Marked narrowing of 4th intervertebral space with healing by bony fusion.
perature was not above normal during these 6 days of hospitalization. Gastro-
intestinal and urinary tract studies revealed no abnormalities.

**Course.** With complete rest in bed, improvement occurred so rapidly that he was
discharged on Jan. 8, 1952.

**3rd Hospitalization.** He was admitted on Jan. 29, 1952 because of severe pain in
the groin and back. No longer was there abdominal pain.

**Examination.** The findings were similar to those of Jan. 2, 1952. The lumbo-
sacral spine and pelvis were again examined by roentgen ray. Both absorption and
sclerosis of bone from the opposing surfaces of L4 and L5 vertebrae were present
(Fig. 2B). Because of the rarity of the case, numerous diagnostic procedures were
done.

Differential blood count and two subsequent blood counts were normal. Blood
urea nitrogen, carbon-dioxide combining power, sulfobromophthalein test, cephalin
flocculation, sedimentation rate, alkaline and acid phosphatase determinations were
normal. Spinal fluid pressure and dynamics were normal. The fluid was blood-tinged
(trumatic) and its analysis, therefore, was disregarded. Lumbar myelograms were
normal.

**Course.** On Feb. 8, 1952, a series of roentgen-ray treatments to the affected
vertebrae was begun. He received a total of 900 r in six doses. Although symptomat-
ically improved, severe pain occurred with spinal movement. For this reason a
plaster spica, extending from the nipples inferiorly to both knees, was applied. All
pain ceased by Feb. 24, 1952, and he was discharged 5 days later. The spica was re-
moved 2 months thereafter.

**Follow-Up.** Roentgenography in August 1952 showed a solidly healed fusion be-
tween the 4th and 5th lumbar bodies with obliteration of the joint space (Fig. 2C).
This has been followed by frequent radiologic examinations for the past several
years. He has remained asymptomatic.

**Case 3. #108045.** S.S., a 24-year-old white female, was seen in consultation with
Dr. Alvin Ingram on Oct. 8, 1951. She had always been in good health until the on-
set of acute pain low in the back on Sept. 6, 1951, followed 2 days later by left sciatic
pain. Rest in bed and traction were valueless.

**Examination.** The pertinent findings were marked spasm of the paravertebral
muscles, restricted movement of the lumbar spine, pain on straight leg raising, de-
creased sensation to touch and pin prick over the lateral aspect of the foot, and
a reduced Achilles reflex.

Roentgenogram of the lumbar spine was normal except for the presence of a
lumbarized 1st sacral vertebra (Fig. 3A). Blood and urine were normal.

**Operation (R. L. DeSaussure).** On Oct. 10, 1951, under spinal anesthesia, an
extruded lumbar disc was removed from the 5th lumbar interspace by curette and
pituitary forceps.

**Postoperative course** was uncomplicated. The highest temperature recorded was
100.6°F. (38°C.) on the 2nd day. Penicillin, 400,000 units S.R., was administered
daily for 5 days. She returned to her home on the 7th postoperative day.

When she was seen again on Nov. 9, 1951, she felt improved but slight pain per-
sisted in the left hip. A marked right lumbar scoliosis had developed. Straight leg
raising was painful on the left at 135 degrees. The Achilles reflex on the left was
absent. She was permitted to return to work as a stenographer and exercises for the
back were advised.
Early in March 1952, 5 months after surgery, more intense pain occurred. Results of examination on March 7 were similar to those of November except that she no longer had pain in the extremity. Complete rest on a firm bed was prescribed. The pain in the back became progressively worse and pain returned to the left lower extremity.

2nd Hospitalization. She was readmitted on April 4, 1952, at which time there was pain in the lower part of the back, both lower extremities and left groin. Any movement accentuated the pain.

Examination. The lumbar lordotic curve was increased. There was marked spasm of the paravertebral muscles. There was no spinal or paraspinal tenderness on pressure. Objective weakness could not be elicited. The remaining findings were similar to those on previous examinations. During the 7 days she was in the hospital there was no elevation of temperature.

Sedimentation rate 21 mm. in 1 hour, count of white blood cells was 7,000 with 61 per cent segmented neutrophils, 29 per cent lymphocytes, 8 monocytes and 2 eosinophils.

In roentgenograms of the lumbar spine the superior margins of the lumbarized sacral vertebra appeared ragged and irregular. The lesion was ascribed to interference with the vascularity of the vertebrae. An infection could not be excluded (Fig. 3B).

Course. Three million units of penicillin were administered and roentgen-ray therapy to the lower lumbar spine was carried out. She received 800 r in four doses. She was discharged asymptomatic on April 11, 1952. Complete rest in bed at home was carried out for 8 weeks, during which time no antibiotics were administered.

Follow-Up. She has been completely free of pain since the last hospitalization. There were no abnormalities on examination on Sept. 12, 1955. Roentgenograms of the lumbar spine showed normal-appearing intervertebral spaces without narrowing or evidence of the previous bony changes of the adjacent vertebrae (Fig. 3C).
Case 4. #187514. L.T., a 43-year-old housewife, was seen on May 12, 1955. She had complained of intermittent pain low in the back and right sciatic pain for years. For 4 months no relief was derived from medication and confinement to bed was necessary.

Examination. She walked with a limp favoring the right extremity. The lumbar lordotic curve was decreased and there was a lumbar scoliosis to the left. Marked spasm of the paravertebral muscles was present. Straight leg raising was positive at 150 degrees on the right and negative on the left. There was no muscular weakness. Slight atrophy of the right calf was noted. Sensation for pin prick and touch was diminished over the lateral aspect of the right foot. The Achilles reflex was absent on the right. The remaining reflexes of the lower extremities were normal.

Roentgenograms of the lumbar spine showed a reduction in the lordotic curve, a left scoliosis, and narrowing of the 5th intervertebral disc space (Fig. 4A). The temperature was normal. Blood and urine were normal.

Operation (E. C. Schultz). On May 14, 1955, under spinal anesthesia, an extruded 5th lumbar disc and a ruptured 4th lumbar disc were removed. The intervertebral spaces were curetted.

Pathologic report was “fibrocartilage with degeneration.”

Postoperative course was uneventful. The highest temperature was 101.2°F. (38.4°C.) on the 1st day. Penicillin, 400,000 units, was administered for 4 days. She was discharged free of pain on May 22, 1955.

2nd Hospitalization. Seven weeks later, on July 2, 1955, she was readmitted with a history of progressively severe pain in the lower part of the back and pain in the right thigh on attempting to sit or walk. Pain was noted on her return home from the hospital. She had remained in bed most of the time and she appeared weak and anemic.

Examination. The temperature was normal. The operative wound was well healed. Standing was impossible because of the severe pain in the back and groin it
produced. Severe spasm of the paravertebral muscles existed and no movement of the lumbar spine was observed. Straight leg raising was now bilaterally positive at 150 degrees, causing pain in the right hip. The remainder of the findings were similar to the original.

Peripheral blood and urine were normal. Alkaline phosphatase and sedimentation rate were normal. No ova or parasites were found on examination of the stools.

Roentgenograms showed that the lumbar spine was straightened, and the 4th lumbar interspace was narrowed. Destruction of the end plates and adjacent bone of the inferior portion of the 4th body and the superior portion of the 5th body was evident (Fig. 4B). These changes suggested tuberculosis to the roentgenologist.

2nd Operation (E. C. Schultz). The old operative wound was reopened on July 7, 1955, using Pentothal anesthesia. The 4th interspace was found to contain very soft slimy-appearing cartilage. No fluid or pus was encountered. The annulus was stripped away with ease so that a very large quantity of cartilage was removed. A roentgenogram made at the operating table confirmed this to be the 4th lumbar interspace.

Pathologic Report. Dr. Merlin L. Trumbull reported, "The disc tissue itself departs from the usual appearance of herniated discs by having scattered small foci of polymorphonuclear cells. Some of these have pyknotic nuclei. One could term this a mild form of acute nonspecific chondritis. The presence of polymorphonuclear leucocytes, lymphocytes and plasma cells about the few bone fragments submitted suggests a subacute osteomyelitis. There is no significant necrosis of bone demonstrated."

Postoperative Course. The patient complained of more pain than following her first operation. There was a slight rise in temperature daily to around 100°F. (37.8°C.). Smears and tissue cultures made of the material removed from the 4th intervertebral space were negative. Because of previous success in control of pain, roentgen-ray therapy was administered to the involved spine in doses of 200 r daily for 5 days. Following the third treatment pain decreased markedly. She was discharged on July 22, 1955, to remain in bed at home for 2 weeks.

Follow-Up. When last examined on Jan. 30, 1956, she was free of pain. There was roentgen-ray evidence of fusion of the 4th and 5 lumbar bodies (Fig. 4C).

Case 5. #196741. M.A.W., a 34-year-old housewife, was operated upon in February 1953 in New Orleans, Louisiana and the 4th and 5th lumbar discs were removed from the left side. Postoperative course was uneventful. Six months later the pain recurred and myelography was done in February 1955. Re-operation was performed in Monroe, Louisiana in February 1955, and tissue was removed from the 4th and 5th interspaces on the left. Again a normal recovery ensued for 5 weeks. Then severe pain in the back and both lower extremities recurred. Because of pain, she was unable to walk. Any movement of the lumbar spine exaggerated her pain. She remained in bed 5 weeks and her activity was restricted for an additional month. Pain continued and she was seen in consultation by Dr. R. E. Semmes. Because of persistent symptoms that incapacitated her, re-operation was advised.

Examination. Roentgenograms of the lumbar spine made Sept. 14, 1955, were reviewed. There was narrowing of both the 4th and 5th intervertebral spaces. There was sclerosis of the adjacent bony surfaces of the 5th interspace (Fig. 5A).

Operation (R. E. Semmes). On Sept. 17, 1955, partial hemilaminectomy at L4 and hemilaminectomy at L5 was performed. The 5th lumbar and 1st sacral nerve
roots were dissected from dense scar tissue. The intervertebral spaces were not entered.

Postoperative Course. She did well following operation and returned to light work 1 month later. During the first week in November, 7 weeks after surgery, pain occurred in the sacral region and in both hips. Spinal movement or straining accentuated the pain. Analgesics were necessary even though she was confined to bed.

When re-examined Jan. 6, 1956, there was paravertebral spasm and bending was restricted. Pressure over L4 and L5 spines produced pain located in the sacrum. Motor power, sensation and reflexes were normal. Straight leg raising was painless. Rotation of either hip produced low-back pain. Motion of the spine was guarded since even turning on the examining table was accompanied by severe spasm of the muscles of the back. Compressing the veins of the neck, however, was painless.

Roentgenograms of the lumbar spine showed loss of cortical detail, absorption of bone, and reactive sclerosis of the opposing surfaces of L5 and S1 vertebral bodies (Fig. 5B).

On Jan. 7, 1956, and again on Jan. 9, 1956, roentgen-ray therapy was administered to the lumbosacral joint, consisting of 200 r at each treatment. An additional 600 r units were given in three doses of 200 r each at another hospital. Subjective relief from pain resulted.

Follow-Up. She was last seen here on Oct. 22, 1956. She was markedly improved and almost completely free of discomfort.

Roentgenograms of the lumbar spine demonstrated pronounced narrowing of the 5th intervertebral disc space and the adjacent surfaces of the sacrum and 5th lumbar body were sclerotic (Fig. 5C).

Case 6. #426084. An additional case was encountered by Dr. R. E. Semmes on the Neurosurgical Service of Dr. Paul Bucy of Chicago. Dr. Bucy has kindly permitted us to include his patient.
W.C., a 32-year-old white male, was referred to the Neurosurgical Service of the Chicago Wesley Memorial Hospital on March 11, 1956 by Dr. R. Hilker. The patient stated that in 1948 he may have injured his back playing baseball and had suffered intermittent pain in the lumbar area. In November 1955, without any known injury, his condition became worse and for the first time there developed radiation of pain into his right leg, followed by weakness of dorsiflexion of the right foot. In January 1956, a myelogram was done. There was a filling defect at L4 level on the right.

On Jan. 6, 1956, right hemilaminectomy was performed by an orthopedic surgeon. Herniated disc material and other loose material were removed from the 4th lumbar interspace. The interspace between the vertebral bodies was not curetted. Following operation the sciatic pain was relieved and some strength returned to his right foot. Three weeks later he began to complain of severe pain in the lower part of the back with development of severe spasm of paravertebral muscles. He was treated by rest in bed and traction, with improvement. He was unable to bear his weight either sitting or standing because of pain in the lumbar region.

Examination. The patient was a well developed, well nourished, alert and cooperative man. His blood pressure was 118/60, pulse rate 88, respiratory rate 16, and temperature 98.6°F. There was a well healed midline lumbar scar. No spasm of muscles was present as he lay quietly in bed. There was no particular tenderness to percussion except at the level of the 5th lumbar vertebra. Reflexes were symmetrical though not brisk in the lower extremities, with the exception of the right Achilles reflex which was decreased. Strength was normal in the lower extremities. Kernig's sign was positive bilaterally producing pain in the lumbar region. The patient was unable to stand or sit without severe pain. There was no sensory change. No atrophy was demonstrated in the lower extremities.

There was a normal hematocrit of 44 per cent, and count of white blood cells was 5,900 with 46 per cent polymorphonuclear leucocytes, 48 per cent lymphocytes, 5 per cent monocytes and 1 eosinophil. Sedimentation rate was 24 mm. per hour and 26 mm. per hour on two occasions. The Kahn test was negative. Urinalysis was negative. The nonprotein nitrogen was 16.2 mg. per cent.

Roentgenograms of the thoracic and lumbar spine were made. There was a partial laminectomy on the right side at the 4th and 5th lumbar vertebrae and some residual Pantopaque in the subarachnoid space. On laminagrams of the lumbar spine there was definite evidence of destruction of the cortical surface of the inferior margin of the body of the 4th and superior surface of the body of the 5th lumbar vertebrae without collapse of the intervertebral space or of either body.

Course. During his hospitalization of 21 days there was no fever and he was given roentgen-ray therapy in four treatments of 200 r each to the skin every 3rd day. This treatment delivered a total of 800 r to the skin or a calculated 370 r to the 4th lumbar interspace. He continued to complain of severe pain in the back and was confined to rest on a firm bed. At his discharge the patient admitted that the pain was somewhat better though still quite severe.

A second laminagram was made 13 days after the first. There was little change.

Follow-Up. The patient was seen in the office on Nov. 26, 1956. He was feeling well and had no complaints. He was wearing a brace more for protection than for any other reason.
He believed that when the brace was removed he felt weak and tired. Neurologic findings were all normal.

Roentgenograms of the lumbar spine showed a sclerosing type of reaction of the subarticular bone of the opposing surfaces of the 4th and 5th lumbar vertebrae.

A laminagram on Dec. 5, 1956 demonstrated a dense sclerosis of the opposing surfaces of the 4th and 5th lumbar vertebrae with narrowing of the interspace between the 4th and 5th vertebrae. The urine contained no alkaptonic.

The patient was last seen on Feb. 26, 1957. He was feeling well but used his brace occasionally. He had no complaints. Neurologic findings were completely negative.

DISCUSSION

The literature of the past twenty-five years has been reviewed and no concise report of the aforementioned complications of disc surgery was encountered. It is our belief the complication is not infrequent but is often overlooked. In none of our cases were there the usual signs of infection postoperatively. One patient had severe pain 5 days after surgery requiring treatment, a second had symptoms by the 12th day, while 5 months were required by the third, 7 weeks by the fourth, about 3 months by the fifth and 3 weeks by the sixth before medical treatment was sought. In all, we have been particularly impressed with the severe pain in the back and spasm of muscles. The pain is mechanical in nature and movement of the back greatly accentuates pain. Because of marked abdominal pain in 3 of our patients, the possibility of intra-abdominal pathology was considered. Large amounts of anodynes were necessary for symptomatic relief. Recalling other patients with prolonged symptoms postoperatively, we cannot help but believe a number of similar cases have been overlooked. It seems logical to assume that with various degrees of involvement of joints, only the most severe cases have come to our attention. It has been our constant concern that such patients with few objective findings and severe pain may be neglected or completely misjudged. Although we have no evidence that the pathologic process is a septic one, the roentgen-ray studies are suggestive of this. Tissue from Case 4 was examined and compared with disc material removed from patients having recurrent ruptured lumbar discs without finding any significant microscopic differences. Routine roentgenograms of the spine often are inadequate to demonstrate early lesions and laminagraphy will then prove valuable as in Case 6.

In a recent discussion of this paper with Dr. Albert D'Errico, recalling a similar case of his own, he suggested virus infection as the possible etiology. The role of surgical trauma to the joint space seemed likely as a cause but in our Case 5, bone absorption occurred at an interspace which had not been entered. Two neurosurgeons have informed me of cases of their own in which the affected lumbar interspace was distant from the one subjected to operation. This would negate local trauma to the adjacent vertebral bodies as essential to the production of the changes in the bone seen on roentgenograms.
Believing the lesions may be of a type of aseptic necrosis or “osteo-chondritis,” roentgen-ray therapy was tried in the hope of obtaining relief of pain as sometimes results in similar conditions (osteitis pubis, osteitis of the tibial tubercle). The results were gratifying. All our patients had relief from irradiation, with time and rest. I have learned that in similar cases the patients responded equally well to the administration of cortisone.

SUMMARY

A complication of disc surgery is discussed. It most probably occurs far more frequently than we now suspect. Only with further investigation will a clearer understanding of this complication ensue and better methods of diagnosis and treatment occur.

ADDENDUM

Since completion of this paper another patient with a similar lesion was seen by the author. This was a medicolegal problem in which the lesion had gone unrecognized and untreated for months and the patient was suspected of grossly exaggerating his disability. Roentgenographic changes were marked. He responded readily to treatment.

Recently we were asked to see still another patient with recurrent severe spasm of the muscles of the lower part of the back which began 3 weeks after removal of his 5th lumbar disc from the left side. Spasm had persisted 3 months. He was confined to bed by the pain and large amounts of analgesics were required. Roentgenograms of the spine were normal. On laminagrams bone absorption and condensation were readily apparent on the left side of the 5th interspace. Response to treatment was prompt.

REFERENCES