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Transient Paraparesis after General Anesthesia in a Patient in the Prone Position

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IT is widely recognized that patient position and general anesthesia may precipitate neurologic deterioration in patients with cervical spine injury and impending cervical cord injury. The influence of position and sedation on thoracic and lumbar spinal cord functioning is less commonly a clinical problem.

We report a case of transient paraparesis associated with prone positioning during general anesthesia.

Case Report

An 8-yr-old, 27-kg girl underwent posterior fossa craniotomy for resection of a grade 1 pilocystic astrocytoma of the obex and fourth ventricle. Her hospital course had been notable for repeated ventriculoperitoneal shunt malfunctions and revisions.

Three months after craniotomy, during a follow-up clinic appointment, she complained of severe position-related back pain of 2 weeks' duration. The pain occurred with assumption of the supine position and was localized to the lower back just below the level of the iliac crests. She also complained of bilateral sacroiliac joint tenderness. Palpation of the sacroiliac joints resulted in pain at each respective groin. Neurologic examination demonstrated a decrease in the sense of vibration at the right great toe without changes in coordination or deep-tendon reflexes. Motor strength and light-touch sensation of the lower extremities were intact. She had limited cervical spine flexion, a stooped posture with knees slightly flexed, and a forward-leaning stance with the waist in notable flexion. This posture was exaggerated with walking. She could assume an erect posture but could not maintain it because of rapid onset of fatigue. She denied having pain on standing or walking.

The patient received tricyclic antidepressant agents and nonsteroidal antiinflammatory drugs but with minimal benefit. Because of her history of back pain without neurologic symptoms, she was scheduled for elective outpatient magnetic resonance imaging (MRI) in accordance with a management algorithm described by Portenoy *et al.*[1] Her back pain increased during the subsequent week with a concomitantly worsening sleep disturbance. She was able to sleep only in semirecumbency with several pillows for support. Therefore she was admitted for urgent MRI and multidisciplinary pain management.

The patient underwent the MRI while in the supine position. The knees were flexed and the lower extremities were supported on a pillow to improve comfort. Noninvasive monitors were placed, and a continuous intravenous propofol infusion was titrated to effect. The MRI revealed extensive tumor involvement and significant compression of the anterior aspect of the spinal cord from the T6 vertebra to the S1 vertebra (fig. 1). The patient was taken to the postanesthesia care unit after completion of the MRI procedure. Recovery was without incident. MRI was repeated 48 h later with the same anesthetic technique and the patient again in the supine position. She was awakened and had an uneventful recovery.

The decision to begin palliative radiation therapy was made. It was deduced that the staging for radiation therapy ports would be most effective if the patient were placed in the prone position.[2] After routine noninvasive monitors were placed, the patient was sedated with midazolam while in the semisitting position because the supine posture was intolerable. Intravenous propofol was administered until

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Fig. 1. Extensive tumor involvement of the anterior aspect of the spinal cord (arrows). No motor deficit was noted on initial examination. However, direct compression of the anterior spinal cord and vascular compromise of the anterior spinal artery may explain the rapid progression of symptoms from pain to the paraparesis that occurred after prone positioning.

she was unresponsive to voice and light touch. She was then log-rolled onto the radiation table, and her arms were flexed at 20°. Bony prominences and peripheral nerves were protected as described by Britt *et al.*[2]; however, her head was kept midline and her back was more lordotic for proper radiation planing (fig. 2). Blood pressure was maintained within ± 15% of preanesthetic values. Blood pressures were measured every 5 min with a sphygmomanometer (Dinamap), and values from 100/50 to 130/80 mmHg were obtained. Oxygen saturation was maintained at 99% with supplemental oxygen at 8 $l \cdot min^{-1}$. The measuring and planing of the radiation ports lasted approximately 1 h. Total anesthesia time was 75 min. The patient was awakened in left lateral decubitus.

Twenty-five minutes after awakening, while in the postanesthesia care unit, the patient complained of inability to move her legs. Motor tone was flaccid, and deep-tendon reflexes were markedly diminished. Sensation of both lower extremities was intact, but the patient reported subjective numbness of the plantar surfaces bilaterally. Bowel and bladder incontinence were noted. Dexamethasone 10 mg was given intravenously, and the patient underwent emergent irradiation of the neuraxis from C6 through S3 in the supine position. At 90 min after emergent irradiation (2.5 h after notation of the motor deficit), the patient was able to abduct her legs. Dexamethasone, 4 mg intravenously administered every 6 h, was continued.

Twenty-four hours later, the patient could walk with assistance. Fecal and urinary continence returned 48 h after the episode. Tolerance of the supine position was improved with maintenance doses of methadone 3.5 mg four times per day. Radiation therapy was later completed on an outpatient basis. Currently the patient can ambulate with minimal assistance.

Discussion

The prone position may be associated with several complications, including ocular trauma, brachial plexus injury (especially the ulnar nerve), injury to the dorsum of the foot, vena caval compression, and lateral femoral cutaneous nerve compression.[3] In 5–10% of cancer patients, spinal metastases that cause neurologic manifestations develop.[4]

The patient described here had extensive spinal metastases sufficient to cause position-related back pain and an isolated neurologic change on initial examination. Spinal pain is the most frequent sign associated with subsequent cord compression and is seen in 95% of cases. This pain may occur weeks to months before actual cord compression symptoms develop.[4] The pathogenesis of the clinical symptoms caused by spinal cord compression is still debated.

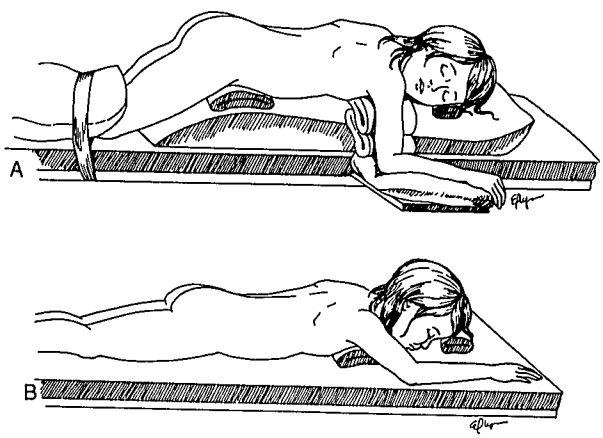

Fig. 2. (*A*) The proper prone position as described by Britt *et al.*[2] (*B*) Position modification used during initial irradiation planing.

There are currently three acceptable modes of treatment for spinal cord compression: radiation alone, surgery plus radiation, and radiation plus steroids.[4,5] Irradiation alone has been effective in as many as 33% of patients who were initially examined within a few hours after the onset of paraplegia. There is clinical and experimental evidence that the effects of steroids are mediated by the reduction of spinal cord edema and oncolytic reduction of tumor mass.[5-7]

Neuropathy of the central nervous system in anesthetized patients can be a result of hypoxemia, although neurologic dysfunction is more often due to a cerebral rather than a spinal cord insult. During anesthesia, skeletal muscle tone is diminished, allowing nerve traction or compression by nonanatomic positioning. In addition, normal protective pain mechanisms are attenuated or ablated in anesthetized patients.[8] The most common cause of peripheral nerve injury in anesthetized patients is ischemia of the intraneural vasa nervorum.[2]

In retrospect, our patient on initial examination displayed intolerance of vertebral column extension. She preferred a flexed stance and could not comfortably lie in the supine position. She had undergone MRI twice while in the supine position without incident. However, the flexion and slight elevation of the knees decreased the degree of lumbar lordosis, lower vertebral extension, and probable encroachment of the spinal cord.

The cause of the paraparesis in this patient cannot be identified. However, the initiation of neuraxial insult was temporally associated with prone positioning. It has been suggested that patients should be placed in the position of surgery before the induction of anesthesia to help identify areas of undue pressure.[3] Following that advice may have alleviated the need for emergent intervention in this child, who displayed symptoms consistent with cauda equina compression. In children, because cooperation may be impossible without sedation, awake trial positioning may not be practical. A drug such as propofol or perhaps methohexital may have been useful in this case to sedate the patient during the time that she was being moved; afterward, she could have been allowed to awaken. A second examination, with the patient in the prone position, may have provided valuable information.

Documentation of neurologic function is requisite in patients with a propensity for nerve or spinal cord compromise. With uncooperative children, if awake trial positioning is not possible, positioning during sedation with a short-acting agent may be an alternative.

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