

EMPYEMA*

A SYLLABUS OF OPERATIVE TREATMENT

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THIS is an attempt to standardize the selection of operative methods in the surgery of empyema of the thorax. It is presented here for discussion and criticism. It consists of: (1) A classification of the conditions demanding operation. (2) A list of procedures with a brief description of each. (3) A synoptic table showing the types of the disease paired with their appropriate operations.

In such a presentation as this there can be given no complete plan for carrying any save the simplest cases to their conclusions; but complications, such, for example, as the discovery of an unsuspected sacculation, may put the case in another class which can be treated according to the table. It is also recognized that there can be no absolute rule for the treatment of any given case because the conditions are never twice exactly alike; but this does not forbid our attempt to construct a model. Bacteriology is not considered because it has nothing to do with our subject. It is of prognostic value only. Every case is assumed to have been röntgenologically studied except in acute intrathoracic tension, when therapeutic aspiration is urgent even without the X-ray. Anæsthesia in minor operations should be local, even with rib resection. Intraparyngeal differential pressure by ether vapor or nitrous oxide and oxygen is preferable for the more serious procedures. The Carrel-Dakin method is recommended as a most valuable post-operative aid but it should not be employed when the instillation of even small quantities of the fluid with a wide opening for its escape from the thorax is followed by severe coughing. Also in children and in a few susceptible adults the long-continued application of this treatment seems to cause a general deterioration. Such patients improve on discontinuing this remedy. Empyema can best be treated in a hospital.

CLASSIFICATION OF CONDITIONS DEMANDING OPERATION

(Tuberculosis, syphilis, actinomycosis, etc., are not included.)

Acute empyema	{	A. Seropurulent effusion	a. General or large.
			b. Sacculated, single or multiple.
		B. Frankly purulent effusion	c. With purulent expectoration (hidden lung abscess or empyema emptying through a bronchus).
			d. With lung abscess (intrinsic).
			e. With lung abscess (bronchiectatic).
			f. From extrapleural sources other than lung, by direct extension.
			g. With tension pneumothorax.
			h. Traumatic.

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Chronic empyema

- I. With closed thorax.
- II. With pleurobronchial fistula and closed thorax.
- III. With open thorax (fistula).
- IV. With pleurobronchial fistula and open thorax.
- V. With fibrosis and permanent contraction of lung.

A LIST OF PROCEDURES WITH A BRIEF DESCRIPTION OF EACH

PROCEDURE No. 1.—Diagnostic Aspiration. Only a few c.c. to be removed. Syringe to be detached and needle to be withdrawn while 2% lysol is slowly injected through it into the puncture tract to prevent infection and phlegmon of the chest wall (5 to 15 c.c. may be injected).

PROCEDURE No. 2.—Therapeutic Aspiration. Use fine trocar and canula with rubber tube attached so as to empty the chest by patient's expulsive efforts and by gravity. No forcible suction to be employed. Air permitted to replace the fluid removed or if desired the air may be expelled from the chest by the patient's straining with closed glottis or even by his normal respirations, the tube being pinched during *inspiration* until no more bubbles appear on straining or on *expiration* from end of tube held under water. The canula is then quickly withdrawn. (X-ray will demonstrate the efficacy of this method of getting air out of the thorax.)

PROCEDURE No. 3.—Minor intercostal thoracotomy and tube drainage (with or without airtight closure).

PROCEDURE No. 4.—Resection of rib with its periosteum. Tube drainage.

PROCEDURE No. 5.—Major intercostal thoracotomy with rib retraction (rib spreader) and full exploration of chest cavity with mobilization of lung if desirable.

PROCEDURE No. 6.—Noncollapsing major thoracoplasty, with costotomy but no resection of ribs. Mobilization of lung.

PROCEDURE No. 7.—Various forms of collapsing thoracoplasty. (Schede, Estlander, Wilms, etc.)

SYNOPTIC TABLE

(Showing the Types of the Disease Paired with Their Appropriate Operations.)

Condition	Operation
Acute Seropurulent Effusion.	{ Procedure No. 2. Repeat if necessary until frank pus is present or no more fluid accumulates.
a. General or large	
b. Sacculated, single or multiple....	{ Procedure No. 2 applied to larger cavities. Repeat if necessary until pus is present or no more fluid accumulates.
c. With purulent expectoration (hidden lung abscess or empyema emptying through a bronchus)...	
d. With lung abscess (intrinsic)....	{ Procedure No. 2. Repeat until pus is present (or no more fluid accumulates), then Procedure No. 5.
	{ Procedure No. 4. This is preliminary as a rule, but it may prove curative.

OPERATIVE TREATMENT OF EMPYEMA

Condition	Operation
e. With lung abscess (bronchiectatic)	{ Procedure No. 5 with a view to dealing later on or at the same time with pulmonary condition (lobectomy).
f. From extrapleural sources other than lung by direct extension...	{ Procedure No. 4. Generous resection and dealing at once with the cause (<i>e.g.</i> , subphrenic abscess).
g. With tension pneumothorax.....	{ Procedure No. 2 followed by Procedure No. 3.
h. Traumatic	{ Procedure No. 2 followed by Procedure No. 3 or 5 according to extent of trauma.

Acute Frankly Purulent Exudate.

a. General or large	{ Procedure No. 3 followed if course is unsatisfactory by Procedure No. 5. (Fluoroscopic study important.)
b. Sacculated, single or multiple	{ If single, Procedure No. 4. If multiple, Procedure No. 5.
c. With purulent expectoration (hidden lung abscess or empyema emptying through a bronchus)...	{ Procedure No. 4.
d. With lung abscess (intrinsic)	{ Procedure No. 4. Generous resection with simultaneous or deferred drainage of abscess.
e. With lung abscess (bronchiectatic)	{ Procedure No. 5. Possibly as first stage of lobectomy.
f. From extrapleural sources other than the lung by direct extension.	{ Procedure No. 4 with immediate attention to cause.
g. With tension pneumothorax.....	{ Procedure No. 2, later No. 3 or No. 5, according to X-ray.
h. Traumatic	{ Procedure No. 4. (Revision probably necessary.)

CHRONIC EMPYEMA

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| I. With closed thorax (simple)..... | Procedure No. 5. |
| II. With pleurobronchial fistula and closed thorax. (X-ray diagnosis pyopneumothorax.) | { Procedure No. 3, later No. 5. |

FATAL POST-OPERATIVE PULMONARY THROMBOSIS *

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It has seemed worth while to consider our experience with post-operative pulmonary thrombosis in connection with a review of the most important papers which have been written upon this subject with a view to bring out any points of value in the direction of prophylaxis, as none of the methods of treatment of the condition, once it has been established, seem to have proved successful.

It seems clear from all of the many careful observations that are recorded in the literature, as well as from our own experience, that the condition does not depend upon any one cause, although most observers seem to agree upon several causes which are more important than others. In order that these views may be brought out clearly, we have stated each together with the name of its author in as concise a form as possible before stating our own observations and conclusions.

Causation.—The causes of pulmonary thrombosis in their order of importance are: (1) Local infection; (2) anæmia; (3) slowing of blood stream; (4) subnormal general physical condition; (5) cachexia; (6) micro-organisms in the blood; (7) excess of white blood-cells; (8) inefficient hæmostasis; (9) traumatization of tissues with retractors, etc.; (10) injury to veins of extremities due to badly arranged operating table; (11) injury to intima of veins; (12) excess of calcium salts in the blood.

History.—The condition has been recognized and discussed for generations. Van Swieten ⁸ in 1705 recognized that clots occur in the vessels during the puerperium and wrote gravely on their prognosis.

In 1784 Dr. Charles White, a distinguished London physician, did not associate pulmonary embolism with phlegmasia alba dolens.

Virchow in Berlin and Meigs in Philadelphia wrote on the subject of blood clots stopping the stream of the circulation; Virchow advocating that the obstructing clot must always travel to the heart and the pulmonary arteries; Meigs advocating that it may be formed *in situ* in the heart or pulmonary artery as well. Virchow upheld the embolus theory, Meigs the thrombosis theory.

Virchow ²⁹ first showed the relation between thrombi and emboli, pointing out that emboli not infrequently have their origin in the soft-

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