COMPARISON OF HEFFNER CRITERIA AND LIGHT CRITERIA IN DIFFERENTIATING EXUDATIVE AND TRANSUDATIVE PLEURAL EFFUSION

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ABSTRACT

Pleural effusion is present when there is >15ml of fluid is accumulated in the pleural space. It can be divided into two types; exudative and transudative pleural effusion. Tuberculosis and parapneumonic effusion are the common cause of exudative pleural effusion whereas heart failure accounts for most of the cases of transudative pleural effusion. This study was a hospital based cross sectional study performed at Nepal Medical College during the period of January 2016-December 2016. A total of 50 patients who fulfilled the inclusion criteria were enrolled. Pleural effusion was confirmed by clinical examination and radiology. After confirmation of pleural effusion, pleural fluid was aspirated and was analysed for protein, LDH, cholesterol. The Heffner criteria was compared with Light criteria to classify exudative or transudative pleural effusion. Among 50 patients, 30 were male and 20 were female. The mean age of patient was 45.4±21.85 years. The sensitivity and specificity of using Light criteria to detect the two type of pleural effusion was 100% and 90.9%, whereas using Heffner criteria was 94.87%, 100% respectively(P<0.01). There are variety of causes for development of pleural effusion and no one criteria is definite to differentiate between exudative or transudative effusion. In this study Light criteria was more sensitive whereas Heffner criteria was more specific to classify exudative pleural effusion. Hence a combination of criteria might be useful in case where there is difficulty to identify the cause of pleural effusion.

KEYWORDS

Pleural effusion, Heffner criteria, Light criteria

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INTRODUCTION

Pleural effusion is present when there is >15ml of fluid is accumulated in the pleural space. Pleural fluid accumulates when pleural fluid formation is more than absorption and pathophysiologically can be divided into two type: Transudative pleural effusion and Exudative pleural effusion.

Transudative pleural effusion occurs when systemic factor affects formation and absorption of pleural fluid and the leading cause is heart failure. Exudative pleural effusion occurs when local factors leads to accumulation of pleural fluid and the leading cause is pneumonia, malignancy etc.[1-2]

The two pathophysiologic type of pleural effusion can be differentiated by measuring pleural fluid protein and LDH. Light criteria is commonly used to classify pleural effusion and is as follows:

- Pleural fluid protein/serum protein ratio: >0.5
- Pleural fluid LDH/serum LDH ratio: >0.6
- Pleural fluid LDH more than 2/3rd of upper limit of normal for serum LDH.

Exudative effusion is when at least one of the above criteria is met. Whereas transudative effusion is when none of the criteria is met.[3-4] However the fallacy of Light's criteria is that it misidentifies approximately 25% of transudative effusion as exudative.[5-8] Hence misidentification may lead to unnecessary investigations and treatment.

This lead to search for other better criteria and hence Heffner *et al* put forward a criteria to differentiate exudative and transudative pleural effusion:

- Pleural fluid cholesterol >45mg/dl,
- Pleural fluid protein >2.9g/dl
- Pleural fluid LDH >2/3rd of upper limit of normal.

If any of the criteria is meet the pleural effusion is classified as exudative and it has lower misidentifaction rate which is approximately 10%. And it has the advantage of using pleural fluid investigation only and do not require blood investigations as in Light's criteria.[9-10]

Cholesterol is synthesized by pleural cells themselves for their own needs. Extrahepatic synthesis of cholesterol is now known to be much greater than was once thought, the synthesis depends on the metabolic needs of cells, and is in dynamic equilibrium with cholesterol supply by LDL and cholesterol removal by HDL. The concentration of cholesterol in pleural cavity is increased by the degeneration of leukocytes and erythrocytes, which are present in large number in pleural fluid.[11-14]

Pleural cholesterol derives from plasma, about 70% of plasma cholesterol is bound to low density lipoproteins (LDL), and the rest to HDL or very low density lipoproteins (VLDL). The increased permeability of pleural capillaries in patients with exudative pleural effusion would allow plasma cholesterol to enter the pleural cavity.[15-17]

MATERIALS AND METHODS

This study was conducted in Nepal Medical College Teaching Hospital from January 2016-December 2016. It was hospital based cross sectional study. Fifty Patient with pleural effusion confirmed by chest xray were enrolled in the study. Those who were already on antibiotics, history of thoracocentesis were excluded from the study.

After clinical history and examination a chest X-ray was performed and USG chest was performed where there was difficulty to differentiate from pleural thickening. According to clinical diagnosis, pleural effusion were classified into exudative and transudative types.

Diagnostic thoracocentesis was performed with aseptic measures and fluid were examined for protein, LDH, cholesterol, cell count by automatic analyser. Serum level of protein, LDH was also analysed.

Light criteria is as follows:
- Exudative effusion is when at least one of the following criteria is met.
- (in bullets or no)
- Pleural fluid protein/serum protein ratio: >0.5,
- Pleural fluid LDH/serum LDH ratio: >0.6, Pleural fluid LDH more than 2/3rd of upper limit of normal for serum LDH.

Heffner criteria:
- If any of the following criteria is met the pleural effusion is classified as exudative.
- Pleural fluid cholesterol >45mg/dl, Pleural fluid protein >2.9g/dl, Pleural fluid LDH >2/3rd of upper limit of normal.

The laboratory results were analysed using Light criteria and Heffner criteria and the results were compared with clinical diagnosis by pearson correlation test and value of P<0.05 is considered significant statistically.

RESULTS

Among 50 patient enrolled in the study, majority were male (n-30) and the mean age of the patient were 45.4±21.85yr. The most common cause of pleural effusion was tuberculosis (54%) followed by heart failure (20%) and parapneumonic effusion(20%). Other less common causes were empyema, bronchogenic carcinoma, and renal failure.
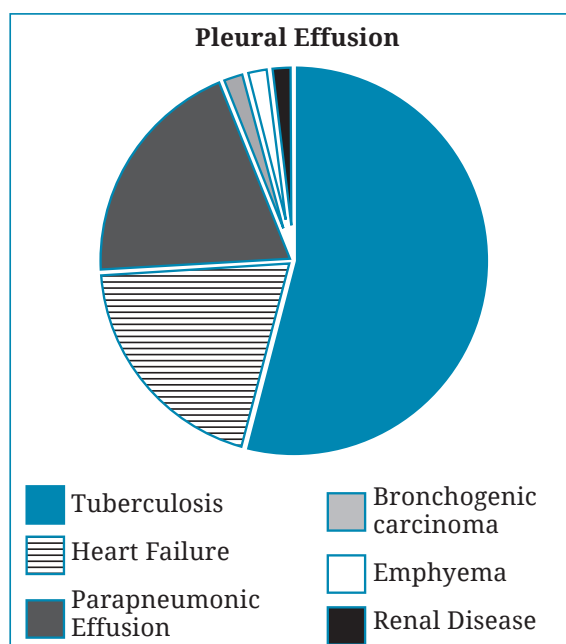
Fig. 1: Causes of pleural effusion in patient.

correctly identified 40 patients as exudative effusion while the rest 10 cases were due to transudative effusion among 50 patients.

In table 1 horzontal row shows types of effusion identified by light criteria and vertical Column shows types of effusion identified by clinical diagnosis. There is significant association between light criteria and clinical diagnosis(P<0.001).

This study showed that sensitivity and specificity of light criteria to identify

Among 50 patients in the study, clinical diagnosis of exudative effusion was made in 39 cases, among which tuberculosis was most common (69.2%), followed by parapneumonic effusion(25.6%), remaining(5.1%) was due to bronchogenic carcinoma and empyema.

Among 50 patients in the study, 40 patients were identified by Light criteria as exudative effusion compared to 39 patients identified clinically as exudative effusion. Light criteria
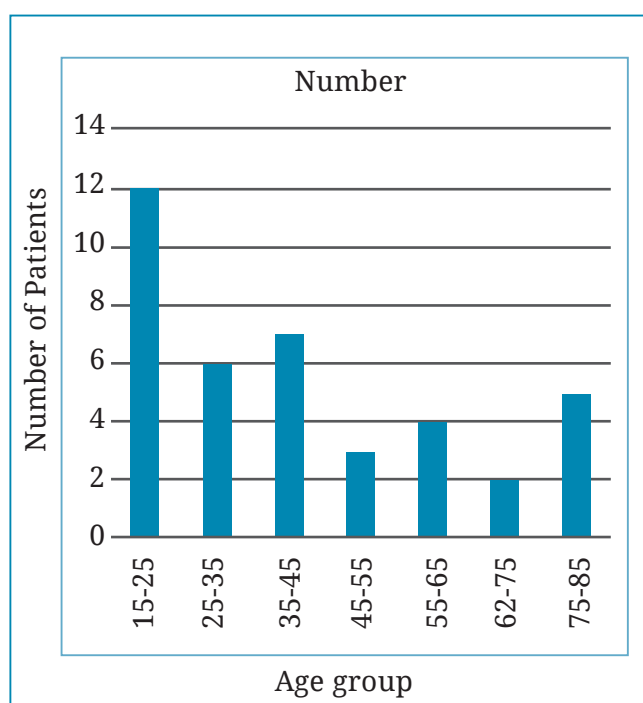
Table 1: Comparison of causes of effusion with clinical diagnosis

Light criteria	Clinical diagnosis		
	Exudative effusion	Transudative effusion	Total
Exudative effusion	39	1	40
Transudative effusion	0	10	10
Total	39	11	50
Chi square test= 44.318		P-value = <0.001	

exudative pleural effusion was 100.0% and 90.9% respectively. In table 2 horizontal row shows types of effusion identified by heffner criteria and vertical column shows types of effusion identified by clinical diagnosis. There is significant association between heffner criteria and clinical diagnosis(P<0.001). When applying Heffner criteria to identify exudative pleural effusion 37 patients were identified as exudative effusion. This study shows that the sensitivity and specificity of Heffner criteria to identify causes of exudative pleural effusion is 94.87% and 100% respectively.

Fig. 2: Age wise distribution of exudative pleural effusion.

Table 2: Showing causes of effusion by 2×2 table

Heffner criteria	Clinical diagnosis		
	Exudative effusion	Transudative effusion	Total
Exudative effusion	37	0	37
Transudative effusion	2	11	13
Total	39	11	50
Chi square test= 40.318		P-value = <0.001	

DISCUSSION

This study enrolled 50 patients, among which 30 were male and 20 were female.The mean age of the patient was 45.4±21.85 years. Among the patient studied, exudative effusion was common (n-39) with tuberculosis(n-27), parapneumonic effusion(n-10) being the most common causes. Maldhure *et al*, also showed similar result in study conducted in India where TB was the commonest cause 66% followed by malignancy and parapneumonic effusion.[18]

In this study, the sensitivity and specificity to identify exudative effusion by Light criteria was 100% and 90.90%(P<0.01). Similarly, Heffner criteria had sensitivity and specificity to identify exudative pleural effusion was 94.87% and 100% respectively(P<0.001).

The study by Hamal *et al* in TUTH, had almost similar result with sensitivity and specificity to identify exudative effusion by protein criteria 81.4% and 82.6%, LDH criteria 86% and 94.7% and Cholesterol criteria 97.7% and 100% respectively.[19]Shen *et al* also showed high sensitivity and specificity of Cholesterol criteria in their study with 88% and 96% respectively.[20]

Guleria *et al* in their study with pleural fluid cholesterol had cut off value of >60mg/dl. In their study the sensitivity and specificity to identify pleural effusion was 88.2% and 100% respectively.[21]

In this study light criteria had high sensitivity rate(100%) whereas heffner criteria showed high specificity(100%) to identify exudative effusion. Hence, a combination of criteria might be useful to minimise the misclassification by either of the criteria alone.

In conclusion, this study showed that light's criteria has high sensitivity and pleural fluid cholesterol has high specificity to detect pleural fluid into exudative and transudative and hence a combination of criteria may be useful to identify the etiology in difficult cases as either of the criteria is not complete alone.

This study also showed that tuberculosis as most common cause of pleural effusion in our hospital and hence a keen observation is required to diagnose and treat those cases.

The limitation of the study include; it is a single centered study and may not represent the various ethinic groups and hence furthur randomised trials are needed to confirm the result of this study.

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