drawn out cases, ventricular blocking, and high mortality are probably due to too small doses of serum, given at too long intervals.

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EMPYEMA—TREATED BY DAKIN'S SOLUTION.*

By GUY COCHRAN, M. D., Los Angeles.

I have nothing either brilliant or new to add to the many empyema studies recently made. The severity of the disease has differed throughout the many scattered cities, camps and hospitals almost as much as the types of treatments and techniques. So reports and conclusions are just as varied. However, it seems worth while that reports should come from everywhere in order that out of the composite something may be learned.

At Navy Base Hospital No. 3, on the North Sea, we had twenty-eight cases, but they occurred before, during and after the influenza epidemic, representing all the types—I think—and were all treated along the same line. During the epidemic our influenza cases all showed streptococcus haemolyticus, pneumococcus and influenza bacilli; the predominance of one over the others determined early the prognosis, for the haemolytic cases mostly died in from six to twenty-four hours, before empyema developed, whereas the others lived. So in our empyemata we had only four haemolytics with ten penumococcus and eleven influenza, and three chronics with mixed infections. Only two of these (influenza) cases went to the operating room, and these were the only resections done. The others were too sick to move, and were operated in bed, for we realized early that the cases sent in from the fleet, or who had endured railway journeys all did badly, and in many the cyanosis and prostration was much too great to justify lifting to a cart and hauling to the operating room and back.

One per cent. novocain solution was the anaesthetic used.

The incision was intercostal—three or four inches long, at the lowest level shown by the pictures and other findings—mostly commonly the 8th interspace—post axillary line.

The opening through the pleura was of sufficient size for exploration and to receive a hard rubber tube, a centimeter in diameter, for drainage; also a smaller one alongside it through which the C. D. tube entered. Usually one tube was sufficient by changing the position of the patient. The large drainage tube is important, for the breaking down fibrinous clumps would plug a smaller one.

Irrigation was given every two hours with Dakin's Solution for the first few days, or until the pus and drainage ceased and temperature was normal—when the irrigations between 10 p. m. and 6 a. m. were discontinued. Later these were reduced to twice daily. By this time all tubing was withdrawn, and the irrigations were done through a catheter until we got sterile smears and a reddish tinge appeared from the granulation tissues, when the wound was allowed to close.

No secondary closures were made.

No suction or negative pressure apparatus was used.

The patients were over-fed as much as practicable. They were given no exercise beyond deep breathing, but were got up as early as the wound sealed and given work they were able to do about the wards. We found no difficulty with lung expansion, for the Dakin's Solution dissolves the fibrin, and limiting bands do not exist.

The shortest irrigation period was twelve days and the longest twenty-one days.

We took over our hospital from the British Army, and with it a number of patients too sick for transfer. Among these were three old empyemata. They were of special interest to me, for they were of a type which we had seen in civil life, and had always been so difficult. Also because they were the first chest cases in which I had ever used irrigation of any type.

Case No. 1. J. T. McC. Had been operated upon ten weeks before. The incision and resection of rib had been made posteriorly, and apparently with arm extended, for the angle of the scapula lay in the middle of the wound, making it extremely difficult to keep a tube in. There were copious drainage (while the tube was in)—a mixed infection with a lot of pyo-cyaneous stain in the dressings. His temperature ranged from 100 to 103. Under novocain his wound was enlarged—fibrous bands broken down and a large drainage tube inserted. Irrigation with Dakin's Solution as in acute cases. In eight weeks he was well.

Case No. 2. W. M. J. Similar in many ways; had been operated upon six weeks before. He ran an irregular, high temperature for a time, until we found a pocket and got a tube into it. He was well in seven weeks.

Both of these had been pneumococcus cases.

The third case, J. C. P. Shrapnel in right lung two years previously. He had been operated upon six times—the last being an Estlander. Like the others, he ran irregular and high temperature until his wound was enlarged and bands broken and irrigation started. We had several pocket formations with him, and bad times for a few days, but in four months he was well and went home. I have had a letter from him since my return, telling me how fine he feels. So I believe that he has remained well. An interesting incident in his case was apropos of the C. D. solution in fistulous cases. For weeks the dissolving fibrin had come away in lumps with each irrigation, until one day I was called in a hurry to find him in extreme paroxysmal coughing immediately following his

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irrigation, and he told me he felt and had a taste just as when he was gassed two years ago. And he was right, only instead of the Hun, I had given him the chlorine.

This little paper is deliberately superficial—its only object being to emphasize the importance (1) of disturbing these patients as little as possible, (2) of a very simple technique, (3) of the success of irrigation, even in old mixed infection cases, (4) of feeding as much as possible, (5) of getting them up as soon as the wounds are sealed, and (6) of not losing any patients.

THE PATHOGENESIS OF PACHYMENINGITIS DUE TO NASAL OPERATIONS, WITH REPORT OF CASES.*

By ANDREW B. WESSELS, M. D., San Diego.

That there are relatively infrequent deaths following intranasal operations is shown by a review of the literature. Considering the number of nasal operations done, one wonders why meningitis as a complication is so seldom reported by the surgeon. In reporting my own case and putting on record three other cases operated on by other surgeons, but which have not been reported, I do so with the idea of getting closer to the pathology of the ethmoid labyrinth. It seems to me not enough attention has been paid to radiography in sinus work. Many of the deaths reported in the literature might have been obviated had the surgeon had a radiograph before attempting intranasal instrumentation. The possibility of brain involvement resulting by continuity, though bones and dura mater are intact, has been demonstrated (Hajek). In operations on the middle turbinate, infection can readily spread by way of the porous, poorly resisting ethmoid labyrinth. Removing polypi may open up diseased periosteum and bone with possible extension into new areas for absorption into regions always dangerous. Similarly, operations intranasally on frontal sinus, the bone structure of which may be atrophied through extension, might infect the meninges. The transmission of microorganisms through the blood stream from the nasal cavities has been established (Hajek and Flexner). There is a direct relation between the perimeningeal lymph-spaces and the lymphatics and the nasal mucosa by way of the cribriform plate of the ethmoid. Downward prolongations of the subarachnoid space, which forms a net work around the olfactory filaments as they pass through, other prolongations also pass through quite independently of the olfactory nerves. By means of these prolongations direct communication exists between the subarachnoid space and the lymphatics of the upper portion of the nose (Andre). When the condition of the nose is considered, in disease of the sinuses, with the bones sclerotic, porous, or atrophic, is it a wonder that oftentimes the slightest instrumentation will result in meningeal involvement through fracture? Unfortunately, all deaths from meningitis following nasal operations do not go to autopsy, hence the location of most frequent perforation and fracture is not available.

In analyzing the available literature on intranasal operative deaths, from meningeal complication, it seems that the operations directly on the ethmoid labyrinth are responsible for the largest number, perhaps because it is most frequently operated upon. The radical external frontal sinus operation is not considered here, although intranasal frontal sinus instrumentation is responsible for quite a number of deaths, due to fracture of the inner wall of the sinus or extension through the bone or perforation through the cribriform when no frontal sinus exists. The apparently simple operation for the removal of portions of the middle turbinate appears to be responsible for a large number of deaths either by direct fracture through the ethmoid and cribriform plate or by extension of infection through blood stream and lymphatics. The submucous operation on the nasal septum, which ordinarily is simple and would appear not at all dangerous, is responsible for its quota of deaths, this by hematogenous and lymphogenous extension.

Any operation of the nose, no matter how slight it has been, may be fatal through complication, by producing a recrudesence of an old latent meningitis or a meningitis by infection through an old perforation or dehiscence in either the ethmoid labyrinth, cribriform plate, or internal wall of the frontal sinus. The infection, once it reaches the cranial cavity, whether through the cribriform or frontal sinus, is usually found in the frontal lobe in the basal portion or anterior or median region (Freundenthal).

I. The writer saw in consultation a patient who, as the result of a nasal operation, died of a meningitis. The anterior tip of the middle turbinate had been removed, the bones were sclerotic, and there was a large amount of pus in both the frontal and ethmoid sinuses. The patient went into shock immediately after the operation and died on the fourth day from a pneumococcic extension.

II. A skilled operator removed the middle turbinate, which was hypertrophied and causing an obstruction. It was followed by a severe hemorrhage, tamponage was resorted to to check the bleeding. The patient died on the fifth day from a meningeal involvement. Streptococci were found in the spinal fluid.

III. The third case of meningitis following the removal of the middle turbinate was in the office of a surgeon. Patient developed meningitis and died on the seventh day. There were no postmortems on these cases.

The supposition is that in these three cases, there was a fracture into the cribriform plate through the ethmoid labyrinth after simple operations on the middle turbinate. Apparently the patients were in good health prior to operation.

IV. A second cruise man of about thirty-two years of age was referred to me because he was "dopey." He seemed to be unable to hear commands given by his drill master, and was very slow in executing any order. He complained of moderate headaches extending over a period of

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