

# Bacteriology and the Antibiotic Therapy of the Descending Necrotizing Mediastinitis Caused by Esophageal Perforation on Emergency at Viet Duc University Hospital.

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## Abstract

**Purpose:** Descending Necrotizing Mediastinitis (DNMs) caused by perforation of the esophagus has been known as the life-threatening infection. Aim of this paper is to analyze the bacteriology isolation and the antibiotic use.

**Materials and Methods:** A prospective and retrospective study of cases diagnosed DNMs due to perforation of the esophagus were treated in Viet Duc hospital from 1/2016 to 3/2019 including the deaths and discharged to die. The diagnosis criterias of DNMs was based on Estrera (1983) standard. The database was collected and analysed by SPSS.20.0. The proposal of study was approved by the scientific committee of hospital.

**Results:** A total of 40 cases, man and women were 4,7:1, mostly ages were between 36 and 60 years old in 60%. Esophageal perforation caused by bone is in 88,5%. Location esophageal lesions: 1/3 upper in 57,5%, 1/3 middle in 22,5 % and 20 % accounted for one third lower part. With regard to type of this condition, 55% was found typeI, 45% type IIb, however, no typeIIa was observed.

**Bacteriology isolation:** 24/40 (60%) isolated were bacteria and fungi, 100% combines both anaerobic and aerobic, in which Gram (+) aerobic bacteria predominantly contributed 75,9%, composed of 37,5% *Streptococcus species*, 20,8% *Enterococcus faecalis*, 20,8% *Acinetobacter Baumanii*. Gram (-) aerobic accounted for 17.2%, commonly were *Klebsiella pneumonie* 12.5%, *Pseudomonas aeruginosa* 12,%; Gram (+) anaerobic: *Peptostreptococcus* accounted for 8.3%; Fungi was isolated in 6/24: 25%.

**Antibiotic used:** Cephalosporin (3 rd generation) and Carbapenem combined with Metronidazole (100%), suitable with results of antibiogram.

**Outcomes:** Postoperative complications were 7 cases (17,5%). Mortality was 3 cases (bleeding+ toxic infectious shock and multiple organ failure) accounted for 7,5%.

## Conclusions:

Microbiological characteristics in the study showed that the combination of anaerobic and aerobic isolated were 100%, in which the aerobic Gram (+) was the majority. Experienced use with the first antibiotic Cephalosporin (3rd generation) and Carbapenem strong and broad spectrum combined with Metronidazole is effective.

**Keywords:** Perforation of the esophagus; Mediastinal abscess; Descending Necrotizing Mediastinitis

## 1.Introduction

Descending Necrotizing Mediastinitis (DNMs) was first described in 1938 by Pearse HE [1] as a serious infectious regional association at neck area spreading to chest, and death mostly due to untreated. In 1938 Estrera AS [2] gave the criteria for the diagnosis of ARB still applied to this day. Despite progress in treatment and resuscitation so far, mortality is as high as 60% in a number of reports. The patient died mainly from severe infections or acute bleeding due to damage to large



vessels. Infectious control in DNMs need proper attention apart from emergency surgery for purulent drainage [1-3].

In Vietnam nowadays, there are not many studies on DNMs. Some studies by Nguyen Duc Chinh et al at Viet Duc hospital (2001 and 2017) [4], Nguyen Cong Minh (2014) at Cho Ray hospital, overall mortality ranges from 17% to 35% [5]. However, not so many in-depth studies on DNMs are particularly related to microbiological and antibiotic treatment, so the main purpose of this study was to learn the microorganisms isolated and the antibiotic treatment strategies.

## 2. Subjects and Methodology

### 2.1. Objects and Research Methods

#### Subjects

Patients diagnosed with DNMs due to perforation of esophagus are treated at Viet Duc hospital, including death, from 2016 to 2019, regardless of age.

#### Selection criteria:

Criteria diagnosis of DNMs according to Estrera (1983) [2]:

Classification according to Endo S (1999) [6]:

Sample size: all patients during the study period were enrolled,

#### Exclusion criteria:

The cases of DNMs are not caused by esophageal perforation.  
Died without surgery or forensic examination

### 2.2. Research Methods

Retrospective combined with prospective study, clinical description, vertical follow-up, no comparison.

Design medical records to collect information

Cultured microorganisms are identified by the automatic method  
Antibiotic therapy by experience and by antibiogram results.

## 3. Results

### 3.1. Some clinical and subclinical features

Relationship between ages and sex are shown in the table 3.1

Ages Gender	≤15	16-25	26-35	36-45	46-60	> 60		
							n	%
Male	3	1	2	7	13	7	33	82.5
Female	0	1	0	1	3	2	7	17.5
n	3	2	2	8	16	9	40	
%	7.5	5	5	20	40	22.5		100,0

**Table 3.1:** Characteristics related to age and sex

**The cause of perforation by injuries:** The majority of injuries account for 70% (28/40), the pathology is 30%, and there is no cause of medical intervention.

In the cause of foreign bodies, the main bones are 23/26 accounting for 88.5%, of which chicken bones are 12/23 (52.2%), fish bone are 9/23 (39.1%).

**The cause of perforation by pathology:** Boehaave mainly

accounts for 5/12, unknown 4/12.

### Classification according to Endo S

Description	N	(%)
Type I	22	55
Type IIa	0	0,0
Type IIb	18	45
Total	40	100,0

**Management:** one by preservative treatment; 39 by emergency surgical interventions

**Table 3.2:** Classification by Endo S

The procedures were drainage 82.1%, chest opening 17.9%. Drainage includes: cervical drainage 40.6%; Chest Drainage 31.2%, Neck Drainage + Chest 28.1%. Open chest 7/39 including open surgery (05) and Video Assisted Thoracotomy (02)

### 3.2. Microbiological test results:

**24/40 cases of microbial isolation, accounting for 60%**

Microorganism	n	%
<b>Aerobic Gram (+)</b>		
<i>Streptococcus species</i>	9	37,5
<i>Enterococcus faecalis</i>	5	20,8
<i>Acinetobacter Baumanii</i>	5	20,8
<i>Staphylococcus Epidermidis</i>	3	12,5
<b>Aerobic Gram (-)</b>		
<i>Klebsiella pneumonie</i>	3	12,5
<i>Pseudomonas aeruginosa</i>	2	8,3
<b>Anaerobic Gram (+)</b>		
<i>Peptostreptococcus</i>	2	8,3

**Table 3.3:** Microbiological isolation results

**The bacteria can only be isolated once including:** *Streptococcus contell*, *Streptococcus angiosus*, *Streptococcus mitis*, *Staphylococcus aureus*, *Acinetobacter*, *Burkholderia cepacia*, *Enterococcus*, *Citobacter diversus*, *Prevotella intermedia anaerobic*.

Fungi was isolated in 6/24 accounting for 25%.

**Antibiogram:** In addition to *Staphylococcus Epidermidis*, which is not drug resistant, the bacteria isolated are resistant, in which *Acinetobacter baumanii*, *Citobacter*, *Burkholderia cepacia*, and *Peptostreptococcus* are resistant to many.

### 3.3. Outcomes



### Antibiotic therapy:

	n	%
Metronidazol + Cephalosporin	16	40
Metronidazol + Cephalosporin + Quinolon	5	12,5
Metronidazol + Carbapenem + Quinolon	2	5
Metronidazol + Carbapenem + other	15	37,5
Metronidazol + Cephalosporin + Quinolon + other	2	5
Total	40	100

**Table 3.4:** Antibiotic used by experience

These antibiotics were used firstly by experience. However, the results of the antibioticgram were shown that they were not resistant and continued to be used.

**Complications:** 7/40 postoperative complications were noted, accounting for 17.5%

Description		n = 7	%
Surgical site bleeding		3	5
Multiple organ failure		1	2,5
Infection shock		1	2,5
Gastrostomy fistula		2	10

**Table 3.5:** Postoperative complications

**The mortality was noted in** 3/40, accounting for 7,5% including one serious bleeding from large vessal injury, one septic shock, one multiple failure.

## 4. Discussion

### 4.1. Some characteristics of objectives

**Age:** The mean age of patients with DNMs in our study was 56.3 ± 8.6, while in the study of other authors Ricardas J was 55.3 ± 15.4, Sofia Arizaga was 40 years old. Thus, the age of patients in our study is older [4.7].

**Gender:** In our study, men account for 4.7: 1 higher than women, consistent with other authors such as Ricardas J is 2.7: 1, Nguyen Duc Chinh 3: 1. [7-9]

The causes of perforation: Most of international authors have reported that the iatrogenic esophageal perforation accounted for

70%. Amudhan A's study of 726 long-term patients from 1990 to 2003 [10] in India showed that esophageal perforation by medical intervention accounted for 19% (about 7% to 33%), trauma accounted only for about 7% (from 0% - 33%), of Gupta NM [11] accounts for 70% due to medical intervention. In our study, the leading cause of trauma accounted for 70%, especially the cause of bones injured accounted for 88.5%, no case related to medical intervention. In the study of Nguyen Duc Chinh [4], there were 02 related cases after the cervical spine vis-brace surgery. Thus in Vietnam, the rate of iatrogenic esophageal perforation is very low, but it can occur, it is necessary to pay attention to the spine surgery with implant.

Management: one preservative treatment; 39 were treated surgically on emergency Including drainage 82.1%, chest opening 17.9%.

Drainage includes: cervical drainage 40.6%; Chest drain 31.2%, Neck + Chest drainage 28.1.

### 4.2 Microorganisms

According to F. ethui, Nguyen Duc Chinh [9,12] bacteria isolated are 100% poly-bacteria, combining both aerobic and anaerobic, no case of isolating only one bacteria. The results of microbiological examination help physician to have appropriate antibiotic treatment strategies.

According to Luis Marcelo (2003) [13] the most common bacteria are throat *hemolytic streptococci* (*beta-hemolytic oral Streptococcus*). Other common bacteria are *Prevotella*, *Peptostreptococcus*, *Fusobacterium*, *Veillonella*, *Actinomyces*, *Bacterioides*, *Staphylococcus*, *alpha-hemolytic Streptococcus*.

In the study of Weaver E (2010) [14] microorganisms combine both anaerobic and aerobic and are the most common oral group, in which aerobic is *hemolytic streptococcus alpha haemolytic Streptococcus*, *Staphylococcus aureus*, *Klebsiella pneumonia*. The common anaerobic bacteria are *Peptostreptococcus*, *Bacteroides fragilis*, *Prevotella Porphyromonas*. In the study of Muhammad Arza (2016) [15], the main bacteria isolated were *Pseudomonas aeruginosa*, *Enterobacter aerogenes*, *Acinetobacter baumannii*. According to Ochi N (2018) [16] Gram (+) bacteria isolated were *Streptococcus pyogenes*, *Streptococcus constellatus*, *Fusobacterium necrophorum*, and *Peptostreptococcus sp*.

In our study, the combination of both aerobic and anaerobic microorganisms was 100%. (Table 3.3). In 24 positive cases: 10 patients had one bacteria, 9 patients combined 2 bacterias (including 8 patients with a combination of anaerobic bacteria *Peptostreptococcus*), 4 patients combined 3 bacterias, one patient has 4 types of pathogenic bacteria.



The study of microorganisms in our series is also consistent with the authors showing that pathogenic microorganisms are a combination of both aerobic and anaerobic (100%). Gram (+) aerobic bacteria accounted for the majority of 75.9%, the most was *Streptococcus species* 37.5%. Anaerobic bacteria Gram (-) accounted for 17.2%, the most was *Klebsiella pneumoniae* accounting for 12, 5%, *Pseudomonas aeruginosa* 12,%. Gram (+) anaerobic bacteria: *Peptostreptococcus* accounts for 8.3%.

### 4.3. Antibiotic treatment

Septic shock is one of the high risk factors for death. Reported by Nguyen Cong Minh (2012) [5] all cases of DNMs with septic shock were fatal. The antibiotic treatment must be early and the antibiotic is broad spectrum, but the result of late culture should be used by experience. Nguyen Duc Chinh (2015) [4] reported the mortality 16.7%, due to serious bleeding and septic shock (multi-organ failure) despite taking early and strong antibiotics once at admission. According to S. Diamantis [17] when the results of microbiological studies were not available, the authors recommended using intravenous antibiotics starting with vancomycin and unasyn. Ochi N [16] and Japanese colleagues suggested that the first choice antibiotic was 600 mg clindamycin bid and 4. 5 g of tazobactam / piperacillin hydrate intravenously and most patients were well controlled the infection.

Our study results showed that in addition to *Staphylococcus Epidermidis*, which is not drug resistant, the isolated bacteria are resistant to drugs, in which *Acinetobacter baumannii*, *Citobacter*, *Burkholderia cepacia*, *Peptostreptococcus* were resistant to many antibiotics. The experiences with the ultimate combination of strong and broad-spectrum antibiotics, Cephalosporin (3rd generation) and Carbapenem, and Metronidazole have been shown to be all effective and we found that it was not necessary to change antibiotics compared with antibiotic results later (Table 3.4).

### 5. Conclusion

Microbiological characteristics in the study showed that the combination of anaerobic and aerobic isolated were 100%, in which the aerobic Gram (+) was the majority. The experiences with the ultimate combination of strong and broad-spectrum antibiotics, Cephalosporin (3rd generation) and Carbapenem, and Metronidazole have been shown to be all effective.

**Conflict of interest: none**

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