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X-ray Diagnosis of Acute Mediastinitis in Children

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Summary

The etiopathogenesis, clinical and x-ray characteristic features of acute mediastinitis are studied in a series of thirty children, treated in the Section of Pediatric Surgery of the Pirogov Emergency Hospital, covering the period 1988 through 1997. Three basic groups are differentiated as follows: group one – perforation of the oesophagus (19 cases), group two – diffuse periesophagitis (6), and group three – descending cervical infection (5). From diagnostic viewpoint, of the symptoms seen on the survey radiography the presence of pneumomediastinum is the most frequently detected and clinically relevant. The presence of hydropneumothorax ranks second, whereas mediastinal shadow enlargement is a sign of acute mediastinitis free of perforation – an expression of diffuse periesophagitis. In the event of clinical evidence of perforation, survey radiography of the thorax and contrast examination of the oesophagus are done, insofar as the combination of the two methods contributes greatly to increase the precision of diagnosing and make a correct judgement with a view to the forthcoming surgical and therapeutic procedures.

Key words: MEDIASTITIS, OESOPHAGEAL PERFORATION

The cases of acute infection of the mediastinum in children become ever more frequent lately. On the first place, this is related to the broad usage of endoscopic methods of examination of the oesophagus and the tracheobronchial tree [2]. Second rank the cases of corrosive intoxication resulting from the swallowing of chemical substances, trauma or surgical intervention in the mediastinal bodies [1, 4, 5]. Descending cervical abscess is observed more rarely [5]. The current study dwells on the etiopathogenesis and clinical and X-ray characteristics of acute mediastinitis during children's age stressing the role of early and precise X-ray diagnostics for evaluation of the stages of development of mediastinal infection.

Clinical materials and methods

The clinical material covers 30 children treated in the Clinic of Pediatric Thoracic Surgery with the Pirogov Emergency Hospital in a ten-year period (1988-1997).

The children fall in the following age groups: 4 were aged 5 months to 2 years, 19 were aged from 3 to 7 years and 7 from 8 to 15 years. The boys/girls ratio was 18/12.

On the basis of the etiopathogenesis the children with acute mediastinal infection were divided into three main groups: group one – perforation of the oesophagus (19 cases), group two – diffuse periesophagitis (6 cases) and group three – descending cervical infection (5 cases) (table 1).

Table 1

Causes of mediastinitis

Corrosive disease	25 children
- iatrogenic perforation (11)	
- necrotic perforation (8)	
- diffuse periesophagitis (6)	
Traumas in the cervical area	3 children
Cervical abscess	2 children
Total	30 children

The diagnosis was made based on the anamnesis, clinical and paraclinical data and the results of the X-ray and endoscopic examinations.

Results

The main group of 25 children developed supportive infection of the mediastinum during the acute or chronic stage of the corrosive disease. In 19 cases the infection was severe due to partial necrosis of the oesophagus after swallowing of a caustic substance (8 children) or iatrogenic perforation during instrumental manipulations (11 children). The other 6 children developed a creeping infection of the mediastinum due to a heavy corrosive oesophagitis and progressive diffuse periesophagitis. In the third group (5 children) the mediastinal infection also developed gradually from a descending cervical infection following a traumatic rupture of the cervical area of the oesophagus (3 children) or cervical abscess (2 children).

The mediastinal complication resulting from iatrogenic perforation was characterized with sharp deterioration of the general condition (looseness, collapse of the peripheral blood vessels, febrility and progressing respiratory insufficiency). Subcutaneous cervical emphysema was observed in two children immediately after the manipulation and vomiting of blood substances in three of the cases. The comprehensive radiography in the first 24 hours showed signs of discrete or outspoken pneumomediastinum in four children (figure 1). In limited quantities of air it appeared as a narrow stripe along the mediastinal pleura or around the aortal arc. Pneumo- or hydropneumothorax was observed in other five children following a rupture of the mediastinal pleura (fig 2).

The contrast radiological examination of the oesophagus does not necessarily result in extravasation of contrast but always shows changes in the wall of the oesophagus. Extravasation of contrast from the lumen of the oesophagus in a separate paraoesophageal cavity or free pleural space was seen in 6 children while there was no extravasation in two of the cases (f.3a, b). Hydropneumothorax on the right-hand side was observed only in a later stage in 2 children.

The clinical picture of children with progressing diffuse periesophagitis following swallowing of caustic substances is characterized with heavy general condition, septic temperature, anemia with extreme changes in the number of white blood bodies, metabolic disturbances and hypotrophy. Radiologically, it was seen as a gradually broadening mediastinal shadow on both sides or paracardially on the right-hand side (fig 4 a, b). Eventually, the infection spread to the adjacent areas of the pulmonary parenchyma. Hydropneumothorax was observed in one case in the advanced stage of the disease.

In the descending cervical mediastinitis the radiological changes occurred comparatively faster and involved enlargement of the mediastinal shadow in the upper third as in the multiaxial scopy the suppurate collection had an anterior mediastinal location. The laterography of one child showed an air/fluid level in the mediastinum (fig. 5 a, b, c). The radiography of two children, who were admitted when the mediastinal process was at an advanced stage, showed a unilateral or bilateral piopneumothorax.

Life-saving oesophagotomy was performed in 15 children (50%). Other operative interventions (thoracocentesis with drainage, oesophagostomy and gastrostomy) was made in 4 of the cases (13.3%), unilateral or bilateral thoracocentesis (with or without drainage of the posterior mediastinum) in 5 (16.7%) and 6 of the children (20%) were treated conservatively. Eight of the children (26.6%) died. Coloesophagoplastics was eventually performed in 13 children (43.3%).

Discussion

The acute suppurate mediastinitis in children results most often from oesophageal perforation during operative interventions or corrosive damages [1, 2, 6]. Our study covers 25 such cases (73.3%) that swallowed soda caustic.

The early endoscopic diagnosis and the dynamics of the clinical picture give grounds to suppose that there is necrotic perforation of the oesophagus. The radiological symptoms such as mediastinal emphysema or discrete pneumomediastinum should be interpreted in the highlight of this fact. In two of the cases it was located paracardially on the right-hand side and involved separation of the mediastinal pleura.

Iatrogenic perforation of the oesophagus can occur both in the acute and in the late stage of the corrosive disease. In 7 of the cases it emerged during direct dilatation of the oesophageal stricture through the mouth and in 4 during an endoscopic examination. When there is extravasation of contrast during examination of the oesophagus this implies that there is iatrogenic perforation. In three children there were only changes in the lumen of the oesophagus without extravasation of contrast. The necrotic changes were confirmed during operation.

The diffuse periesophagitis in extensive caustic intoxication is characterized with clear clinical symptoms and involves gradual enlargement of the mediastinal shadow extending to the adjacent areas of the pulmonary parenchyma with the advancement of the process. In operative revision (right-hand side toracotomy) the mediastinum is enlarged and phlegmonously changed with packages of enlarged lymph nodes around the pulmonary hilus and massive fresh adhesions in this area.

There is a typical radiological picture only in the initial stage of the descending cervical mediastinitis and it is indicative of enlargement of the mediastinum in the upper third. At a later stage the existence of piopneumothorax on the right-hand side or bilaterally cannot explain the etiopathogenesis of the process but is a firm indicator of active drainage of the pleural cavity.

Conclusion

The acute suppurate mediastinitis in children is a serious complication. High mortality rate is typical of it especially when it is established in a later stage. It occurs mainly due to oesophageal perforations resulting from transmural necrosis or diagnostic or treatment procedures. From the point of view of the diagnosis, the presence of pneumomediastinum on the radiograph is of highest importance. Second comes the hydropneumothorax. The enlargement of the mediastinal shadow is a sign of acute mediastinitis without perforation and of diffuse periesophagitis. Extravasation of contrast and changes of the mucosa of the oesophagus are important in the contrast radiological examination. In clinical indications of perforation a chest radiograph and contrast examination of the oesophagus should be made. The combination of these methods increases the possibility to make a precise diagnosis and assign the right surgical and therapeutic procedures.

Figure 1

Oesophageal perforation. Clear bilateral pneumomediastinum

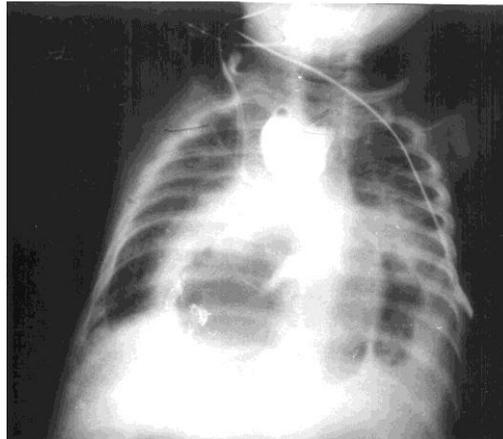


Figure 2

Graphical presentation of clinical and radiological symptoms: 1) subcutaneous cervical emphysema; 2) left-hand side pneumomediastinum; 3) right-hand side pneumothorax; 4) right-hand side hydropneumothorax

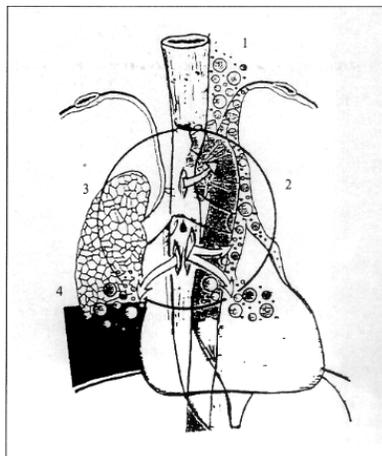


Figure 3

Necrotic perforation of oesophagus: a) restricted paraoesophageal collection; b) extravasation of contrast in the right pleural cavity

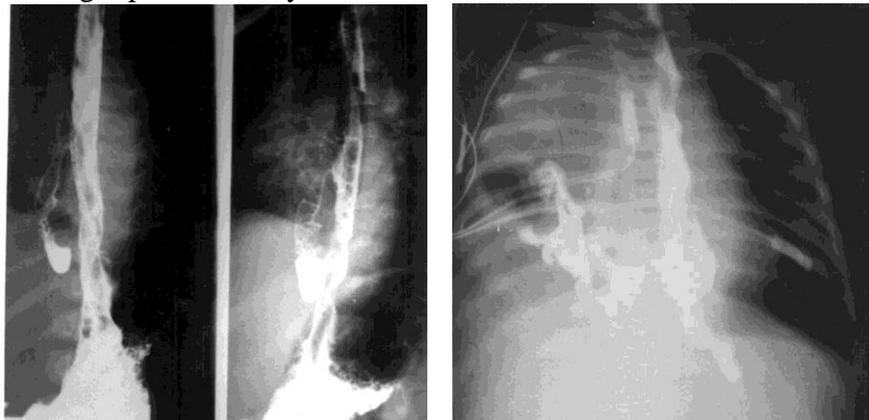


Figure 4

Diffuse periesophagitis: a) bilaterally enlarged mediastinal shadow; b) enlargement of the mediastinal shadow on the right-hand side

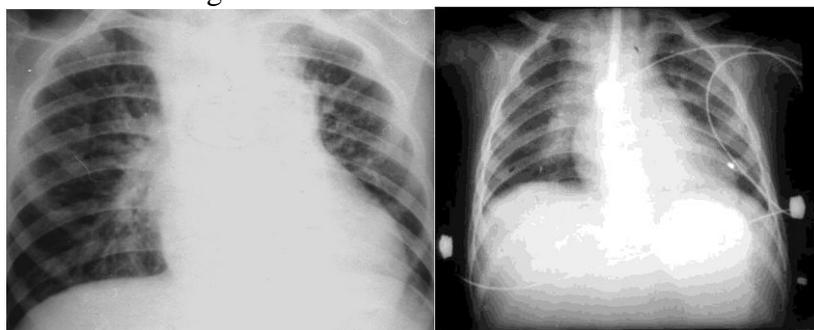
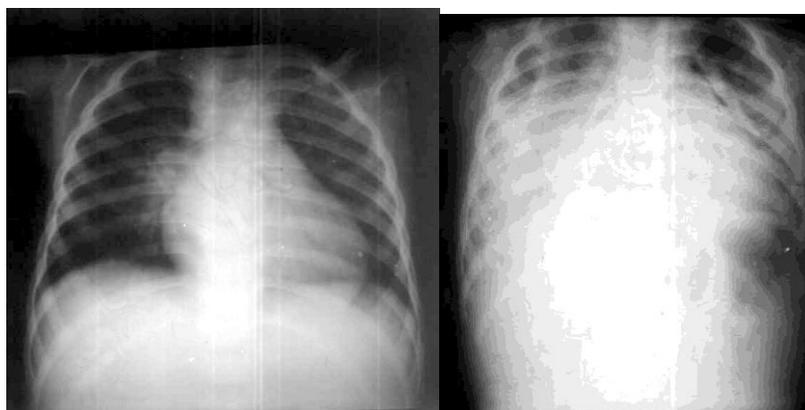


Figure 5

Descending mediastinitis: a) radiography on the day of admittance; b) enlargement of the mediastinal shadow on the 2nd day of the inflammatory process;



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