Case Report and Technical Note

Post-Traumatic Abscess of the Medulla Oblongata Containing Nocardia Asteroides

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Abscesses of the medulla oblongata have been described rarely, only 10 cases having been reported thus far. The first 2 cases were described by Eisenlohr in 1892. Because of the rarity of the condition Weickhardt and Watts were able to find only 7 additional cases in the literature by 1944 and added a case of their own. We were unable to find any subsequent reports while reviewing the literature of the past 20 years.

Abscesses of the medulla oblongata present a heterogenous clinical picture being similar only in that they are invariably fatal. Six of the reported 10 cases were metastatic from other known foci of infection including lungs, prostate, peridural abscess and an infected thumb.

The following report refers to a fatal abscess in the medulla oblongata which developed after a seemingly trivial "whiplash injury" suffered in an automobile accident.

Report of Case

Mrs. E.W., a 61-year-old right-handed, white female, was in good health until 5 days prior to admission, when the automobile in which she was a passenger was struck from behind and she was propelled forward. She did not strike her head or trunk, but felt her neck "pop," noting pain in the left side of her neck and shoulder with no motor or sensory loss. Examination at the scene of accident revealed no abnormalities. Three days after the injury more pain developed in the left shoulder and neck and a day later sensation diminished in the fingers of her left hand. During the subsequent 24 hours diminished sensitivity of left arm and leg was noted.

Examination. She was an alert, oriented white female with no evidence of external trauma to head, neck, trunk or extremities. Blood pressure was 190/80, pulse rate was 84/min, and regular, and respirations were 20/min. Moderate tenderness to palpation in the left anterior chest was present, but no masses were palpable in these regions. There was good mobility of the neck with no abnormal cervical curvature or spasm of muscles present.

There was a spotty loss of sensation in the left upper and lower extremity with apparently normal sensation in the trunk. There was decreased positional, vibratory and proprioceptive sense in the left arm, leg and toes, it being most deficient in the hand. Generalized weakness in the left shoulder girdle and arm was found with minimal weakness in the left leg. Deep tendon reflexes were equal and active but equivocal bilateral Babinski's sign was present.

Blood count and urinalysis were within normal limits. Lumbar puncture revealed normal dynamics with clear, colorless cerebrospinal fluid containing no cells; sugar was 69 mg. per cent and total protein 35 mg. per cent.

Course. The patient's condition remained stable throughout her 4 days of hospitalization. Multiple neurological examinations demonstrated decreased sensation of touch and pain on the left side with no distinct sensory level. On the 3rd day she required catheterization. Pain persisted on the left side of neck and shoulder. A myelogram, brain scan and roentgenograms of the chest, skull and cervical spine were all normal. She returned to her local hospital and approximately 1 week later weakness of the right arm and leg developed as well as progressive respiratory distress. She continued a progressive downhill course with respiratory distress and quadriaparesis increasing. She expired at her local hospital 26 days following injury.

Autopsy. Permission was obtained to remove her brain and spinal cord. No fracture of the skull or spine was observed during this procedure. The brain appeared normal in the fresh state except for the medulla oblongata which was markedly swollen and appeared softened. The brain and cord were preserved in 10 per cent formalin and mailed to the University of Kansas Medical Center.

The formal-fixed brain weighed 1380 gm. The cerebral hemispheres were symmetrical with normal convolutions and sulci. The meninges were free of exudate or hemorrhage. The cerebral blood vessels showed minimal atherosclerosis without obstruction. The medulla oblongata was markedly swollen and friable, and the edge of the foramen magnum left a deep impression on its ventral surface. Coronal sections of the cerebral hemispheres, cerebellum, midbrain and pons revealed no abnormalities. Sections of the medulla oblongata revealed a roughly triangular area of necrosis and punctate hemorrhages in the right half of the medulla. The center of the lesion was yellow-green and of paste-like consistency, with its caudal portion greyish, rubbery and better circumscribed. The left side of the medulla oblongata showed only edema. In handling the specimen a small friable portion broke off the left side (Fig. 1). The spinal cord was unremarkable.

Microscopic sections showed purulent inflammation with formation of abscess in the right half of the lower medulla oblongata. The center of the abscess consisted of necrotic debris, some fibrin and many polymorphonuclear leukocytes. Close to this area a small speculum of bone was found surrounded by pus cells (Fig. 2). This fragment of bone appeared necrotic with ragged edges.
and no stainable osteocytes were in the lacunae. The bony matrix stained as osseous tissue with van Gieson and trichrome solutions. The periphery of the abscess showed a wide area of fibroblastic proliferation, gliosis, petechial hemorrhages and perivascular lymphocytic and leukocytic infiltration. A conspicuous feature of the inflamed area was the presence of several multinucleated giant cells (Fig. 3). Bacterial stains showed no bacilli or cocci but revealed instead numerous Gram-positive branching filaments within the purulent exudate. These filaments were quite slender, slightly beaded and morphologically consistent with Nocardia organisms (Fig. 4). (More precise identification was not possible since cultures could not be obtained from the formalin-fixed brain. The filaments were very weakly acid-fast.)

The diagnosis was subacute abscess of the right lower medulla oblongata with marked perifocal congestion and edema. Small fragments compatible with Nocardia asteroides were in the purulent exudate. There was a transverse pressure groove on anterior aspect of the medulla oblongata.

Discussion

These unusual pathological findings elicited much speculation as to the possible sequence of events. With regard to the spicule of bone in the area of inflammation the possibility of artefact had to be considered. Small fragments of bone ("sawdust") may contaminate the brain at the time of autopsy when the skull cap is sawed off. However, since the brain stem is not exposed to the electric saw during this procedure, it is unlikely that such contamination should occur. In addition the spicule of bone was enveloped by pus cells and was itself necrotic and eroded, appearing to have been driven into the medulla oblongata prior to death, most likely at the time of the accident. Because of its microscopic dimensions it could not have been detected by roentgenograms of the cervical spine. A very meticulous examination of the spinal canal might have revealed a small defect in the covering periosteum or ligaments. The source of the bony chip may have been the odontoid process or the ventral rim of the foramen magnum.

It is unlikely that this chip of bone would have carried any infectious material into the medulla.
oblongata in a closed injury. Therefore the presence of Nocardia-like organisms in the abscess can be explained only by infection transmitted by the blood stream. The most likely origin of such an infection would be the lungs, although nocardial skin lesions and even infected sockets of teeth have been implicated as the source. The primary source of infection is not always evident. Turner reported a case of a 15-year-old boy with nocardial abscess of the brain in whom autopsy

Fig. 3. The wall of the abscess shows a granulomatous reaction with epithelioid cells and multinucleated giant cells. Hematoxylin-eosin, X300.

Fig. 4. Slightly beaded, slender, branching filaments were found in the pus and granulomatous area. Brown-Brenn stain for Gram-positive organisms. Oil immersion, X900.
failed to show a primary source of infection. A primary source was not found in our case either although the existence of minute foci in the lungs cannot be ruled out even though roentgenograms of the chest appeared normal throughout her hospital course.

It is very probable that the injury of the medulla oblongata by the chip of bone created a favorable site for infection by any micro-organism circulating in the blood stream at the time of the accident or following injury. King emphasized that fragments of bone penetrating into the brain may cause delayed abscess with the injured region of the brain becoming secondarily infected by the blood stream. Quednau was able to produce pneumococcal abscesses of the brain in rats by inflicting sterile wounds of the brain and injecting pneumococci in the vein of the tail 4 days later. He too postulated that the wound in the brain acts as a "locus minoris resistentiae" to circulating micro-organisms. We believe that a similar mechanism was involved in our case.

Summary

A 61-year-old woman was involved in a car accident and suffered what seemed to be a "whiplash injury." Subsequently there developed pain and decreased sensation in the left arm, later weakness of the left side, quadripareisis, and finally she died of respiratory failure 26 days after injury. Autopsy revealed an abscess in the right half of the lower medulla oblongata. Within the abscess was a necrotic spicule of bone of microscopic size which was apparently driven in at the time of the accident. Bacterial stain revealed the presence of numerous Gram-positive filaments, morphologically compatible with Nocardia asteroides in the pus. It is postulated that the infection originated from some hidden focus, possibly in the lungs, with the wound of the medulla oblongata creating a favorable site for development of a fatal nodocardial abscess.

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References