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Original Article

Experience on Diagnosis of Descending Necrotizing Mediastinitis at Viet Duc Hospital

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Abstract ***Background:*** **Descending Necrotizing Mediastinitis (DNMs) are rare and are serious infections with a high mortality rate which complicates from pharyngeal, odontogenic infection or esophageal perforation. Early recognition and treatment are essential in order to minimize morbidity and mortality. Evaluation with imaging diagnosis, especially with computed tomography is necessary to confirm the diagnosis, and facilitate surgical planning. It is an important diagnostic method showing widened mediastinum, air-fluid level in mediastinum and subcutaneous crackling. Estrera's criterias could be implemented for diagnosis of DNMs. We present one serie of 19 cases diagnosed with DNMs, with characteristic imaging findings. From this study we found that most of DNMs in Vietnam are commonly caused by esophageal perforation and we recommend to perform fibro-gastroendoscopy associated with CT for purposes of diagnosis and intervention. It also helps to locate the esophageal perforation.**

Keywords: **Descending necrotizing mediastinitis, esophageal perforation; Ludwig's angina**

Introduction

Descending Necotizing Mediastinitis (DNMs) are rare infections, associated with a mortality rate as high as 50%, they can be a serious and life-threatening complication. The patients died due to serious infections resulting in multiple organ failure, or due to serious bleeding. Careful clinical examination and radiological evaluation are of great value because timely surgical intervention and medical management are required[1,2,3].

The most common cause of DNMs is an esophageal perforation due to foreign bodies or iatrogenic such as endoscopic procedures, or Boerhaave's syndrome. In addition, a retropharyngeal abscess is a common pathological condition that is caused by an acute infection of the throat, a dental abscess or a chronic infection, such as those occurring in patients with a tuberculous cervical spine. In almost all cases the patients should be treated surgically on emergency, associated with antibiotic therapy and resuscitation. However, the diagnosis needs to be established as soon as the patient is admitted in order to facilitate the

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treatment planning and prevent the onset of death[3,4,5]. Aim of this paper is to review the patients diagnosed with DNMs, that have been treated at Viet Duc Hospital to share experience on its diagnosis which could help to manage on time, in order to reduce the morbidity and mortality.

Material and Methods

A retrospective study of all DNMs which were diagnosed and treated at Viet Duc Hospital during two years of 2013- 2014, including death, was performed. The patient records as well as the autopsy reports were reviewed.

The information collected included gender, age, medical history, clinical features as well as laboratory examination, x ray, endoscopy.

Diagnosis of DNMs was according to criteria of Estrera AS[5] developed in 1983 which includes:

- Clinical manifestation of serious infections,
- Demonstration of characteristic imaging features of mediastinitis,
- Documentation of necrotising mediastinal infection at surgery or postmortem,
- Establishment of a relationship between the oropharyngeal infection and development of a necrotizing mediastinal process.

Classification according to the degree of diffusion of infection diagnosed by computed tomography, introduced by Endo S (1999)[6], includes three following types:

- Type I: Infection is localized to the upper mediastinal space above the carina.
- Type IA: Infection is extended to the lower anterior mediastinum.
- Type IIB: Infection is extended to both anterior and posterior lower mediastinum

Table 1 Clinical features and x-ray examinations

No.	Age	Gender	Causes	X Ray examination (CTscanner)
1	37	M	Ludwig's angina due to dental abscess	widened mediastinum, air-fluid level in mediastinum, pleural effusion
2	27	M	Esophageal perforation from chicken bone	air-fluid at cervical level and widened mediastinum
3	24	F	Esophageal perforation from chicken bone	foreign body with widened mediastinum, air-fluid level
4	75	F	Esophageal perforation from chicken bone	foreign body, widened mediastinum, air-fluid level, associated with pleural effusion
5	35	M	Iatrogenic esophageal perforation	widened mediastinum with air-fluid level
6	64	M	Tonsillitis caused Ludwig's angina	widened mediastinum, air-fluid level in mediastinum, pleural effusion
7	45	M	Ludwig's angina due to cervical lymph node abscess	air-fluid level in mediastinum, pleural effusion
8	51	M	Esophageal perforation from chicken bone	air-fluid level in both cervical and mediastinal areas
9	51	M	Esophageal perforation from chicken bone	air-fluid level in mediastinum, pleural effusion
10	71	M	Esophageal perforation from chicken bone	air-fluid level in mediastinum
11	59	F	Esophageal perforation from chicken bone	air-fluid level in mediastinum, pleural effusion
12	26	M	Esophageal perforation from chicken bone	air-fluid level in mediastinum, widened mediastinum
13	26	F	Retropharyngeal abscess caused Ludwig's angina	air-fluid level in mediastinum
14	47	M	Esophageal perforation from cervical spine implant	air-fluid level in mediastinum
15	65	M	Esophageal perforation from chicken bone	air-fluid level in mediastinum
16	51	M	Ludwig's angina from throat abscess	air-fluid level in cervical and mediastinal areas
17	41	M	Ludwig's angina from throat abscess	widened medistinum and pleural effusion
18	52	M	Esophageal perforation from chicken bone	air-fluid level in mediastinum
19	34	M	Esophageal perforation from fish bone	air-fluid level in mediastinum

Table 2 Clinical examinations

Signs	N	%
Fever, odeur breathing	19	100
Cervical swelling, inflammation	15	78.9
Subcutaneous crackling	10	52.6
Dyspnea and chest pain	9	47.4

Blood examinations: 100% with white blood cell counts above 10,000/ mm^3 in 85,6%.

Table 3 Classifications

Classifications	N	%
Type I	8	42.1
Type IIA	6	31.6
Type IIB	5	26.3
Total	**19**	**100**

Based on the results of CT scanner, the DNMs type I and type IIA were commonly in this series.

Table 4 Location of esophageal perforations

Locations	N	%
1/3 Superior	6	46.1
1/3 Medium	4	30.8
1/3 Inferior	3	23.1
Total	**13**	**100**

Exclusions

For patients who had no operation, either autopsy check should be excluded from study.

Results

The study included 19 cases, diagnosed with DNMs. There were 4 female patients and 15 male patients, average age was 54,6 ± 6,7 years.

The perforation locations were mostly in 1/3 superior of esophagus.

The fibro-endoscopy was performed on emergency and foreign bodies found in place for 9/13 patients.

All the patients were operated, however, three of them were released to die at home, accounting to 15.8%.

Discussion

Since the first case of DNMs was described by Pearse HE in 1938, it was considered as a severe infection of the connective tissue of the neck spreading downward that can develop into a highly lethal complication. Almost all the first cases reported, were caused by retropharyngeal or dental abscess spreading downward to the neck, namely Ludwig's Angina. From the neck, the infection spreads downward to the mediastinum and causes medistinitis or mediastinal abscess. However, today the primary cause of DNMs is esophageal perforations from foreign bodies or less common due to iatrogenic perforation. Despite modern therapy, DNMs are still associated with a high mortality, with reportedly ranging from 14% to 50%. It has several causes such as: time delay between the onset of the primary infection and the date of hospitalization, the extent and aggressiveness of the infection, and the pre-existing clinical status of the patient as well as delayed diagnosis[1,2,4,5].

As above mentioned, the delayed diagnosis could cause the delay of proper treatment, resulting in high morbidity and mortality. Immediate diagnosis significantly reduces the mortality rate. Lacking of knowledge and facilities, DNMs have conferred a very poor prognosis. Thus, we would like to discuss about the diagnosis of DNMs based on the criteria of Estrera.

1. Establishment of a relationship between the oropharyngeal infection and development of a necrotizing mediastinal process.

In the past DNMs were commonly caused by oropharyngeal infections, nowadays the common cause is the esophageal perforation. Pearse et al. collected a serie of 110 cases of DNMs, finding that 64 cases (58.2%) of DNMs were related to an esophageal perforation, while 21 cases (19%) were caused by buccopharyngeal or dental abscess. The main reason for esophageal perforation was due to swallowing of foreign bodies, only rarely it was iatrogenic. Some authors have reported the postemetic rupture of the esophagus, known as Boerhaave's syndrome[6,7,8].

In the study of N. D. Chinh et al.[9] (2001) 56 cases of DNMs were collected, of them there were 51 cases caused by esophageal perforation (91%), the majority of them due to swallowed chicken bones (92,2%).

In our series, 10/13 (76.9%) esophageal perforations were caused by chicken bones, one caused

by a fish bone, one due to iatrogenic fibro-endoscopy and one was complicated from cervical spinal instrumentation. Another six cases were caused by buccopharyngeal infections. In total there were 13/19 of esophageal perforations (68,4%). This statistic was the same as other reports[6,9].

2. Clinical manifestation of serious infections

Clinical signs of a serious infection such as fever, chest pain, leukocytosis, and a high blood sedimentation rate are important clues for DNMs, especially in cases of delayed hospitalization. Some clinical manifestation of serious infection such as severe dyspnea, tachycardia, high fever suggested septic shock and a high risk of death. Physical examination revealed local swelling or inflammation, cervical subcutaneous crackling with bad odour breathing[1,5,6].

In our study high fever and bad odour breathing were found in 100% of the cases, neck swelling in 78.9 %, subcutaneous crackling in 52.6%, dyspnea in 47.4 %. Laboratory examination shows leukocytosis 100%, with white blood cell counts above 10,000/mm^3 in 85.6%.

3. Characteristic imaging features of mediastinitis

According to Dolikay[1], DNMs is a highly lethal complication. Careful clinical examination as well as x-ray study based on the characteristic imaging features of mediastinitis could help to establish early diagnosis and to give proper interventions, which reduce the mortality. Imaging examination includes:

Ultrasound: Findings of neck tissues edema, air-fluid or abscess, subcutaneous air, foreign bodies or local pathology such as cancer and adenopathy. However, this examination could only be used in the cervical areas or neck. If the infection is spreading down to the mediastinum this method is not useful.
Plain chest radiographs: Easy to perform, however they do not seem to be suitable for accurate diagnosis because they lack sensitivity as well as specificity even conventional radiographs may demonstrate retro-pharyngeal soft tissue swelling, widening of mediastinal shadow, gas bubbles in the soft tissues of the neck, pneumomediastinum which could in turn prompt further evaluation by CT to confirm.

Computed tomographic scanning: CT imaging to visualize soft tissue and potential spaces in the neck and chest is typically obtained following IV administration of an iodine-based contrast. CT evidence of mediastinitis includes localized mediastinal fluid collection or abscess, gas bubbles in the mediastinal soft tissues, pleural or pericardial effusion, sometimes with venous thrombosis and lymphadenopathy. Diffuse mediastinitis may be seen, characterized by increased density of the mediastinal fat with resultant loss of definition of normal fat planes. Mediastinal abscess is diagnosed based on the presence of a well-defined low-attenuation fluid collection with or without air, which may demonstrate rim enhancement following contrast administration. In addition, to confirm a diagnosis of DNMs and to detect complications, CT assessment of the extent of infection would aid in determining optimal management and can assist in surgical planning and in assessing response to therapy[10,11,12].

In our series, all the patients (100%) were checked by both plain chest radiographs and CT examination

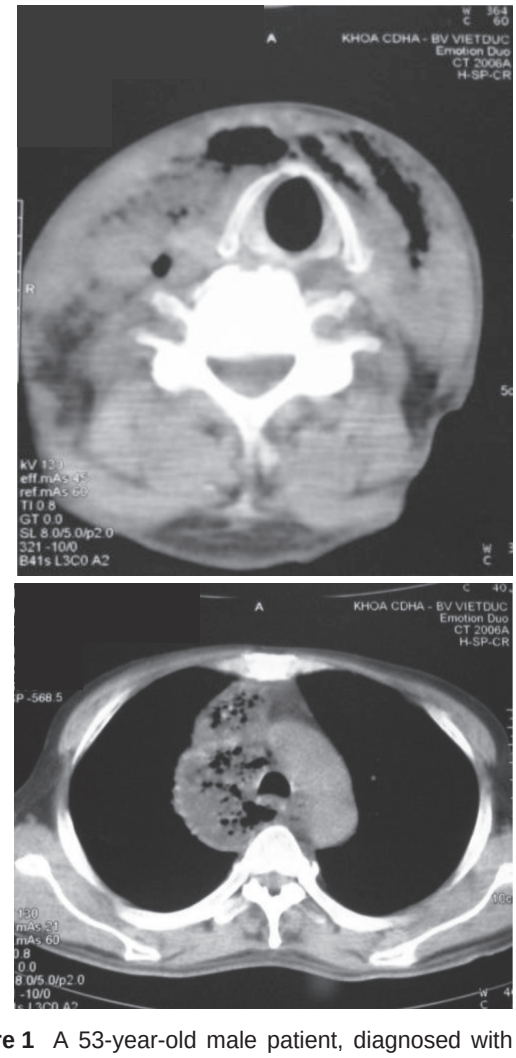

Figure 1 A 53-year-old male patient, diagnosed with DNMs due to cervical esophageal perforation

with contrast administration. This examination confirmed the DNMs, assisting to make the surgical planning as well. Also this examination was helpful to show out the location of abscess, to guide us the procedures as well as drainage anterior, posterior or video-assisted thoracotomy.

Fibro-gastroendoscopy: Nowadays as the common cause of DNMs is esophageal perforation from foreign bodies, fibro-gastroduodenoscopy on emergency could aid to accurate the esophageal lesion and to remove the foreign bodies. On the other hand, if the foreign bodies were suspected on imaging examination, the endoscopy could be used to double-check. In the study we performed this examination on emergency and found nine cases with foreign bodies in place.

Although this procedure was not mentioned in the criteria of Estrera, it seems to be helpful in conditions comparable to Vietnam where the commonly cause DNMs is esophageal perforation.

4. Documentation of necrotising mediatinal infection at surgery or postmortem

Although the surgical approaches, together with comprehensive care management, have improved mortality, complications of DNMs can be severe. The surgeries could assess the lesions and its management, also confirm the DNMs[9,10,11]. All 19 patients underwent the surgery on emergency and the DNMs were confirmed. The lesions were found as suggested in the x-ray images.

Conclusion

Clinicians must be aware of the possibility of DNMs in patients with suspected esophageal perforation (due to foreign bodies as chicken bone, or after endoscopy examination) or a banal oropharyngeal abscess that is associated with persistent fever, neck swelling and pain. Clinically suspected DNMs should be evaluated and checked carefully with imaging examination, especially CT with contrast administration. It could help to establish the diagnosis and to make treatment planning. Estrera's criteria could be implemented for diagnosis of DNMs. Because most of DNMs in Vietnam are commonly caused by esophageal perforation, we recommend to perform fibro-gastroduodenoscopy for purposes of both diagnosis and intervention.

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