

Research Article

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Contribution of Chest Ultrasound in the Management of Acute Respiratory Distress in the Emergency Department and Intensive Care Units: About 57 Cases at the Regional Hospital Centre of Saint Louis



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Abstract

The management of dyspnea in the emergency department and intensive care unit has benefited from the development of medical imaging. This study aimed to show the contribution of chest ultrasound in critical patients.

Patients and methods: We conducted a looking-forward descriptive and analytical study over a 6-month-period and data were processed in Excel and Sphinx 2.0

Results : Overall 57 patients were enrolled. The mean age of the patients was 48.39 years with a standard deviation of 24.77. The extremes were 5 and 83 years. The sex ratio was 1.7. The patients were from Saint Louis in 81.5% of cases. The most common underlying conditions were high blood pressure and asthma (14.04% and 10.53%). Patients were admitted with polytrauma in 37.03% of cases. Thoracic ultrasound was suggestive in 92.59% of cases. Specific treatment was initiated on the basis of the ultrasound findings in 74.1% of cases. A chest CT scan was necessary in 48.14% and a correlation of 88.8% was found between the results of the ultrasound and those of the CT scan. The outcome of the patients was favourable in 72.72% of cases and the average length of hospital stay was 4.07 days.

Discussion and conclusion : Chest ultrasound in the emergency department and intensive care unit is a powerful tool in the management of dyspnoeic patients. It surpasses the clinic and the chest X-ray without sharing the CT scan-related side-effects.

Introduction

Dyspnea is a common chief complaint in the emergency unit. It is sometimes indicative of serious conditions for which it is advisable to act quickly and properly. The lung is a vital organ which investigation raises problems in the critically ill patients, as standard radiography doesn't provide enough information while CT scan are not always affordable [1]. The development of sonographic imaging has improved the diagnosis and management of conditions affecting the pleuropulmonary system [1,2]. The aim of this study is to demonstrate the value of thoracic ultrasound in the management of acute dyspnea in the emergency and intensive care units.

Patients and Methods

We carried out an analytical and descriptive study with prospective data collection over a 6-month-period ranging from 1 January to 31 June 2022. The data were processed using Excel and sphinx 2.0 software

Results

During this study period, a total of 57 patients were enrolled. The mean age of the patients was 48.39 years with a standard deviation of 24.77. The extremes were 5 and 83 years. The sex ratio was 1.7. The patients were from Saint Louis in 81.5% of cases. The

most common underlying conditions were high blood pressure and asthma (14.04% and 10.53%). Patients were admitted with polytrauma in 37.03% of cases and 62.07% of patients had consulted the emergency department for non-traumatic rest dyspnea. The clinical examination revealed an acute respiratory failure syndrome in these patients. Weezhing, crackles and pleural effusion syndrome were the most common findings. Among these patients, we noted that 19.23% had signs of distress with 14.03% signs of hypercapnia. Chest ultrasound was suggestive in 92.59% of cases. The patients were systematically subjected to ECG and cardiac ultrasound coupled with pleuropulmonary ultrasound. The table below shows the distribution of patients according to the ultrasound findings.

The performance of the associated echocardiography revealed signs of hypokinetic dilated cardiomyopathy in 7.01% of cases, chronic cor pulmonale (5.26%) and mitral stenosis in 1.75% of cases. Treatment was initiated on the basis of ultrasound results in 74.1% of cases. Systematic pleural drainage was done in 22.8% cases, or 68.42% of all patients who had pleural effusion. The proportion of patients who had presented a non-specific biological inflammatory syndrome was 31.58%. A chest scanner was performed in 48.14% and a correlation of 88.8% was found between the results of the ultrasound and those of the scanner obtained. The following (Table 1) shows the distribution of patients according to the final diagnosis found after clinical and paraclinical explorations.

Table 1: distribution of patients according to pleuropulmonary ultrasound findings.

Sonographic Signs	Amount	Percentages
Profile A	31	54,4%
Profile A B	2	3,5%
Bilateral Profile B	7	12,3%
Barcode Sign	12	21%
Sinusoid Sign	3	5,3%
Barcode Sign + Sinusoid Sign	2	3,5%

Associated cardiac ultrasound revealed signs of hypokinetic dilated cardiomyopathy in 7.01% of cases, chronic cor-pulmonale (5.26%) and mitral stenosis in 1.75% of cases. Treatment was initiated on the basis of the ultrasound results in 74.1% of cases. Systematic pleural drainage was performed in 22.8% of cases, standing for 68.42% of all patients with pleural effusion. The proportion of patients with a non-specific biological inflammatory

syndrome was 31.58%. A thoracic CT scan was performed in 48.14% and a correlation of 88.8% was found between the ultrasound and CT scan findings. The following (Table 2) shows the distribution of patients according to the final diagnosis found after the clinical and paraclinical explorations. The outcome was unremarkable in 72.72% of patients and the average length of hospital stay was 4.07 days.

Table 2 : Distribution of patients according to the final diagnosis.

Diagnosis		Amount	Percentages
Asthma Attack		7	12,3%
	DCM	2	3,5%
	MS	1	1,8
	Nephrogenic APE	2	3,5%
COPD Decompensation		1	1,8
Pneumothorax		10	17,5%
Haemopneumothorax		4	7%
Purulent Pleural Effusion		2	3,5%
Hypoxemic Pneumonia		8	14%
Pulmonary Embolism		1	1,8
Others		19	33,3%

Discussion

Point-of-care ultrasonography (POCUS) is a powerful tool available to the emergency physician to overcome the limitations of clinical examination and plain X-rays [3]. It can be used to adjust a misdiagnosis, but also to assist in the performance of therapeutic procedures and their monitoring [4]. Although pleuropulmonary ultrasound has undergone a revival in its application in clinical practice, diagnostic accuracy is obtained when it is coupled with cardiac ultrasound [5]. The data from the literature are the subject of defined protocols that make thoracic ultrasound a powerful diagnostic tool [5,6]. The clinical examination of this series of patients reveals a mean age of 48.39 years, which may correlate with the underlying condition in which the dyspnea occurred. S Karim [7] in his study found a mean age of 46.34%. The majority of patients are admitted for post-traumatic dyspnea following a road traffic accident. Young people are the age group most concerned by this scourge. Patients with severe trauma benefit from FAST ultrasound as part of the initial assessment. Non-traumatic dyspnea occurs in patients with special pulmonary or cardiac conditions [7].

The physical signs associated with standard radiography that point to a diagnosis are only accurate in 60% of cases, whereas ultrasound offers an average performance of 92% [8,9]. In addition, patients with major respiratory failure often do not present the conditions for a quality clinical examination, and in these patients, ultrasound can logically be performed as a first line approach and still have the dignity of being called the stethoscope of today and tomorrow [10]. The work of Daniel Lichtenstein [11,12] has led to a significant advance in the analysis of the lung ultrasound image. The information obtained is indirectly appreciated thanks to reverberation artefacts arising from the air-fluid interface. The only time the lung can be approached directly is when there is a complete loss of ventilation (consolidated lung or pulmonary hepatisation). Ultrasound offers the possibility of diagnosing pleural effusion, pneumothorax, alveolar consolidation, and interstitial syndrome with performance close to that of CT. The diagnosis of cardiogenic APE (5.3% of cases) is made in the presence of multiple anterior B-lines called bilateral pleural flares, the non-specific biological inflammatory syndrome (NSBIS) is absent and the cardiac ultrasound shows increased left ventricular filling pressures and, in some cases, the causative cardiac pathology [5,6]. The sonographic signs are early and disappear in real time. The distance between B-lines in the same intercostal space is a fundamental element in differentiating APE from ground-glass pictures. Pneumothorax presents as an abolition of pleural sliding with the presence of the lung point. The latter is a pathognomonic sign of pneumothorax and its location helps to define the abundance of pneumothorax [11,12].

Pleural fluid effusion and pneumoniae are associated with pulmonary consolidation. The absence of a C-profile ("C" for consolidation) in the ultrasound findings is explained by the fact

that fluid pleural effusions were described by the presence of a sinusoid sign, and that the diagnosis of pneumonia, pulmonary embolism and causes of spontaneous pneumothorax were the cases for which a CT scan was subsequently performed. According to the French Society of Emergency Medicine [13], lung ultrasound has both diagnostic and therapeutic value in acute pneumonia. Situations that limit the effectiveness of ultrasound in practice are not rare [11,12,14]. Dyspneic patients in the emergency department for whom thoracic ultrasound is strictly normal include neurological conditions, metabolic disorders and sepsis. These same trends were observed in the study by S Karim [7].

In our patients, we performed systematic pleural drainage in 22.8%. In addition to making the diagnosis, ultrasound is useful for quantifying the effusion and defining the ideal position of the drain. According to the learned societies, pleuropulmonary ultrasound is strongly recommended before any pleural drainage procedure [15]. Patients with pleural effusions seen on ultrasound and who had a chest CT scan without drainage (32.58% of cases) were cases of spontaneous effusions, suspected of fragile and clinically stable lungs. The CT scan is a sophisticated examination which still has an important place in the exploration of pleuropulmonary pathologies. However, the problems associated with performing it in critical patients (transport, irradiation, etc.) have made ultrasound a valid alternative with similar performance and significant time savings. In addition, it helps to initiate treatment and monitor its effectiveness [16].

The outcome of the patients was unremarkable in 72.72% of cases and the average length of hospitalisation was 4.07 days. S Karim [7] in his study found a success rate of 52.63% with a smaller sample size and shorter study duration. The application of practical ultrasound reduces the diagnostic and therapeutic delay as well as the total length of hospital stay of patients [11,12,16].

Conclusion

Chest ultrasound in the emergency and intensive care unit is a diagnostic and therapeutic tool which performance is no longer arguable [16]. It surpasses plain X-rays and clinical imaging with an efficiency similar to that of CT scan. It is perfectly adapted to fragile subjects and reduces the time and cost of treatment, but also the effects of invasive procedures. However, its impact on mortality deserves further study.

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