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Syringomyelia

A Potential Risk Factor in Scoliosis Surgery

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Study Design. An 18-year-old patient with "idiopathic" adolescent scoliosis is presented. A thoracic syrinx was detected as an incidental finding during magnetic resonance imaging of the spine.

Objectives. Syringomyelia may be a risk factor for neurologic injury during correction of scoliosis, and in these cases, spinal cord monitoring may be of particular value.

Background Data. Spinal distraction and instrumentation carry a risk of neurologic damage in patients with scoliosis and associated syringomyelia. Syringomyelia is a cause of scoliosis, and although neurologic problems are the usual symptom, scoliosis may be the only sign at initial examination. A higher risk of neurologic injury has been reported in corrective surgical treatment of patients with syringomyelia. The mechanism of cord damage is unclear. Monitoring of spinal cord function is recommended to detect intraoperative neurological injury, which may be reversed on removing distraction and implants.

Results. Intraoperative somatosensory-evoked potential (SSEP) spinal cord monitoring detected possible cord damage during outrigger distraction. Reduction of distraction led to a recovery of SSEPs and a satisfactory operative outcome.

Conclusion. Syringomyelia may be a risk factor for neurologic injury during correction of scoliosis, and SSEP spinal cord monitoring may identify and prevent intraoperative spinal cord injury. [Key words: surgery, scoliosis, syringomyelia, complications] **Spine 1994;19: 1406–1409**

Spinal distraction and instrumentation carry a risk of neurologic damage in patients with scoliosis and associated syringomyelia, and three cases of permanent paraplegia have been reported after correction of scoliosis in these patients.[7,9,13] Syringoyelia has been recognized as a neurogenic cause of scoliosis, and the incidence of scoliosis in patients with syringomyelia is between 20% and 85%, with a higher incidence in those with skeletal immaturity.[6,7,18] Although neurologic problems are the usual symptom, scoliosis may be the only sign at initial examination.[2,6,19] Syringomyelia is often associated with other abnormalities, particularly the Chiari type I malformation. Magnetic resonance imaging (MRI) should be used to evaluate syringomyelia.[9]

Neurologic complications during surgery for spinal deformity vary between the populations treated and the procedure performed and are reported between 0.7% and 5%.[1,10] A higher risk of neurologic injury has been reported in corrective surgical treatment of patients with syringomyelia.[13,19] The mechanism of cord damage is unclear, although risk factors have been identified.[12] Monitoring of spinal cord function is recommended to detect intraoperative neurologic injury, which may be reversed by the reduction of distraction or the removal of implants.

An 18-year-old adolescent with "idiopathic" scoliosis is presented; a Chiari type I malformation and a thoracic syrinx were detected as an incidental finding during MRI spinal scanning trial. Intraoperative somatosensory-evoked potential (SSEP) spinal cord monitoring detected possible cord damage during outrigger distraction. Reduction of distraction led to the recovery of SSEPs and a satisfactory operative outcome. Syringomyelia may be a risk factor for intraoperative neurologic injury during correction of scoliosis, and in these cases, spinal cord monitoring may be of particular value.

Case Report

An 18-year-old male had scoliosis, which was detected 1 year previously, at initial examination. He had occasional discomfort over the right scapula for 2 years. He had no history of illness or injury. Birth, perinatal, and early development were within normal limits; there was no family history.

On examination, he was 5 feet and 5 inches tall, and he had right thoracic scoliosis, with a high right shoulder, and a prominent right scapula. There was a full range of spinal movements, and the deformity corrected with lateral flexion. A neurologic examination including examination of power, tone, coordination, light touch sensation, pin- prick sensation, joint position sensation, reflexes, and the plantar response, did not reveal any abnormality. Measurement of rotational deformity using the Bunnell method yielded 17°, in the thoracic spine.

Radiographic films (Figure 1) showed a right-sided thoracic curve from the T5–T11 levels, measuring 55° by the Cobb method. The iliac epiphyses had fused. Longitudinal traction reduced the curve to 35°. A technetium 99m bone scan did not showed any significant abnormality. MRI scans of the whole spine showed a small syrinx extending from the T6–T8 ver-

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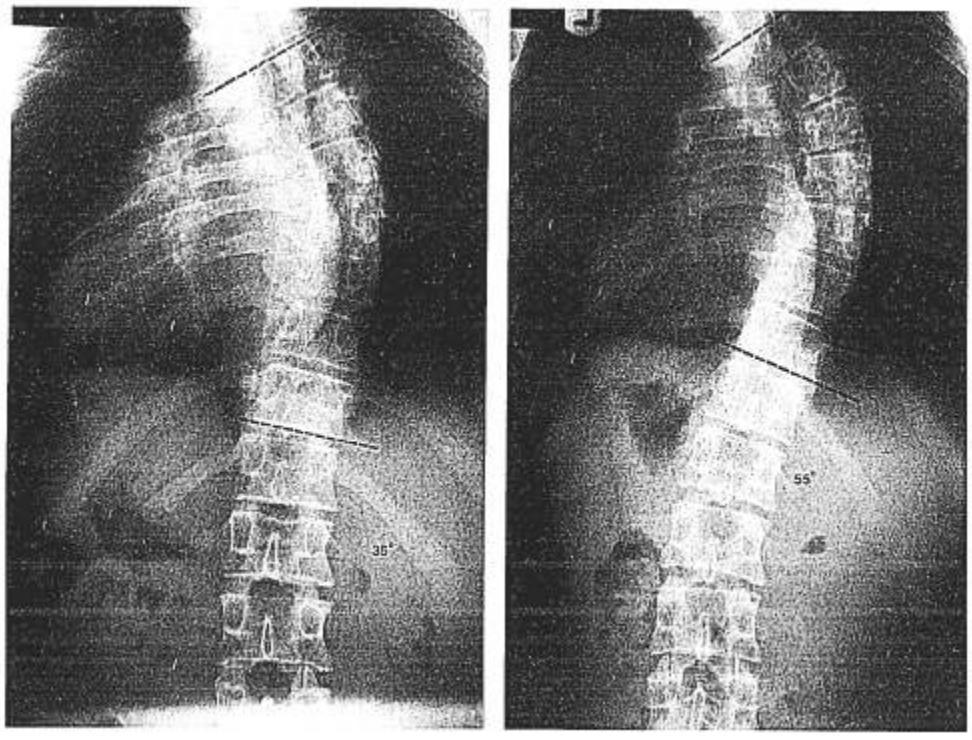

Figure 1. Preoperative anteroposterior and lateral radiographic films, demonstrating the deformity before and after horizontal traction.

tebral levels, crossing the apex of the scoliosis (Figure 2). A Chiari type I malformation was identified in the cervical spine. The patient had a Moe fusion performed with a contoured Harrington rod and sublaminar wiring, through a posterior midline incision. SSEP spinal cord monitoring was used throughout the operation.

Spinal Cord Monitoring. Posterior tibial nerve stimulation with supramaximal constant voltage single pulse stimuli of 0.2 ms, at 20 per second were applied alternately to left and right legs. The SSEP was recorded with a 4F bipolar electrode (Orthoexpress, Amersham, Bucks, England) from the epidural space at the T2 level. Signals were amplified, conditioned, and displayed on a Medelec MS91 (Medelec, Old Woking, Surrey, England) and PA89 preamplifier. Filters were set to BER (200–2000 Hz), and sweeps were averaged to obtain clear recordings. Recordings were of good technical quality throughout.

After exposure of the spine and insertion of upper and lower Harrington hooks, outrigger distraction was applied initially to 12.5 lb. After facet joint excision, distraction was increased to 17.5 lb, and simultaneous changes in pulse, blood pressure, and the SEP occurred on the right side, which dropped to 36% of the control amplitude (Figure 3). Distraction was discontinued completely, and pulse and blood pressure rapidly returned to previous levels. The SSEP from the right leg rapidly recovered to 150% of control amplitude. Redistraction to 12.5 lb did not alter the SSEP, which remained stable for 30 minutes until insertion and distraction of the Harrington rod, which again caused a rapid decrease to

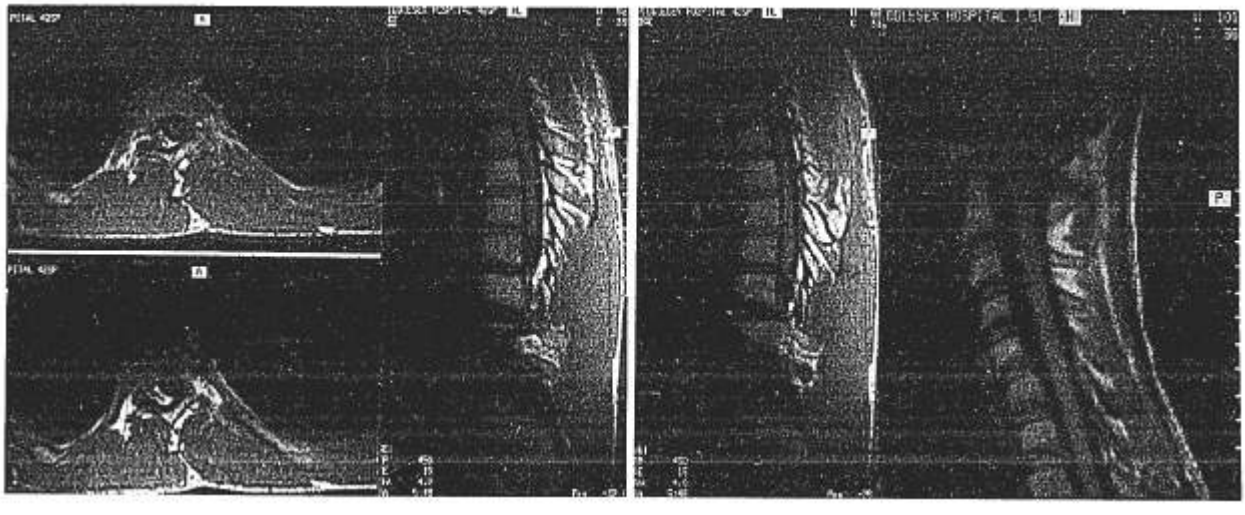

Figure 2. MRI imaging of thoracolumbar spine demonstrating a small syrinx at the T6–T8 vertebral levels, transverse section at the T7 vertebral level demonstrating the syrinx, and at the level of the foramen magnum, demonstrating the Chiari type I malformation.

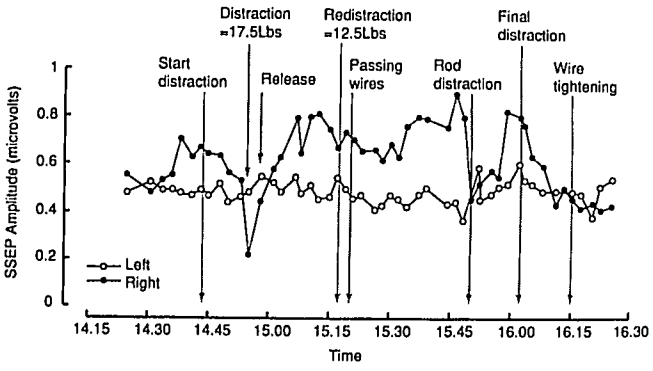

Figure 3. Chart showing SEP potentials obtained, the relationship between time, the SEP potentials on each side, and intraoperative events.

50% of peak amplitude. This recovered over 10 minutes but again decreased (to initial control amplitude) after sublaminar wire tightening.

Postoperatively, the patient had urinary retention and had to be catheterized. Neurologic examination including examination of power, tone, coordination, light touch sensation, pin-prick sensation, joint position sensation, reflexes including abdominal reflexes, and the plantar response, revealed loss of the right-sided abdominal reflex. At 48 hours, both the ability to void urine, and the abdominal reflexes, had returned. Neurologic examination did not reveal any abnormalities. Postoperative erect radiographic films (Figure 7, 8) showed correction to 30°, measured by the method of Cobb. The patient was mobilized with a brace and is included in follow-up without any evidence of problems.

Discussion

Unusual curve types, painful curves, and rapidly progressive curves despite skeletal maturity, have been recognized as heralding the presence of syringomyelia in scoliosis.[2,6] MRI studies on patients with idiopathic scoliosis have shown that syringomyelia may be more common than previously thought, and MRI imaging of the spinal cord should be mandatory before bracing or operative correction of scoliosis.[17] In patients with neurologic symptoms, scoliosis, and syringomyelia, drainage of the cyst is recommended because it stabilizes or improves neurologic function, and although it does not arrest progression of the curves, it temporarily does so in immature patients. It may make scoliosis surgery less dangerous.[15] The recommendations for patients with small cysts presenting with scoliosis only, are less clear, though scoliosis may precede neurologic symptoms by several years.[3,16] Patients with Chiari type I malformations who do not have syringomyelia are unlikely to develop scoliosis, and the effect of Chiari surgery on scoliosis is inconclusive.[17] If surgical correction is anticipated without syrinx decompression, constant intraoperative monitoring may be particularly indicated.

Intraoperative monitoring of spinal cord function includes wake-up techniques and recording of SSEP. A small number of patients, however, continue to have neurologic complications despite monitoring.[5] A study of SSEP spinal cord monitoring in 1168 consecutive patients using techniques identical to that used in the present case[4] showed no false-negative cases of intraoperative spinal cord damage.

When decreases in SSEP amplitudes were more than 50%, as observed in this instance, 38% had clinically detectable postoperative neurologic changes. Those patients with a decrease of amplitude greater than 80% had a high risk of significant neurologic deficit (57%). There was a 100% correlation between the side of the amplitude decrease and the side of the neurologic loss in the trunk or limb. Those patients in whom SSEP amplitudes did not return to levels above 50% had an increased risk of neurologic complication. Abdominal reflexes are cutaneous reflexes consisting of a brisk unilateral contraction of a part of the abdominal wall in response to a cutaneous stimulus, such as light scratch with a pin. It is a polysynaptic, multisegmental reflex, localized in the spinal cord from the 7th to 12th dorsal segments. Although lower motor neurone damage may cause dimunition or loss of the reflex, it is normally dependent on the integrity of the ipsilateral corticospinal tract,[8] thus indicating ipsilateral upper motor neuron injury in the case reported.

Spinal cord injury may occur intraoperatively after "moderate" distraction in "idiopathic" scoliosis. The case reported was an "idiopathic" scoliosis until MRI scanning revealed an unsuspected thoracic syrinx. MRI scanning has improved the detection of syringomyelia, and this case strengthens the case for routine MRI screening of all "Idiopathic" scolioses. Syringomyelia may be a risk factor for neurologic injury during correction of scoliosis; SSEP spinal cord monitoring may identify and prevent intraoperative spinal cord injury.

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