

Paraplegia

Traumatic Spinal Cord Injury Followed by Cerebrospinal Fluid Complications

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Summary

Following closed traumatic spinal injuries, complications such as spinal fluid fistula, leakage or meningitis are rarely seen. The mechanisms causing a CSF fistula or leakage of CSF in these blunt injuries are obscure, while they are more understandable in penetrating injuries (Gentleman et al., 1984; Romanick et al., 1985; Wilson et al., 1976). The literature mentions subarachnoid-pleural or mediastinal fistulae but we did not find either fistulae or meningitis after closed injuries of the lumbar spine. We present our experience with these rare complications of penetrating and blunt traumatic injuries of the spine.

Key words: *Spinal cord injuries; Spinal fluid leak; Meningitis; Gunshot wounds; Cerebrospinal fluid fistulae.*

Patients and methods

Since the opening of our National Spinal Cord Injury Center in 1973, we have admitted over 900 patients with new traumatic spinal cord injuries (SCI), only 5 of whom developed cerebrospinal fluid fistula or meningitis.

Case report 1

A 22-year-old soldier, had a severe car accident in December 1986, sustaining a fracture dislocation of the T12/L1 vertebrae, a bilateral lung contusion with haemothorax, rupture of the left diaphragm and flaccid paraplegia below L1. Assisted artificial respiration was required and two thoracic drains were inserted. A CAT scan of the spine showed no bony fragments in the canal. The diaphragm tear was sutured. In January 1987 the patient was transferred to our department; one day later a paravertebral bulge could be palpated in the region of the L1 vertebra and he developed signs of meningeal irritation. Both lumbar puncture and a fine needle aspiration of the bulge revealed that the content was clear, normal CSF fluid. No specific treatment was necessary except antibiotics, and the bulge slowly disappeared. Postural reduction was applied for the dislocated vertebra. The frequent abdominal pains from which the patient suffered disappeared. This was presumably due to stopping the CSF leakage to the retroperitoneal area or to the neighbouring tissues.

No neurological changes had occurred. The patient is now wheelchair-bound and completely independent in ADL.

Case report 2

A 45-year-old woman accidentally fell from the second floor of a building in December 1985. She sustained a fracture dislocation of T9 vertebra with complete paraplegia below T10. Conservative treatment was started. Three days after admission she developed severe clinical meningismus with intense headaches, opisthotonus and pyrexia. Repeated CSF analysis showed no signs of bacterial meningitis, but red and white cells, and high protein content (140 mg%) due to blood in the CSF. Anaerobic and viral cultures were negative. The condition subsided spontaneously after a week. It is likely that the patient had aseptic meningitis and that there was a failure to culture the causative organism. No neurological changes had occurred. The patient is wheelchair-bound and partially independent in ADL.

Case report 3

A 23-year-old soldier, was injured in July 1982 by gunshot. Three pieces of shrapnel entered the cervical area from left to right through the spinal cord. Two of them remained there and one emerged from the right side, near the C2 region. He had complete quadriplegia below C2 and a fracture of the C2–C3 vertebrae, and was treated in the intensive respiratory care unit for 6 weeks. Then he developed pneumonia and atelectasis. A CSF fistula was noted in the C2 region. The pads on the wound were frequently changed and antibiotics were administered. The leakage slowly stopped. In September 1982 the patient suddenly became comatose, with clinical signs of what we suspect was transtentorial herniation of the brain due to migration of shrapnel metal into the foramen magnum. He died 2 days later. No autopsy was performed.

Case report 4

A 22-year-old soldier was injured in October 1973 by pieces of shrapnel which penetrated his chest, shoulders and spinal column. He suffered from bilateral haemothorax, right brachial plexus damage and complete spastic paraplegia below T5. Bilateral thoracic drains were inserted and surgical extraction of the shrapnel pieces was performed. The largest piece was lodged posteriorly to the fifth thoracic vertebra in the spinal column. Surgical debridement was carried out. Severe wound infection developed at that site, later followed by CSF leakage. No signs of meningitis appeared. Antibiotics were given and the conservative treatment consisted of frequent pad changes, wound cleaning, etc. The wound slowly healed and the CSF leakage stopped. The patient was discharged 7 months later. He is now married, has 2 children, works in his own printing firm and is fully independent in ADL.

Case report 5

A 20-year-old soldier sustained a posterior gunshot wound at C7–T4 level in March 1984. The bullet entered the spine in the C7–T1 area, went downwards to the T2, 3 and 4 regions and came out from there. CAT scans showed severe destruction of these vertebrae. There was complete quadriplegia below the C8 level. Following the injury, a posterior CSF leakage was noted from the C7 level; the patient received systemic antibiotics and an epidural drain was inserted at the C1–C2 level, causing slow disappearance of the leakage below. Except for episodes of autonomic dysflexia, the rehabilitation process was uneventful. The patient is partially independent in ADL, is married and is a university student.

Discussion

Cerebrospinal fluid (CSF) fistula or leakage, either internal (subarachnoid–pleural fistula), (Lovaas *et al.*, 1985; Moorehead *et al.*, 1985; Rocha-Campos *et al.*, 1974) or external, is a rare and alarming complication in traumatic spinal cord patients. In our small group of patients, 3 developed external leakage of CSF after GSW of the spine. We were unable to find in all our clinical material, any proof of internal leakage.

Shannon *et al.* (1982) have reviewed the literature concerning subarachnoid–pleural fistulae. The detection of such a complication can be achieved by various techniques: intrathecal dye injection, myelography, conventional X-ray films, CT scans and isotope scanning. The authors advocate plain radiographs and CT scans to envisage both the anatomy in the trauma area and the density of the pleural fluid. Subsequently, water-soluble myelography may be used to demonstrate the subarachnoid space, and CT scanning after myelography may clearly show small fistulae. If the fistula is not demonstrated, isotope scanning is necessary. A fistula persisting over several weeks is an indication for surgery (Romanick *et al.*, 1985). In some cases, early debridement and closure of a CSF fistula is advocated (Shannon *et al.*, 1982) to ensure that the cord is not further damaged. Kitchel *et al.* (1988) have concluded that closed subarachnoid drainage for post-operative CSF leakage is a safe technique. This procedure avoids the risks of repeat surgery, but sometimes does not preclude direct dural repair.

Lovaas *et al.* (1985) have written that ‘although a small dural tear may respond to bedrest or drainage via tube thoracostomy, on occasion an operative approach may be become necessary’. Meningitis may sometimes follow a penetrating spinal injury (Wilson, 1976; Jones *et al.*, 1973; Gentleman and Harrington, 1984) in spite of antibiotics. Blunt trauma may cause meningitis on rare occasions (Jones *et al.*, 1973). Systemic and intrathecal antibiotics are advocated for penetrating or blunt post-traumatic meningitis. Meningitis after stab wounds of the spine despite antibiotics is another rare phenomenon (Gentleman and Harrington, 1984). Meningitis after spinal injury may be associated with damage to the colon (Romanick *et al.*, 1985). If the colon was not involved in the initial penetrating trauma, spinal surgery is not indicated (Romanick *et al.*, 1985). In our cases we failed to isolate any organism causing the meningitis and we gave conservative treatment only: bedrest, postural reduction and antibiotics.

In our small series, 2 patients developed ‘aseptic’ meningitis. This term is usually applied to a viral infection causing fever, signs of meningeal irritation, headaches, drowsiness and abnormal CSF. In non-penetrating wounds, it is assumed that organisms gain entrance through skull or spine fractures (Jones *et al.*, 1973). We did not perform thorough radiological or isotopic investigation because both meningitis and CSF fistulae subsided after a relatively short time.

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