BRAIN ABSCESS AFTER INSERTION OF SKULL TRACTION

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Skeletal traction using metal tongs attached to the skull is commonly used in the management of fracture-dislocations of the cervical spine. We report on three cases of intracerebral abscess after insertion of Crutchfield calipers, review the literature and comment on the pathogenesis of this extremely serious complication that has rarely been reported.

Skeletal traction using metal tongs attached to the skull has been used in the management of fracture-dislocations of the cervical spine since 1933 (Crutchfield 1933) and halo traction was introduced in 1960 as another method of immobilising the cervical spine (Perry and Nickel 1959); both methods involve inserting metal pins into the cranial vault. There is always a risk of infection developing with this form of treatment and although in the majority of cases it is relatively trivial, involving merely a local cellulitis, it can lead to more serious complications such as local osteomyelitis (Crutchfield 1936) and extradural abscesses (Tindall, Flanagan and Nashold 1959; Weisl 1972). If the infection penetrates the dura, a subdural abscess (Weisl 1972; Busch 1973) or cerebral abscess may result. Cerebral abscess after the use of skeletal traction is a rare but extremely serious complication that has been reported only sporadically (Tindall et al. 1959; Jamieson and Yelland 1965; Masuhr, Menzel and Piscoc 1970; Weisl 1972; Busch 1973; Victor, Bresnan and Keller 1973; Hoffmann, Merck and Vercauteran 1974; Hall and Burke 1979). Hall and Burke (1979) reported two cases of cerebral abscess out of 490 patients treated by skull traction at the Victorian Spinal Injuries Unit between 1975 and 1976, giving an incidence of 0.4 per cent.

We report three cases of cerebral abscess resulting from the insertion of skull tongs for skeletal traction in the treatment of injuries of the cervical spine which have presented at the Radcliffe Infirmary during the past 17 years.

CASE REPORTS

Case 1. A 51-year-old man presented in 1964 after falling 30 feet from a building. Initially he had severe dysphasia and flaccid hemiplegia on the right side. Radiographs of the cervical spine showed a fracture-dislocation of the sixth cervical vertebra on the seventh. Crutchfield calipers were inserted into the skull and traction applied. Over the following weeks his mental state and dysphasia improved markedly but the hemiparesis persisted. One month after admission he had a rapid onset of drowsiness and muscular paralysis of the left side of the body which quickly progressed until he became comatose with a complete left hemiplegia. An area of suppuration around the wound where the calipers had been fixed into the right parietal bone was noted. Radiographs of the skull revealed no evidence of osteitis and an angiogram of the right carotid artery was normal. A burrhole was drilled into the right frontal bone which showed the meninges and the cortex to be normal. The right lateral ventricle was tapped and found to be capacious and contain clear colourless cerebrospinal fluid. The patient subsequently developed Jacksonian convulsions on the left side of the body which were difficult to control. A ventriculogram showed hydrocephalus but no focal lesion. His neurological state continued to deteriorate and he died two weeks later.

Necropsy revealed a subdural empyema on the right, a swollen right cerebral hemisphere, and a right-sided intracerebral abscess with a cavity three centimetres in diameter. Specimens of pus from the cavity grew Staphylococcus aureus which had the same antibiotic spectrum of sensitivity as the Staphylococcus aureus grown from the suppurating wound on the scalp.

Case 2. A 26-year-old man became tetraplegic after sustaining a fracture of the sixth cervical vertebra when diving from Brighton pier into six feet of water. He did not lose consciousness and was treated with skeletal traction using Crutchfield tongs. Two weeks later he had a grand mal fit after which he became increasingly drowsy and his
speech became slurred. On admission to the Radcliffe Infirmary six weeks after the initial injury, he was drowsy but orientated, and had spastic dysarthria. He had a flaccid tetraplegia, although both biceps and deltoid muscles were spared. The hair had not been shaved around the points of insertion of the caliper into the skull and the wound on the left side was discharging pus. A radiograph of the skull showed that the metal pin on the left was well inside the inner table of his skull; computerised tomography revealed a small intracerebral lesion surrounded by considerable oedema (Fig. 1).

The tongs were removed and the wound debrided and cleaned. Three millilitres of thick pus were aspirated from the intracerebral abscess which was two centimetres beneath the cortex; penicillin was instilled into the cavity. The abscess was aspirated daily for four days and the patient given large doses of intravenous antibiotics. *Staphylococcus aureus* isolated from the cavity of the abscess and the skin wound were identical. The abscess rapidly resolved and the only complication after operation was an episode of muscular convulsions on the right side of the face.

**Case 3.** A 62-year-old woman presented at the beginning of March 1981 having fallen in her bathroom and sustained a markedly displaced odontoid fracture. She was treated with skeletal traction using Crutchfield tongs. Four weeks after injury she developed progressive right-sided weakness and one week later she was transferred to the Radcliffe Infirmary. On admission she was drowsy with a right visual field defect and a right hemiplegia. The site of the Crutchfield tong on the left side of the skull was inflammed and oozing pus.

Computerised tomography showed a small, parietal intracerebral abscess on the left surrounded by low-density material (Fig. 2). This abscess was too small to aspirate and the wound was explored at operation, where a small extradural abscess was found and pus noted to extend through a small perforation in the dura into the subdural space. The wound was thoroughly debrided and cleaned and the patient was given high doses of parenteral antibiotics. The pus from the extradural space, the subdural space and from the wound grew *Staphylococcus aureus* of identical sensitivities.

After treatment with high doses of parenteral antibiotics the abscess gradually resolved (Fig. 3) and her neurological state improved considerably.

**DISCUSSION**

Skull traction is a most useful method of treatment of fracture-dislocation of the cervical spine. However, it carries a risk of infection of not only the subcutaneous tissue but also the bone, the extradural and subdural spaces, and the brain itself. Although there have been reports of either one case (Masuhr et al. 1970; Weisl 1972; Busch 1973; Victor et al. 1973; Hall and Burke 1979) or two cases (Tindall et al. 1959; Jamieson and Yelland 1965) of intracerebral abscess after skull traction, we present three cases to emphasise the risk of intracranial infection.

The development of an intracerebral abscess after skull traction normally follows superficial infection. In the three patients presented, the organisms grown from the superficial wound and the abscess were similar. Some of the case reports in the literature were also associated with an infective superficial wound (Tindall et al. 1959; Weisl 1972; Victor et al. 1973; Hall and Burke 1979) and others with deeper infections of the subcutaneous tissues or bone (Tindall et al. 1959; Jamieson and Yelland 1965; Weisl 1972). Although infection may be confined to a local osteomyelitis, it is likely to spread deep to the bone if the metal pin of the Crutchfield caliper has penetrated the skull as occurred in Case 2. If the pin of the traction device penetrates the dura, as in one of the two cases reported by Jamieson and Yelland (1965), the mechanism of intradural spread of infection is obvious. Mechanical irritation of the dura may allow intracranial spread of extradural infection without actual penetration of the dura. Intracerebral infection results from the spread of organisms either directly through the meninges and brain or more likely by retrograde septic thrombophlebitis of the superficial cortical veins (Victor and Banker 1963; Beekhuis and Taylor 1969; Gurdjian and Thomas 1969; Samson and Clark 1973). Superficial vein thrombosis associated with superficial cerebral infection probably occurred in Case 3 and the subsequent venous infarction was responsible for at least some of the area of low density surrounding the abscess on the computerised tomographic scan (Fig. 2) and would account for the extremely severe neurological deficit noted in this patient in the presence of a small intracerebral abscess.

The mortality from intracranial abscess remains high, ranging from 28 to 53 per cent (Loeser and Scheinberg 1957; Victor and Banker 1963; Beller, Sahar and Praiss 1973; Jefferson and Keogh 1977). To minimise the frequency of infection when using skull traction it is
essential that the surgeon should be aware of the potential risks and pathogenesis of intracranial infection so that adequate preventative measures can be taken; a sufficient area of the scalp should be shaved and the calipers must be fitted in a scrupulously sterile fashion, taking care that the metal pins do not penetrate the inner table of the skull. The wound surrounding the pins should be treated with great care throughout the period of skull traction.

In patients with a neurological abnormality after a lesion of the cervical spine, it may be more difficult than usual to diagnose an intracranial abscess. However, any changes in the mental state, additional focal neurological signs or epileptic convulsions in patients with skull traction should be treated with the highest degree of suspicion, particularly in those patients in whom the sites of the pins appear infected.

REFERENCES


