DELAYED BRAIN ABSCESSES FORTY-SIX YEARS AFTER WOUNDING

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SUMMARY: The longest delay in the presentation of a brain abscess in relation to retained foreign bodies so far reported is 38 years. The case now presented is of a patient wounded in 1917 who developed epilepsy in 1956, who had an abscess removed in 1963, and who died in 1970. The relation of retained bone and metallic fragments to the formation of brain abscesses is discussed.

Case report

In 1917 the patient, then aged 18 years, was blown up by a mine when serving in the Royal Fusiliers during the first battle of the Somme. He sustained a penetrating left frontal wound. He was taken to a base hospital in France where it is believed that debridement was undertaken, although a small metallic fragment and some bone remained in the brain. He was unconscious for several days and was then transferred to Colchester Military Hospital. He made a good recovery and returned to his unit. After the War he was apparently completely well apart from occasional headaches and he worked for the Eastern Electricity Board for 23 years.

In 1956 he had an episode of automatic behaviour in which he walked home from work and was briefly aphasic. A few months later he had a major seizure and was put on Phenobarbitone. From 1957 to 1959 he had frequent “absence” attacks which were preceded by a cry followed by silent withdrawal. His attacks were occasionally associated with movements of the right arm and following these he was drowsy with a right hemiparesis and sensory loss. This period culminated in a series of grand-mal seizures which led to further investigations at the National Hospital, Queen Square, London.

X-rays in 1959 showed a bone defect immediately in front of the coronal suture to the left of the mid-line with small bone and metallic fragments lying in the brain beneath it. Carotid angiography and a pneumo-encephalogram showed no mass to be present, although there was slight enlargement of both lateral ventricles and dilatation of a few brain sulci. On discharge from hospital, there were no abnormal neurological signs and Phenytoin was added to the Phenobarbitone. He suffered no more major seizures after this, but minor attacks continued to occur every one or two months.

During 1962 there was an insidious deterioration in his personality with loss of interest and drive, progressive withdrawal and long silences, failing memory, slovenly or inappropriate behaviour, and occasional emotional outbursts. Some of these were seizures, for they often culminated in weeping followed by silence and urinary incontinence. He had occasional headaches. There was an attack in January 1963 when his legs gave way, and he fell to the ground. In this one he lost consciousness and was incontinent of urine. In March 1963, he was admitted to...
Guy's Hospital following a similar attack. While he was there, he had a major seizure and a focal fit involving the right arm, which was followed by aphasia for 15 minutes and a Todd's palsy.

He was transferred to the Neurosurgical Unit, where he was found to be a somewhat plethoric right handed man who looked physically well. He was fully conscious but inattentive and not very co-operative. There was some poverty of speech but no convincing dysphasia. He had a severe loss of recent memory. There were signs of raised intracranial tension. There was a mild right hemiparesis, more marked in the upper than in the lower limb and the right plantar response was extensor. There was no sensory impairment. Carotid angiography showed stretching of the pericallosal branch of the left anterior cerebral artery and displacement of the internal cerebral vein to the right. Ventriculography revealed symmetrical hydrocephalus with displacement of both lateral ventricles to the right and depression of the frontal horn and body of the left lateral ventricle (Fig. 1).

It was clear that a mass was present in the left frontal parasagittal region but a preliminary biopsy revealed only gliotic tissue on which no diagnosis could be made.

On 19th April 1963 a craniotomy was performed (PHS) and firm tissue was found beneath widened pale cerebral gyri. As it was being dissected, a bead of pus appeared at a point where the tissue was adherent to the dura, and the diagnosis of an abscess became apparent. The remains of the abscess capsule was dissected from the surrounding brain and from the falx, to which it was adherent at one point. There were two large loculi and some smaller ones. The total volume of the abscess was 24 ml and it weighed 22.5 g. A small loose piece of bone measuring 8 x 3 x 2 mm was found at a depth of about 2.5 cm. Subsequent X-ray of the abscess capsule revealed a metallic fragment within it (Fig. 2.). No organisms were seen, and the pus was sterile on culture.
The patient made steady progress after the operation and on returning home at the beginning of June 1963 his speech was normal, but he continued to have some impairment of memory. He had a mild right hemiparesis although his gait was normal. Poor memory for recent events continued to be a slight difficulty for him, but his speech and the power in his right arm recovered. He had occasional...
minor seizures, but was otherwise well and able to enjoy life until he died from a cardio-vascular accident in 1970 at the age of 71 years.

Discussion

The basic principles for the treatment of penetrating brain wounds were enunciated by Cushing (1918); they were applied in the Second World War, and their absolute importance was reiterated by Hammon (1971) as a result of experience during the War in Vietnam. Cushing urged a thorough debridement of the wound with the removal by suction of all fragments of bone and metal unless their extraction would increase the damage done by the missile.

Neurosurgical debridement must be carried out early after attention to any life saving procedures demanded by other injuries. Unless there is active bleeding from a dural sinus or a superficial artery, the neurosurgical procedures can often be combined with attention to other wounds. It is essential that all traumatised brain tissue should be removed, and by following the missile track, the walls of the passage are sucked until sound brain is encountered, and all debris is withdrawn. Hammon (1971) points out that the collapse of the walls usually means incomplete debridement, on account of the presence of a haematoma beyond them. He recommends postoperative X-rays in order to identify any bone or metal fragments that may have been overlooked, and suggests that re-exploration to remove them should be undertaken within two days if possible. By this time, the patient will probably have been evacuated from the forward area. In his series of 2,187 consecutive penetrating wounds of the brain, retained bone fragments were found in 4.6 percent.

They were found in 5.8 percent of those who died after the treatment of cranial injuries. Hagan (1971) reporting on the early complications following penetrating wounds of the brain in Vietnam, found that 35 out of 62 retained bone fragments were contaminated with Staphylococcus epidermidis, and all metal fragments were similarly contaminated. He concluded that "adequate facilities and personnel to accomplish early operation with removal of necrotic brain, foreign bodies and haematomas, appear to be the main factors in lowering the mortality rate with penetrating brain wounds". Metallic foreign bodies are better tolerated than retained bone fragments (Grant 1941, Dzenitis and Kalsbeck 1965). Acute abscesses can occur in relation to either, for any retained fragment is surrounded by debris and necrotic tissue that may contain organisms. Furthermore, sterile abscesses have the same mortality rate as those in which infection can be demonstrated. Liquefaction of tissues by proteolytic enzymes from disintegrating leucocytes will take place if an inadequate operation has been performed. Even if retained bone fragments are not infected, they may undergo chemical decomposition in time, and contribute to the formation of a sterile abscess. There is surrounding oedema and new vessel formation, and the increased osmolarity within the abscess attracts water, electrolytes, and small proteins, from the adjacent tissues to enlarge the mass (Hagan 1971).

The possibility of delayed abscess formation has been known for many years. Nauwerk (1917) reported the case of a patient who attempted suicide in 1878, and who developed an abscess in relation to a revolver bullet 38 years later, in 1916. He quotes another case in which the delay was 27 years. Cairns et al (1947) in their important review of the complications of head wounds in the Second World War,
recognise the possibility of delayed abscess formation and record two cases in which organisms were found 2 and 3 years after the initial wound.

The advent of antibiotic therapy, has not removed the threat, for Drew and Fager (1954) describe 2 patients who were wounded in 1942 and 1944, and who died from abscesses in 1949 and 1950. Inadequate antibiotic therapy may increase the likelihood of late development, for bacterostasis may decrease the virulence of organisms without affecting their viability.

The pathology of acute abscesses is obvious, and delayed abscess formation within the first 4 or 5 years is also likely to be due to infection from organisms introduced in relation to the time of wounding. There may have been a small inactive abscess from the start, the organisms may have had a low virulence, or a subsequent acute infection, debilitating disease or operation may decrease the resistance of the body to any organisms that are present (Drew and Fager 1954). However, when an abscess presents after a long period of time, as in several of the reported cases, it is difficult to imagine dormancy for the whole of this period. The association of cerebral abscesses with congenital heart disease is probably related to the presence of micro-infarcts in the brain in patients with cardiac anomalies, and when a bacteraemia occurs, the organisms settle in the necrotic tissue. The tissue around a foreign body carries a similar vulnerability, and whereas an occasional organism in the blood stream might pass into the cerebral tissues and be destroyed, it will lodge in old gliotic scars or in the walls of a porencephalic cyst and set up a focus of infection. It may be significant that the patient who is the subject of this report had some septic teeth removed in 1956, before the first fit occurred. We know that there was no significant mass in 1959, so that if the infection did occur in 1956, the abscess did not present for another 7 years. This would be within the time in which a slowly developing lesion culminating in an abscess might be expected to arise.

It is accepted that if a metallic fragment lodges at a distance from the main missile track, or in an area where removal is impossible without creating further damage, then it may be left. However, any such patient should be suspected of harbouring an abscess if he subsequently develops focal neurological signs or evidence of intracranial disturbance. Furthermore, consideration should be given to the removal of accessible metal fragments as a cold procedure, if they have not been taken out at an early stage. In one of the cases reported by Drew and Fager (1954) the wound was in the right hemisphere, and the missile was retained in the left frontal region. The patient died from a left frontal abscess. The morbidity from late abscesses is greater than from primary lesions, on account of the pre-existing damage. They carry a higher mortality, partly because they are developed in tissues which have an inadequate blood supply, which may be but thinly separated from the ventricle or meninges, and in which porencephalic cysts may be present. Rupture may occur readily and at an early stage. The diagnosis will be greatly facilitated in future by the use of computerised axial tomography (CT scan) but any change in the position of a retained metal fragment seen in plain X-rays should be regarded as a very important pointer to the possibility of abscess formation, and if a bone fragment can be detected, the likelihood is increased many times. Treat-
ment of an abscess due to a penetrating brain wound should be by total excision wherever possible. The late development of abscesses after penetrating brain wounds is infrequent, but it is not a rarity. They can be prevented by adequate operations.

REFERENCES


Queen Elizabeth Military Hospital

The following letter from Clarence House, London SW1 dated 2nd November 1978 was received by the Director General of Army Medical Services:

"I am commanded by Queen Elizabeth The Queen Mother to write and let you know how delighted Her Majesty was to open the Queen Elizabeth Military Hospital at Woolwich.

Queen Elizabeth was extremely impressed by the design of the hospital and in particular by the layout of the wards, which afforded a certain privacy to the patient and yet allowed the nursing staff to supervise and work with the greatest possible convenience.

The Queen Mother was very conscious of the cheerful atmosphere, which was so apparent in all parts of the building, and it indeed gave Her Majesty much pleasure to meet so many people, not only patients, but also those from the variety of departments which help to run an efficient hospital.

It was a very interesting and enjoyable afternoon, and one which Queen Elizabeth will long remember."

The Official Opening Ceremony took place on 1st November, 1978.

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P. H. Schurr

J R Army Med Corps 1979 125: 22-27
doi: 10.1136/jramc-125-01-04

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