COMMON ACADEMIC PROGRAMME

BY
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DEPARTMENT OF PAEDIATRICS

A 7yr old Female child 2nd born to NCM couple hailing from Reddyvaripalle brought by her mother who is the informant with good reliability and admitted in our hospital 5 days ago with C/O fever × 5days Cough × 4days Rt chest pain × 3days Increased WOB× 3days

► HOPI:

- ♦ Present illness started 5 days before admission as fever which is high grade, continous not associated with chills and rigors.
- Cough developed on D2 of fever,insidous in onset(not associated with sputum -dry cough)more in lying down position,no diurnal variation,not relived with medication
- ♦ Pain in right side of chest since 3days ,pricking type aggravated by deep inspiration/cough,relived on lying on that side (radiating to back).

Increased wob ×3days in the form of fast breathing, lower chest wall in drawing , child feels comfortable on lying in Rt lateral position

NO H/O trauma, skin rash

NO H/O nasal discharge ,sorethroat,ear pain

NO H/O vomiting, regurgitation of feeds

NO H/O palpitations, pnd, cyanosis

NO H/O allergy, contact with TB, skin rashes

- On D2 of illness child was taken to a local RMP doctor, child was given medication for fever and cough
- I/V/O increased WOB, Child was taken to a private practioner in Rajampet, where chest X-ray and blood investigation were done and referred to higher center for further management

- Child admitted to PICU in our hospital ,started on o2 with mask,IVF, IV medications ,blood investigations and USG chest were done
- Chest xray showing massive pleural effusion on right side of chest.
- ▶ Then diagnostic tap was done, serus fluid was sent for investigations
- Child was started on IV antibiotics PIPERACILLIN/ TAZOBACTAM and VANCOMYCIN.

- PAST HISTORY:
 No H/O similar complaints in past
 No H/O previous hospital admissions
- ► ANTENATAL HISTORY:Not Significant
- ► NATAL HISTORY: FT LSCS
- ▶ POST NATAL HISTORY: Not significant
- DEVELOPMENTAL HISTORY: Normal
- ▶ DIETARY HISTORY: A deficit of 200 k.cal and 2gms of proteins is observed.

► Family history:

2nd born to NCM couple
No H/o similar illness in family members
No H/o contact with TB

IMMUNIZATION HISTORY:
 Immunized as per NIS
 BCG scar not present
 optional vaccines were not given

SOCIO-ECONOMIC HISTORY:
 Lives in purchased house with 1 room
 No of family members- 4
 Over crowding is noted

Belongs to upper lower class as per modified kuppuswami socio economic scale

General examination

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Child is sick, lying on bed.
  No pallor No Icterus
  No Cyanosis No Clubbing
  No Lymphadenopathy No Edema(pedal)
  Vitals:
  PR – 146/min, normal volume,
  no radioradial & radiofemoral delay
  (80-110)
  BP – 90/60 mm Hg on right arm in supine position
  RR – 56/min (Tachypnea)
  Temp. - 102°F
  SpO2 – 100% with O2 mask
          88-90% without O2
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Anthropometry:

	Measured	Expected	Inference WHO	
Weight	18kgs	22kgs	Between 3 rd & 15 th centile	
eight/Length 115cms		119cms	Between 15 th & 50 th centile	
Head Circumference	51cms		Normal	
Chest Circumference		7	Normal	

Examination of the upper respiratory tract

No DNS,POLY,NASAL DISCHARGE, CONGESTION OF NASAL MUCOSA

No BLEEDING, No FOREIGN BODY

▶ Pharynx : Normal

Examination of lower respiratory tract

- Inspection:
 - Trachea appears to be in mid-line
 - Movements of Chest diminshed on right side
 - Lower chest indrawing with sub-costal and intercostal retractions
 - Apical impulse visible in left 5th Intercostal space
 - No visible scars and engorged veins

Palpation:

All inspectory findings are confirmed

Apex beat felt at 5th Intercostal space medial to mid-clavicular line

Chest movements decreased on right side

Tenderness noted on right side of chest

Right Hemi-thorax: 25.5 Inspiration: 53.5

Left Hemi-Thorax:26.5 Expiration: 52

AP Diameter: 14cms

Transverse Diameter: 17 cms

VOCAL FREMITUS: Diminished on right side – Normal on left side

Percussion

Right side

Left side

Dull notes: Mammary

Infra mammary

Infra scapular

Stony dull notes: Axillary and Infra axillary areas

Resonant notes: Supra clavicular

All areas have resonate notes

Infra Clavicular

Supra scapular

Inter scapular regions

Auscultation

Air entry diminishedon right side

Bronchial breath sounds heard on Mammary, Infra Clavicular regions

Vocal resonance:

Diminshed in Infra mammary,Infra scapular,Axillary and Infra axillary areas.

Normal in all areas on left side

- Cardiovascular system: \$1 and \$2 Heard, No murmurs
- Per Abdomen: Soft, Non-Tender,

Liver palpable: 3cms below right costal margin

Liver span: 8 cms

Central nervous system: No abnormality detected

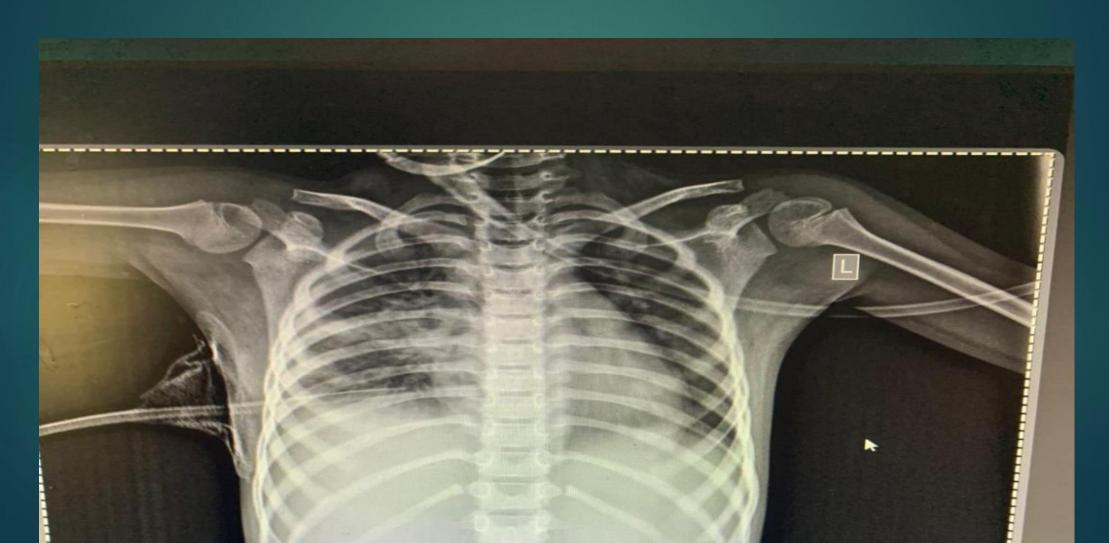
Diagnosis: RIGHT SIDE EMPYEMA / Secondary Bacterial pneumonia

Xray of the child at the time presentation



- Chest xray was taken which showed right side massive pleural effusion
- ▶ 16 Fr ICD was inserted in the right 5th Intercostal space in the posterior axillary fold with under water seal and drain
- Drained around 780ml of Seropurulent discharge.
- ► Total drain is 1800ml of pus

Chest Xray after placing Intercostal chest tube





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Patient Name:	KOMALIK	Patient ID:	20210802917 ASP
Age:	7 Years	Sex:	F
Modality:	CT	Study Date:	10-Aug-2021

H.R.C.T CHEST

On a 16 serial slice scanner in helical mode, sections of chest are taken with TECHNIQUE: 25mm slice thickness with sagittal, coronal reconstruction and volume rendering.

Clinical background: Post ICD for right empyema.

FINDINGS:

- Moderate pyopneumothorax with collapse/consolidation of the underlying lung on right side.
- A small pneumatocele meas. 14x10 mm noted in the collapsed anterior segment of right upper lobe.
- Minimal fluid noted in left pleural cavity.
- No obvious ground glass opacities /consolidatory changes noted in left lung.
- Left lung parenchyma appears normal.
- Trachea and major bronchi are normal.
- Mediastinal vascular structures are normal. Ing ICD, CT chest was done
- Cardia appears normal.
- Few small volume pre tracheal and pre vascular lymph nodes noted.
 - No e/o free fluid noted in pericardial cavity.
 - Abdominal organs appear normal up to the visualised extent.
- Visualised bones appear normal.
- Subcutaneous emphysematous changes noted along the right lateral chest wall.

- Post procedure changes.

IMPRESSION- Sub optimal study due to motion artefacts.

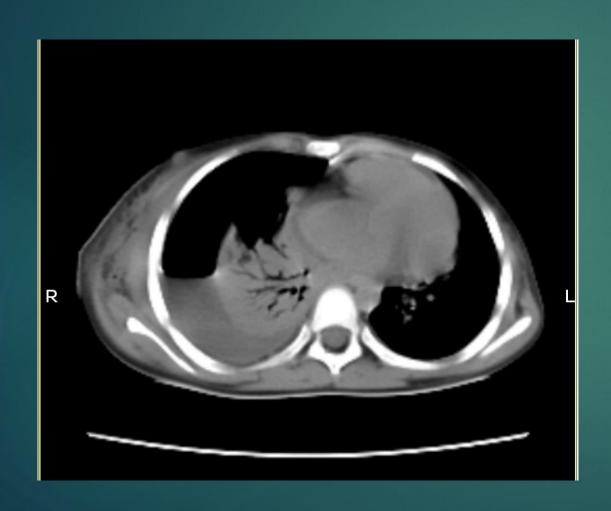
- Moderate right pyopneumo thorax with collapse/consolidation of underlying lung
- Minimal left pleural effusion.

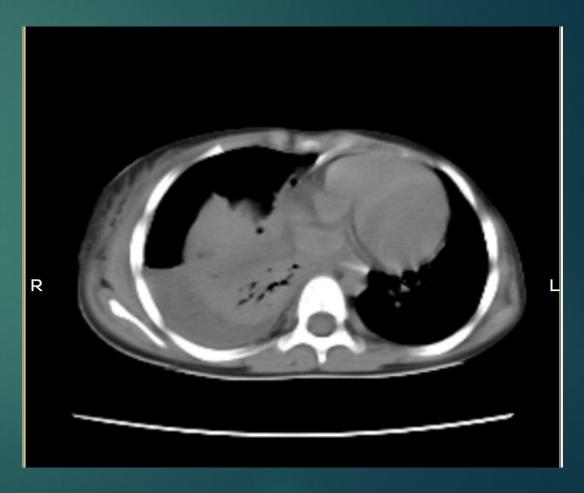
Dr. P. SUNEETHA., MD. Radiology Professor.

CT report

After inserting ICD, CT Chest was done

CT Showing





Relevant investigations

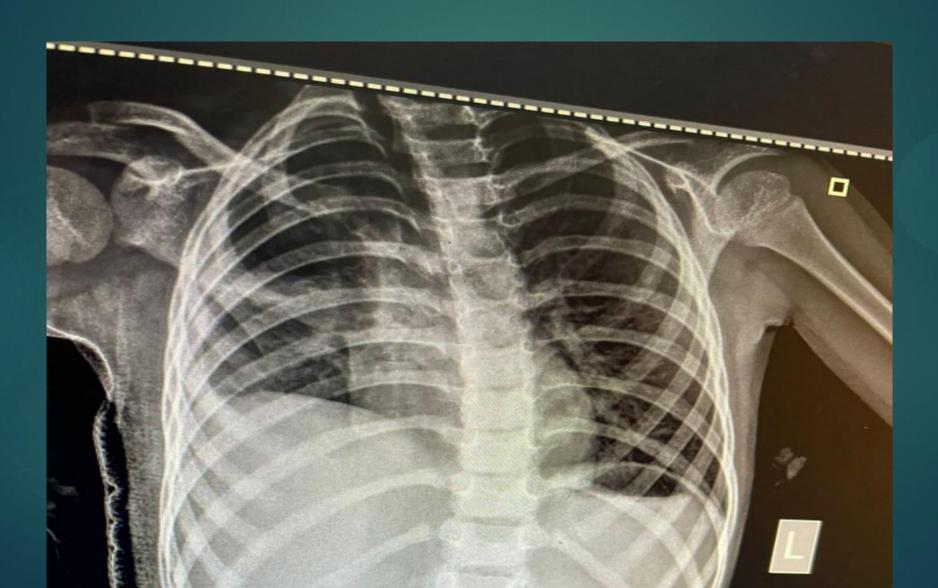
- ► Total counts: 48,000, PMN: 91%
- ► CRP: 414 mg/L
- ► Blood culture: Negative
- Pleural fluid culture: Negative
- ► CB NAAT: Negative
- Pleural fluid Glucose: 12mg/dl
- ▶ Pleural fluid Albumin/ Serum Albumin ratio > 0.5
- ▶ Pleural fluid LDH/ Serum LDH ratio > 0.6

All the above relevant investigations are suggestive of Exudative Pleural effusion

Treatment

- ▶ ICD tube was inserted and drained 1800ml of pus
- ▶ I/V antibiotics PIPTAZ and VANCOMYCIN was given for 14 days
- Fibronolytics Streptokinase was instilled into pleural spaces for three days
- ► ICD tube was kept for nearly 10 days and removed after clamping as the drain was less than 50ml

Xray after removing chest tube



Discussion:

- Empyema refers to frank pus in the pleural cavity. It could be localised or free collection of purulent material in pleural space as a result of combination of inoculation of bacteria & culture medium of pleural fluid
- Para-pneumonic effusion is a reactive pleural fluid collection in association with underlying pneumonia.
- A complicated para-pneumonic effusion is the presence of thick pleura with loculations or frank pus
- Suspect para-pneumonic effusion or empyema in any child who has been febrile or remains unwell for 48-72 hours after initiation of treatment of pneumonia

Common organism

- Streptococcus pneumonia
- ▶ Staphylococcus areus
- ► H.Influenza

Rare Organisms: E.Coli, Klebsiella, Pseudomonas, Anaerobes

Pleural space infection is a continuum but classically has been divided into three stages:

Stage 1 or Exudative or Acute phase (lasts upto 3 days):

The inflammatory process associated with the underlying pneumonia leads to accumulation of clear fluid with no or low PMN invasion ,ph >7.3, normal glucose & LDH levels: termed as 'simple 'parapneumonic effusion. Stage 2 or Fibrinopurulent or Transitional phase (3 to 21 days):

- There is deposition of fibrin in the pleural space leading to septations & formation of loculations.
- ► There is increase in white cell count, ph < 7.3, glucose < 40mgs.,LDH >3 times the normal. This is termed as 'complicated 'paraphumonic effusion. Eventually when it becomes overt or frank pus which is termed as an 'empyema'.

Stage 3 or Organisational or Chronic phase (> 3 wks . duration):

- Fibroblasts infiltrate the pleural space & thin intrapleural membranes are reorganised to become thick & non elastic the 'peel' or 'rind'.
- These solid fibrous or leather-like peels may prevent lung reexpansion ("trapped lung"), impair lung function & create a persistent pleural space with potential for infection.
- ► At this stage spontaneous healing may occur or a chronic empyema may develop.

Investigations

► INVESTIGATIONS:

- 1) Chest X-ray: Posteroanterior (PA) view
- 2) Ultrasound chest: Sensitive for confirmation of pleural fluid, for guided diagnostic tapping & insertion of chest drainage tube.
- 3) Pleural fluid exam: Colour, Odour, Gram staining, AFB, Bacterial culture, cytology. Biochemistry: Ph, Sugar, LDH, Proteins.
 - 4) Blood & sputum culture: if feasible

Modified lights Criteria

Pleural fluid is an exudate if one or more of the following criteria are met:

Pleural fluid

- Serum protein ratio > 0.5
- Serum LDH ratio > 0.6
- LDH >2/3 upper limit of normal serum LDH
- Protein >30 g/l

If only one of the above criteria is met, then calculate the fluid to serum albumin gradient

If the albumin gradient >12 g/l, consider a transudate

LDH = lactate dehydrogenase.

Treatment

Conservative Management:

- ► Antibiotics ± Intercostal Dranaige Tube (ICD)
- ▶ If effusion is simple & small in quantity can be managed with antibiotics alone .But very close observation is necessary for development of enlarging size &/or compromise of respiratory function when prompt ICD placement is necessary.
- ► If effusion is complicated or frank pus : Antibiotics + ICD

Treatment

- ▶ Intravenous antibiotics for 10 to 14 days for community acquired pneumonia covering Gram positive cocci & anaerobes to be started empirically pending preferably c & s report.
- ▶ Broad spectrum coverage should be started for hospital acquired pneumonia as well as empyema following surgery, trauma & aspiration.
- ▶ Oral antibiotics should be continued at discharge for 1-4 wks. or longer depending on disease state.

Antibiotic therapy for Empyema

Infective agent	Drug & dosa	ige
Aerobic bacteria Staphylococcus	Linezolid**	50 mg/kg/dose Q6H 10 mg/kg/dose Q6H 10 mg/kg/dose Q8-12H * 10-20 mg/kg/dose Q8H
H. influenza	Cefotaxime Ceftriaxone	50 mg/kg/dose Q6H 100 mg/kg/day Q12-24H
Pneumococcus & Streptococcus	Penicillin G	1-4 lakh/kg/day Q6H
Pseudomonas	Ceftazidime Ticarcillin Tobramycin	50 mg/kg/dose Q8H 200-300 mg/kg/d Q4-6H 5-7 mg/kg/day (once daily)
Anaerobic bacteria Bacteroides fragilis and others	Clindamycin Metronidazole	10-20 mg/kg/dose Q8H IV 5-7.5 mg/kg/dose Q6H oral 7.5 mg/kg/dose Q8H

Surgical Management

- ▶ Only in situation where there is no satisfactory response (persistent fever, incomplete lung expansion, loculations on ultrasound etc..)ie.. in stage 2 or fibrinopurulent phase.
- ▶ Video-assisted thoracoscopic surgery (VATS) is a key hole or minimal access surgical approach.
- ▶ It achieves debridement of fibrinous pyogenic material, a breakdown of loculations, and drainage of pus from the pleural cavity under direct vision. It leaves three small scars.

Surgical procedures

- ► Mini-thoracotomy achieves debridement and evacuation in a similar manner to VATS but it is an open procedure leaving a small linear scar along the rib line.
- ▶ Decortication involves an open posterolateral thoracotomy and excision of the thick fibrous pleural rind with evacuation of pyogenic material. It is a longer and more complicated procedure leaving a larger linear scar along the rib -

Complications of Empyema Thoracis

► Complications which may occur are:

Bronchopleural fistula,

Lung abscess,

Pyopneumothorax

Pneumatocele formation,

Empyema necessitans

Perforation through the chest wall,

Fibrothorax etc

Pneumonia + effusion Categorise size of effusion based on CXR Small Moderate Large >10 mm rim or <1/2 chest >1/2 chest X-ray opacified <10 mm rim or X-ray opacified <1/4 CXR opacified Treat with IV antibiotics Synpneumonic effusion Degree of respiratory compromise Obtain USG chest to assess for High Law loculations. Treat with antibiotics Pleural fluid tapping or Treat with IV antibiotics Follow large Obtain pleural fluid draining not recommended and obtain pleural fluid empyema Chest X-ray for analysis and either by tapping or algorithm culture during placement of ICD Improvement Insert ICD and drain f no improvement in Yes No and assess for respiratory compromise, loculations using USG do USG Continue Reassess the antibiotics effusion size USG shows increasing fluid or with loculations and septations No loculations Complicated with signs of echogenic or loculations or thick fluid draining loculations No increase in size, Increasing in size or Continue ICD continue antibiotics developing loculations Insert chest drain Options Pleural fluid analysis and If inadequate · Chest tube with microbiology C/S Follow moderate pleural Antibiotics drain due to fibrinolytics for 7 days effusion algorithm thick pus, insert VATS fibrinolytics No improvement Improvement in clinical conditions Continue chest drain Remove the ICD once clinically Insert intrapleural fibrinolytics better No improvement Continue IV antibiotics for 7-10 days; switch to oral antibiotics for total of 14-21 days Follow large pleural effusion algorithm

Algorithm for treating Empyema

- Empyema is an uncommon complication of pneumonia and is an accumulation of infected fluid in the pleural space.
- All children with empyema should be managed in a hospital with appropriate paediatric expertise preferably under the care of a Respiratory paediatrician as treatment of paediatric empyema is very different to that of adult disease.
- An antero-posterior/posterior-anterior chest X-ray should be performed in all children in whom empyema is suspected; there is no need for a routine lateral film.
- An ultrasound should be performed on all children with empyema as it is the
 best technique to differentiate pleural fluid and consolidation, estimate
 effusion size and grade complexity, demonstrate the presence of fibrinous
 septations and guide chest drain placement.

- A routine pre-operative CT should not be performed and should be reserved
 for complicated cases where children have failed to respond to treatment or if
 there is concern that there is other pathology such as a tumour.
- All children with empyema should receive high dose antibiotic therapy via the intravenous route to ensure pleural penetration.
- Appropriate antibiotics should be used to cover at least Streptococcus pneumonia and Staphylococcus aureus.
- Moderate to large effusions require drainage.
- Chest drainage alone is not recommended and the intervention of choice is either percutaneous small bore drainage with urokinase or video-assisted thoracoscopic surgery.

Reference

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- ► Empyema Thoracis In Children : Govt. Of INDIA Guideline By Sivatha Thakuri

Thank you