Is Streptokinase Fibrinolysis the Best Treatment for Empyema in Pediatric Patients? And Must We Tap Every Cirrhotic Patient with Bilateral Pleural Effusion?

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KEY WORDS: streptokinase fibrinolysis, pediatric empyema, bilateral pleural effusion

From the 5th century BC, empyema has been diagnosed in both adults and children. Empyema is defined as pus in the pleural space due to infection. There are multifactorial underlying causes, but the majority of cases are post-bacterial pneumonia or due to direct infection of the chest. Despite advances in antibiotics development and improvement of minimal invasive therapeutics, empyema is still associated with significant morbidity and mortality [1]. Management guidelines were published by the British Thoracic Society in 2003 for adults [2] and 2005 for children [3] and were reviewed in 2010 [4].

The question whether all patients with empyema should undergo medical thoracostomy before proceeding to video-assisted thoracoscopic surgery for both acute and chronic empyemas has been the subject of debate in the literature for the last 20 years and continues to be.

In this issue of IMAJ, Levy Faber et al. [5] review their experience treating 75 children suffering from empyema. They implemented intrapleural streptokinase washing instead of surgical treatment for stage II pediatric empyema and present the success rates compared to the historical surgical approach, namely, reduced stay in the pediatric intensive care unit as well as shorter overall hospitalization duration. In a study in 1949, Tillett and Sherry [6] reported the use of a mixture of streptokinase and streptodornase for intrapleural fibrinolysis. Purified streptokinase was available in the 1960s, resulting in an improved safety profile [7]. Due to concerns about the antigenicity of streptokinase, urokinase was introduced in 1987 and became the most frequently used agent for fibrinolysis. Yao and co-researchers [8] demonstrated the safety and efficacy of streptokinase pleural fibrinolysis in a pediatric population. Levy Faber and co-authors [5] concluded that streptokinase pleural fibrinolysis could obviate the need for surgery in most cases. The authors stress that the attempt be made early on, when complicated parapneumonic effusion is first diagnosed.

Treatment of empyema can be summarized as appropriate antibiotic therapy combined with medical or surgical drainage of the pleural space, management of any underlying factors, with early use of intrapleural streptokinase or urokinase. Such treatment can obviate the need for surgery in most cases of empyema, leaving the complicated chronic disease cases for surgery.

In the spectrum of pleural infectious disease, not much attention is paid to spontaneous bacterial empyema, defined as the spontaneous infection of the pleural fluid, which represents a distinct pathogenetic mechanism. The causative microorganisms in most cases of SBEM are Escherichia coli, Streptococcus species, Enterococcus and Klebsiella [9]. Nitzan et al. [10] present a cirrhotic patient with bilateral pleural effusion and a positive culture from the pleural fluid. Moreover, SBEM may occur even in the absence of ascites. In such cases, a transient bacteremia that infects the pleural space could be the underlying pathogenetic mechanism. The causative microorganisms in most cases of SBEM were obtained. SBEM is rarely diagnosed because thoracocentesis is not routinely performed in cirrhotic patients with hepatic hydrothorax. Therefore, the authors stress the need for awareness regarding early thoracocentesis. Conventional cultures are not sufficiently sensitive for the diagnosis of SBEM. Therefore, inoculation of 10 ml of the pleural fluid into a TSB (tryptic soya broth) [11] blood culture bottle at bedside is advisable since it contains an opsonin inhibitor that protects bacteria from further complement- or phagocyte-mediated killing [12].

Chen et al. [13] found that 56% of 26 SBEM episodes were associated with spontaneous bacterial peritonitis and 31% had bacteremia. The incidence of

SBEM = spontaneous bacterial empyema
SBEM was 2% in 862 cirrhotic patients and 13% in 132 with hydrothorax. They thus concluded that lower serum albumin, prolonged prothrombin time, and lower pleural fluid protein are associated with the presence of SBEM in cirrhotic patients with hydrothorax.

Since SBEM is a frequent complication in cirrhotic patients with hydrothorax and almost half the cases of SBEM are not associated with spontaneous bacterial peritonitis, a diagnostic thoracentesis should be performed in cirrhotic patients with pleural effusion when infection is suspected or clinical deterioration occurs. A chest tube is not even necessary in patients with positive pleural fluid culture. Culture performed by inoculating 10 ml of the fluid into a blood culture bottle at the bedside is a more sensitive method and should be considered.

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References

**Towards a systems understanding of MHC class I and MHC class II antigen presentation**

The molecular details of antigen processing and presentation by MHC class I and class II molecules have been studied extensively for almost three decades. Although the basic principles of these processes were laid out approximately 10 years ago, research in recent years has revealed many details and provided new insights into their control and specificity. MHC molecules use various biochemical reactions to achieve successful presentation of antigenic fragments to the immune system. Neefjes et al. present a timely evaluation of the biology of antigen presentation and a survey of issues that are considered unresolved. The continuing flow of new details into our understanding of the biology of MHC class I and class II antigen presentation builds a system involving several cell biological processes.

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**Capsule**

**Langerhans cells may promote the transformation of skin epithelial cells**

Several immune cell populations reside in the skin and are thought to provide a protective barrier against infections and to act as sentinels against malignant transformation. However, studies in mice that lack Langerhans cells, a subset of dendritic cells, have suggested that these cells may actually promote tumorigenesis. Using a mouse model of squamous cell carcinoma, Modii et al. reveal how Langerhans cells may promote the transformation of skin epithelial cells. In response to the carcinogen 7,12-dimethylbenz[a]anthracene (DMBA), Langerhans cells increased their expression of the cytochrome P-450 enzyme CYP1B1, which can metabolize DMBA to the mutagenic DMBA-trans-3,4-diol. Thus, besides their functions in regulating the adaptive immune response, Langerhans cells may participate in the metabolism of environmental carcinogens.

*Science* 2012; 335: 104
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