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Interpretation of the paediatric chest x-ray

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KEYWORDS
chest x-ray; paediatric; diagnosis; pattern recognition

Summary Interpretation of the paediatric chest x-ray may appear intimidating at first, but knowledge of a few basic rules and an understanding of how the radiographic appearance may be influenced by age and technique will help the clinician arrive at the correct diagnosis in many cases. A structured and logical approach to x-ray interpretation is described, drawing attention to the range of abnormal signs that should be sought. A limited differential diagnosis is given for some of the more frequent radiological abnormalities seen in children.

PRACTICE POINTS

- x-ray appearances are influenced by technique and the age of the patient
- The thymus is the most common cause for a widened mediastinal shadow
- Increased translucency of the hemithorax—consider an inhaled foreign body
- Hazy increased opacity of a hemithorax, on a supine x-ray, may be due to a pleural effusion
- Round pneumonia is the most common solitary pulmonary 'mass lesion' in childhood

INTRODUCTION

The chest x-ray is the most frequently performed radiographic examination in children. Correct interpretation can be crucial to reaching the correct diagnosis and avoiding inappropriate treatment due to failure to appreciate normal variation and the influence of technical factors on the radiographic appearance. A methodical approach is important in the evaluation of a chest x-ray to ensure that important clues to the diagnosis are not overlooked, as suggested below:

- Check the patient's name, date of examination and side marking.
- Note the projection (supine or erect, antero-posterior or postero-anterior), phase of respiration and the presence of any rotation. Identify any artefactual shadows.
- Identify abnormal radiological signs by systematically reviewing all regions, including: trachea, carina and major bronchi; mediastinal outlines and hilar regions; cardiac size and contour; pulmonary vascularity; size and translucency of the lungs; position of the major fissures; clarity and height of the diaphragms; costo-phrenic angles; soft tissues and thoracic skeleton.
- Suggest the most likely diagnosis or list possible differential diagnoses based on the observed radiological signs and clinical features.

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INFLUENCE OF TECHNIQUE AND AGE ON RADIOLOGICAL INTERPRETATION

Projection

For most clinical indications, a single frontal projection of the chest is appropriate, but a lateral view may be helpful to demonstrate an abnormality in the mediastinum and at the lung base, or to localize a lesion identified on the frontal projection. The supine antero-posterior (AP) projection is used for most babies, whereas toddlers are generally examined in an erect AP projection until the child can co-operate sufficiently for a standard erect postero-anterior (PA) chest x-ray to be performed. The heart size and mediastinal width will be exaggerated by both the supine position and the AP projection. Pleural fluid and pneumothoraces are more difficult to detect in the supine position, and a horizontal beam projection

will be necessary to demonstrate air-fluid levels, for example in a hydropneumothorax following trauma.

Phase of respiration

The diaphragms are projected over the fifth to seventh anterior rib ends in a well-inspired examination. In the young infant, an expiratory phase film will exaggerate the heart size and bronchovascular markings, and misinterpretation may lead to an erroneous diagnosis of cardiac failure or bronchopneumonia. The high position of the diaphragms will obscure abnormalities at the lung bases (Fig. 1).

Positioning

Rotation is the most common cause for inequality in the translucency of the two lungs, and needs to be differentiated from increased transradiency resulting from other causes, particularly air trapping. Rotation can be assessed by checking the symmetry of the ribs and the distance of the medial borders of the clavicles from the spinous process of the vertebrae.

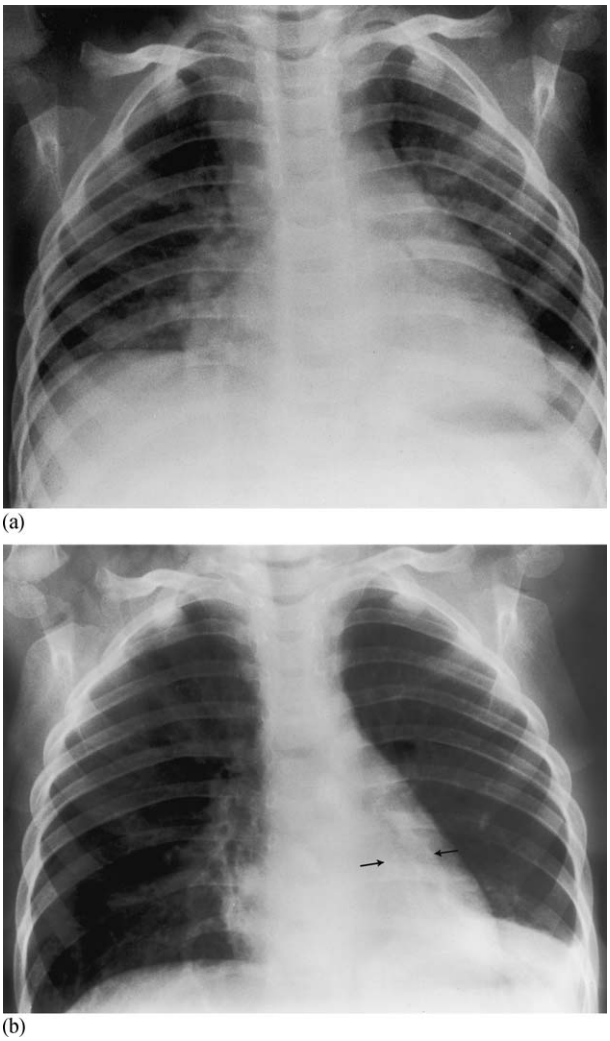


Figure 1 (a) Technically poor expiratory-phase chest x-ray with prominent broncho-vascular markings and a large heart shadow. (b) Repeat examination. Note the normal heart size; the consolidation at the left base is now more clearly visualized on this well-inspired x-ray (arrows).

Artefacts

x-rays taken on the wards are particularly prone to artefacts. A round translucency caused by the hole in the Perspex of the incubator, and skin folds between the baby and the cassette which mimic a pneumothorax, are well recognized. In older girls, hair either plaited or dressed with ornaments and lotions may cause a variety of artefacts projected over the upper lobes and mediastinum (Fig. 2).

Age

The gradual change in the normal appearance of the chest x-ray from infancy to adulthood must be appreciated. In a baby, the chest configuration is more triangular shaped and relatively deeper in the AP diameter. Air bronchograms are frequently seen projected through the cardiac shadow in the neonate and young infant, but should be considered pathological when seen more peripherally. The anterior aspects of the diaphragms are higher, the costo-phrenic angles are relatively shallow in the infant, and the lower zones may be obscured particularly in a poorly penetrated examination.

Thymus gland

The thymus gland gives rise to a prominent anterior mediastinal shadow in infancy which is quite variable in size and can be recognized by its characteristic 'sail'

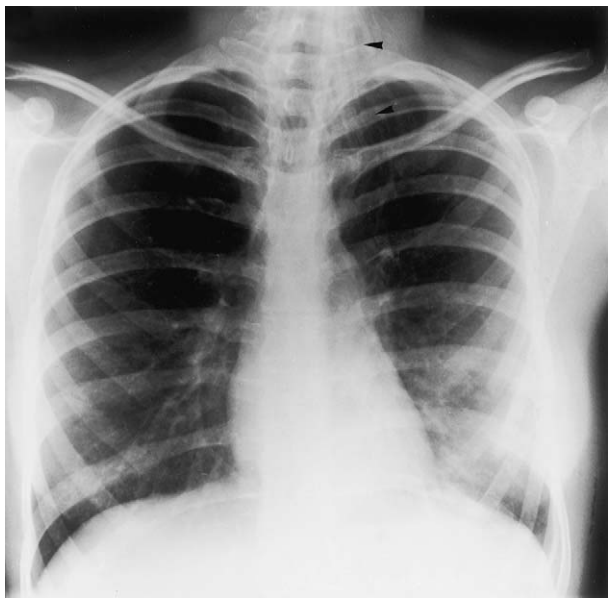


Figure 2 Linear translucencies due to shadows of dressed hair adjacent to the trachea mimicking mediastinal air (arrowheads).

shape or wavy margins resulting from the interdigitation of the soft thymic tissue in the intercostal spaces (Fig. 3). The thymus gradually becomes less evident between the ages of 2–8 years, after which it cannot be visualized on the frontal chest x-ray. At times, the normal thymus can appear very large, and may need to be differentiated from a mediastinal mass or an area of pulmonary consolidation. A lateral decubitus view of the chest may accentuate the scalloped appearance of the thymic outline and help to clarify the nature of an anterior mediastinal shadow. Additional imaging using ultrasound scanning and, in exceptional cases, computed tomography/magnetic resonance image scanning may also be useful.

INTERPRETATION OF ABNORMAL RADIOLOGICAL SIGNS

Pattern recognition forms the cornerstone of successful x-ray interpretation. Although some x-ray findings are pathognomonic for specific conditions, in most cases, the diagnostic process depends upon correlating the x-ray abnormalities with the age of the child, the clinical history and examination, and the results of any previous x-rays and laboratory investigations. In some situations, the diagnosis may only be confirmed on follow-up, by monitoring response to therapy or following biopsy.

SYSTEMATIC REVIEW OF THE CHEST X-RAY

Trachea and main bronchi and hilar regions

In the infant, the trachea is quite mobile and may buckle anteriorly and to the right on expiration. However, below the thoracic inlet, the intrathoracic trachea should always appear straight on a lateral chest x-ray, even in expiration, and any anterior or posterior displacement of the intrathoracic trachea should raise suspicion of a mediastinal mass. Special techniques, for example the Cincinnati view, may help to improve visualization of the airway in the AP projection, particularly to demonstrate the carina and the major bronchi. A lateral view from the larynx to the carina is advisable where there is a history suggestive of upper airway obstruction. Subglottic narrowing of the trachea is most commonly seen in acute laryngo-tracheo-bronchitis (i.e. croup), but extrinsic compression by a vascular ring or an impacted oesophageal foreign body, and narrowing due to a congenital tracheal stenosis or an intraluminal tumour, must also be considered in the differential diagnosis, particularly when the trachea is narrowed at or below the level of the thoracic inlet. Widening of the trachea may be seen in children following prolonged intubation, or in those with chronic cough, for example cystic fibrosis and in Mounier-Kuhn syndrome (i.e. congenital tracheomegaly). Enlargement of the hilar shadows may be due to hilar gland lymphadenopathy, most commonly related to viral pneumonia or chronic infection, for example in cystic fibrosis. When markedly enlarged, tumour infiltration, tuberculosis and sarcoidosis should be considered. A lateral view of the hilum is useful to confirm the nature of the hilar enlargement, since other pathology, for example pulmonary consolidation, may be projected over the hilum on a frontal film and mimic hilar lymphadenopathy.

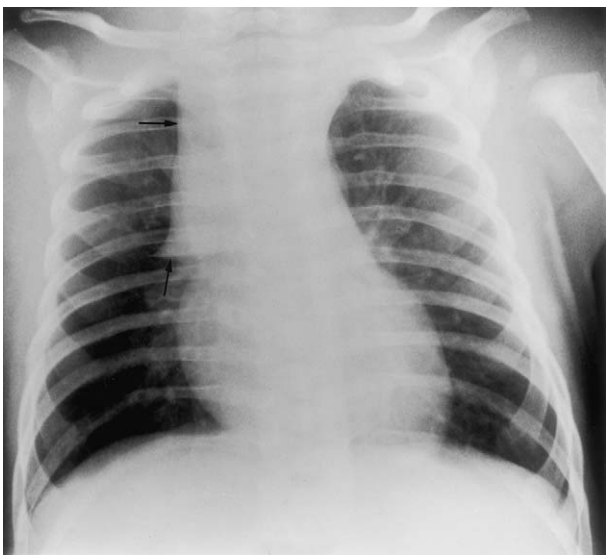


Figure 3 Sail-shaped outline of the thymus gland demonstrating wavy right lateral border (arrows).

The superior mediastinum

The superior mediastinal outline should be assessed for both size and shape. The characteristics of any abnormal shadow should be noted, particularly whether the widening is bilateral or unilateral. If a nasogastric tube is in situ, its position should be noted as an indicator of the line of the oesophagus (Fig. 4). Classically, the superior mediastinum has been divided into the anterior, middle and posterior compartments, with the great vessels, trachea, oesophagus and paratracheal lymph nodes comprising the middle compartment. An anterior mediastinal mass is suspected when the trachea is deviated posteriorly, as in lymphoma or terato-dermoid tumour. Loss of visualization of the aortic knuckle indicates that the mass lies adjacent to the aortic arch and arises from the anterior or middle mediastinum. Lateral deviation of the trachea or separation of the trachea and oesophagus (i.e. position of the nasogastric tube) point to a middle mediastinal mass, for example bronchogenic cyst. Masses arising in the posterior mediastinum, for example a neurogenic tumour, may show areas of calcification, and may result in splaying or even destruction of the posterior rib ends. Localization of any radiographic

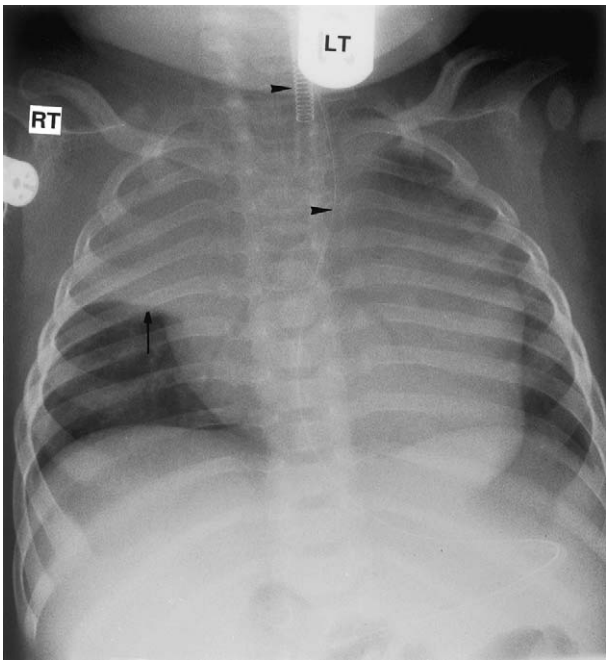


Figure 4 Large anterior/ middle mediastinal mass obscuring the arch of the aorta. The endotracheal and nasogastric tubes are displaced to the left (arrow heads) by the mass which is also causing loss of aeration of the right upper lobe (arrow). Normal thymus gland outline noted on the left.

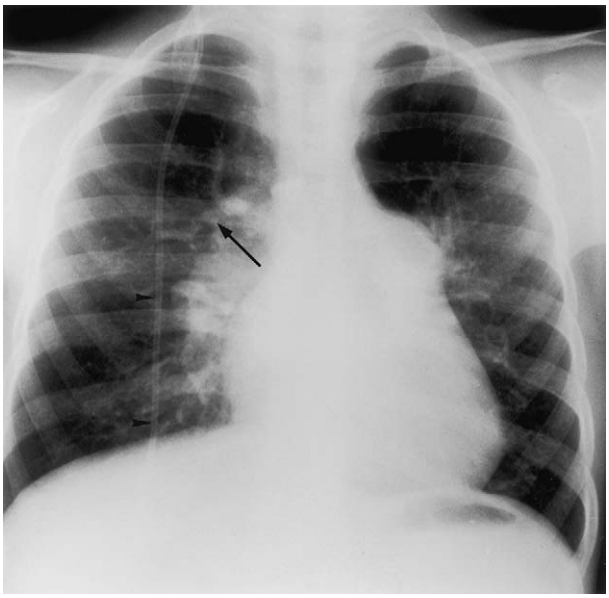


Figure 5 Peripheral pruning of the pulmonary artery branches (arrow) indicating pulmonary arterial hypertension secondary to multiple pulmonary emboli precipitated by a previous ventriculo-atrial shunt, which was subsequently replaced by a ventriculo-peritoneal shunt (arrowheads).

abnormality into one of these compartments will help to focus the anatomical origin and nature of the abnormality.[1]

Acute infection or steroid therapy may result in transient thymic atrophy. However, if persistently narrow, the possibility of an absent thymus gland, for example in Di George syndrome, or congenital heart disease should be considered.

The heart and great vessels

The mediastinum and cardiac contour are relatively large in the infant, and the transverse diameter of a normal heart may approach 60% of the thoracic transverse diameter. The atrial and visceral situs should be established by inspection of the bronchial anatomy, and position of the stomach bubble and the side of the ascending and descending aorta should be noted. A right-sided aortic arch is commonly associated with congenital heart disease, and vascular rings are seen more frequently in association with a right-sided aortic arch.[2] Any increase in cardiac size should prompt a close inspection of the lungs to assess pulmonary vascularity. The branches of the pulmonary arteries should not be visible in the peripheral third of the lung, and if seen, this suggests increased pulmonary blood flow. Non-visualization of pulmonary vessels more centrally suggests reduced pulmonary blood flow. Pulmonary arterial hypertension is indicated by the presence of peripheral pruning of the pulmonary arteries recognized by the presence of dilatation of the proximal arteries and a distinct reduction in calibre of the central and peripheral pulmonary arteries (Fig. 5). There are many causes of cardiomegaly including congenital heart disease, cardiomyopathy, congestive cardiac failure and pericardial effusion. Whilst abnormalities in cardiac contour may be useful to indicate which cardiac chambers may be enlarged, the appearances are often non-specific and full assessment by echocardiography is recommended.

Lungs/pleural cavities–patterns of disease

Abnormalities in the lungs and pleural cavities are often indicated by focal or generalized areas of either increased or decreased translucency in the lungs, ring shadows and pulmonary nodules.

Increased translucency

Generalized increased translucency of the thorax in association with low flattened diaphragms may be seen in a healthy child having made a large inspiratory effort, but is commonly associated with air trapping, for example in asthma, bronchiolitis and cystic fibrosis (Fig. 6). Upper airway obstruction due to tracheal obstruction, for example a vascular ring or tracheal foreign body, should also be considered.

Unequal translucency of the lungs always merits serious consideration. Patient rotation, probably the most

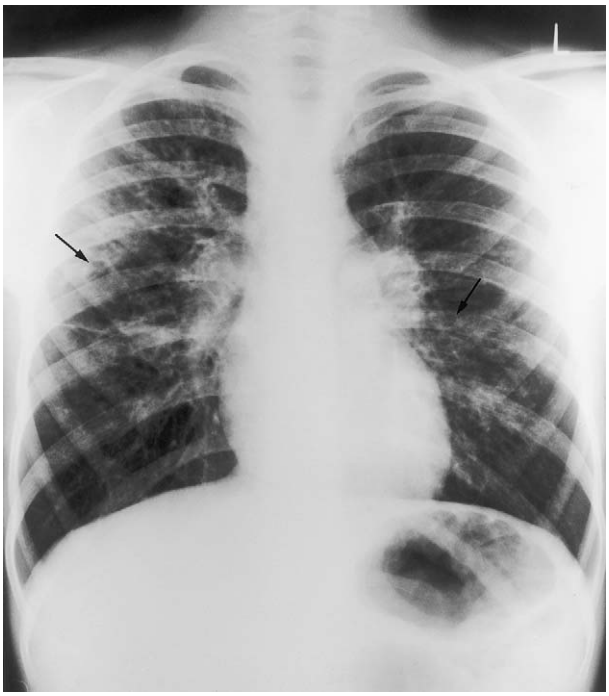


Figure 6 Low flat diaphragms and hyperinflated lungs in cystic fibrosis. Note the prominent hilar shadows and multiple ring shadows (arrows) in the right upper and left lower lobes.

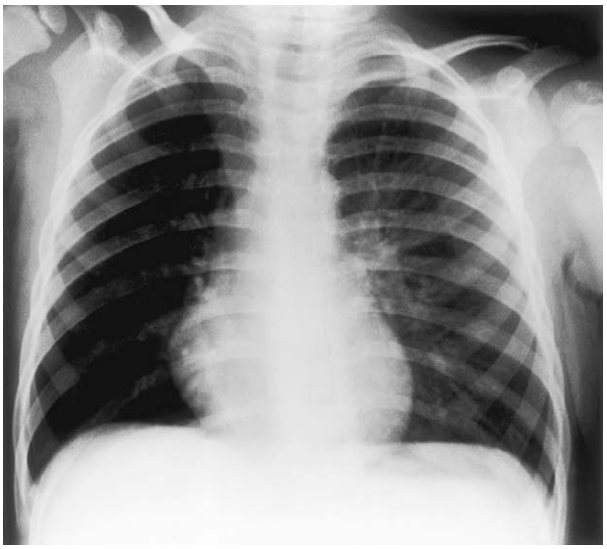


Figure 7 Translucent right hemithorax is due to air trapping resulting from an inhaled peanut in the right main bronchus. Note decreased pulmonary vascular markings on the right.

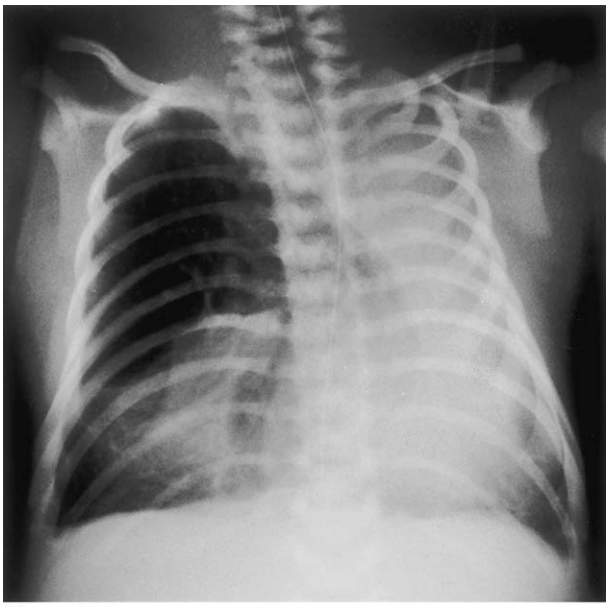
common cause, should be excluded by obtaining a repeat straight radiograph to avoid overlooking unilateral obstructive emphysema if there is any doubt as to the cause (Fig. 7). It may be difficult to determine which side is abnormal when the two lungs are of different densities, but consideration of the following points, as described by Swischuk and John,[3] should help to identify the abnormal side.

- Pulmonary vascularity
  - The side with decreased vascularity is abnormal.
  - The side with increased or normal vascularity is usually normal.
- Variation in appearance between inspiratory and expiratory films
  - The side which changes least on expiration is usually abnormal.
- The size of the hemithorax
  - A small completely opaque hemithorax is abnormal.

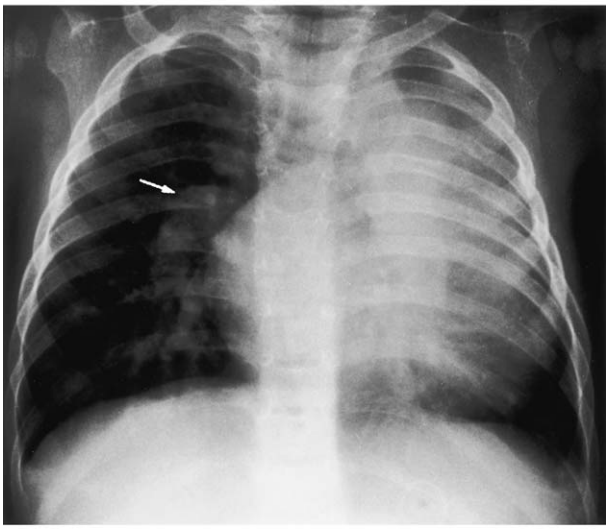
Both compensatory and obstructive emphysema may be associated with a large translucent hemithorax, with the contralateral lung showing increased opacity (Fig. 8). Increased translucency due to obstructive emphysema, for example from an inhaled foreign body or congenital lobar emphysema, is usually associated with attenuation of the pulmonary vascularity, and the disparity between the two sides will become more pronounced on an expiratory phase film with the abnormal side remaining overinflated. On the other hand, compensatory emphysema due to collapse or hypoplasia of the contralateral lung will usually become less marked on expiration, and will be associated with normal or increased pulmonary vascularity. A small translucent hemithorax is most commonly associated with pulmonary hypoplasia with ipsilateral hypoplasia of the pulmonary artery, for example following repair of congenital diaphragmatic hernia, but may be seen in the Swyer-James-Mcleod syndrome where bronchiolitis obliterans develops following a severe pneumonia.

Air leaks

The diagnosis of a pneumothorax may be obvious by visualization of the lung edge in association with increased translucency of the thorax (Fig. 9). However, when air is loculated anteriorly, the only abnormality may be increased clarity of the heart border as the lung edge may not be visible. Air in the mediastinum may be suspected by the appearance of a central area of increased translucency and increased clarity of the cardiac outline. Mediastinal air is easier to detect when the air is noted to outline the lobes of the thymus, or when the air tracks along the soft tissues of the neck give rise to streaky linear translucencies in the root of the neck. A horizontal lateral view may be useful to confirm an anterior pneumothorax and mediastinal air. Air may also leak into the pericardium, peritoneum and the systemic circulation, in addition to the pulmonary interstitium, particularly in ventilated neonates with idiopathic respiratory distress syndrome, where the typical bubbly appearance of pulmonary interstitial emphysema develops.



(a)



(b)

Figure 8 (a) Congenital lobar emphysema of the right upper lobe causing incomplete collapse of the right middle and lower lobes and the left lung. Note the reduced pulmonary vascularity in the abnormal emphysematous right upper lobe. (b) Right lung shows compensatory emphysema due to collapse of the left upper lobe. Note prominent pulmonary vascularity on the right indicating the normal side (white arrow).

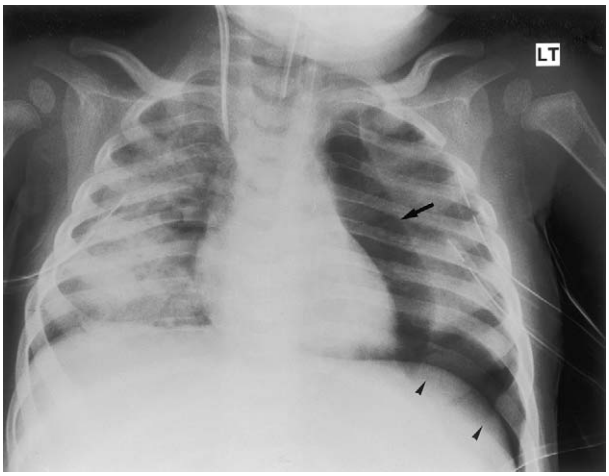


Figure 9 Adult respiratory distress syndrome. A right-sided pneumothorax has been drained. On the left, a loculated anterior pneumothorax (arrow) and subpulmonary pneumothorax (arrowheads) persist despite attempted drainage with two chest drains.

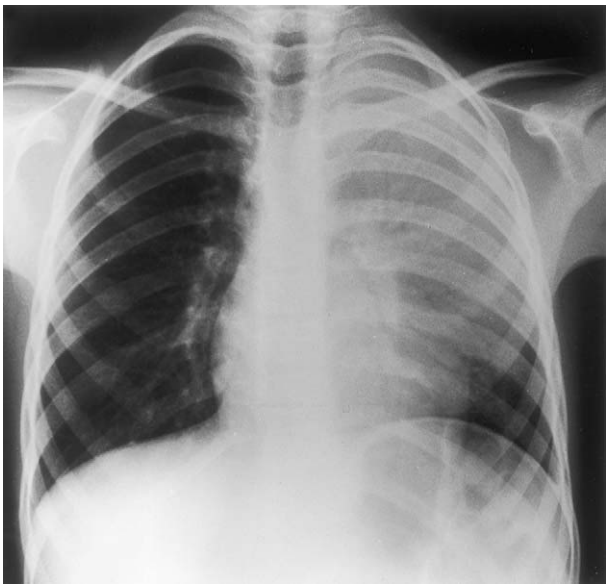


Figure 10 Lobar pneumonia, demonstrating air bronchogram, and loss of mediastinal contour indicating the infection is in the left upper lobe (Silhouette sign).

Increased pulmonary opacification

Increased pulmonary opacification may be caused by the presence of pulmonary infiltrates, pulmonary collapse, pulmonary hypoplasia and agenesis, pleural fluid and by tumour infiltration. A mass lesion or diffuse thickening of the chest wall may also give rise to increased opacification of the underlying lung.

Pulmonary infiltrates may be alveolar (air space) or interstitial, and are associated with characteristic radiological appearances.[4] Air space shadowing is characterized by areas of increased opacity in the lungs which may be hazy or dense, inhomogeneous or coalesce to form confluent areas of pulmonary shadowing in which air bronchograms may be apparent. Air space shadowing is typically seen in association with infection where the infiltrate is commonly segmental or lobar (Fig. 10), or due to pulmonary oedema and opportunistic infection where the changes are generally bilateral (Fig. 11a). Interstitial infiltrates develop following thickening of the pulmonary interstitium or alveolar walls due to inflammation, fibrosis, infiltration or increased interstitial fluid. A number of patterns of pulmonary opacification may result. A predominantly

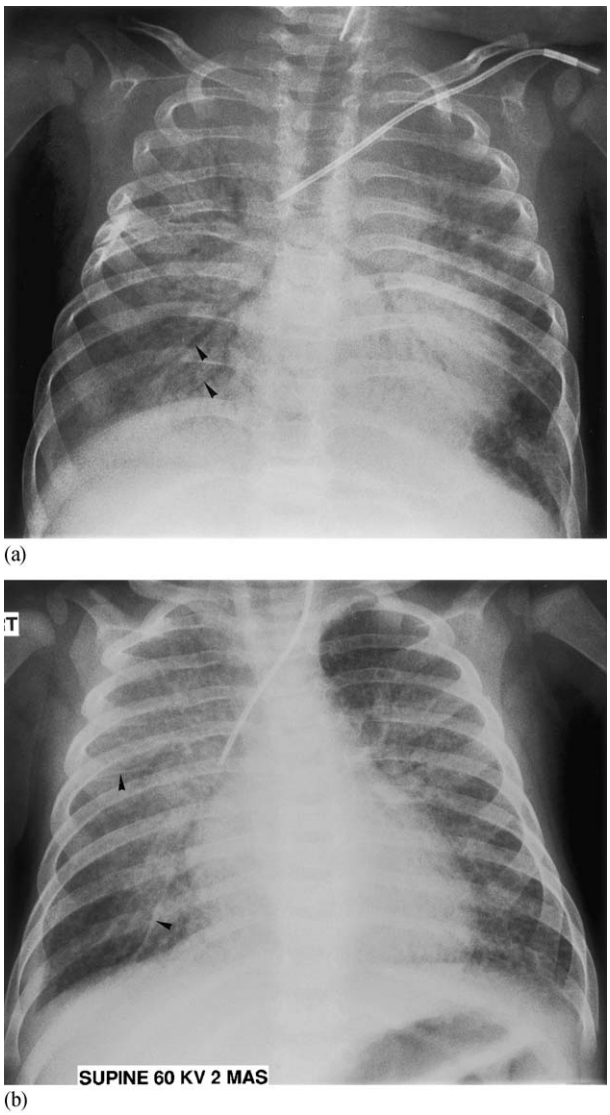


Figure 11 Pulmonary infiltrates. (a) Air space shadowing with prominent air bronchograms (arrowheads). (b) Interstitial shadowing with prominent linear pattern, fluid in the horizontal fissure (arrowheads) and a small right pleural effusion.

linear pattern with peribronchial cuffing due to thickening of the bronchial walls is associated with acute interstitial pulmonary oedema (Fig. 11b) or infection, for example with *Mycoplasma pneumoniae* (Fig. 12). Other interstitial patterns more commonly associated with chronic interstitial disease processes include reticulo-nodular, nodular, miliary shadowing and, particularly in end-stage disease, a honeycomb appearance. A full discussion of the differential diagnoses of these patterns can be found in the literature.[5]

Pleural fluid may produce a generalized hazy increased opacification throughout the hemithorax when the x-ray is taken in the supine position. Lung markings may be visible through the fluid indicating the pleural nature of the shadowing. Large pleural effusions may displace the mediastinum to the contralateral side unless there is collapse of the ipsilateral lung (Fig. 13). An ultrasound examination will determine whether the pleural fluid is loculated or amenable to percutaneous drainage, and may also help to identify other pathology, for example tumour or congenital abnormality in the underlying lung.

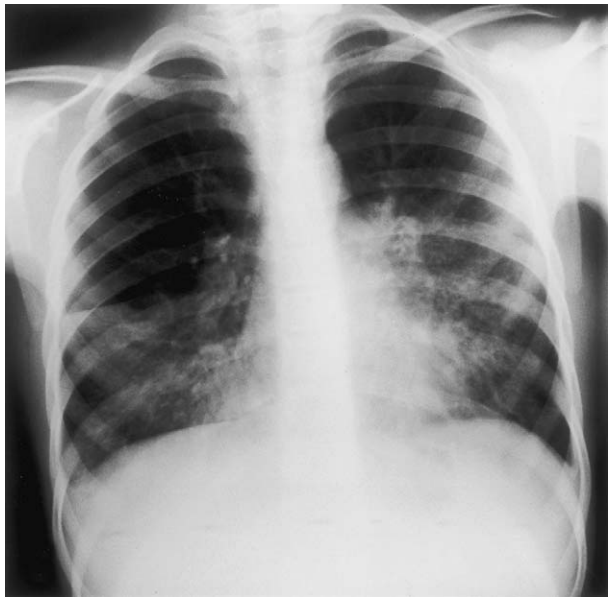


Figure 12 Bilateral interstitial pulmonary infiltrates due to *Mycoplasma pneumoniae*.

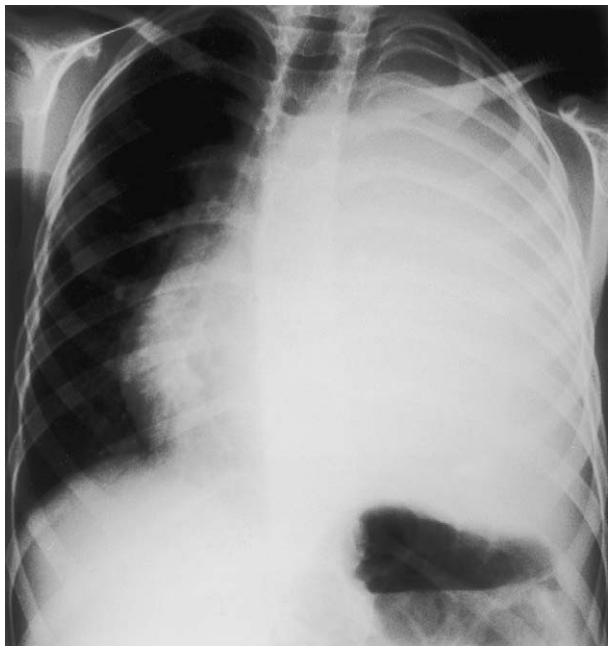


Figure 13 A completely opaque hemithorax due to a large pleural effusion with shift of the mediastinum to the right.

A thoracic tumour may also present as a large opaque hemithorax which may be difficult to differentiate from a large pleural effusion without further imaging. The mediastinum is usually shifted to the contralateral side and

the trachea may be bowed away from the mass. The presence of foci of calcification or evidence of bone destruction or erosion are important diagnostic clues if present.

The differential diagnosis of bilateral and complete opacification of the hemithoraces depends on the age of the child, although poor inspiration or tracheal obstruction may result in a generalized increase in pulmonary shadowing at any age. The most common causes for the neonate and older children are given in Table I.

In the neonate, meconium aspiration, infection and aspiration are the most common causes of widespread multifocal and non-homogeneous opacification. The differential diagnosis in the older child includes aspiration, infection, particularly due to tuberculosis, atypical and opportunistic infections, and tumour infiltration (Fig. 14). The diagnosis will usually depend upon the correlation of the radiological findings with clinical history and examination, and laboratory investigations.

Focal opacities confined to a lobar or segmental distribution are most frequently due to areas of consolidation secondary to infection or atelectasis, and the classical patterns of collapse and lobar consolidation are well described in standard texts.[6] The presence of an air bronchogram within the opacity confirms the presence of air space shadowing of the common bacterial pneumonias, for example pneumococcal pneumonia. The affected lobe can usually be deduced from the frontal x-ray using the silhouette sign, where the mediastinal or heart border is obscured by an area of adjacent consolidation as the air soft tissue contrast required for visualization is lost (Fig. 10). Atypical pneumonia, for example *Mycoplasma pneumoniae*, often result in a more interstitial pattern and are frequently bilateral (Fig. 12).

Pulmonary collapse is associated with the development of a region of increased opacity associated with loss of lung volume, as seen by alteration in the position of the greater fissures and/or hilar shadows (Fig. 15). Where the loss of volume is sufficiently large, there may also be shift of the mediastinum towards the collapsed lung and elevation of the ipsilateral diaphragm.

It is important to differentiate focal areas of consolidation from those of collapse, since collapse may be associated with a foreign body inhalation or other extrinsic obstruction for which bronchoscopy or surgery will be indicated. However, collapse, particularly when subsegmental, may be difficult to differentiate from the air space shadowing of infection, especially in children with asthma. In these situations, the clinical features will help decide whether a pulmonary infiltrate is due to mucus plug obstruction or underlying infection.

Table I Bilateral pulmonary opacification

Neonate	Older child
• Idiopathic respiratory distress syndrome	• Acute respiratory distress syndrome
• Pulmonary haemorrhage	• Pulmonary oedema
• Cardiac failure	• Neuromuscular disease
• Group B streptococcal infection	• Opportunistic infection
• Pulmonary hypoplasia	• Bilateral pleural effusions
• Bilateral pleural effusions	• Chronic lung disease

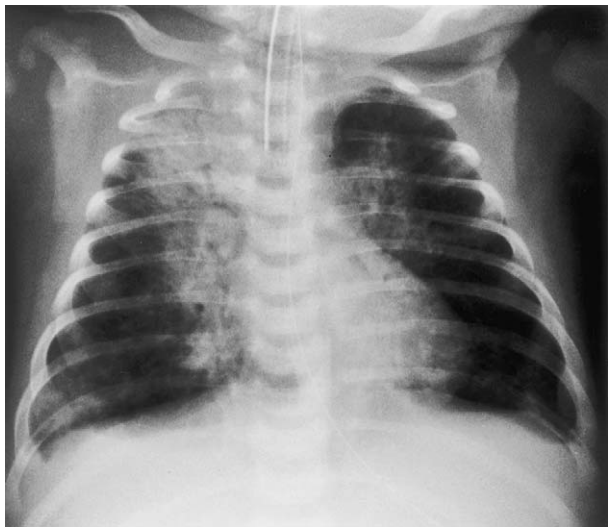


Figure 14 Bilateral overinflation and widespread pulmonary infiltrates in an intubated infant with severe bronchiolitis with secondary bacterial infection.

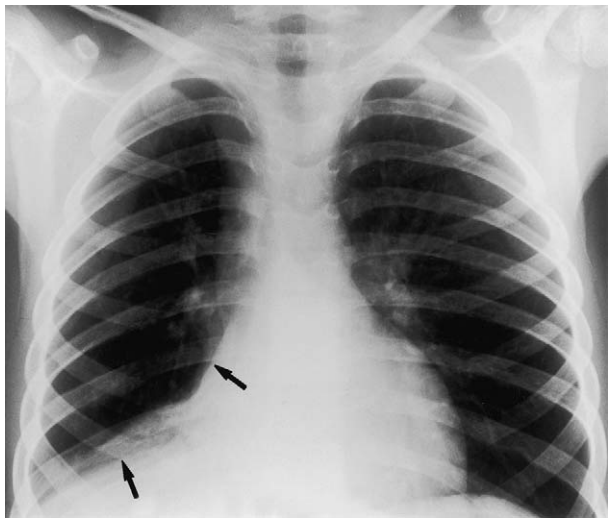


Figure 15 Collapse of the right middle and lower lobes (arrows). A Dinky car steering wheel which had been mislaid 3 months previously was removed from the intermediate bronchus at bronchoscopy!

Pulmonary nodules

Pulmonary nodules are discrete opacities seen within the lungs. These may be solitary or multiple, evenly sized or of varying sizes, and may show evidence of

calcification or cavitation. There is a wide differential diagnosis, but by far the most common cause of a solitary pulmonary opacity seen in childhood is 'round pneumonia,' often associated with pneumococcal infection. In the acute phase, air bronchograms are not usually visible and they may be erroneously misinterpreted as possible focal lesions due to tumour (Fig. 16). The clinical findings are usually suggestive of infection, and the opacity and clinical status rapidly respond to antibiotic therapy.

Multifocal nodules may be due to multiple metastases, but multifocal infection, granulomas, laryngeal papillomatosis and multiple emboli must also be considered in the differential diagnosis. Cavitation within solitary or multiple pulmonary nodules is most frequently associated with infection, and when multiple, raises the possibility of septic emboli.

Ring shadows

Ring shadows refer to thin-walled air-filled cystic lesions in the lungs which may be solitary or multiple, and may be bilateral, for example in bronchiectasis. The detection of the thin wall is important in the differentiation from other cavitating nodules, particularly abscesses. Pneumatocoeles are the most frequent cause of ring shadow seen in children, and commonly affect the middle and lower lobes, but may be solitary or multiple and are often of varying sizes. They are particularly associated with staphylococcal and streptococcal pneumonia. Infected pneumatocoeles may contain fluid and exhibit air fluid levels on erect films.

Congenital lesions which may present as a solitary thin-walled cystic lesion include a bronchogenic cyst or extralobar sequestration, whereas complex masses comprising multiple ring shadows include the diagnoses of congenital diaphragmatic hernia and cystic adenomatoid malformation of the lungs[7] (Fig. 17). The former diagnosis may be obvious due to the intrathoracic position of the stomach, and continuity of the thoracic ring shadows with the abdominal bowel gas.

The differential diagnosis for generalized cystic lung change, i.e. the bubbly lung, is quite different to that for more focal ring shadows. In the neonate, pulmonary interstitial emphysema, bronchopulmonary dysplasia and Mickity Wilson disease must be considered. In older children, cystic fibrosis, extensive cavitating Hodgkin's disease, disseminated fungal infection and honeycomb lung may result in this pattern of abnormality.

Diaphragms

Marked elevation in the diaphragm may be due to loss of lung volume, paralysis, eventration, congenital diaphragmatic hernia or subpulmonary effusion. A flattened diaphragm generally indicates overinflation of a lung, but may also be due to a loculated subpulmonary pneumothorax (Fig. 9). Loss of clarity of the diaphragm may be related to adjacent pulmonary collapse or consolidation, but the possibility of a congenital extralobar sequestration should be considered, particularly if the opacity is slow to clear following treatment for any infection. The association of a small hemithorax and basal opacity on the right should raise a suspicion of Scimitar syndrome, and a search should be made for the linear density of the Scimitar vein (Fig. 18).

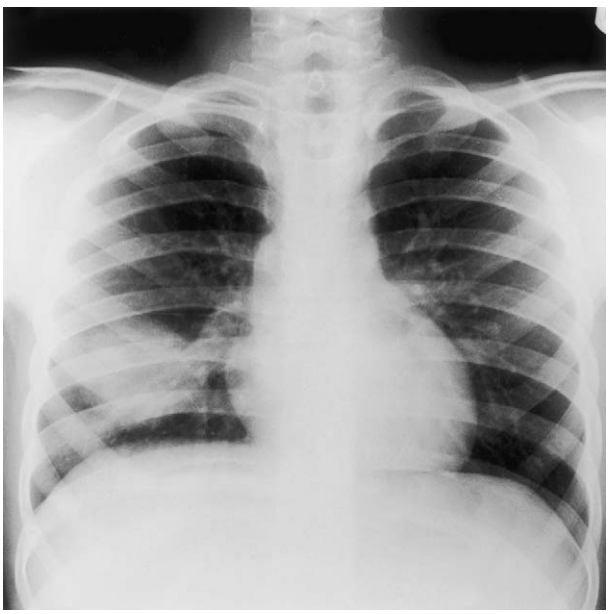


Figure 16 Round pneumonia simulating a mass lesion in the right lower lobe.

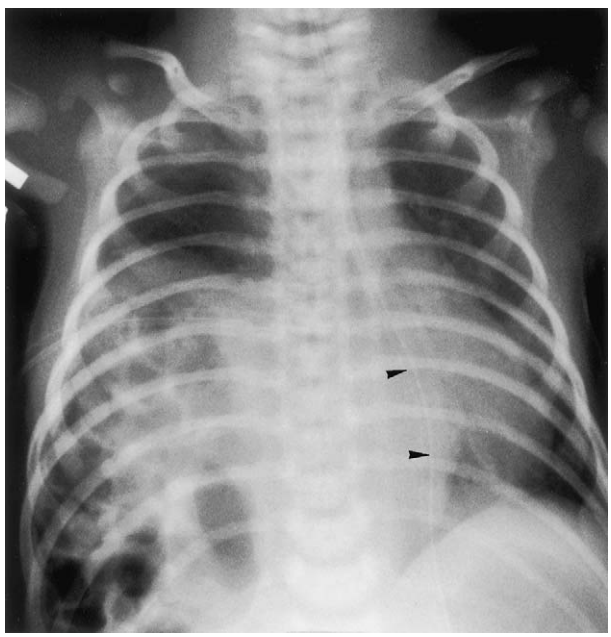


Figure 17 Multiple ring shadows continuous with the bowel gas pattern in an infant with congenital diaphragmatic hernia. Note the mediastinal shift (arrowheads), and chest drain inserted on the right to drain a pneumothorax.

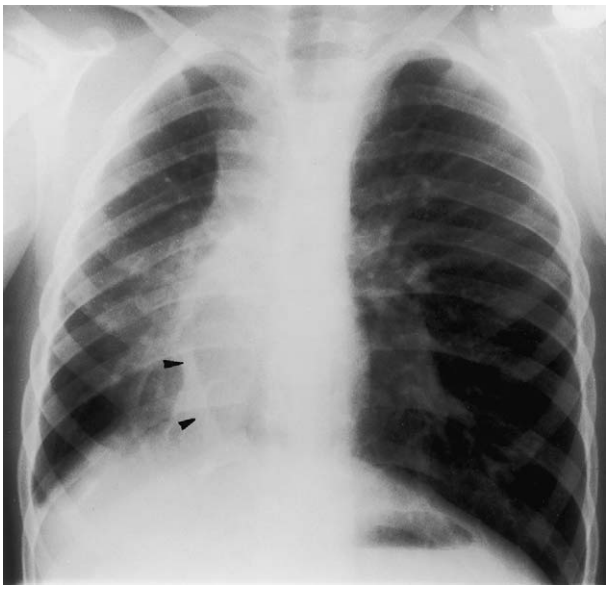


Figure 18 Scimitar syndrome. Small hemithorax associated with right basal opacity partially obscuring the diaphragmatic contour. Note the Scimitar vein (arrowheads).

Thoracic skeleton and soft tissues

Abnormalities of the thoracic skeleton are important to identify since they may be a marker for a generalized bone disorder, including the expanded anterior rib ends of a rickety rosary, short or broad ribs of a skeletal dysplasia, and destructive bone lesions in malignancy and infection. The identification of rib fractures on the chest x-ray of a child on the intensive care unit may be the only clue that a head injury may have been inflicted non-accidentally.

Generalized thickening of the chest wall may result in decreased opacity of a lung, whilst a unilateral congenital absence of the pectoral muscles can simulate air trapping due to the increased translucency of the thorax. Multiple soft tissue masses, for example neurofibroma, may project as multiple opacities in the lungs. However, close inspection of the soft tissues should reveal the subcutaneous origin of the shadows.

Having completed the systematic review of the chest, it is always worth reviewing those areas where abnormality is easily overlooked, for example behind the clavicles, the mediastinum and retrocardiac regions of the lung bases. A second look at an x-ray is often useful when the appearances are difficult to interpret or there is a discrepancy with the clinical impression. Discussion with the radiologist may help to find just one more radiological clue to arrive at the correct diagnosis in the more difficult cases.

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