

## EMPYEMA OF THE SUBDURAL SPACE\*

BY CARL V. BISGARD, M.D.,

*Department of Pathology and Bacteriology,  
University of Toronto,  
Toronto*

Acute suppurative processes confined to the subdural space form an infrequent but long recognized type of intracranial inflammation. The literature relating to the subject is largely limited to that of subdural abscess. In other reported cases, and the case herein given, the condition arose as a secondary or complicating feature of another disease process. In this instance, unlike the usual subdural abscess, no circumscribing adhesive response, or even localizing depression with marginal shelving of the underlying brain tissue, was present. This character of unobstructed diffuseness, together with the abundant thickness of the suppurative collection, occasions the designation "empyema of the subdural space". This term describes adequately and more precisely the condition found in this case.

These unusual pathological findings, which explain very well the puzzling clinical syndrome of an acute meningitis with a cloudy but persistently sterile spinal fluid, make the condition worthy of report.

## CASE REPORT

R. P., a twenty-nine year old, ill-nourished, male, a rubber worker, entered the Toronto General Hospital January 30, 1931, complaining of frontal headache of six days' duration. On January 21st, the patient had had a head-cold and chill. Two days later his physician, called because of severe frontal headache and vomiting, noted the presence of nasal discharge and a puffy swelling of the forehead at the root of the nose. The patient's temperature at this time was 101°. Local treatment was instituted. The following day the patient felt improved and the local signs were much less apparent. However, the frontal headache returned, was persistent, and was accompanied by occasional nausea, vomiting and an irregular fever. On admission the patient's temperature was 101°, and the pulse 88. The patient was poorly nourished, markedly dehydrated, rest-

less, and at times irrational. A purulent discharge, which appeared to be coming from the right middle meatus, was present in the nasal cavities. The right frontal and maxillary sinuses were dull on transillumination. The pharynx was congested. Neurological examination disclosed slight stiffness of neck, a positive Kernig sign and hypertonic reflexes.

On the day after admission the patient was comatose. The temperature and pulse rose progressively. The spinal fluid remained cloudy and under increased pressure, death ensuing three days after entry to hospital.

*Laboratory findings.*—The blood leucocyte count was 18,000 per c.mm. The spinal fluid was cloudy and under a pressure of 20 mm. of mercury; the cell count, 8000, mostly polymorphonuclears. Numerous cultures on routine and special media and repeated smears of the spinal fluid, obtained at the bedside and from centrifuged fluid, were free from organisms in all instances.

*Clinical diagnosis.*—Acute meningitis; brain abscess (?).

Lumbar puncture was performed several times daily during the last three days of the patient's illness. The persistence of the same very liquid character and fine cloudiness of the spinal fluid was in striking contrast to the rapid thickening and yellow, opaque character of the spinal fluid so quickly obtained in the usual pyogenic meningitis. At no time was difficulty experienced in obtaining fluid through the puncture needle.

*Post-mortem examination.*—The dura externally and the longitudinal sinus were clear. On opening the dura, a great quantity of yellowish-green exudate, lying over the superior surfaces of both cerebral hemispheres, welled up. This exudate was very abundant over the anterior portions of both cerebral hemispheres, especially the right, and extended posteriorly, though in decreasing amount, to the occipital region. On the right side the veritable "cushion" of pus measured up to one-half an inch in thickness. On removing the brain from the cranium the same abundant exudate was found upon the antero-inferior aspects of both hemispheres, extending posteriorly about the optic chiasm, backwards to the pons. The posterior poles of the hemispheres, the tentorium, and the posterior fossa were free from pus.

The posterior plate of the right frontal sinus

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presented a somewhat eroded, granular, yellowish-red area, measuring three-quarters of an inch in diameter, over which the dura formed a mounded pus-containing loculation. The dura over the summit of this small extradural abscess was shreddy and necrotic. Both lateral sinuses throughout their lengths contained greyish-pink purulent thrombi which were firmly attached to the intimal surfaces at some points.

On opening into the right frontal sinus a large amount of greenish-brown purulent material exuded. The sinus walls were covered with a yellowish-green exudate. Although no definite opening could be demonstrated in the right posterior frontal plate it was thinned out, translucent, and easily fragmented in the area adjacent to the extradural abscess. The right ethmoidal and sphenoidal sinuses contained small amounts of greenish, purulent material. The remaining bony sinuses and middle ear cavities were clear.

The gyri of the brain were somewhat flattened, and the sulci shallow over the superior aspects of the cerebral hemispheres. After removal of the subdural purulent accumulations the subarachnoid spaces were found to be free from demonstrable purulent exudate. The ventricular system and the subarachnoid spaces contained a slightly cloudy fluid. The underlying cortex was slightly injected and oedematous. The remainder of the brain examination was essentially negative.

Bacteriological examination of the exudate from the subdural space and from the frontal sinus revealed on direct smear a small Gram-negative bacillus and Gram-positive coccus in chains. On culture, *B. coli* and *S. hæmolyticus* were obtained in both instances.

*Microscopic examination of dura and brain.*—The dura over both hemispheres was markedly thickened by oedema and hyperplastic granulation tissue, which was diffusely infiltrated by lymphocytes and small numbers of leucocytes. Fragments from the tissue overlying the small extradural abscess of the right frontal region showed extensive necrosis of this membrane. Sections of the dura overlying the subdural exudate, at some distance from this point, showed only an irregular narrow margin of necrosis on the cerebral aspect. The purulent exudate was adherent to this necrotic layer.

Section of the cortex and pia-arachnoid

showed a thick purulent exudate overlying the latter membranes. The vessels in the pia-arachnoid and adjacent superficial brain tissue were congested. The subarachnoid spaces contained only a few polymorphonuclear leucocytes and slight amounts of fibrinous material.

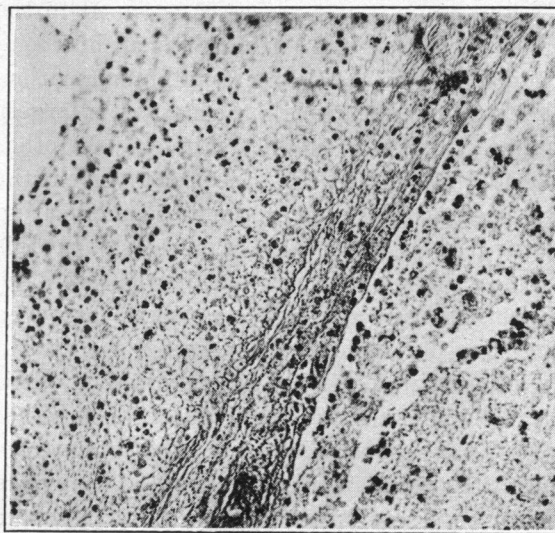


FIG. 1.—Fibrino-purulent exudate on the surface of the pia-arachnoid overlying the brain tissue.

The underlying brain tissue appeared somewhat granular and oedematous. The more remote brain substance was normal.

#### DISCUSSION

The dissemination of infection in this instance was found to pursue the following sequence. An acute osteomyelitis, associated with a suppurative sinusitis, gave rise to the small extradural abscess situated upon the posterior plate of the right frontal sinus. Following necrosis of the dura overlying the latter extension to the subdural space occurred.

Progressive intradural infection arising from without the dura eventually manifests itself as a leptomeningitis, brain abscess, or less frequently as a subdural abscess. The course of events which follows in these pathological conditions may be briefly stated. Once an extradural pyogenic infection is established, a fibrinous exudate quickly seals the underlying meninges over the inflammatory area. Further intradural extension, aside from vascular and perivascular metastases, is always preceded by secondary degenerative changes in this inflammatory barrier. MacEwen<sup>9</sup> referred to this ability of the meninges to throw out a localiz-

ing plastic exudate and thus "stitch the intradural cleavage planes" as the "soldering" process. The great ease with which such a potential space as that between the dura and arachnoid layers could be barricaded, in contrast to the semi-patent sub-arachnoid meshwork, is apparent. MacEwen states that the low incidence of subdural suppuration among the secondary intracranial complications of extradural infection is attributable to the facility this anatomical arrangement lends to the "soldering" response.

When opportunity for the enveloping membranes thus to fortify themselves is not afforded, as in traumatic injuries, subdural infection is not infrequent. Likewise, it is striking how regularly this condition, as reported in the literature, has arisen following intracranial manipulation, (post-operative). The import of this circumscribing inflammatory reaction is further emphasized when one recalls the ready diffusion which occurs in non-inflammatory affections of the space, (traumatic hæmorrhage). In the event of subdural suppurations it is usually quickly localized. The same factors which discourage the initial infection tend to limit its dissemination. The resultant abscess is characterized by an adhesive inflammation delimiting its margins, and a well defined local depression of the underlying brain substance. No such confinement was exhibited in this instance. No local depression of the cortical surface was perceptible after careful removal of the exudate. It would seem that in this case, the circumscribing responses were outstripped by the rapid and excessive exudative accumulations, provoked by virulent and, moreover, mixed pyogenic organisms. The widespread and thick collection of exudate which resulted was the outstanding feature. It is felt that "empyema of the subdural space" adequately and appropriately describes the condition.

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A CASE OF LYMPHATIC LEUKÆMIA  
IN AN INFANT\*

BY R. R. STRUTHERS, M.D.,

*Montreal*

Lymphatic leukæmia, while a comparatively common disease during the early years of life, is not particularly common under the age of two. At that period of life it is usually characterized by severe anæmia, acute hæmorrhagic involvement of the mouth and throat, a large spleen and a rapidly fatal termination, the so-called "bucco-pharyngeal syndrome". With this is a severe degree of anæmia, a colour-index of 1, immature white cells of the lymphatic and myeloid series in peripheral circulation, a progressively downward course and a rapidly fatal termination, usually within a period of days or weeks after coming under observation.

The case to be reported herewith differs from this recognized clinical picture in several points. Firstly, the length of the illness, four months; secondly, the peculiar blood picture showing very marked diminution in the platelet count; with a high percentage of reticulocytes; and, thirdly, the striking post-mortem findings.

Baby V. T., aged 16 months, was admitted to the Pædiatric Service of the Montreal General Hospital on November 22, 1930, with pallor, loss of weight and hernia.

*Family history.*—Irrelevant, the father and mother and one other child being well.

*Personal history.*—The child was born at the eighth month of pregnancy, weighing 4 lbs., was breast fed for six weeks, then went on to a milk, water and sugar mixture on which she did well. Aside from pallor the child was well and gained weight steadily until six weeks previously, when she suffered from diarrhœa and vomiting for a period of a week. After a period of starvation the child was apparently well but failed to gain in weight. From that time up to admission to hospital the parents noted that she was very pale, but did not appear lacking in energy or suffer from shortness of breath. Her appetite was good and the digestive functions normal, but she was very irritable and cried more than was her previous habit. There was no history of jaundice.

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