ACTINOMYCOTIC BRAIN ABSCESS
COMPLETE EXCISION WITH RECOVERY

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In 1878 Israel reported the first case of actinomycosis in man, which had been observed by von Longenbeck 33 years earlier. Ponfick first described actinomycosis of the brain in 1880 when he reported 2 cases. The involvement of the central nervous system by this disease is in itself rare, and there has been considerable discussion as to whether it can be primary. Zeitlin and Lichtenstein stated that actinomycotic lesions of the central nervous system were secondary to a focus elsewhere in the body, and that if no obvious gross primary lesion could be found, the lungs and other organs should be carefully examined after fixation. However, Cope in a monograph on the disease lists 10 cases of isolated involvement of the brain, 6 of which were located either in the third ventricle or near the septum pellucidum and the anterior commissure. Sanford and Voelker, reporting 670 cases of actinomycosis in 1925, and Cope, reviewing 1,330 cases in 1938, grouped the sites of infection into the cervico-facial, thoracic, abdominal, and miscellaneous. The incidence of cerebral distribution was so small that a separate designation was not made, but these cases were merely included in the miscellaneous group of 8 per cent and 5 per cent respectively. In an extensive review of actinomycosis of the head and neck in 1936, Gardiner stated that “actinomycosis of the brain is almost a hopeless situation.” The following year Friedman and Levy collected from the literature 108 cases of actinomycotic involvement of the central nervous system; 23 of these were reported as primary. Treatment was symptomatic and the cases were “invariably fatal.”

The advent of chemotherapy has changed the prognosis of the disease. Walker reported a cure of the abdominal type of actinomycosis using sulfa drugs. Ogilvie and Dobson, Holman, and Cutting found that these drugs inhibited secondary invaders, thereby permitting the natural body resistance to overcome the actinomycosis. Cures with penicillin were reported in 1944 by Wollgast, Herrell, Christie and Garrod, and by numerous others since that time. Penicillin was not necessarily the only drug used, but it was regarded by all authors as the most important factor in effecting the cure. Kolouch and Peltier reviewed 1,236 cases with regard to the success of therapy in cervico-facial, thoracic, and abdominal cases and concluded that a regime of energetic supportive therapy, chemotherapy, and radical excision of the infected tissue was best. None of the above authors reported on the treatment of actinomycosis affecting the central nervous system. However, in June 1948 Jacobson and Cloward described the cure of a patient with actinomycotic meningitis treated with sulfonamides, penicillin, and streptomycin.

Krönlein in 1910 appears to have been the first surgeon to perform complete excision of a brain abscess. Although not their usual procedure, most neurosurgeons have, in selected cases, completely removed well encapsulated abscesses. Clovis Vincent in 1936 recommended this procedure in practically all cases. In recent years many pyogenic brain abscesses have been treated by radical excision along with

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massive doses of chemotherapy. \textsuperscript{1,7,11,14,17,20} LeBeau\textsuperscript{19} reported 3 cases of thoracogenic brain abscesses which were cured by these methods.

We are presenting an additional case of apparent cure of an actinomycotic brain abscess, probably of thoracogenic type, which was treated by a similar procedure.

CASE REPORT

On Oct. 13, 1947, V. P., a 45-year-old white male, was awakened from his sleep by a convulsive movement beginning in the left arm, extending to the left leg, and eventually followed by numbness over the left side of the body. He then lost consciousness, bit his lips, and had sphincter incontinence. Although he was placed on anticonvulsants, he had several similar seizures during the ensuing 10 days before admission to the hospital. Following each episode there was a marked left hemiparesis from which he never completely recovered. The only other significant symptom was vertex headache, which began with the acute phase of his illness.

At the age of 6 the patient had aspirated a piece of leather and a lung abscess developed, which on one occasion caused such severe illness that a fatal outcome was feared. Secondarily there was a chronic productive cough which was noticeably aggravated by an attack of pneumonia in 1940.

On admission to the Neurological Service at University Hospital, the patient’s temperature was 99\textdegree, pulse 68, and respirations 20. Abnormal neurological findings were limited to slight weakness of the left upper and lower extremities, with hyperactive patellar reflex on the right. There was slight dyspnoea with coarse ronchi throughout the chest and definite moist rales at the bases. The only other unusual physical finding was a generalized shotty lymphadthenopathy.

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\caption{(left). Roentgenogram of chest. Note foreign body (arrow).}
\caption{(right). Right lateral view showing nodular configuration (arrows) suggestive of neoplasm.}
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denopathy in the posterior auricular, inguinal, and epitrochlear nodes. X-rays of the skull showed a calcified pineal gland in the midline, a persistent frontal suture, and no evidence of an intracranial lesion. Films of the chest showed a foreign body (Fig. 1) producing partial secondary collapse of the right lower lobe and a hypostatic pneumonia. The X-ray consultant stated that the nodular configuration in the right lateral view (Fig. 2) suggested a neoplasm. Ophthalmological examination disclosed no papilledema or gross visual field defect.

On Oct. 30, 1947 the patient had a convulsive seizure with flexion of the left arm and rotation of the head toward the left side. A complete left hemiplegia developed and he became semi-comatose within a brief period. A diagnosis of right frontoparietal metastatic brain abscess or tumor was made.

Following bronchoscopy with removal of large quantities of tenacious sputum, there was considerable improvement in the respiratory exchange. Ventriculography was performed, demonstrating a space-occupying lesion in the right frontoparietal area (Figs. 3 and 4).

Operation. The dura was extremely tense. A small incision was made in the dura and in the cortex of the premotor area. Upon inserting the exploring needle to a depth of 3.5 cm., an abscess was tapped and several ounces of thick, greenish-gray material exuded, cultures of which were made. The exposure was enlarged. No discrete abscess capsule was found, but upon gentle palpation with the finger, a shotty granular tissue was felt. This was removed completely by suction, making what appeared to be a complete excision of all abnormal tissue and leaving a cavity of about 4.5 cm. in diameter which was in direct communication with the right lateral ventricle. The scalp incision was closed in layers, without drainage.

Postoperatively the patient received 10 gm. sodium sulfadiazene intravenously during the first 24 hours and 5 gm. intravenously daily for 10 days. From that time on he tolerated 1 gm. orally given with an equal dosage of sodium bicarbonate; total dosage was 258 gm. sulfadiazene. He received 40,000 units penicillin intramuscularly every 3 hours and also for the first 4 days 50,000 units intrathecally, making a total of 4,440,000 units penicillin.

The CSF was xanthochromic for a few days after operation but subsequent lumbar punctures showed a colorless fluid with a wbc. ranging from 0–10 lymphocytes. Three cultures were negative for pyogens, and smears of the sputum contained no fungi or tubercle bacilli.
Direct culture from the abscess showed a dispersed "snow flake" growth on Brewer's thio-glycolate broth and brain-heart infusion broth. Subcultures to blood agar plates when innoculated in 10 per cent CO₂ showed the typical long, filamentous, branching bacilli with clubbed ends. Colonies were granular and emulsified in physiological saline with difficulty. The organism was not acid-fast. Both colony formation and morphology of the stained organism were typical of actinomycosis. Growth requirements indicated a microaerophilic organism.

*Pathological Study.* The tissue excised from the brain showed focal accumulations of polymorphonuclear leucocytes, particularly perivascularly, with severe edema and astrocytic proliferation. There was no evidence of granuloma formation in these sections, but only a small portion of the tissue had been preserved. The findings were compatible with a recent brain abscess.

*Course.* The patient responded well to therapy. Late in his convalescence he was referred to the thoracic surgeons, who agreed that the brain abscess had developed secondarily from the lesion in the right lower lobe. Two bronchoscopies were performed, but the abscess could not be located. Specimens of sputum procured at these times yielded staphylococci and streptococci, but no actinomycosis. Lobectomy was considered, but not performed.

On Dec. 2, 1947 the patient was transferred to the Veterans Hospital at Dearborn, Michigan. He was afebrile but a large amount of sputum was expectorated daily and a complete hemiplegia was still present. An additional 1,920,000 units penicillin were given intramuscularly followed by aerosol penicillin 4 times daily. On this therapy his sputum decreased markedly. Smears and cultures of the sputum were negative for tubercle bacilli and fungi on several occasions. With the aid of physiotherapy his left leg and thigh improved but there was no movement of the left upper extremity.

The patient was examined at home on May 27, 1948. He was mentally alert, but had no recollection of his 6 weeks' stay at University Hospital. There was a left central facial paresis. The left upper and lower extremities were slightly spastic with inability to flex the arm at the elbow or pronate or supinate at the wrist. Extension of the left leg at the knee and movement of the left foot and ankle were absent. With support he was able to walk about 15 yards. There was hyperesthesia over the entire left half of the body with generalized hyperreflexia on that side. Although confined to a wheel-chair, the patient was in good spirits and quite optimistic about the future.

**COMMENT**

Since the patient had received large doses of chemotherapy and the organism was microaerophilic, it is perhaps not surprising that the fungus could not be grown postoperatively from the spinal fluid or the sputum.

According to Gardiner and Zeitlin and Lichtenstein, the histological changes in the brain due to actinomycosis may not differ from those caused by the ordinary brain abscess. This was true in the case presented above. It is possible that the communication of the abscess with the ventricular system, allowing the intrathecal penicillin to come in direct contact with the contaminated area, was an important factor.

Aerosol penicillin was of great value in diminishing the patient's profuse expectoration of tenacious sputum and may have favorably influenced the primary lung lesion. As long as the pulmonary focus remains, extension to other parts of the body may occur, and therefore a pulmonary lobectomy seems indicated.

**SUMMARY**

A case of actinomycotic cerebral abscess, most likely thoracogenic, apparently treated successfully by combined total surgical excision and antibiotic therapy, is reported.
ACTINOMYCOTIC BRAIN ABSCESS

The patient received a total dosage of 60 gm. sulfadiazene intravenously during the first 10 postoperative days. The drug was then administered orally, 1 gm. daily, making a total dosage of 258 gm.

Penicillin was administered intrathecally for the first 4 postoperative days in doses of 50,000 units daily. He also received 40,000 units parenterally every 3 hours, making a total dosage of 4,440,000 units penicillin. Following transfer to another hospital an additional 1,920,000 units penicillin were given plus aerosol penicillin 4 times daily.

Pulmonary lobectomy was not performed, but we believe that it should be, to remove, if possible, the suspected primary lesion.

REFERENCES