

Non-Visualization of Lung Markings Below Hemidiaphragm in Subtle Subpulmonic Effusion: An Old Sign Resuscitated

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Abstract

To assess the lack of visibility of vascular markings under the hemidiaphragm on a frontal chest radiograph as a sign of pleural effusion, fifteen patients were collected showing this sign. Pleural effusion was diagnosed by ultrasound, comparison with previous or subsequent chest x-ray or computed tomography. Patients in the study group exhibited this sign in the absence of the classical signs of pleural effusion. In the control group, lack of visibility of blood vessels was observed in only 4.2% cases. Non-visualization of vascular markings below the hemidiaphragm should alert the interpreter to the possible presence of pleura! effusion and a lateral or decubitus view or ultrasound examination may be carried out to rule out effusion (JPMA 47:284,1997).

Introduction

Pleural effusion is one of the most common positive findings noticed on a chest radiograph and its value thus cannot be overemphasized. Early detection of pleural effusion has been described by many authors¹⁻⁴. Schwarz described a new radiologic sign of subpulmonic effusion as obliteration of normally seen intrapulmonary blood vessels below the level of hemidiaphragm³. In routine practice we have observed many such cases in which the only clue to the presence of subpulmonic effusion on frontal chest x-ray was lack of visibility of lung markings below hemidiaphragm. This report is based on 15 such cases.

Patients and Methods

The study group comprised of 17 subpulmonic effusions in 15 patients without typical chest roentgenographic signs to prompt the diagnosis. Two patients had bilateral involvement. Non-visualization of lung markings below the hemidiaphragm was the basis of early detection of subpulmonic effusion. All films were taken at high kVp (100-110) and low mAs (2-5) technique. The frontal erect or (supine) chest radiographs of these patients were evaluated for the presence of occult signs of pleural effusions i.e., loss of lung markings below the hemidiaphragm and increased density below the hemidiaphragm on the affected side. Interpretation was done by two radiologists (YAH and TRK) independently. The diagnosis of pleural effusion was confirmed by ultrasound (US), computed tomography (CT), decubitus view or comparison with previous or subsequent chest film demonstrating normal vascular visibility below the hemidiaphragm in question. Underexposed films, patients with significant obesity or large breasts obscuring the region of interest and those with known ascites were excluded from the study. Visibility of vessels below hemidiaphragm was assessed in 105 normal subjects as control group.

Results

The age range of the study group subjects was 9 to 68 years with a male to female ratio of 3:2, The

control group had an age range of 16 to 80 years and a male to female ratio of 1:1.9. Of the 17 subpulmonic effusions, lateral costophrenic sulcus was sharp and pointed in configuration in 14, while changed equivocally (minimally blunted, hazy or displaced) in remaining 3.

Table. Description of 15 patients included in the study.

Type of exam.		Method of confirmation				Side		Loss of vascular markings	
PA	AP	US	Decubitus	Comparison with prev. or subseq	CT	R	L	AT Hemidiaph.	Below Hemidiaph.
11	4	10	1	5	1	13	4	14(82%)	3(12%)

Abbreviations:

PA= Posteroanterior, AP= Anteroposterior, US= Ultrasound, Prev.= Previous, Subseq= Subsequent, CT= Computed Tomography, R= Right, L= Left.

Table gives description of patients used in the study alongwith, mode of confirmation of pleural effusion and pattern of loss of vascular markings below the hemidiaphragm. In 5 patients comparison with previous or follow-up films, revealing normal subdiaphragmatic vascular pattern, was used as a diagnostic sign for confirmation of pleural effusion (figure 1a and 1b).

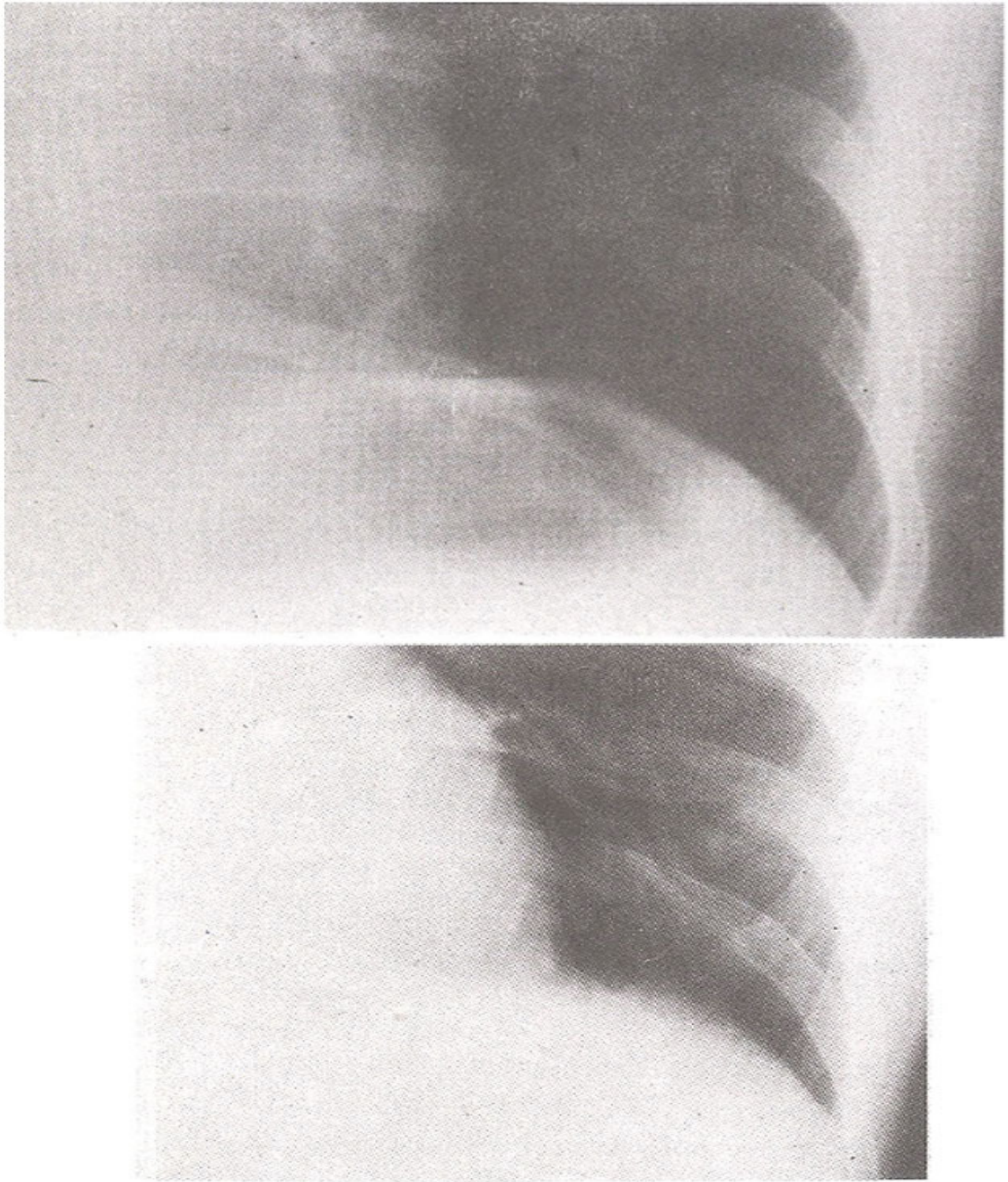


Figure 1 (a) and 1(b). Note normal visualization of branching vascular pattern below the left hemidiaphragm before (a) and complete disappearance of it after the development of pleural effusion (b). The costophrenic sulcus and diaphragmatic outline is preserved.

Vascular visibility ended at (n=14) or just below (n=3) the level of presumed hemidiaphragm. Three patients in latter group showed abrupt change in the vascular visibility with a sharp cutoff. In control group, the distance for which vessels were seen coursing below the diaphragm ranged from 0 to 8.5 cm on right and 0 to 5.5 cm on left. Mean length of visualized vessels was 4.3 cm on right and 2.4 cm on left.

left. Typically a gradual loss of vascular visibility was noted from above downwards. In 9 normal cases (4.2% hemidiaphragms) vessels were not visualized below the hemidiaphragm (8 on left and 1 on right).

Discussion

Blunting of lateral costophrenic sulcus, loss of hemidiaphragm, increased density below hemidiaphragm and meniscus signs are classical manifestations of pleural effusion. Subpulmonic effusions may be diagnosed by raised hemidiaphragm, straightening of hemidiaphragm and Hessel's sign i.e., lateral shift of the superior most portion of hemidiaphragm on the frontal chest film². Detection of minute subpulmonic effusion may be difficult on the frontal film. Whilst the decubitus examination can detect as little as 5-15 ml of pleural fluid¹, it may take 200-600 ml of fluid to cause blunting of the lateral costophrenic sulcus^{2,5} to be seen on frontal examination. Minute fluid collection starts in the subdiaphragmatic location, spilling to posterior costophrenic sulcus, obliteration of which may be seen only on the lateral view⁸. Frontal film, which could be the only examination available in routine cases, may not show a conclusive evidence of subpulmonic effusion in these cases. Schwarz described 3 cases with loss of vascular visibility below hemidiaphragm as the only sign of pleural effusion³. Present study included 12 such patients. The remaining 3 had minimal equivocal vascular change observed included loss of visibility at (82%) or below (18%) the presumed hemidiaphragm. Comparison of previous or subsequent films is useful in the early detection of this vascular divergence. If on one occasion the vessels below hemidiaphragm are discernible and a comparable frontal film on another occasion reveals loss of visibility, the possibility of subpulmonic effusion should be strongly suggested. This criteria was used successfully in 5 patients (Figure 1a and 1b). The sign was seen more frequently on right side probably because of more homogenous background provided by liver leading to better appreciation of vascular pattern as compared to left side where overlapping bowel shadows interfere with visibility of already hard to see "subdiaphragmatic" vessels. Other conditions which may obscure vessels below hemidiaphragm due to increased density or basal lung disease, include basal consolidation or collapse, subdiaphragmatic pathology, large breasts and obesity^{3,6}. The final diagnosis should therefore be entertained in the light of clinical picture and associated radiologic signs. It is postulated that the blood vessels are obscured by two situations: a) increased density produced by the pleural effusion; b) compression of adjacent lung that commonly accompanies pleural effusion⁶ (Figure 2a and 2b).

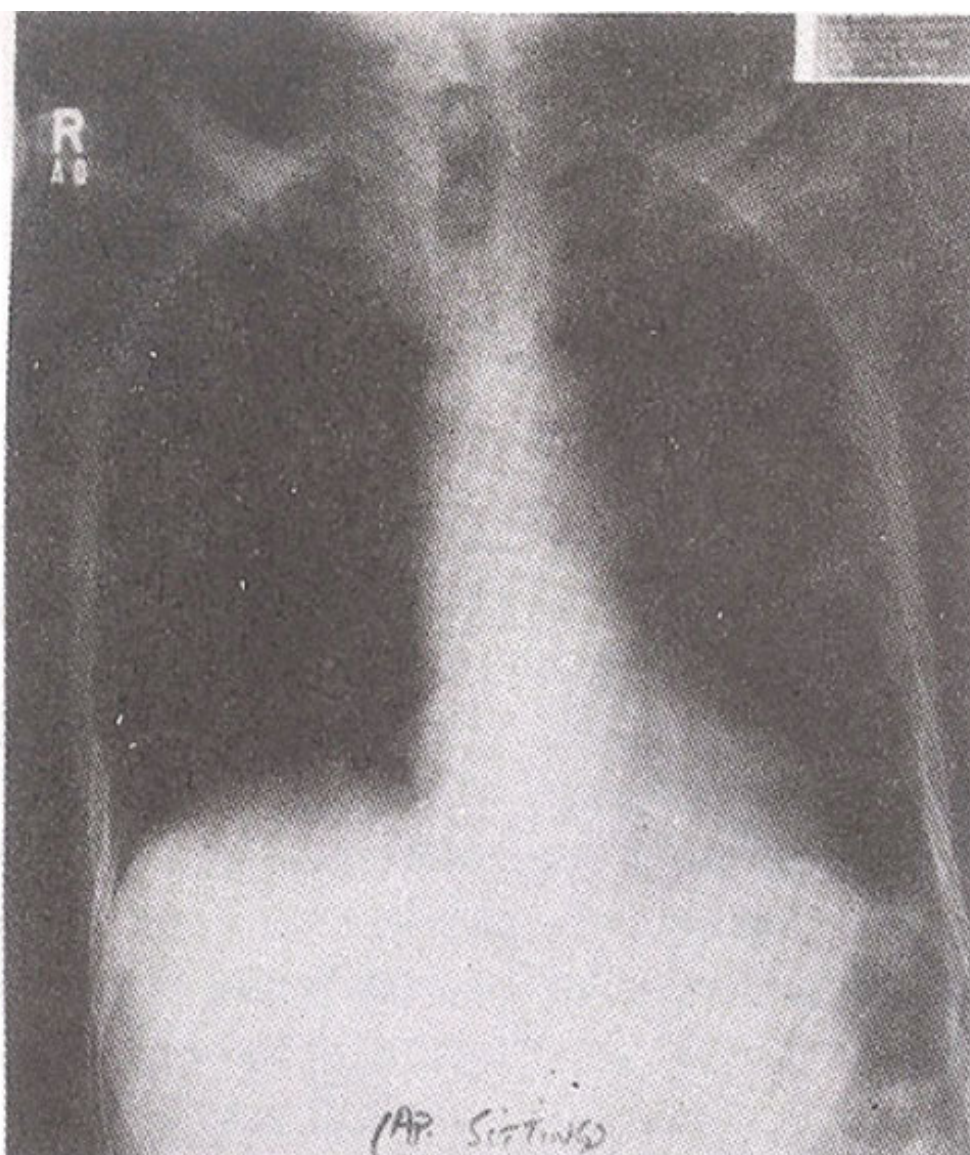


Figure 2 (a). Right subpulmonic effusion. Right hemidiaphragm is sharply outlined and lateral costophrenic sulcus is maintained. On the original film the vessels were appreciated for a short distance below the hemidiaphragm, after which there is abrupt increase in density and loss of vascular markings.

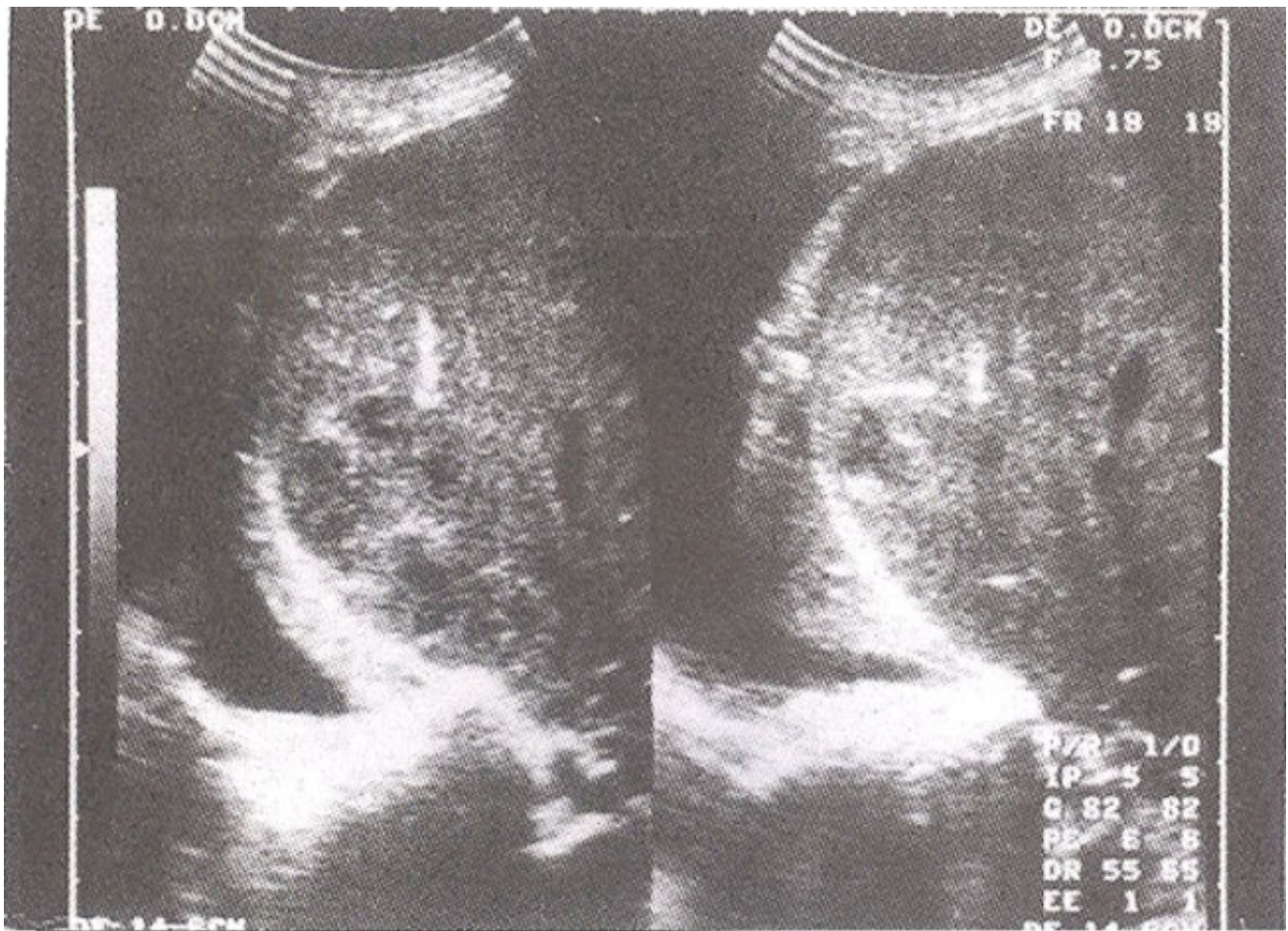


Figure 2 (b). Right subpulmonic effusion. Ultrasound examination demonstrating the right pleural effusion with associated partial atelectasis.

Loss of or abrupt change in vascular visibility below diaphragm may be the only sign in minute subpulmonic effusion. Whenever seen, it should prompt further evaluation by ultrasound examination or decubitus film. Comparison with previous or subsequent films showing normal vascularity in the region may also be of help.

References

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