

APPARENTLY TRIVIAL WOUNDS OF THE EYELIDS WITH INTRACRANIAL DAMAGE

BY

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The importance of making an immediate correct diagnosis in cases of compound depressed fracture of the skull is well known, and such cases are usually recognized, either clinically or by radiological means, at the latest within a few hours of admission to a casualty department. There is, however, one sort of cranial injury which appears to be particularly common in children and in which, to judge by personal experience, early diagnosis is exceptional. This is the penetrating wound of the roof of the orbit. The present paper reports the course and outcome of six such cases seen at the Royal Manchester Children's Hospital during the last decade.

Case 1

A 9-year-old girl, playing cowboys and Indians, was carrying an arrow made from a sharpened bamboo stick when she fell. The stick entered her left cheek, just below the inner canthus of the eyelids. She was not rendered unconscious and walked to a hospital, where the lids were found to be swollen and the eye closed. The wound was explored under anaesthesia and several pieces of bamboo were extracted. She failed to regain full consciousness, so next day the wound was re-explored and brain tissue was noticed in its depths.

At this stage the girl was transferred to a neurosurgical unit, where radiography showed a hole in the medial part of the roof of the orbit and several radiopaque foreign bodies within the skull. Frontal craniotomy was performed and it was found that there was laceration of both frontal lobes, with a large intracerebral haematoma. The indriven pieces of bamboo were removed, together with damaged brain tissue and blood-clot. The frontal and anterior ethmoidal air-cells had been penetrated, so the dura of the anterior fossa was repaired with fascia. The child rapidly regained full consciousness after the operation, but her later progress has been marred by the development of epilepsy, and by a permanent change in personality.

Case 2

A boy aged 9 years missed his footing while climbing over some railings and fell, so that one of the iron spikes by which they were surmounted entered his right upper eyelid. He felt little discomfort, but attended his family doctor, who found only a trivial-looking wound, a bare $\frac{1}{4}$ in. (6 mm.) long. Next day the eyelids were very swollen so he was referred to a hospital, but no action was taken there, apart from changing the dressing. A week later, although the swelling had disappeared, there was noticed to be a complete ptosis of the upper eyelid. He was kept under observation for a further week, when, the ptosis being still present, x-ray films were taken and a metallic foreign body was found lying with its tip within the anterior fossa of the skull.

The boy was transferred to a neurosurgical unit, where craniotomy was performed and the foreign body—actually the rusty point of the iron spike—removed. Recovery was uneventful; the ptosis, which seemed to be due to mechanical interference with the levator palpebrae muscle, recovered within three weeks.

Case 3

A 6-year-old boy was playing alone in the garden when he fell. No details of the injury are known, but he was not rendered unconscious, and ran back into the house with a small wound on his right upper eyelid. He was taken to his family doctor and the wound was sutured and antitetanus serum given. He was then put to bed at home, but within 24 hours he had begun to complain of a pain in his head and had become restless and feverish. He was admitted to hospital on the third day, by which time, though still conscious, he was very ill with signs of frank meningitis, early papilloedema, and a left hemiparesis. Lumbar puncture showed a purulent yellow fluid under high pressure from which *Staphylococcus pyogenes* was subsequently cultured. Intraventricular and systemic antibiotics were administered, but his condition deteriorated very rapidly and he died four days after the injury.

Post-mortem examination revealed a fracture of the orbital plate of the frontal bone, consistent with penetration by a sharp object. There was laceration of the overlying meninges and brain, a diffuse suppurative encephalitis of the whole right hemisphere, and a generalized meningitis.

Case 4

On March 3, 1957, a baby girl aged 23 months was playing with a pencil when she fell forward, driving the sharpened end into her right upper eyelid. She was admitted to hospital, where the wound was sutured and antibiotics were administered. A fortnight later a small abscess formed under the wound and was drained, after which she remained well for months. At the beginning of August, 1957, she began to vomit each morning and within a week had become drowsy, and listless. On August 15 she was admitted to a neurosurgical unit, where she was found to be listless, drowsy, and resentful of interference. There was gross bilateral papilloedema, the left abdominal reflexes were diminished, and both plantar responses were extensor. X-ray films of the skull showed a small circular hole in the medial part of the roof of the right orbit.

A diagnosis of brain abscess was made and a cavity containing 75 ml. of foul-smelling green pus was found in the right frontal lobe; *Staph. pyogenes* being subsequently cultured on two occasions. Repeated aspiration and instillation of antibiotics into the cavity failed to control the abscess, so four weeks after the original tapping a craniotomy was performed. The whole frontal lobe was found to be riddled with abscesses and a lobectomy was performed. The baby's subsequent progress was complicated by the development of osteomyelitis of the bone flap, some of which had to be sacrificed, but she ultimately made a good recovery. At the time of writing she was developing normally, and so far there had been no signs of epilepsy.

Case 5

A 2-year-old boy took hold of a $\frac{1}{4}$ -in. (6-mm.) chisel lying on his father's workbench. When told to put it down he ran away, holding it in his hand. After taking a few paces he stumbled and fell, the sharp end of the chisel piercing his right lower eyelid near the inner canthus. He developed an apparently ordinary "black eye," and, although he was taken to hospital for examination, the wound was thought to be too small to require suture and no further action was taken. A week later there was noticed to be a swelling of the upper eyelid without any discoloration of the skin, but this soon cleared up.

Four weeks after the injury the little boy began to complain of headache, which woke him at night. He had previously complained of earache on one or two occasions, and a diagnosis of mastoiditis was made. He was referred

back to hospital and mastoidectomy performed, but without relief of his symptoms. He continued to complain of headache from time to time, was listless, and ate poorly, vomiting about twice a week.

Three months after the injury he was referred to a neurosurgical unit. By this time the scar on his eyelid was barely visible, and no mention of the accident with the chisel was made to any of the doctors who saw him. At this time he was listless and drowsy: there was bilateral papilloedema, with a slight left lower facial weakness. Standard x-ray views of the skull showed gross sutural reparation, but the roofs of the orbits were not well demonstrated, and it was only later that a small hole was noticed in the medial part of the roof of the right orbit.

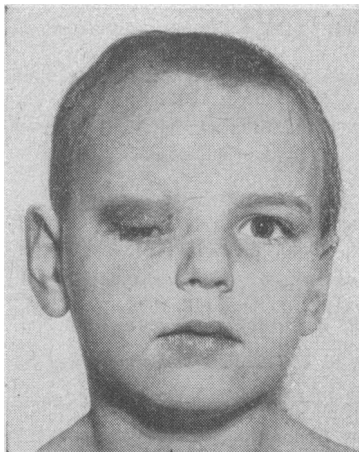
A diagnosis of brain abscess was suspected, and was confirmed by ventriculography and subsequent exploration. As with Case 4, an attempt was made to control the infection by repeated aspiration and instillation of antibiotics, but it soon became obvious that there were many loculi of infection. Ultimately, craniotomy and right frontal lobectomy were performed, the specimen proving to contain no fewer than 16 separate abscess cavities, of which the two largest contained between them 50 ml. of pus. An indurated fibrous track in the inferior part of the lobe led to the hole in the roof of the orbit. An uneventful recovery ensued, and 18 months after the craniotomy there had been no sign of epilepsy. Temperament and intelligence were normal.

Case 6

A 7-year-old girl was hit on the right side of the head by a falling coat-rack. She sustained several cuts on the face, and it was noticed that one of the coat-hooks had pierced her right upper eyelid. She was not rendered unconscious, but the eye immediately became very swollen and she was admitted to an ophthalmic unit. X-ray films were taken, and it was found that a triangular piece of bone had become detached from the roof of the orbit and had been driven into the frontal lobe. At this stage the child showed little sign of intracranial damage, and in view of the very gross chemosis and the possibility of damage to the globe of the eye itself primary treatment was limited to the administration of antibiotics and the performance of a tarsorrhaphy.

Five days later the chemosis was subsiding and it was established that the eye was intact; the child was therefore transferred to a neurosurgical unit for further care. At this stage it was noted that there was a rather profuse discharge of clear fluid, of the chemical composition of C.S.F., from the wound on the eyelid. There was no constitutional disturbance or meningism and no focal neurological abnormality. Craniotomy was performed and the anterior fossa explored. The triangular fragment of bone, its sides measuring 2 cm., was extracted from within the frontal lobe and the dura of the anterior fossa repaired with a fascial graft. The intracerebral cavity appeared clean but contained a few millilitres of semisolid blood-clot, which was removed.

The immediate recovery was uneventful (see Fig.), but one month later the child was readmitted to hospital, complaining of vomiting and headache of three days' duration. A diagnosis of brain abscess was made, being confirmed by angiography and explora-



Case 6, showing the small wound on the upper eyelid.

tion. During the next four weeks the abscess was sterilized by repeated aspiration and instillation of antibiotics; craniotomy was then performed and the tip of the frontal lobe, with the abscess inside it, was removed. Once again recovery was uneventful, but the period of follow-up is too short to exclude the possibility of late epilepsy.

Discussion

The bone of the roof of the orbit is well known to be thin and easily fractured. Indeed, psychiatrists have taken advantage of this fact to carry out frontal leucotomy simply by introducing a sharp instrument through the superior conjunctival fornix and tapping it through the skull into the frontal lobe, a procedure which, it has been claimed, can even be performed in the consulting-room. In the child, not only is the roof of the orbit very thin indeed but the lack of development of the supraciliary ridges renders it peculiarly vulnerable to any wound that is inflicted in an upward direction. In five of the six cases cited above it was known that an injury in the region of the eye had been sustained from a sharp object, and in most of them an upward direction of the blow might reasonably have been inferred, if not actually observed. In the remaining case (No. 3) no details of the injury could be established, but even here the existence of a wound of the eyelid might have been deemed suspicious, since a simple contusion after a fall is more likely to involve a prominent part of the face, such as the nose, cheek, or forehead. Despite these facts, the suspicion of a penetrating wound of the cranial cavity was entertained in only one case (No. 6), and in the others the precaution of x-ray investigation was not taken until the patients' subsequent clinical course was giving rise to anxiety.

In Case 2 the patient was lucky. Had the foreign body penetrated the dura he might well have developed meningitis or brain abscess. In Case 5 the appearance of a swelling of the upper eyelid some days after the resolution of the original haematoma might also have led to the correct conclusion by suggesting the possibility of an effusion of C.S.F.; yet, in fact, the original injury was completely forgotten and its history was elicited only after the demonstration of a track leading through the dura of the anterior fossa, and the subsequent discovery of a small scar on the eyelid, had led to the parents being directly questioned about the possibility of trauma. In Case 6 the correct diagnosis was made immediately, but in view of the danger to the sight of the right eye and the lack of evidence of serious intracranial damage the surgeon in charge of the case took the calculated risk of relying on antibiotic cover to control intracranial infection. In retrospect, the case serves to demonstrate once again that antibiotics are not an adequate substitute for surgery and that the ideal primary treatment of a penetrating wound is still an immediate excision of all its layers.

In civilian practice missile wounds of the head and those inflicted by sharp objects are relatively uncommon. Closed injuries are rarely serious unless associated with altered consciousness, either immediately through cerebral commotion or later through compression by an intracranial haematoma; the obvious exception—injuries of the air sinuses with their consequent risk of infection and aerocele—is sufficiently well known to need no further discussion here. In the case of penetrating wounds of the brain the situation is different. Loss of consciousness is only to be expected in the case of trauma by heavy objects or by those of

high velocity, or where there is immediate damage to the central parts of the brain. None of the six patients in this series showed any immediate loss of consciousness or appeared much disturbed by their experience, and it is perhaps for this reason that the injuries were regarded as trivial and that in only one case was even the precaution of immediate x-ray examination deemed necessary. Yet the results were serious enough. One case sustained severe bilateral brain damage and four developed intracranial infections, with one fatality. There has been one established case of epilepsy and two more children are still at considerable risk. Three children needed multiple operations, and the total duration of their stay in hospital exceeded a year.

Conclusions

Wounds in the region of the orbit in which there is any suspicion of the entry of a sharp object, and particularly where the victim is a child, must be taken seriously.

Despite the absence of any history of loss of consciousness or other neurological disturbance, immediate x-ray examination of the skull, with special reference to the roof of the orbit, should be made.

If the cranium has been penetrated, early and complete exploration is imperative.

Medical Memoranda

Amphetamine Poisoning Associated with Hyperpyrexia

A recent annotation in the *British Medical Journal* (1960) describing a case of amphetamine poisoning in an athlete reported by Bernheim and Cox (1960) makes the comment: "Were it not for the extraordinary high rectal temperature reported, this man's death might have been attributed almost entirely to amphetamine. . . ." The implication that hyperpyrexia and amphetamine poisoning are unrelated prompts us to report a recent fatal case of poisoning by this drug in which hyperpyrexia was a presenting clinical feature.

CASE REPORT

A 25-year-old single woman, said by her friends to have been "full of life and energy" for the few days preceding her death, was admitted to hospital with a history that two hours previously she had complained of headache and taken two aspirin tablets. She became comatose after taking the aspirin, and her temperature at that time is recorded as 101.6° F. (38.7° C.) (axilla). On admission she was found to be comatose, with a temperature, taken in the axilla, of 109° F. (42.8° C.). The skin was hot and moist and there was intense shivering with some neck retraction. At this time her pulse was rapid (132 a minute), full, and bounding, and her systolic blood-pressure was 80 mm. Hg. The pupils were dilated and non-reactive, and respiration was rapid and stertorous. 100 mg. of chlorpromazine was given intravenously and after tepid sponging the temperature fell to 102° F. (38.9° C.) during the next hour. Lumbar puncture showed a pressure of 130 mm. H₂O and the fluid was normal on examination. At this stage she was able to give her name and to respond to simple commands, but one hour later she suddenly collapsed and died in spite of resuscitative measures.

At necropsy the only significant findings were a moderate degree of cerebral oedema and the presence in the stomach

of very large numbers of white granules which varied in size up to about that of a pin's head. Analysis showed 310 mg. of amphetamine (expressed as sulphate) in the stomach contents, and the analyst's report suggested that the drug had been taken in the form of "spansules." At the coroner's inquest which followed no light was thrown on the circumstances in which the drug had been taken, and a verdict of accidental death was recorded.

COMMENT

Neither the clinical history nor the necropsy revealed any cause for the hyperpyrexia observed in this patient. The day of her death had been warm, but not excessively hot, with maximum temperature in the lower seventies. She had taken no strenuous exercise and had passed the day quietly indoors. In the circumstances we felt that consideration must be given to the possibility that the hyperpyrexia was a manifestation of amphetamine poisoning.

Polson and Tattersall (1959) state that severe poisoning by this drug may result in tachycardia and a raised body temperature followed by exhaustion. The *Extra Pharmacopoeia* (1958) makes no mention of pyrexia as one of the symptoms of overdosage. In a number of published cases a raised temperature has been described after large doses of amphetamine, though we have found no example of such a high temperature as that recorded in our case or in the case of Bernheim and Cox (1960). Mitchell and Denton (1950) describe a fatal case in a nurse who had consumed massive doses for 9-12 months and in whom a temperature of 105° F. (40.6° C.) was recorded shortly before her death. In her case, however, there was a striking pancytopenia, so that the interpretation of the pyrexia is in doubt. Gericke (1945) describes a case of suicidal poisoning by the drug, with a recorded rectal temperature of 103.8° F. (39.9° C.); Pretorius (1953) describes a case in a child where the temperature was 104° F. (40° C.); Patuck (1956) mentions a temperature of 100° F. (37.8° C.) in another case; and Shanson (1956) reports a case in which the temperature was 100.5° F. (38° C.), though in this case ingestion of the drug had been preceded by a mild febrile illness.

It seems clear that amphetamine in high dosage can raise the body temperature, and the present case suggests that hyperpyrexia may result. The hyperpyrexia in the case reported by Bernheim and Cox may or may not be attributable to amphetamine, but we would suggest that the drug cannot be ruled out as a possible contributing factor.

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