Cauda equina–penetrating injury in a child

Case report

CLAUDIO PIQUERAS, M.D., JUAN F. MARTÍNEZ-LAGE, M.D., MARÍA JOSÉ ALMAGRO, M.D., JAVIER ROS DE SAN PEDRO, M.D., PEDRO TORRES TORTOSA, M.D., AND AGUEDA HERRERA, M.D.

Regional Service of Neurosurgery, Service of Pediatrics, and Pediatric Intensive Care Unit, “Virgen de la Arrixaca” University Hospital, El Palmar; and Laboratory of Experimental Neurology and Neurosurgery (Group NYNE), University of Murcia Medical School, Campus de Espinardo, Murcia, Spain

✓ The authors report the case of a 10-year-old boy who sustained an injury to the cauda equina as a result of the accidental penetration of a wooden pencil into the spinal canal. After neuroimaging evaluation to exclude visceral and vascular lesions, the foreign body was removed and the wound was repaired. This is the first report of a cauda equina injury caused by a pencil.

KEY WORDS • spine-penetrating injury • cauda equina • pencil injury • pediatric spine injury • pediatric neurosurgery

Case Report

Presentation and Examination. This 10-year-old boy was brought to our hospital’s emergency department after falling while playing. The child had been carrying a pencil in his back pocket that stabbed him in the lumbar region when he fell. At admission, the patient complained of low-back pain radiating down his left leg. On inspection, a red pencil was seen penetrating the child’s back, slightly to the right of the midline at an approximate level of L-5 (Fig. 1). A neurological examination revealed left foot paralysis, an absent left ankle reflex, and hypalgesia in the area of the left S-1 root and on the left buttock reaching the perianal region; the patient was hemodynamically stable. The child was started on a course of cefotaxime and amoxicillin/clavulanate.

A plain radiograph (Fig. 2) and CT scans of the lumbar spine (Fig. 3) showed that the pencil had penetrated the spine from the right L5–S1 space; then, changing its trajectory, it traversed the vertebral canal and exited toward the retroperitoneal space through the left L5–S1 foramen. The pencil tip ended near the bladder and close to the bifurcation of the left iliac artery. A CT scan obtained after contrast infusion ruled out vascular injury. Findings on a contrast pyelogram revealed that the urinary tract was intact.

Operation. On February 2, 2004, the child underwent an operation. A linear skin incision was made from L-2 to S-2, with an additional transverse opening to encompass the wound caused by the pencil. A laminectomy from L-4 to S-1 was performed (Fig. 4). The pencil had penetrated the lig-
amentum flavum, traversed the dura mater, and exited to the retroperitoneal space though the foramen between the roots of L5–S1 on the left side, partially lacerating several rootlets. The pencil, which was chipped both at the entry and exit of the dural sac, was removed completely. Intradural remnants of the lead were carefully removed using thorough irrigation with saline and the aid of the surgical microscope. A watertight closure of the dural sac was achieved and the wound was closed in layers.

Postoperative Course. On the 4th day after surgery, the child exhibited mild neck rigidity and fever. A lumbar puncture could not be performed, but the blood culture was nondiagnostic. As a precaution, the child was treated with cefotaxime and vancomycin for 2 additional weeks. A magnetic resonance imaging study demonstrated postsurgical fibrosis and ruled out the presence of an abscess. After a follow-up period of 1 year, the boy’s neurological deficits had completely resolved.

Discussion

In adults, penetrating injuries constitute the third most frequent cause of SCI. Surpassed only by traffic accidents and falls, they account for four to seven cases per million persons per year.4 In children, this figure must be lower, although Osenbach and Menezes14 reported an incidence of 4% in a series of 179 pediatric patients with spinal column injuries and SCIs. Children are victims of penetrating injuries resulting from violence perpetrated with guns, knives, and play objects (including compressed airguns and sharp-pointed toys), and from falls onto sharp objects (especially glass and some toys).6,8 Foreign objects can easily penetrate the skull through thinner portions of bone such as the orbit and the temporal squama.9

Very few studies have been undertaken concerning the management of penetrating injuries to the conus medullaris and cauda equina.1,3,15,16 Excluding reports on SCIs caused by firearms during wartime, most data on penetrating spinal injuries refer to civilian gunshot and stab wounds.7,3,4,15,16 Although these injuries do not share the same kinetic mechanism, much knowledge can be gained from these reports for use in managing other types of penetrating SCIs, such as the one sustained by our patient.

Cerebral injuries caused by skull penetration with pencils have been more amply publicized.2 Miller, et al.,11 reviewed the dangers of intracranial wood, mainly introduced transorbitally. Pencils have been demonstrated to have potential adverse effects due to the organic nature of the wood and the toxicity of the pencil lead. The retention of these materials may cause intracranial infection and abscess formation.2,11

In our literature review, we found several interesting cases of penetrating SCIs produced by mechanisms similar to the one in our patient. Jawish and Ponet5 reported on a child with torticollis due to the retention of a pencil cap that had lodged in the neck after having pierced the posterior wall of the pharynx. An airgun pellet implanted intradurally at C1–2 was documented by Martínez-Lage, et al.8 An 18-year-old man with a late granulomatous lesion at C-3 caused by pencil lead was described by Meltzer, et al.10 Missori, et al.,12 reported on the conservative treatment of a 15-year-old boy with a bullet lodged close to the lateral mass of the atlas. Lunawat and Taneja7 described the case of an 18-year-old man with two intraspinal stonelike objects at T12–L1 that turned out to be pieces of retained wood from a penetrating abdominal injury that had occurred 6 years before. Most unusual was the case described by Notermans and colleagues13 regarding a 12-year-old boy with a metallic stylet found within his cervical canal after attempted infanticide by insertion of a stylet through the fontanelle.

Initial principles for the management of penetrating intraspinal injuries should include performing a meticulous neurological examination and the administration of prophylactic antibiotic agents.3,4 Particular attention should be paid and priority given to eventually life-threatening visceral and vascular injuries.18 With this purpose in mind, we performed contrast-enhanced CT scanning of the abdominal blood vessels and viscera in our patient, together with an intravenous

FIG. 1. Photograph of the child’s back showing the point of entry of the pencil in his lumbar region.

FIG. 2. Spine x-ray film showing the trajectory of the pencil. Note the presence of contrast agent in the urinary system.
pyelogram to ascertain the integrity of the urinary tract. We also obtained plain radiographs and a CT scan of the affected vertebral region, which included three-dimensional reconstructions. These reformatted views permitted us to follow the trajectory of the pencil and its fragments within the spinal canal and retroperitoneal space.

Contrary to cases of spine-penetrating injuries due to gunshot and stab wounds, in our case there was no doubt that early surgical treatment was necessary. Given the risk of infection, surgery was aimed at retrieving the pencil and its fragments, and at trying to achieve a hermetic dural closure for the prevention of a cerebrospinal fluid leak. Although antibiotic therapy was instituted immediately, a meningeal reaction developed in our patient, probably due to chemical irritation to the particulate fragments of the pencil lead. Unfortunately a sample of cerebrospinal fluid could not be obtained, so the child underwent a prophylactic course of antibiotics.

Conclusions

This is the first reported case of a penetrating pencil injury to the cauda equina in a child. Needless to say, many accidental events of this type can be prevented by supervision of children during sports and play activities.

References


Manuscript received August 29, 2005. Accepted in final form January 6, 2006.

Address reprint requests to: Juan F. Martínez-Lage, M.D., Regional Service of Neurosurgery, “Virgen de la Arrixaca” University Hospital, El Palmarejo Hospital, Murcia, Spain. email: juanf.martinezlage@cablemurcia.com.