SURGICAL TREATMENT OF EMPYEMA IN CHILDREN.

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In presenting for your consideration the subject of the surgical treatment of empyema in children, I am sure that no apology will be necessary, when we consider that more than half the cases of empyema recorded occur during the first decade of life; and that more errors of diagnosis are made than in probably any other thoracic affection.

Definition.—By empyema we mean a collection of pus in the pleural cavity, the abscess bounded upon one side with the soft, receding, compressible lung, and upon the other side with the firm unyielding bony chest wall. And in the consideration of its surgical treatment, we must remember the ever-present surgical maxim, that "wherever we have a pus collection, it must be evacuated in the speediest, safest, and most thorough manner."

Causes.—It is not my purpose in this paper to enter into a consideration of the various causes giving rise to empyema, but I may state that in the majority of cases, it is my belief that a purulent pleuritis is due to auto-infection of a more or less limited area of the inflamed or damaged pleura through the medium of the general circulation; the pus microbe thereby gaining entrance and commencing its destructive action upon tissues that otherwise would only be the seat of a simple pleuritis. Other methods of infection are the use of unclean aspirating needles; rupture of a bronchus; extension of a septic pneumonia; secondary infection from the primary foci in some other point of the body; tubercular infection, etc.

Symptoms.—The symptoms, where we rely upon clinical evidence alone, are not sufficiently pathognomonic to be diagnostic. It is easy to determine by physical examination that we have a pleural sac distended with fluid, but its exact nature can only be determined by the introduction of a hypodermic needle (better of large size). If, following the usual symptoms of an acute pleuritis we have chills, fever, hectic, diarrhoea, and sweating, we are reasonably certain of our diagnosis without the aspirating needle. If these symptoms are accompanied by localized œdema or bulging of the intercostal space, usually the 5th in the mammary line, there is almost absolute certainty of pus in the pleura. The diagnosis may be made as early as the fourth day of the disease, although usually it is delayed until the second week or later. All cases of pneumonia that are tardy in undergoing resolution should awaken a suspicion of empyema. I have seen a

number of striking cases of error in diagnosis in cases of this character. Secondary infection of the pericardium is a fatal complication in a number of cases running a rapid course. A striking example of this mode of termination was recently detailed to me by Prof. C. W. Earle.

Empyema, if left to itself, may terminate in recovery in one of three ways according to L. Emmet Holt: (1) by spontaneous absorption of the purulent effusion; (2) by evacuation through the bronchus; (3) by opening externally through the intercostal muscles; but when left to nature the mortality is appalling.

Killiet and Barthez mention thirty-three cases with four recoveries, twenty-one deaths, and eight not accounted for.

Surgical Treatment.—No absolute rule can be laid down for the management of all cases. We have our choice of operations from the following: For example, we may resort *first*, to aspiration; *second*, aspiration and washing out of the cavity with an antiseptic solution; *third*, thoracentesis with trocar and canula; *fourth*, thoracentesis with sub-aqueous drainage; *fifth*, simple incision; *sixth*, simple incision and drainage; *seventh*, simple incision with through and through drainage, with, or without, antiseptic precautions; *eighth*, subperiosteal resection of rib and drainage; *ninth*, thoracoplasty (Eslander's operation); *tenth*, perflation.

Which of these various methods will give the best results? As a matter of fact, as practical surgeons, we may confine ourselves to the relative merits of but two of these methods—aspiration, and free incision with drainage.

There is no question but that in a certain minority of cases in children, simple aspiration once or twice repeated, will effect a permanent and satisfactory cure.

I have the records of four such cases:

Case 1.—Charlie F., æt. 18 months; diagnosis, empyema, which was confirmed by Prof. H. A. Johnson; cured by aspiration; five ounces of odorless pus; died three years subsequently of malignant diphtheria. This patient was also seen by Prof. Waxham, and Dr. D. H. Sullivan.

Case 2.—Mamie S., æt. 30 months, treated for six weeks for chronic pneumonia by a distinguished physician; cured by one aspiration; twelve ounces of greenish pus withdrawn, very flaky; diagnosis confirmed by Drs. E. E. Babcock and T. K. Jacobs.

Case 3.—Baby, æt. 14 months; two aspirations; cured.

Case 4.—Infant (Home of the Friendless); empyema; two aspirations; cured.

Aspiration has the advantage of being simple, safe, and occasionally curative; but if we find the fluid re-accumulates, or septic symptoms are developed, then a free incision with drainage is imperatively demanded.

Aspiration has the disadvantages of leaving a small amount of pus for reabsorption, or which may become an inspissated residuum according to Abbe, that will result in a secondary abscess in after-life. Surgically considered, it is not as perfect an operation, or as scientific a procedure, as evacuation by a free incision and the introduction of a large sized drainage-tube.

Of 121 cases treated by aspiration alone, 23, or 19 per cent. were cured, six died, and the rest came to some other method of treatment, usually incision.

Incision.—Free incision, therefore, remains as the method possessing the decided advantages of complete evacuation of the purulent fluid, flakes of lymph, etc., and it moreover permits us to explore the cavity with the finger or sound and break down any septa or bands of adhesion. It permits of subsequent irrigation, if the septic nature of the fluid demands a washing out, and also gives us complete drainage.

The technique of the operation is comparatively simple; the diagnosis having been established beyond a doubt by preliminary definitive hypodermic aspiration. The field of operation is prepared in the usual manner for all aseptic operations. The point of selection for free incision and drainage is the posterior border of the axillary line in the 6th or 7th interspace, as in the recumbent position expansion of the lung tends to expulsion of the fluid at this point, although cases left to nature ordinarily point in the 5th inter-space, two inches to the outer side of the nipple. General anæsthesia is usually not required, although a few whiffs of chloroform in nervous children are of advantage sometimes. But local anæsthesia by means of the ether spray or hypodermic injections of from ten to fifteen drops of a 4 per cent. solution of muriate of cocaine answer every purpose in abrogating pain. The fold of skin at the site indicated is transfixed on a line with the upper border of the rib and incised for one and a half inches; then the intercostal muscles and pleura are divided, and as pus flows out in a full stream a large-sized rubber drainage tube is inserted and secured by safety pin, or by a button of rubber flange reflected so as to prevent its intrusion into the pleural cavity. The tube should not be more than three inches long. Irrigation should not be resorted to except in septic empyema where the fluid is fetid and caseous from bacterial decomposition.

I recently lost a patient during an irrigation with a solution of warm water slightly borated. The cause of death was probably due to a thrombus or obscure pleural reflexes causing shock.

As soon as the tube is introduced it should be covered with sublimated gauze so as to prevent entrance of septic germs, and the pus should be allowed to flow out upon absorbent cotton or antiseptic gauze, and the dressings changed daily. Strict antiseptic precautions are always necessary,

and our greatly improved results and lessened mortality are due to the antiseptic treatment now employed.

Contrast the different results: Depuytren operated in fifty cases with only four recoveries, while L. Emmett Holt reports sixty-three cases operated upon under full antiseptic precautions, with only two deaths. Of this number twenty-six successive cases were operated on by Goodhart and Taylor in the Eveline Hospital, London, with only one death, and *that* from a complicating pericarditis and peritonitis. The average duration of the discharge was about six weeks. In children we are usually able to discard the use of tubes in three weeks. When close apposition of the ribs causes flattening of the tube during pressure from coughing or induces neuralgia due to pressure upon the intercostal nerve, subperiosteal resection of one and one-half inches of the single rib will afford ready relief and better drainage; although my experience has been that it is rarely required. In old empyemas in children, or when we have a chronic abscess discharging through a sinus and shortening the life of the patient by lardaceous degeneration of kidneys, liver or spleen, or from general exhaustion, Eslander's operation of thoracoplasty should always be performed, although its field of usefulness is limited; but, if necessary, a sufficient number of ribs and a section of each should be made to permit the complete retraction of the divided ends of the ribs to the bottom of the cavity, thus closing it, otherwise a fistulous tract remains requiring a subsequent operation.

In regard to Ewart's method of perflation, reported last year, I have no personal experience.

In conclusion, therefore, I may summarize my observations as follows:

1. The surgical treatment of empyema in children is eminently satisfactory, and yields better results than in adults.

2. Multiple hypodermic aspirations are necessary to perfect a diagnosis, and should always be resorted to in cases of thoracic disease about which there is any element of doubt, especially in cases of pneumonia that exceed the usual period and become "old monia."

3. Aspiration cures a small minority of cases and should always precede a more radical operation, especially in localized empyemas.

4. Free incision and drainage, with local anæsthesia, under strict antiseptic precautions, gives the most satisfactory results in the majority of cases.

5. Subperiosteal resection of the rib is sometimes necessary to afford perfect drainage.

6. Thoracoplasty is rarely required in children.

7. Other methods of treatment should be resorted to for special cases or circumstances.

8. Early incision, perfect drainage, and complete antiseptics should be the rule.

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