Original Research Paper

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Respiratory Medicine

THE DIAGNOSTIC VALIDATION OF CANCER RATIO IN MALIGNANT PLEURAL EFFUSION(MPE)

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ABSTRACT MPE is caused by malignant tumors originating in the pleura or metastasis of malignant tumors from other location to the pleura.Once diagnosed the median survival is 3-12 months with unfavorable prognosis.**METHODS:**The study was designed as a **RETROSPECTIVE** case series.The study was carried out in 100 patients with MPE.AIM: To know the effective marker for the diagnosis of MPE.OBJECTIVE: To know the ratio between serum LDH and Pleural fluid ADA termed as CANCER ratio,To identify the effective cancer ratio values.**INCLUSION:** Pleural effusion was diagnosed after chest xray,ultrasonography,chest ct. Patients underwent thoracocentesis and diagnosis for MPE by cytological confirmation.**EXCLUSION**-We excluded patients with transudate and other exudative effusions.We calculated and analysed the ratio between Serum LDH and Pleural fluid ADA.This was termed as CANCER RATIO.**RESULTS**:Our results should show that CR can be used as a effective marker for the diagnosis of MPE. **CONCLUSION:**There are several advantages for clinical utility of CR for diagnosis.First, nearly all patients with undiagnosed PE undergo routine blood,pleural biochemical tests.It is easy to obtain data of LDH,ADA without incurring any additional costs.Second,patients with high CR values must be treated with caution and further

KEYWORDS : Cancer ratio,Serum LDH,Pleural fluid ADA,Malignant pleural effusion(MPE).

INTRODUCTION

Malignant Pleural Effusion (MPE) is caused by malignant tumors originating in the pleura or pleural space either by direct invasion, hematogenous or lymphangitic spread or metastasis of malignant tumors from other locations to the pleura.

MPE is considered to be the first aggressive sign of malignant diseases in approximately 10% of patients and it is second most common cause of pleural exudate and affects 15% of all patients with malignancy.

Its significance implies the category of a terminal stage with a poor prognosis that may only provide patients with 3 to 12 months of life expectancy.Prognosis even depends on the underlying tumor type and patient comorbidities.

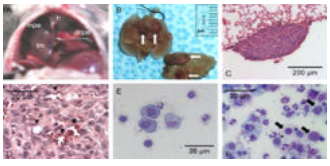
Pleural fluid cytological or pleural pathological examination is helpful for the diagnosis but the positive rate of these diagnostic methods is approximately 60%.The yield of cytology which is only 50% of MPE. When negative, closed or thoracoscopic pleural biopsy is indicated to establish the diagnosis,out of which the closed pleural biopsy adds only 8% to the overall yield.

Low levels of ADA are used as a surrogate indicator of malignant effusion while the cytology reports are awaited.

However,no reliable biochemical marker is available to aid the diagnosis.Although thoracoscopic or closed pleural biopsy improves diagnostic sensitivity,it is not only traumatic with the risk of complications but also requires high cost and technical requirements.

As a result, many times effusion remains undiagnosed in cases when the patient refuses the thoracoscopic biopsy or when unavailable.

This impedes timely initiation of the treatment of lung cancer



Some very important recommendations such as diagnosing MPE with biochemical markers such as serum LDH and Pleural fluid ADA termed as Cancer ratio are mentioned in this study for diagnosis

CLINICAL PRESENTATION

Dyspnea is the most common symptom which occurs in almost all patients with MPE. Even small size effusions can cause significant dyspnea and the severity correlates poorly with the size of the effusion. 60% of patients also experience dull chest pain. Another non specific and common complaint is cough.Patients also experience constitutional symptoms such as fever,weight loss,loss of appetite,loss of weight,night sweats and fatigue.

DIAGNOSIS- IMAGING

Almost all radiological procedures can help us identify MPE. As little as 50ml of fluid can be identified in a lateral view of chest xray.

Ultrasound of the chest (USG) is more sensitive and may help to identify pleural metastasis as well as assessment of pleural thickening. CT chest scans are highly sensitive for diagnosis and even gives additional information regarding the underlying lung pathology,Pleural thickening and metastasis, nodularity, presence of loculations which can point towards the diagnosis of malignant pleural effusions.Other modalities like MRI,PET-CT are also helpful for diagnosis.

PATHOLOGICAL DIAGNOSIS

The diagnosis of MPE requires the presence of tumor cells in the pleural fluid or evidence of tumor presence in a pleural biopsy.A USG guided thoracoscopy has a diagnostic yeild of 60% for the first aspiration and increases to 70-75% following a second aspiration.

Blind percutaneous pleural biopsy has less sensitivity compared to CT or USG guided biopsy,which have yield as thoracoscopic biopsy.Figure 1: Impact of Malignant Pleural Effusion (MPE) (Source: Studylib.net)

MATERIALS AND METHODOLODY For the study,the data is collected retrospectively of 100 malignant pleural effusion cases.

INCLUSION: Pleural effusion was diagnosed after chest

Xray,Ultrasonography,Chest CT. Patients underwent thoracocentesis and diagnosis of MPE and was made by cytological confirmation.

On the other hand, the adopted design for the study is quantitative for analyzing all the collected data and information.It might also be applicable for increasing the research significance of the study. At the same time, the study is made by focusing on the diagnosis of MPE by ratio between serum LDH and Pleural fluid ADA. This was termed as Cancer Ratio.

EXCLUSION Information related to the patients with transudative and other exudative effusions is excluded from the study. Similarly, all the collected information for the study is also applied to determine the impact of the critical disease on the health and present lifestyle of the individual as well. The age, gender and other factors of the patients are also analyzed in the study.

Data has been collected and stored in excel sheets.The collected data has been analyzed.Validation has been done with sensitivity,specificity, cut off values.SPSS software was used for statistical analysis.

RESULTS AND DISCUSSION

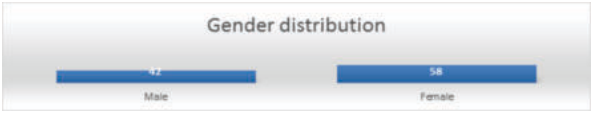
1.DISTRIBUTION OF AGE IN MALIGNANT PLEURAL EFFUSION.

When age trends of patients with malignant pleural effusion were recorded, 78% of patients tends to have age >50 years.This indicates an increasing trend of age group for malignant effusions.

DISTRIBUTION OF AGE IN SIMILAR OTHER STUDIES

STUDY	PERCENTAGE OF AGE
Sami deniz et al,2019	83%
Prasenohadi et al,2022	59%

2.DISTRIBUTION OF GENDER IN MALIGNANT PLEURAL EFFUSION

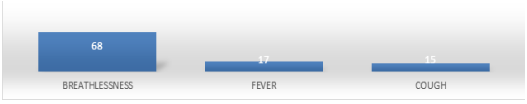


In our study, Malignant pleural effusions are more common in females

DISTRIBUTION OF GENDER IN SIMILAR OTHER STUDIES

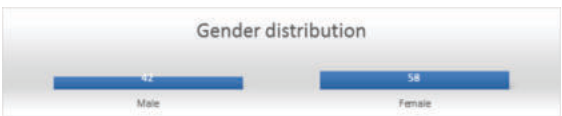
STUDY	MALE	FEMALES
Sami deniz et al	46%	68%
Prasenohadi et al	30.8%	53.8%

3.PRESENTING FEATURE OF MALIGNANT PLEURAL EFFUSION



In present study,the most common presenting feature of malignant pleural effusion is breathlessness followed by fever and cough

4. DISTRIBUTION OF SMOKING STATUS IN MALIGNANT PLEURAL EFFUSION



In present study,the distribution of smokers are less comparitive with non smokers in malignant pleural effusion, this correlates with the female predominance of the disease.

5. THE DIAGNOSTIC MEAN VALUES : Pleural Fluid ADA is 12.8 ± 6, Serum LDH is 405.05 ± 120.69. Similar studies of Akash varma et al has Pleural fluid ADA- 10, Serum LDH - 627 and Zhang et al has Pleural fluid ADA- 8.00 ±3.77,Serum LDH- 215.77 ± 101.95.

6.CUT OFF FOR CANCER RATIO

CUT OFF	SENSITIVITY	SPECIFICITY	PLR	NLR
>12	93.1	75.1	3.6	0.02
>24	94.2	95.4	32.5	0.04
>32	82.4	97.3	30.1	0.18

Sensitivity,Specificity and predictive values were calculated based on the cut offs derived from ROC .

We can observe that at the cut off >24,there is high sensitivity and specificity.

CUT OFF FOR CANCER RATIO VALUE: >24

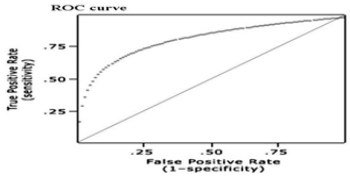


Figure 6: MPE

Figure 6: Graph showing sensitivity and specificity

In our study significantly higher CR values were observed in MPE. Our results show that CR can be used as a effective marker for the diagnosis of MPE

MAJOR FINDINGS OF VARIOUS STUDIES

STUDY	CUT OFF	SENSITIVITY	SPECIFICITY
Verma et al,2016	20	0.98	0.94
Zhang et al,2016	10.6	0.94	0.95
Elmahalawy et al,2017	20	1.00	1.00
Korczynski et al,2018	16.4	0.95	0.68
Prasenohadi et al,2022	26	43%	90%

DISCUSSION

Serum LDH is a ubiquitous cellular enzyme,that occurs in high concentrations in the liver,kidney,myocardium,skeletal muscles and red blood cells.LDH rises in response to tissue injury.

A very high levels might be a marker of diagnostic and prognostic role and as a poor outcome in sepsis and cancer patients.

EXPLANATION

The preferential use of glycolysis for energy by tumor cells,instead of oxidative phosphorylation,a switch in the ATP generation pathway which is mediated by LDH.

In our study,Serum LDH was raised to a significantly higher level in cancer patients.

ADA is a key enzyme in purine metabolism that catalyzes the conversion of adenosine to inosine.It is secreted by mononuclear cells,neutrophils, lymphocytes and red blood cells.

EXPLANATION They are increased in immature and undifferentiated T-Lymphocytes. High levels are associated with infectious conditions such as tuberculosis,empyema and helps in early diagnosis.

Immune function of cancer patients are suppressed,resulting in LOW levels of ADA in MPE.Hence,this shows the possibility of high MPE. In our study,ADA level was 12.8±6.

In our study,we combined the positive and negative markers in

malignant effusions to develop a predictor of malignant pleural effusion. Serum LDH : Pleural fluid ADA as CANCER RATIO.

This study attempted to find a better cut off point which could be applied to patients with suspected MPE.

Thus our study aimed in finding a laboratory investigation as a novel diagnostic marker for MPE.

Conclusion and future scope

All the conducted analyses and findings might play a very crucial role in reducing the number of cancer cases along with providing a better lifestyle to the individual. A highly sensitive test is good for screening. High specificity makes the test more definitive for diagnosis.The cut off >24 gave us reasonable sensitivity and specificity.

In conclusion,this study describes the ability to glean additional diagnostic information from a simple routine blood,pleural biochemical tests.It is easy to obtain data of LDH,ADA. Secondly,these findings can help in early identification of patients with MPE in a simple manner,with no added cost or test.

This data can help guide treatment plans and early follow up .Patients with High CR values must be treated with caution and further diagnostic examination should be considered.

This study explains how regular blood and pleural biochemistry testing can provide extra prognostic information. This information can direct treatment strategies and prompt follow-up. Individuals who have high CR levels need to be handled carefully, and additional diagnostic testing should be taken into consideration.

Recommendations

Drain the malignant pleural fluid: It is the most important and effective method of curing the disease of the patients. This particular procedure might be used in the primary stage of the disease. Thoracocentesis treatment might also be very helpful in curing this disease and providing better health and lifestyle to the patient.

Chemotherapy: It is also a very crucial and conventional method of treatment for the malignant cells of patients. Applying these methods has the potential to detect the cells and destroy them in a specific way. It is applied to increase the lifespan of the patient by curing the disease. Preventing the effusion from returning can also be possible by applying chemotherapy as a treatment.

Proper medicine and treatment: The patient suffering from Malignant Pleural Effusion must go through a proper diagnosis and treatment. Visiting a doctor regularly and taking the appropriate medicine is also very helpful for the patient to live healthily and happily by reducing the effect of this disease. In case necessary the patients also should go through surgery and other medical support given by the doctors and another healthcare specialist.

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