volvement of the cortex distinguished it from the cases of thalamic tumour described by Nevin.\textsuperscript{4} The pure intracortical type of spread of this tumour is one of the modes of growth of a glioma named by Scherer\textsuperscript{7} a secondary structure. The extensive infiltration of the cortical grey matter produced widespread dysfunction with little distortion of the gross appearance of the cerebrum, and this is the reason why such profound disability could be present with normal air studies and arteriogram. This case emphasizes the fact that a glioma may kill its host without producing pathological changes demonstrable by the ancillary methods of investigation in use today. The most constant diagnostic feature in the natural history of such tumours remains their relentless progressive course.

**SUMMARY**

There is reported a case of brain tumour which produced hemiparesis, hemi-hypaesthesia and dysphasia in which carotid arteriography and air encephalography disclosed no abnormality and which at necropsy showed no displacement of the ventricular system.

The authors are indebted to Dr. E. Arnold Carmichael for permission to report the clinical aspects of this case.

**REFERENCES**


**TORULA GRANULOMA OF THE CERVICAL SPINAL CORD**

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(Received for publication August 18, 1950)

In their recent paper on the infection of the central nervous system by the *Cryptococcus hominis*, or *Torula histolytica*, Carton and Mount\textsuperscript{8} presented an exhaustive review of the literature. They found only 10 instances in which either the spinal cord or its membranes showed involvement by Torula. In most of these cases the infection was widespread, also affecting the brain or its meninges. In only 3 instances was the infection confined to the spinal cord, the cauda equina or their

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* Read before the Neurological Section of the Academia de Ciencias Médicas de Cataluna, April 17, 1950.
coverings. Of these 3 cases, 1 presented no clinical symptoms of involvement of the spinal cord (Freeman); in 1 the vertebral column and the thoracic cavity were also invaded (Heinrichs); and only in the case reported by Carton and Mount were the lesions confined to the neural structures with the expected neurological symptoms. In their case the granuloma involved the roots of the cauda equina so extensively that no attempt at its removal was made. This conservative attitude was further dictated by their knowledge of the etiological agent. Mosberg and Arnold, in a review of the literature of torulosis of the central nervous system since 1946 (172 cases), found another instance of involvement of the spinal cord (and of the brain and kidney) which was reported by Jones and Klineck.

In the case to be reported here the granuloma involved the cervical spinal cord and produced the typical symptoms of compression of that structure, without any signs of meningeal irritation. A diagnosis of a tumor of the spinal cord was made, the patient was operated upon and the extramedullary mass was removed. Its true nature was not recognized until the microscopic studies were made. To our knowledge this is the first reported case of human infection by Torula histolytica in Spain.

CASE REPORT

Maria-Dolores P.U., an 8-year-old white girl from Tarrasa, Catalonia, Spain was first seen by us in consultation with Dr. F. Duran and Dr. Claveria on Nov. 3, 1949. She was the eldest of 6 healthy children. Her birth and subsequent development had been uneventful until the present illness.

In August 1949 she was first taken ill with a severe pain in the back of her neck which occasionally radiated into the right arm. The pain was most severe on arising in the morning. It was aggravated by exertion. It gradually increased in frequency and in severity. On Sept. 12 the spinous process of the 6th cervical vertebra was found to be tender and the muscles of the back of the neck were strongly contracted. Roentgenograms of the cervical spine were negative. The pains lessened when the neck was immobilized in a plaster cast, but a progressive paralysis of the upper extremities developed in the next 8 days. During the following week the lower extremities became spastic and paralyzed and were the seat of painful involuntary spasms. The upper extremities were hypotonic. She was constipated and had occasional urinary incontinence. She was afebrile throughout her illness.

Examination. The child was well-developed for her age, but very undernourished. T. was normal. She was quite uncooperative, crying and complaining whenever she was touched. There were almost continuous painful involuntary contractions of her legs. There was a complete lack of voluntary power in all extremities (Fig. 1). The upper extremities were hypotonic and markedly atrophic, particularly distally. She complained bitterly whenever her arms were moved. The biceps reflexes bilaterally and the stylo-radial and pronator-ulnaris reflexes on the right were abolished. The triceps reflexes, and the stylo-radial and pronator-ulnaris reflexes on the left were present but very weak. There was complete paralysis of the lower extremities with marked spasticity and hyperactive tendon reflexes, more marked on the right. Ankle clonus and Babinski’s sign were present bilaterally. There was some difficulty with respiration but the diaphragm seemed unaffected.

Sensory examination was far from satisfactory but there appeared to be a zone of hyperesthesia just above the C5 dermatome. From C5 to T1 pain and temperature sensibility seemed to be decreased; while below that level they were lost. Tactile sensibility seemed to be preserved everywhere. Position sense was impaired in the toes.

The cranial nerves were intact.

X-rays of the cervical spine revealed some erosion of the pedicles and widening of the spinal canal from C4 to C6 (Fig. 2). The vertebral bodies and the intervertebral discs appeared normal.
Urinalysis and blood count were normal. Sedimentation rate was 19 mm. in the 1st hr., 40 mm. in the 2nd, and 105 mm. in 24 hrs. Katz index was 19.50.

Diagnosis: Tumor of the cervical spinal cord.

Operation, Nov. 7, 1949. The laminae of all of the cervical vertebrae and a small portion of the occipital bone were removed. The epidural fat formed a thickened firm sleeve of increased vascularity about the dural sac (Fig. 3 A, B, C). The dura mater was under great tension. When it was opened a greyish extramedullary mass was exposed (Fig. 3 C). This tumor was firmly adherent to the dura mater but was only loosely attached to the spinal cord (Fig. 3 C, D). It lay posterior to the cord, which it completely covered and severely compressed (Fig. 3 E, F, G). The mass was separated from the dura mater by sharp dissection but was readily separated from the spinal cord. Laterally it was adherent to a dentate ligament and seemed to receive most of its blood supply at that point (Fig. 3 G), although a few small vessels passed directly to the tumor from the surface of the spinal cord. The inferior margin of the tumor lay about 2 cm. above the lower end of the cervical spinal canal while the upper end lay in the cisterna magna. It was not adherent to the medulla oblongata or the cerebellum. The tumor was removed en bloc. The dura mater was closed tightly and the other soft tissues were closed in layers as usual.

Postoperative Course. Shortly after operation she had a moderate rise in T. to 38.5°C, and temporary respiratory embarrassment. Penicillin was given in doses of 100,000 units every 3 hrs. until a total of 7,000,000 units had been administered. Pain began to lessen in 24 hrs. and 5 days after operation she began to regain control over the paralyzed muscles.
Her improvement continued steadily but slowly, and she was discharged on Nov. 26, 1949. Sensation was practically normal and her strength much improved. However, she could not flex or extend her fingers completely. She could bend her elbows but she could not extend them without help. Movement of the legs was possible only with considerable difficulty. The involuntary painful spasms of the legs had disappeared but there was still considerable spasticity.

When seen again on Feb. 1, 1950 she was able to walk slowly and somewhat unsteadily, to write, and to play the piano. The spasticity of her legs had largely disappeared. The tendon reflexes were still sluggish in the upper extremities and lively in the lower. Babinski’s sign could not be elicited. She had gained 5 kg. (11 lbs.) in weight (Fig. 4). By July 6, 1950 she had completely recovered and was leading a normal life.

Pathological Findings. The mass removed at operation was greyish-white and firm in consistency. It was the size of a walnut (Fig. 5). Microscopically it was found to be composed of chronic inflammatory tissue with abundant giant cells, a few epithelioid cells and leucocytes, most of which were lymphocytes (Fig. 6). In some places there were noted the beginnings of follicular formations with a central giant cell surrounded by lymphocytes and epithelioid cells. In the cytoplasm of some of the giant cells were spherical bodies 10μ in diameter. These bodies resembled degenerated lymphocytes. They had a central part of nuclear appearance, which stained readily with hematoxylin and which was surrounded by a thick refringent cap-

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**Fig. 3.** Operative sketch. (A, B) Thickening of epidural tissue. (C, D) Appearance of the granuloma after opening the dura. (E, F) Two stages of the removal. (G) Appearance of medulla oblongata and spinal cord after removal of the granuloma. Note the two lateral bands to which the tumor was attached. (H) Schematic reconstruction showing situation of the granuloma and its relations to spinal cord and its meninges.
TORULA GRANULOMA OF THE CERVICAL SPINAL CORD

Fig. 4. The patient 3 months after operation.

Fig. 5. Photograph of gross specimen removed at operation. (Scale in cm.)

Fig. 6. General appearance of the granuloma under low magnification. Note the large number of giant cells scattered in the tissue (H. and E.).
Fig. 7. Left, a giant cell containing two torula conidia. Right, the same cell under higher magnification (H. and E.).

Fig. 8. Giant cells containing torula bodies seen under high magnification. Note the large hyaline capsules of these torula cells (H. and E.).
sule of gelatinous appearance (Fig. 7). The capsule was colorless, both in hematoxylin-eosin preparations and in sections impregnated with silver (Fig. 8). These bodies stained violet with Gram's method. The capsules varied in thickness and the spherical bodies ranged from 5 to 15μ in diameter. There were a few spherical bodies outside of giant cells, free in the tissues (Fig. 9). A few were seen in the perivascular spaces and even within the blood vessels. No endospores could be found. The blood vessels within this granuloma were mostly capillaries and arterioles. Most of them were surrounded by polymorphonuclear leucocytes, eosinophiles and lymphocytes. A rich network of reticulin radiated from the walls of the blood vessels.

As the tumor had been promptly fixed in formalin, cultures and inoculations into laboratory animals were not possible. Nevertheless it seemed obvious that the spherical bodies were the causative agents of mycotic type. They had the typical appearance of yeast-cells and were thought to be *Torula histolytica*.

DISCUSSION

Blastomycosis of the central nervous system has been rarely recognized in Spain. The only case previously reported was one of an obscure meningitis in which the spinal fluid contained some fungus-like cells which failed to grow on culture media. No pathological examination was made (Barraquer1).

Infection of the nervous system with *Torula histolytica* usually produces a rather widespread meningo-encephalitis, with a severe granulomatous reaction in the leptomeninge5,6,8,10,17. Sometimes the lesions may be more limited and localized in the brain, giving rise to minute cysts, so-called “soap suds” cysts, 6 with little or no alteration of the leptomeninge. These lesions can simulate a brain tumor6,13,18,20.

Torula granuloma limited to the spinal cord has been reported only once before (Carton and Mount5), and that very recently. On the other hand, Rand16 has reported 2 cases of coccidioidal granuloma of the spinal cord. The macroscopic findings
in his cases were very similar to those reported here (Fig. 10). We, therefore, at first thought that we were dealing with such an infection and Verbiest, who saw our patient and who had had a previous experience with a coccidioidal granuloma of the spinal canal, was of the same opinion. However, the cells were smaller than those found in coccidioidal infections; they had a typical yeast-like appearance; there were no endospores; and the thick hyaline capsule was typical of Torula.

The clinical course has been most gratifying. Seven months after removal of the granuloma the patient is free of symptoms and apparently cured. Most cases of Torula infection have terminated fatally in a few weeks to years, regardless of what form of treatment, medical or surgical, was used. What part the penicillin played in the recovery of our patient is undetermined.

Green concluded that sodium iodide, sodium salicylate and tartrate, magnesium sulphate, potassium tartrate, colloidal silver, thymol, quinine and gentian violet are all completely ineffective. Acriflavine, which is active in vitro, failed in one case treated by Warvi and Rawson. The same was true of acti-dione, alkalosis, sulphonamides, streptomycin and aureomycin. The reports concerning penicillin have been contradictory. Fisher, and Krainer et al. found it ineffective in vitro, and Gifford and Hullinghorst in vivo. On the other hand, Goldberg, and O'Neill, Newcomb and Nielsen reported beneficial results in their cases.

Freeman has pointed out the variable virulence of different varieties of Torula, and the organism present in our case may have been one of lesser virulence. However, the cells present in our case were of the smaller size and Freeman points out that these are usually the more virulent. In any case it is obvious that the surgical removal of the granuloma with relief of the severe compression of the spinal cord was quite effective. It is possible that a similar decompression might have been effective in the case of Carton and Mount, but knowing its nature, they elected not to remove the lesion. Bucy and Oberhills had a successful experience similar to ours with another granuloma of the spinal cord of different etiology. We are of the opinion that a radical operation would be indicated in any case similar to that herein reported.

**SUMMARY**

An extensive granuloma of the cervical spinal cord in a child 8 years old is reported. The symptoms were those of compression of the spinal cord. The granuloma was removed surgically and the child, who had a severe quadriparesis before the operation, recovered completely. Study of the surgical specimen indicated that the causative organism was the *Torula histolytica*. The authors stress the rarity of the case and advocate surgical extirpation of the granuloma in all similar cases.

We should like to acknowledge our gratitude to Dr. L. A. Mount and to Dr. R. E. Green for the valuable information they have provided and for making available to us the manuscripts of their papers before publication.
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ARTERIOVENOUS ANEURYSM OF THE BRAIN

REPORT OF CASE CURED BY CLIPPING MIDDLE CEREBRAL ARTERY

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(Received for publication August 19, 1930)

The possibility of curing arteriovenous aneurysms of the brain by craniotomy and direct surgical attack deserves emphasis in light of our present day greater diagnostic accuracy by cerebral arteriography, increased knowledge of the nature of these lesions, and improvement in surgical technic. In the past, most of them have been surgically exposed on the erroneous preoperative diagnosis of focal epilepsy caused by tumor. When the lesion was recognized, the skull was usually closed without treating it specifically for fear of encountering fatal hemorrhage.