Atypical Pneumonia in the ICU

Essay

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Abstract

Introduction: Diseases like bronchitis, bronchiolitis and pneumonia are infections of the lower respiratory tract. These can be severe or fatal, especially pneumonia.

Inflammation of the lung parenchyma, i.e. pneumonia, is a leading cause of hospitalization and death among adults. It remains one of the most common infectious reasons of intensive care unit admission.

Aims: The aim of this essay is to discuss the pathogenesis, clinical presentation and management of atypical pneumonia in the intensive care unit.

Summary: The lungs are the essential organs of respiration. The pleura is a serous membrane arranged as a closed invaginated sac. The visceral or pulmonary pleura adheres closely to the surface of the lung and its interlobar fissures. Its continuation, the parietal pleura, lines the corresponding half of the thoracic wall and covers much of the diaphragm and structures occupying the middle region of the thorax.

Respiration includes two processes: external respiration, the absorption of O_2 and removal of CO_2 from the body as a whole; and internal respiration, the utilization of O_2 and production of CO_2 by cells and the gaseous exchanges between the cells and their fluid medium.

Treatment is started with empirical antibiotics. Recommendations include macrolides (clarithromycin/ azithromycin), fluoroquinolones, Rifampicin, erythromycin, doxycycline, tetracyclines, or Telithromycin. Macrolides are still the most well tolerable, complied drug.

Conclusion: Common complications of pneumonia include pleural effusion, empyema, lung abscess, and metastatic infection. Many actions can help in the prevention of pneumonia including smoking cessation, reporting the important cases to the state or local health organization, and applying general hygiene methods.

Keywords: Atypical Pneumonia, Pathogenesis, ICU

Contents

List of Abbreviations

A-a	Alveolar-arterial
ALT	Alanine Transaminase
ARDS	Acute Respiratory Distress Syndrome
AST	Aspartate Transaminase
BPG	2,3-bisphosphoglycerate
BUN	Blood Urea Nitrogen
C	Celsius
C. burnetti	Coxiella burnetii
C. pneumoniae	Chlamydophila pneumoniae (formerly: Chlamydia pneumoniae)
C. psittaci	Chlamydophila psittaci (formerly: Chlamydia psittaci)
CA-MRSA	Community-associated Mecithillin-resistant Staph aureus
CAP	Community-acquired Pneumonia
CF	Complement Fixation
CFA	Complement Fixation Assay
CHF	Congestive Heart Failure
Cm	Centimetre
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COPD	Chronic Obstructive Pulmonary Disease
CPD	Chronic Pulmonary Disease
CPK	Creatine Phosphokinase
CRP	C-reactive Protein
CSF	Cerebrospinal Fluid
CURB-65	Confusion, Urea, Respiratory Rate, Blood Pressure, Age >65
CXR	Chest X-ray
CYE	Casitone Yeast Extract

DFA	Direct Fluorescent Antibody
dL	Decilitre
DNA	Double-stranded Nucleic Acid
DPPC	Dipalmitoylphosphatidylcholine
DRG	Dorsal Respiratory Group
E. coli	Escherichia coli
EIA	Enzyme Immunoassay
ELISA	Enzyme-linked immunosorbent assay
et al.	(Et alia, Latin) And Others
F. tularensis	Francisella tularensis
FiO_2	Fraction of Inspirated Oxygen
G	Gram
GBS	Guillan-Barré Syndrome
H. Influenza	Haemophilus influenza
H^+	Hydrogen Ion
H_2CO_3	Carbonic Acid
Hb	Haemoglobin
HCO_3^-	Bicarbonate Ion
Hg	Mercury
HIV	Human Immunodiffeciency Virus
i.e.	(id est, Latin) That Is
ICU	Intensive Care Unit
IFA	Indirect Immunofluorescence Assay (Indirect Fluorescent Antibody)
IgA	Immunoglobulin A
IgG	Immunoglobulin G
IgM	Immunoglobulin M
Kg	Kilogram
L. pneumophila	Legionella pneumophila
Lb	Pound
LDH	Lactate Dehydrogenase

M. pneumoniae	Mycoplasma pneumoniae
M. tuberculosis	Mycobacterium tuberculosis
mEq	milliequivalent
min.	Minute
mL	Millilitre
Mm	Millimetre
mmol	Millimole
MRSA	Mecithillin-resistant Staph aureus
NHAP	Nursing Home-acquired Pneumonia
NIV	Non-invasive Ventilation
NP	Nosocomial Pneumonia
O_2	Oxygen
P. aeuroginosa	Pseudomonas aeuroginosa
PA	Particle Agglutination Assay
PaO_2	Oxygen Partial Pressure in Arterial Blood
PAO_2	Oxygen Partial Pressure in Alveoli
PCO_2	Carbon Dioxide Partial Pressure
PCP	Pneumocystis Carinii Pneumonia
PCR	Protein Chain Reaction
PE	Pulmonary Embolism
PEEP	Positive End-expiratory Pressure
pH	Power of Hydrogen (Hydrogen Potential)
PO_2	Oxygen Partial Pressure
PSI	Pneumonia Severity Index
RBC	Red Blood Cell (Red Blood Corpuscle)
rRNA	Ribosomal Ribonucleic Acid
RSV	Respiratory Syncytial Virus
RTI	Respiratory Tract Infection
S	Second
S. milleri	Streptococcus milleri
S. pneumoniae	Streptococcus pneumoniae

SaO_2	Oxygen Saturation
SARS	Severe Acute Respiratory Syndrome
SGOT	Serum Glutamic Oxaloacetic Transaminase
SGPT	Serum Glutamic Pyruvic Transaminase
SJS	Stevens-Johnson Syndrome
sp.	Species (singular)
spp.	Species (plural)
TTP	Thrombotic Thrombocytopenic purpura
TWAR	Taiwan Acute Respiratory Agent
UAT	Urinary Antigen Test
U.S.	United States
URT	Upper Respiratory Tract
V/Q	Ventilation/Perfusion
VRG	Ventral Respiratory Group
WBC	White Blood Cell

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Introduction

Diseases like bronchitis, bronchiolitis and pneumonia are infections of the lower respiratory tract. These can be severe or fatal, especially pneumonia **(Walter & McCoy, 1946)**.

Inflammation of the lung parenchyma, i.e. pneumonia, is a leading cause of hospitalization and death among adults **(Pfuntner et al., 2013).** It remains one of the most common infectious reasons of intensive care unit admission **(Lim et al., 2009)**.

Viruses, fungi and rickettsiae can cause lower respiratory tract infections, though bacteria are the dominant pathogens; which account for a higher percentage of lower than of upper respiratory tract infections **(Walter & McCoy, 1946).**

In the 1930s, the term "atypical pneumonia" was introduced, contrasting the bacterial pneumonia caused by Pneumococci (the best known and the most commonly occurring form of pneumonia by that time). The distinction was considered historically important, as it differentiated the "typical" respiratory symptoms and lobar pneumonia from the "atypical" generalized symptoms (such as fever, headache, sweating and myalgia) and bronchopneumonia **(Dasaraju & Liu, 1996).**

Aim of the Work

The aim of this essay is to discuss the pathogenesis, clinical presentation and management of atypical pneumonia in the intensive care unit.

Chapter (1)

Anatomy and Physiology of the Lung

Anatomy of the Lung and the Pleura

The lungs are the essential organs of respiration. They are situated on either side of the heart and the other contents of mediastinum. Each lung is free in its pleural cavity, except for its attachment to trachea and the heart at the hilum and pulmonary ligament respectively **(Standring, 2016).**

Each lung has a concave base that sits on the diaphragm; a blunt apex, which projects upward into the neck for about 2.5 cm above the clavicle; a concave mediastinal surface, which is molded to the pericardium and other mediastinal structures; and a convex costal surface, which corresponds to the concave chest wall. At about the middle of the mediastinal surface is the hilum, a depression in which the bronchi, vessels, and nerves that form the root enter and leave the lung. While the posterior border is thick and lies beside the vertebral column, the anterior border is thin and overlaps the heart; where the cardiac notch is found on the left lung **(Snell, 2012).**

Features of Lung Surfaces:

The apex protrudes above the thoracic inlet where it contacts the cervical pleura, and is covered in turn by the suprapleural membrane. As a consequence of the obliquity of the inlet, the apex rises 3–4 cm above the level of the first costal cartilage; it is level posteriorly with the neck of the first rib. Its summit is 2.5 cm above the medial third of the clavicle. The apex is therefore in the root of the neck **(Standring, 2016).**

The basal surface is concave and semilunar, and rests upon the superior surface of the diaphragm, which separates the left lung from the left lobe of the liver, the gastric fundus and spleen and the right lung from the right lobe of the liver. Posterolaterally, the base has a sharp margin that projects a little into the costodiaphragmatic recess **(Standring, 2016).**

The costal surface of the lung is convex and smooth, and is adapted in its shape to that of the thoracic wall, which is vertically deeper posteriorly. It is in contact with the costal pleura **(Standring, 2016).**

The medial surface has an anterior mediastinal and posterior vertebral part. The mediastinal area is deeply concave, because it is adapted to the heart at the cardiac impression, which is much larger and deeper on the left

lung where the heart projects more to the left of the median plane. Posterosuperior to this concavity, various structures enter or leave the lung via the hilum, collectively surrounded by a sleeve of pleura that also extends below the hilum and behind the cardiac impression as the pulmonary ligament. The vertebral part lies in contact with the sides of the thoracic vertebrae and intervertebral discs, the posterior intercostal vessels and the splanchnic nerves **(Standring, 2016).**

Borders of the Lung: (Figure 1)

The inferior border of the lung is thin and sharp where it separates the base from the costal surface and extends into the costodiaphragmatic recess, and is more rounded medially where it divides the base from the mediastinal surface. The posterior border separates the costal surface from the mediastinal surface, and corresponds to the heads of the ribs. It has no recognizable markings and is really a rounded junction of costal and vertebral (medial) surfaces **(Standring, 2016).**

Fissures and Lobes of the Lung: (Figure 1)

The right lung is slightly larger than the left and is divided by the oblique and horizontal fissures into three lobes: the upper, middle, and lower lobes. The oblique fissure runs from the inferior border upward and backward