UNUSUAL COMPLICATIONS OF SKULL CALIPER TRACTION

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When Crutchfield (1933) first described skull traction as a method of treatment of fracture-dislocation of the cervical spine he accepted that the method might occasionally be complicated by infection: one of his early patients had developed infection of the diploe but the problem was solved by removal of the calipers. Subsequent authors using skull traction in the treatment of fracture-dislocations of the cervical spine had not referred to this complication (Cone and Turner 1937; Gallie 1939; Schneider 1955; Durbin 1957; Rogers 1957; Forsyth, Alexander, Davis and Underdal 1959; Evans 1961; Munro 1961; Norton 1962; Beatson 1963; Ramadier and Bombart 1963, 1964; Hollin, Hayashi and Gross 1967; Koskinen and Nieminen 1967; Apley 1970). The risk of infection receives no mention in the current textbooks (Watson-Jones 1955, Perkins 1958, Böhler 1956, 1966, Conwell and Reynolds 1961). Nevertheless, as the following cases collected over the past six years indicate, infection occurs occasionally and may sometimes prove fatal.

CASE REPORTS

Case 1—A man aged fifty-two was admitted to hospital after a road accident, suffering from dislocation of the seventh cervical vertebra on the first thoracic. The dislocation was reduced by skull traction with Crutchfield calipers. Three and a half weeks after the accident he showed convulsive movements in the left upper limb and developed a left-sided hemiplegia. Lumbar puncture and angiographs were normal. Staphylococcus aureus and bacillus coli were grown from the caliper tracks. The patient was transferred to the care of a neurosurgeon. Exploration revealed a right-sided cerebral abscess which was drained. Despite this, the patient died a week later. At post-mortem examination there was no evidence that the traction calipers had penetrated the dura mater.

Case 2—A man aged twenty-nine sustained a severe head injury and a fracture-dislocation of the cervical spine; the latter was treated with caliper traction. Sixteen days after the accident posterior fusion of the cervical spine was carried out. Two days after the operation he developed headache, and a day later he became comatose and developed a left hemiplegia. Lumbar puncture, angiography and exploratory burr holes revealed no abnormality. This patient died suddenly three weeks after the spinal fusion. At necropsy a diffuse collection of pus was found over the right cerebral hemisphere.

Case 3—A man aged forty-six was thrown from a motor-bicycle after collision with a car and sustained subluxation of the sixth cervical vertebra on the seventh. This was reduced with Crutchfield tongs, which were applied the day after the accident and tightened as necessary. Twenty-seven days later one caliper tong had penetrated the inner table and there was a slight watery discharge. A wound swab grew a staphylococcus. A course of ampicillin was started. The following day posterior fusion of the lower cervical spine, with internal fixation by wire, was undertaken. After the operation the patient showed pyrexia which seemed to respond to antibiotic therapy. But after a week he collapsed, and died two days later. Necropsy revealed an extradural abscess at the site of the skull puncture. There was also infection of the neck wound and of the iliac (donor graft) wound by a penicillin-resistant staphylococcus.

PREVIOUS REPORTS

Senior members of the Neurosurgical Society were contacted and some of them had had experience of similar complications of traction by skull calipers. Carey (1965), Clarke (1965), Johnson (1965) and Robertson (1965) each reported having treated successfully a single case of cerebral abscess complicating skull traction. Carey also recalled a similar fatal case. Johnson (1965), Maslowski (1965), Northfield (1965) and Kerr (1965) reported altogether six cases of osteomyelitis of the skull complicating traction. McCaul (1965) found an extradural haematoma following the insertion of calipers.

A search of the literature brought further cases to light. Tindall, Flanagan and Nashold (1959) reported three similar cases of infection following the insertion of Crutchfield calipers; in one fatal case there was an extradural abscess and thrombosis of the middle cerebral artery. The two survivors had cerebral abscesses caused by staphylococcus aureus. All three patients...
had radiolucent areas in the skull, an intact dura mater and sterile cerebrospinal fluid. Hooper (1959) in a series of cases of extradural haematomas found one caused by the insertion of calipers through the posterior meningeal artery. Harris and Wu (1965) reviewed a series of 135 fracture-dislocations of the cervical spine: this included a patient with parietal lobe abscess following the application of Blackburn calipers and another with extradural infection caused by Cone calipers. Jamieson and Yelland (1965) reported two further cases of cerebral abscess occurring after the removal of the traction calipers. One of these patients had normal skull radiographs and normal cerebrospinal fluid. They concluded that "no means of skeletal traction is free from infection of bone".

DISCUSSION

Skull traction is an almost indispensable method of treatment of fracture-dislocation of the cervical spine. As the collected cases and the reviewed literature show, this method involves a risk of infection including cerebral abscess, subdural and extradural abscess and osteomyelitis of the skull. To minimise the incidence of infection, it is important that surgeons should be aware of the risk, and that the best possible calipers should be used and used correctly. Crutchfield (1954) himself was not satisfied by the pattern of traction calipers bearing his name which are generally available. He considered that the arms of the caliper, as they were manufactured for the United States forces during the second world war and are now in use, are too short. Longer arms with more obliquely set pins would allow the traction pins to penetrate the diploe nearer at right angles to the line of traction; this would make the calipers more effective and less liable to slip. Longer pins at the ends of the traction arms would avoid crushing of the soft tissue of the scalp, which predisposes to infection. Possibly it may be better to use calipers which can only penetrate the skull to a predetermined depth, such as Vinke's (1948).

Once caliper traction has been instituted the patient and the pin tracks must be watched carefully for signs of infection. Intracranial infection may be insidious in onset: pyrexia and headache are obvious danger signals. Fits, hemiplegia or coma in patients on skull traction are symptoms which require the exclusion of the possibility of an intracranial abscess; on the evidence of the cases reported here normal cerebrospinal fluid and other normal neurological findings do not exclude the possibility of such an abscess.

The pin tracks should be swabbed regularly to determine the nature of the contaminating organisms and their sensitivity to antibiotics. It may be worth while radiographing the skull to show any penetration by the pins of the inner table or radiolucent areas of osteomyelitis. However, a recent experience of checking this penetration by radiography has not been encouraging.

Once an infection has developed in the pin tracks, skull traction should be abandoned and halter traction or immobilisation in a Minerva jacket substituted. Once the infection has been eradicated it may be possible to replace calipers or to proceed with fusion of the cervical spine. As the third case reported here shows, it is not safe to proceed with such a fusion in the presence of infection in the skull.

SUMMARY

1. The insertion of skull calipers is not generally known to be associated with any morbidity or mortality.
2. In the past six years the details of three fatal complications have been collected: there was one case each of cerebral abscess, subdural abscess and extradural abscess.
3. Brief notes of eleven other similar cases, five of cerebral abscess and six of osteomyelitis of the skull, have been supplied by colleagues.
4. The implications of these findings are discussed.

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REFERENCES

CLARKE, P. R. R. (1965): Personal communication.

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