

VALUE OF LUNG ULTRASOUND IN ASSESSMENT OF PEDIATRIC PATIENTS WITH PNEUMONIA VERSUS CHEST PLAIN X- RAY

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Introduction

Community acquired pneumonia (CAP) is defined as an infectious pneumonia that is acquired outside or inside the hospital in children without immune damage.

Chest X-ray (CXR) has been the main modality in the investigation of chest infection since it has been invented in the late 19th century.

CXR has certain restrictions such as radiation exposure risks, high inter-observer and intra- observer variations, and little impact on the clinical outcomes. Children in comparison to adults have 3 to 5 times higher morbidity and mortality risk from radiation exposure.

A call for new imaging modality which is “lung ultrasonography”:

LUS findings were classified as a normal pattern, defined as normal lung sliding with or without A-lines or having the following according to the following Ultrasonographic signs of pneumonia:

- 1- Presence of subpleural lung Alveolar consolidations: subpleural echo-poor regions or tissue-like region, with blurred margins irregular borders “shred sign” in nontranslobar consolidation, or lung hepatization in translobar consolidation.
- 2- Air bronchogram: branching hyperechoic structures in the consolidation. Lentiform or punctiform air bronchogram were not counted as separate signs and were considered as part of the consolidation.
- 3- Presence of B-lines.
- 4- Pleural line abnormalities, defined as irregularities in the pleural line.
- 5- Pleural effusion defined as anechoic or hypoechoic fluid with or without floating debris.

Aim of the work

The aim of this work was to assess the value of lung ultrasound in the assessment of the pediatric patient with pneumonia over routine chest X-ray regarding feasibility, accuracy, and hazards reduction.

Patients and Methods

Patients:

This study was conducted on 50 patients with pediatric pneumonia referred directly to the radio-diagnosis department or chest unit in El-Shatby hospital.

Methods:

CXR examination: PA CXR was only done without a lateral view to pediatric patients in the supine position according to the "British Thoracic Society guidelines".

LUS examination: The anterior, lateral, and posterior areas of each hemithorax was based upon using a methodical scan to map out the entire thorax. The anterior region was divided into upper and lower anterior areas. The upper anterior area extends from the para-sternal line to the anterior axillary line and from the collar bone till the second intercostal space. The lower anterior area extends from the para-sternal line to the anterior axillary line and from the third intercostal space till the diaphragm. The lateral area was also divided into upper and lower lateral areas. The upper lateral area extending from the anterior axillary line to the posterior axillary line and from collar bone to the second intercostal space. The lower lateral area extending from the anterior axillary line to the posterior axillary line and from the third intercostal space to the diaphragm. The posterior area extended from the axillary line posteriorly to the paravertebral line.

Results

Table : Comparison between ultrasound and X-Ray

	Ultrasound (n=50)		X-Ray (n=50)		χ^2	p
	No.	%	No.	%		
Consolidation					29.553*	<0.001*
Negative	12	24.0	16	32.0		
Positive	38	76.0	15	30.0		
Positive inconclusive	0	0.0	19	38.0		
Pleural effusion					9.013*	0.003*
Negative	31	62.0	44	88.0		
Positive	19	38.0	6	12.0		

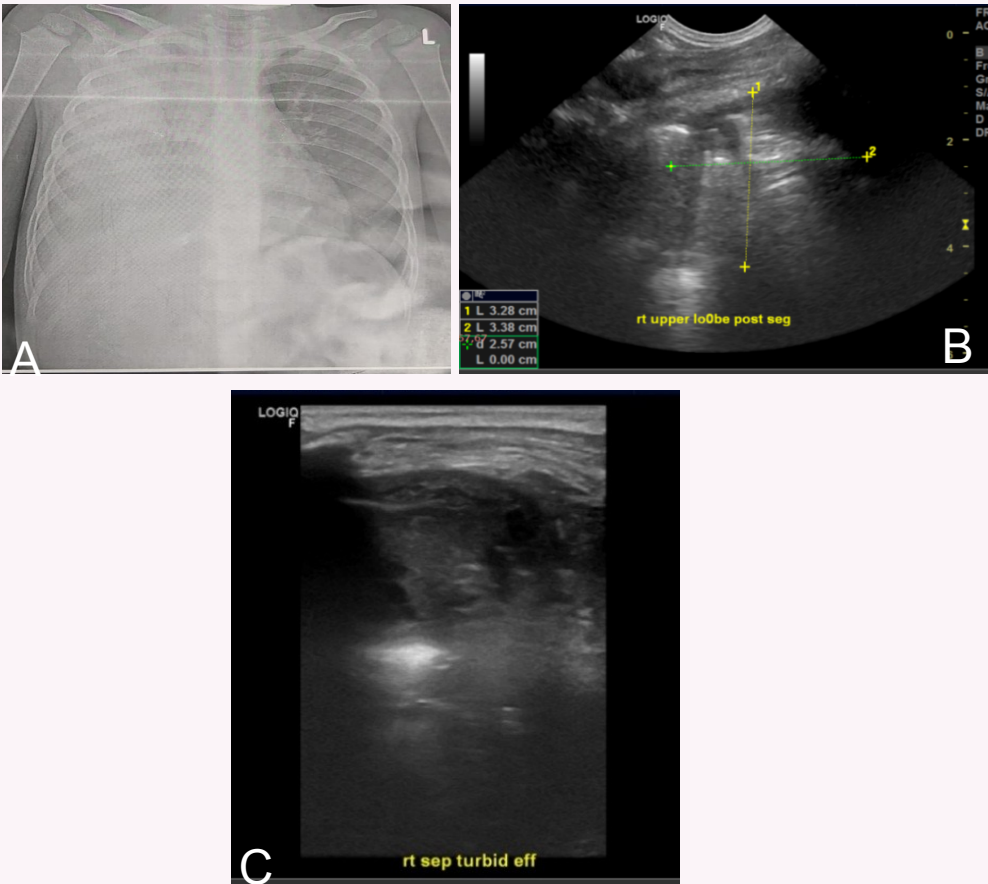


Figure: (a) Chest X-ray shows complete opacification of the right lung lobe "white lung". (b) lung ultrasound (LUS) performed at the same time demonstrates right upper posterior lobar consolidation averaging 3.2x3.3cm, (c) right moderate septated turbid pleural effusion... empyema.

Conclusion

- LUS is a simple and accurate radiological method that is not inferior to CXR in identifying pulmonary and pleural abnormalities in pediatric patients diagnosed as having pneumonia.
- LUS can be considered to be used first before CXR in pediatric pneumonia.
- LUS has shown high accuracy and repeatability to diagnose CAP.