



The Diagnostics and Treatment of Acute Mediastinitis – Single Institute Experiences

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Abstract

Introduction: Acute mediastinitis is diffuse purulent inflammation which is spread in mediastinal connective tissue. It is caused by polymicrobial infection. Most frequently it originates by descendent spreading of odontogenic or peritonsillar infection or by contamination from perforated oesophagus.

Materials and Methods: We treated 54 patients diagnosed with acute mediastinitis between 1.1.2007 and 31.12.2018. In this array were 36 men and 18 women. We followed ethiology and length of anamnesis, microbial specter, way of treatment and its results.

Results: Descendent spreading from the neck was the cause of acute mediastinitis in 61% of patients. 32% of patients suffered from mediastinitis after perforation of the oesophagus. We did not clarify the origin of acute mediastinitis in 7% of patients. Length of anamnesis was between 0 and 14 days. Microbial specter was constituted from G+ bacteria in 57%, in 32% from G-respectively and the yeast-cells in 11%. Each patient underwent 3 surgical operations on average. Deep neck spaces drainage was performed in 18 cases, in 26 cases was performed collar mediastinotomy. Six patients underwent isolated chest drainage. We performed thoracotomy in 18 patients, thoracophrenolaparotomy in 5 patients. Inpatient treatment took 34 days on average. 15% of the patients died due to acute mediastinitis.

Conclusion: Despite modern diagnostic methods and early surgical treatment is acute mediastinitis still a life-threatening disease. Early diagnosis of acute mediastinitis is necessary for successful treatment. Surgical treatment must be aggressive and extensive. The treatment is performed in cooperation of surgery and intensive care.

Keywords: Mediastinitis, Mediastinal infection, Descendent mediastinitis

Introduction

Acute mediastinitis is a diffuse inflammation which is spread in a mediastinal loose connective tissue [1]. For the first time, it was described by Pearse in 1938 [2]. In most cases, the inflammation is caused by polymicrobial infection [1,3]. In most cases, mediastinitis comes from upper gastrointestinal tract perforation as an iatrogenic perforation by endoscopy, by anastomotic leakage after operations on the oesophagus, after perforation by an ingested foreign body or after strenuous vomiting within Boerhaave syndrome [4,5]. Next possibility of acute mediastinitis formation is descending way in case of odontogenic or peritonsillar infection [6,7]. We call these cases as a descending necrotizing mediastinitis or cervico-mediastinal necrotizing fasciitis [8]. Descending necrotizing mediastinitis occurs circa in 5, 1 cases per 1 million in a year [9]. Spreading of an infection from the chest wall or from adjacent lung parenchyma can be also the cause of acute mediastinitis. Finally, the acute mediastinitis can occur as a result of surgical procedures in the mediastinum. This kind of acute mediastinitis comprises 1% to 2.65% of all cases [10]. Acute mediastinitis may also occur on the grounds of penetrating injury of the chest. Exceptionally there are cases, when the mediastinitis is a consequence of hematogenic bacterial super infection after infectious mononucleosis or as a complication of many immuno deficiencies for example such as hyper immuno globulinemia E [11,12].

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Materials and Methods

In our study, we included 54 patients, which were treated due to acute mediastinitis in our hospital between 1st January 2007 and 31st December 2018. We excluded patients with acute mediastinitis after cardio surgical procedures.

The average age of our patients was 56.5 years (range between 20 and 85 years). The array was comprised of 36 men and 18 women.

We followed etiology and the length of anamnesis, cultivation of the microbes, way of treatment and its result. We followed also 30-days mortality.

Results

Summary of acute mediastinitis etiology in our array is described in the attached table (Table 1).

The average length of anamnesis was 3.2 days; however, the range was 0 to 14 days. The anamnesis was very short for patients suffering from the iatrogenic cause of mediastinitis.

The cultivated specter of microbes is shown in the graph (Figure 1). *Staphylococcus* sp. and *Streptococcus* sp. were the most frequent microbes cultivated in G-positive group. In G-negative group were the most common microbes *Fusobacterium* sp., *Enterobacterium* sp. and *Prevotella* sp. *Candida* sp. dominated in the group of yeasts.

In the average, we performed 3 operations in one patient. The count of surgical procedures is described in table (Table 2). If needed, these procedures were extended by the treatment of the primary site of infection. In 20 cases deep neck spaces drainage were performed by the dental surgeon. Seven patients underwent tonsillectomy and one patient underwent closure of communication between the pharynx and retropharyngeal space. Both procedures were performed by an otorhinolaryngologist. Extraction of decayed teeth was done on two patients. Laparotomy with abdominal cavity drainage was performed in 3 patients as a solution of specific cases of dehiscence anastomosis after the operation on the oesophagus. Other procedures were used rarely. Sternoclavicular joint resection, axillar exenteration resp. evacuation of necrotic tissues of the neck was performed identically one time. Thirteen patients underwent insertion of an oesophageal stent to the covering of pinhole perforation either as a single

Table 1: Etiology of acute mediastinitis.

Etiology of acute mediastinitis			Percentage
Perforation	Boerhaave syndrome	10	48.1
	foreign body	5	
	Perforation of tumour	2	
	iatrogenic	9	
Descendent	peritonsillar absces	11	42.6
	Odontogenic	5	
	Inflammation of salivary gland	3	
	Necrotic lymphatic nodes	1	
	Retropharyngeal absces	2	
	Absces of M. sternocleidomastoideus	1	
Hematogenic	pneumonia	2	7.4
	infection of sternoclavicular joint	1	
	axillar phlegmone	1	
Unknown		1	1

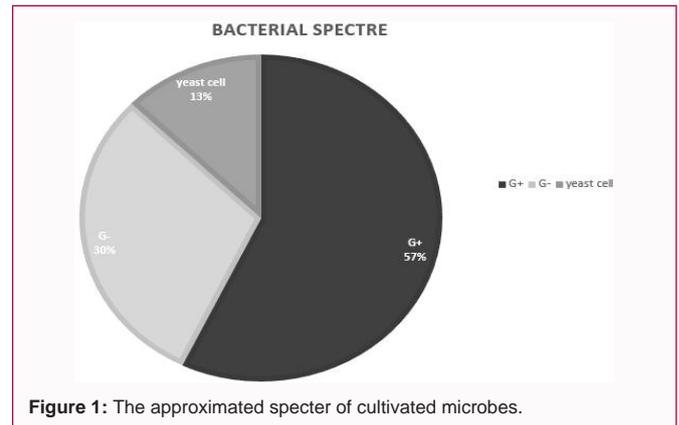


Figure 1: The approximated specter of cultivated microbes.

Table 2: Number of surgical operations.

Surgical operations	Number
Collar mediastinotomy	28
Chest drainage	7
Thoracotomy + Paravertebral mediastinotomy	22
Thoracophrenolaparotomy	8
Laparotomy	3

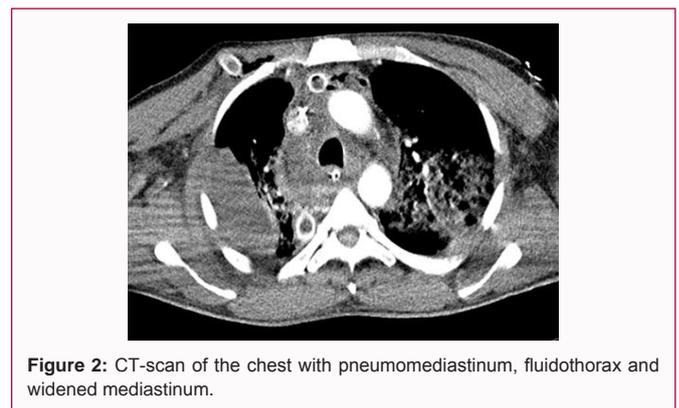


Figure 2: CT-scan of the chest with pneumomediastinum, fluidothorax and widened mediastinum.

procedure or more frequent as a completion of surgical procedure.

The average hospital stay was 39 days (range 10 to 274 days). In connection with acute mediastinitis, 10 patients died (18.5%).

Discussion

The anamnesis plays a very important role in diagnostics. According to anamnesis, we can conclude the etiology. It is necessary to keep in mind that ingestion of foreign bodies such as chicken or fish bones can cause perforation of oesophagus and then acute mediastinitis. As a Boerhaave syndrome is called the perforation of the oesophagus after strenuous vomiting. If tonsillitis or odontogenic infections are in anamnesis, we should consider descending necrotizing mediastinitis. Acute mediastinitis after iatrogenic perforation has very short anamnesis, because these patients were put in an intensive care unit immediately and adequate surgical treatment had been started. Longer anamnesis was in patients who were diagnosed in our or surrounding hospital.

Signs and symptoms depend on etiology. Descending mediastinitis as well as mediastinitis after perforation of the upper oesophagus is shown by fever, a sore throat, odynophagia, dysphagia and swelling of neck soft tissues. Another characteristic of the symptoms

is pneumocollum. It is caused by gas in neck soft tissues, which comes from bacterial metabolism or perforation of the oesophagus. Odontogenic or peritonsillar infections are specific by difficulty swallowing or opening mouth. When the infection is in progress, we can find trismus of masticatory muscles or stridor, which is caused by affliction of recurrent laryngeal nerve [13,14]. If the perforation is in the middle part of the oesophagus, retrosternal pain or pain in epigastrium can occur. Perforation near the gastroesophageal junction may lead to peritonitis. Fast progress and quick development of septic shock are common for all sorts of mediastinitis.

Laboratory signs are not specific. There are leukocytosis and elevated CRP (C-Reactive Protein) level. Signs of multiorgan failure syndrome are found within the progress of the disease. Computed tomography of neck and chest is the most important imaging method, which helps us to localize and consider inflammatory process (Figure 2). Thus, we can accomplish the surgical procedure more accurately [13,14].

In literature, there is described a wide range of age. Patients from 4 years of age to 9th decennium are presented in different articles. Both extremes are quite rare, which is confirmed by our study [1,15].

The polymicrobial specter of pathogens is typical for acute mediastinitis. Bacteria of all different classification are cultivated in every single cause. Gram positive bacteria are the most common (43% to 62%); they are followed by anaerobic bacteria (46% to 78%). Gram negative bacteria are found in a few cases [4].

Surgical treatment consists of debridement of necrotic tissues, conscientious toilette of the pleural cavity and mediastinum and insertion of drains. A study of the classification of mediastinitis was published in 1999 by Endo. Acute mediastinitis is classified by localisation and severity [16]. Patients with the inflammatory process localized strictly in deep neck spaces and upper mediastinum above the carina are in group I. If the infection is spread below the carina to lower anterior mediastinum, we are talking about group IIA. Finally, patients with inflammation in the posterior mediastinum are in group IIB. Surgical treatment depends on the spreading of the inflammation. The surgical procedure must be carried out very early and in a sufficient range. Patients in group I by Endo undergo upper mediastinum drainage through collar mediastinotomy and deep neck spaces drainage. These patients have the best survival. Riddera et al. [17] presented 85% of survival. Debridement and drainage of the anterior mediastinum are recommended for patients in group IIA by Endo. In literature, there is described the approach to anterior mediastinum through middle sternotomy, but we do not use this approach in our clinic [10,13]. If the patient is in group IIB by Endo, we perform paravertebral mediastinotomy through posterolateral thoracotomy. There are different approaches in the literature. Some authors recommend posterolateral thoracotomy, some bilateral transversal sternothoracotomy [13]. If needed, we carry out repeated revisions with additional debridement and toilette of the pleural cavity and mediastinum. Mentioned approaches are combined with deep neck spaces drainage and collar mediastinotomy according to etiology. Mini invasive methods such as video thoracoscopy are presented for the treatment of acute mediastinitis more frequently, but we do not perform this sort of procedures. We prefer open surgery regarding radicality [13,15,18]. Study with repeated usage of the hyperbaric chamber to support the healing was published by Gore et al. [19]. Rarely, covering a pinhole in the oesophagus by stent is feasible in a few cases with minimal symptomatology. But the patient

must be observed very precisely in the intensive care unit. We carry out an urgent surgical procedure in case of development of inflammation [20]. Surgical treatment is always supported by antibiotics. We use antibiotics with wide specter at the beginning. Then a modification should be accomplished after cultivation of taken samples. Of course, the patient must be observed in the intensive care unit. In most cases, intubation and mechanical ventilation are needed.

In spite of an early surgical procedure and an early beginning of the treatment, the lethality is quite high. The range is from 5.6% to 40% [1,3,15,20].

Conclusion

Although modern examination methods and early surgical treatment are accessible, the mediastinitis is still a life-threatening disease. The anamnesis of perforation or teeth or peritonsillar inflammation is necessary for the right diagnosis. The right diagnosis is supported by clinical signs and symptoms. Computed tomography plays a crucial role in the assessment of the spreading of acute mediastinitis. According to the spreading of the inflammation, we performed the appropriate surgical procedure. The early diagnosis and aggressive surgical procedure are one of the most important factors of treatment. Of course, surgical treatment is supported by wide-specter antibiotics. Patients are placed in the intensive care unit from the beginning of their hospitalization.

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References

- Mazzella A, Santagata M, Cecere A, La Mart E, Fiorelli A, Tartaro G, et al. Descending necrotizing mediastinitis in the elderly patients. *Open Med (Wars)*. 2016;11(1):449-60.
- Pearse H Jr. Mediastinitis following cervical suppuration. *Ann Surg*. 1938;108(4):588-11.
- Pota V, Passavanti M, Sansone P, Caterina Pace M, Peluso F, Fiorelli A, et al. Septic shock from descending necrotizing mediastinitis - combined treatment with IgM-enriched immunoglobulin preparation and direct polymyxin B hemoperfusion: A case report. *J Med Case Rep*. 2018;12(1):55.
- Tanaka H, Uemura N, Nishikawa D, Oguri K, Abe T, Higaki E, et al. Boerhaave syndrome due to hypopharyngeal stenosis associated with chemoradiotherapy for hypopharyngeal cancer: A case report. *Surg Case Rep*. 2018;4(1):54.
- Kopelman Y, Abu baker F, Troiza A, Herbon D. Boerhaave syndrome in an elderly man successfully treated with 3-month indwelling esophageal stent. *Radiol Case Rep*. 2018;13(5):1084-86.
- Cariati P, Monsalve-Iglesias F, Cabello-Serrano A, Laseca AV, Garcia-Medina B. Cervical necrotizing fasciitis and acute mediastinitis of odontogenic origin: A case series. *J Clin Exp Dent*. 2017;9(1):e150-2.
- Bali RK, Sharma P, Gaba S, Kaur A, Ghanghas P. A review of complications of odontogenic infections. *Natl J Maxillofac Surg*. 2015;6(2):136-43.
- Razafimanjato NNM, Ralaizafindraibe TH, Ramarolahy AR, Rajaonera TA, Rakatovao HJL. Acute descending necrotizing mediastinitis: Four years of experience at a hospital center in Madagascar. *Med Sante Trop*. 2018;28(3):297-301.
- Deu-Martín M, Saez-Barba M, López Sanz I, Peñarrocha RA, Vielva LR, Montserrat JS. Mortality risk factors in descending necrotizing

- mediastinitis. *Arch Bronconeumol*. 2010;46(4):182-7.
10. Kocher GJ, Hokschi B, Caversaccio M, Wiegand J, Schmid RA. Diffuse descending necrotizing mediastinitis: Surgical therapy and outcome in a single-centre series. *Eur J Cardiothorac Surg*. 2012;42(4):e66-72.
 11. Fuller GW, Rao JN. Fulminant descending mediastinitis secondary to infectious mononucleosis. *J Surg Case Rep*. 2018(8):rjy203.
 12. Takanashi Y, Hayakawa T, Neyatani H, Funai K. Descending necrotizing mediastinitis complicating hyperimmunoglobulin E syndrome. *Respirol Case Rep*. 2016;4(4):e00165.
 13. Sandner A, Börgermann J. Update on necrotizing mediastinitis: Causes, approaches to management, and outcomes. *Curr Infect Dis Rep*. 2011;13(3):278-86.
 14. Cruz Toro P, Castillo AC, Salto T, Compta XG, Faree A, Manos M, et al. Cervical necrotizing fasciitis: Report of 6 cases and review of literature. *Eur Ann Otorhinolaryngol Head Neck Dis*. 2014;131(6):357-59.
 15. Sumi Y. Descending necrotizing mediastinitis: 5 years of published data in Japan. *Acute Med Surg*. 2014;2(1):1-12.
 16. Endo S, Murayama F, Hasegawa T, Yamamoto S, Yamaguchi T, Sohara Y, et al. Guideline of surgical management based on diffusion of descending necrotizing mediastinitis. *Jpn J Thorac Cardiovasc Surg*. 1999;47(1):14-9.
 17. Ridder GJ, Maier W, Kinzer S, Teszler CB, Boedeker CC, Pfeiffer J. Descending necrotizing mediastinitis: Contemporary trends in etiology, diagnosis, management, and outcome. *Ann Surg*. 2010;251(3):528-34.
 18. Nakano T, Onodera K, Ichikawa H, Kamei T, Taniyama Y, Sakurai T, et al. Thoracoscopic primary repair with mediastinal drainage is a viable option for patients with Boerhaave's syndrome. *J Thorac Dis*. 2018;10(2):784-89.
 19. Gore MR. Odontogenic necrotizing fasciitis: A systematic review of the literature. *BMC Ear Nose Throat Disord*. 2018;18:14.
 20. Safranek J, Geiger J, Vesely V, Vodicka J, Treska V. Esophageal stents for less invasive treatment of mediastinitis. *WideochirInne Tech Maloinwazyjne*. 2014;9(1):1-5.