Abscess of Medulla Oblongata Associated with Osteomyelitis of Odontoid Process

Case Report

ALEXANDER B. RIMALOVSKI, M.D., AND STANLEY M. ARONSON, M.D.
Departments of Medicine (Division of Neurology) and Pathology, State University of New York, Downstate Medical Center, and Institute of Pathology, Kings County Hospital Center, Brooklyn, New York

Solitary abscess of the brain stem is a rarely encountered and uniformly fatal lesion. Only 42 case reports have been published.5,7,10-15 This low incidence has been confirmed recently by Weickhardt and Davis, who found four instances of solitary brain-stem abscess among 330,000 autopsies studied at the Armed Forces Institute of Pathology.11 Among 7,270 patients autopsied at Kings County Hospital between 1954–1966, there have been but three cases of macroscopic brain-stem abscess. We are reporting one of these cases because of the unusual cause of the abscess.

Case Report

A 48-year-old, white, diabetic woman with a long history of alcoholism was admitted to Kings County Hospital on February 16, 1965. She complained of severe neck pain and fever of several days' duration. She had not recently suffered head or neck injuries.

First Examination. The patient was alert and well oriented, with a temperature of 102°, pulse rate of 106, and blood pressure of 130/170 mm Hg. The neck was stiff, painful on palpation, and slightly swollen; the pain was constant, independent of changes in position or posture, but aggravated by movements of the neck. The head, eyes, ears, nose, and throat appeared normal. The neurological examination was normal. Urinalysis revealed numerous white blood cells per high power field, one-plus protein, and sugar. Fasting blood sugar was 298 mg/100 ml and blood urea nitrogen 5 mg/100 ml. The cerebrospinal fluid was repeatedly observed to be under normal pressure, acellular, and to have a protein content varying between 200 and 319 mg/100 ml.

Received for publication October 23, 1967.

Smears and cultures of the spinal fluid were negative. Staphylococcus aureus, coagulase positive, was recovered both from blood and urine specimens taken on admission. X-ray examination of the cervical spine revealed osteoarthritic and degenerative changes involving the fourth and fifth cervical vertebrae, with osteophyte formation and anterior bridging. X-rays of the chest and skull were reported as normal.

Course. The fever gradually subsided during therapy with Penicillin and Nitrofurantoin (Furadantin). Pain and limitation of motion in the neck, however, persisted and were attributed to the cervical osteoarthrosis. Under this therapeutic regimen, the patient remained afebrile for 3 weeks. On the 35th hospital day, severe and colicky pain developed suddenly in both flanks and was followed by gross hematuria. Staphylococcus aureus, coagulase positive, was again cultured from her blood and urine. Treatment with Staphycin was begun. An intravenous pyelogram and nephrotomogram performed 2 days later disclosed right hydronephrosis with possible ureteropelvic obstruction and bilaterally enlarged kidneys. Kidney biopsies revealed acute and chronic pyelonephritis, arterio-nephrosclerosis, and arteriolo-nephrosclerosis. The fever gradually subsided; again antibiotic therapy was discontinued and the patient discharged although she was never completely free of the pain in the cervical area.

Second Examination. The patient was readmitted 2 weeks after discharge because of severe headache, difficulty in swallowing, persistent vomiting, and right-sided weakness. She appeared drowsy and disoriented, with a temperature of 99.6°, blood pressure of 137/70 mm Hg, and pulse rate of 50. There was tenderness and limitation of motion in the neck, and considerable spasm of
the contiguous muscle groups. Further significant findings included: diminished perception of pinprick over the face, right facial muscle weakness, diminished hearing in the left ear, bilateral vertical nystagmus, dysphagia, dysarthria, and tongue deviation to the right. In addition, right hemiplegia, hypalgesia, and the Babinski sign were present.

The white blood cell count was 19,900 cells per cubic millimeter, with 92% segmented leucocytes. The spinal fluid examination revealed 300 white blood cells per cubic millimeter, with 70% segmented neutrophiles; protein was 160 mg/100 ml, and glucose 40 mg/100 ml. Smears and cultures for pyogenic and acid-fast bacilli were negative.

The patient remained in this condition for several hours, when sudden respiratory arrest occurred and she died.

Autopsy. Hepatic cirrhosis (nutritional type) and chronic pyelonephritis were found.

Inspection of the posterior cranial fossa disclosed a ragged, red, angular piece of bone projecting rostrally into the foramen magnum and adherent to the ventral surface of the medulla oblongata. This piece of bone was easily separated from its base below the foramen magnum and proved to be a necrotic odontoid process. The ventral surface of the medulla, to which the odontoid process was attached, showed a local area of depression and thickening of the leptomeninges. Cross section through the brain stem revealed a zone of green-gray discoloration and softening extending 1.7 cm in length and 0.6 cm in width (Fig. 1). Microscopic examination of the odontoid process showed portions of necrotic bone in a matrix of granulation tissue and remnants of dura which were heavily infiltrated with leucocytes.

An acute, poorly demarcated abscess occupied the right ventromedial half of the medulla. The inferior olivary nucleus, hypoglossal nerve fibers, medial lemniscus, reticular formation, and part of the pyramidal tracts were either destroyed or compressed. The central portion of the abscess consisted of disintegrated polymorphonuclear leucocytes, while plasma cells and macrophages were predominant at the periphery (Fig. 2). Edema, small hemorrhages, and inflammatory-cell cuffing of the vessels were also prominent in the more peripheral portions. Small colonies of gram-positive bacteria were found in the margins of the abscess. Local leptomeningitis of the brain stem and cerebellum was also noted.

Review of X-rays. In the light of the autopsy findings, all previous skull and upper cervical spine x-rays were reexamined. A lateral x-ray of the skull, upper cervical vertebrae, and atlantooccipital junction which had been taken on the second day of the patient's first admission to the hospital now was found to show a retropharyngeal soft-tissue swelling which measured more than the usually accepted 70% of the antero-posterior diameter of a cervical vertebra (Fig. 3). The lateral skull and cervical spine films taken 14 days later, upon reevaluation, showed that atlantoaxial subluxation was present, with separation of the odontoid process from the anterior arch of the atlas by a distance of 5 mm (Fig. 4). In the last x-ray taken 9 days later, the odontoid process was indistinct and there were changes suspicious of osteomyelitis but no further increase in the atlantoaxial subluxation (Fig. 5).

Discussion

A solitary abscess confined to or extending into the brain stem is an extremely rare condition. Forty-two cases have been reported, but adequate clinicopathological data are available in only 28. In 16, the brain stem abscess had evolved by hematogenous dissemination from distinct foci of primary infection usually in either lung or skin. In the remaining 12 cases, the abscess arose by
direct extension from an adjacent pyogenic infection, and in the vast majority of these, the ear was the primary source.\textsuperscript{5,7,10-15}

Although the lesion had been located in the majority of the reported cases, an accurate etiological diagnosis had been made only at autopsy. In no case did the patient recover; except for the patient reported by Weickhardt and Davis\textsuperscript{14} to have survived for 3 months, death supervened at 1 to 3 weeks after onset of relevant clinical signs.

The brain abscess in our present case,
Osteomyelitis of the odontoid process, indeed of the spine in general, is a rather uncommon condition. The incidence of spinal involvement has been reported to vary between 1.5% and 3.9% of all instances of osteomyelitis. Although it can develop from a variety of clinical conditions, including direct trauma and postsurgical manipulation, osteomyelitis is generally embolic in origin. In 1931, Carson described four cases of spinal osteomyelitis concurrent with staphylococcal septicemia and infection of the urinary tract. There have been subsequent reports of spinal osteomyelitis following infection or surgical manipulation of the genitourinary tract which serve to emphasize its importance as a primary portal of entry and source of embolic infection to vertebrae. In 1940, Batson stressed the role of the intercommunications between the veins of the pelvic organs and those of the vertebral venous plexus in the pathogenesis of the so-called paradoxical metastases to the spine in prostatic carcinoma. This same concept has been used to explain the occurrence and distribution of embolic osteomyelitis of the vertebrae following genito-urinary tract infection. Staphylococcus has been the specific agent in most cases.

In our case, there was a similar concurrence of pyelonephritis, staphylococcal septicemia, and spinal osteomyelitis. We believe the osteomyelitis was probably embolic in origin, and related to the septicemia arising in the urinary tract. Yet, in view of the retropharyngeal soft tissue swelling noted in the x-rays taken on admission (Fig. 3), one must consider the possibility that the osteomyelitis might have arisen by direct extension from a pre-existing retropharyngeal abscess. Although such an alternate route of infection was certainly possible, the reverse process (extension of the vertebral infection into the adjacent retropharyngeal, mediastinal, retroperitoneal, or epidural spaces) has been reported more frequently and in our case seems more plausible.

Summary

We have reported a case of staphylococcus aureus septicemia arising from a genitourinary tract infection which was complicated by osteomyelitis of the upper cervical spine. Direct spread of the infection from the

Fig. 5. Lateral x-ray of the skull and cervical spine, 9 days later. The indistinct odontoid process now suggests osteomyelitis.
Abscess of Medulla Oblongata

odontoid process to the brain stem resulted in the rare occurrence of a solitary abscess of the medulla oblongata. We have emphasized the important role of genitourinary tract infection in the pathogenesis of spinal osteomyelitis and have discussed the subtle x-ray changes that we identified only in re-evaluation after the death of the patient.

References