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ORIGINAL ARTICLE

The Diagnostic Value of carcinoembryonic Antigen and cancer Antigen 125 in Malignant Pleural Effusion

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ABSTRACT

Background: Many studies have proved that carcinoembryonic antigen (CEA) and cancer antigen 125 (CA125) have high affinity and binding specificity and can be used to distinguish pleural effusion in patients with malignant and non-malignant pleural effusion. So, it investigated whether tumour markers carcinoembryonic antigen (CEA), neuron-specific enolase (NSE), cancer antigen 125 (CA-125), and cytokeratin 19 fragment (CYFRA 21-1) in pleural effusions and serum are the most important.

Methods: This is an observational descriptive cross-section study carried out in the Chest diseases department at Zagazig University Hospitals on 70 cases with pleural malignancies from June 2023 to January 2024. Pleural fluid CEA was done using Electrochemiluminescence immunoassay (ECLIA) (Sandwich principle). CA125 was measured in pleural fluid in U/ml using the commercially available ELISA kit.

Results: There was a significantly higher cancer antigen 125 and a carcinoembryonic antigen in malignant pleural effusion compared to benign pleural effusion. Cancer Antigen 125 (Ca125) at cut-off≥12 and carcinoembryonic antigen at cut-off level ≥3 show sensitivity of 97.1%, specificity of 60.0%, and accuracy of 78.6% to discriminate malignant pleural effusion from benign pleural effusion. This indicated that both cancer antigen 125 (Ca125) and carcinoembryonic antigen are highly suspicious of malignancy but have poor specificity.

Conclusions: In cases of malignant effusion, the levels of Ca-125 and CEA are significantly higher in pleural fluid. CA125 and CEA markers proved to be highly effective as malignant markers, and they might be useful in differentiating between malignant and benign effusions.

Keywords: Pleural effusion; CA-125 antigen; Carcinoembryonic antigen.

INTRODUCTION

A high symptom load and mortality are linked to malignant pleural effusions (MPEs), which are an indicator of advanced malignancy. Malignant Pleural effusions (MPE) are known to cause severe morbidity in individuals with advanced cancer, with an annual incidence of 150,000 new cases. Between the time of diagnosis and the end of their illness, MPE is detected in approximately 50% of patients with malignant metastatic tumours. A malignant condition can primarily cause pleural effusion. Usually from original tumours in the breast or lung, metastases account for more than 90% of malignant effusions **[1].**

The prognosis and course of treatment for these individuals depend on the ability to distinguish between MPE and benign pleural effusion (BPE). Pleural fluid cytology and pleura biopsy are the gold standards for the diagnosis of Malignant Pleural effusions (MPE). Cytology, the process of identifying cancerous cells in pleural fluid, is time-consuming, subjective, and has a very uneven sensitivity range of 11% to 78% **[2].**

The primary challenge in diagnosis is discerning between malignant and nonmalignant pleural effusions. The most popular approach is cytological examination of the pleural effusion. Nevertheless, the sensitivity of cytological examination varies from 40 to 70% since malignant cells could be present in the samples but are missed or misidentified **[3].**

Tumour markers (TMs) are chemicals released into the blood and pleural fluid by tumour cells or created by normal cells in response to malignancy; the number of TMs in pleural fluid can be significantly higher than that of serum. Certain T-cell epitopes (TMs), such as cancer antigen (CA) 125, are released by healthy mesothelial cells and are found in higher numbers in BPE patients. To guarantee that the marker levels in BPE do not go beyond the cutoff point, the ideal cutoff value of a TM for MPE diagnosis needs to have a high enough specificity. This high specificity decreases the TMs' sensitivity. Because of this, several writers advise combining two or more TMs in order to boost sensitivity without sacrificing specificity **[2].**

Tumor marker analysis has been shown to be a less invasive method for distinguishing between malignant and nonmalignant pleural effusions. One tumour marker alone cannot be recommended for the diagnosis of malignant pleural effusion (MPE). It seems that a combination of two or more tumour markers has greater sensitivity. The overall diagnosis accuracy of pleural carcinoembryonic antigen (CEA) and carbohydrate antigens (CA) 125 was revealed in a meta-analysis published in 2008 **[4].**

Also, **Nguyen et al. [5]** conducted a meta-analysis which revealed that the pleural CEA, CA 125, and summary estimations of sensitivity and specificity were CEA, 0.549 and 0.962; these values were not as high as anticipated. However, there is still debate over the precise functions of certain tumour marker combinations.

The most used method for this strategy has been using tumour marker concentration cut-off values to guide diagnostic judgments. However, when intricate relationships between tumour markers exist, this method might not function effectively in real-world situations **[6].**

Carcinoembryonic antigen (CEA) and cancer antigen 125 (CA125), two frequent biomarkers that carry predictive information about lung malignancies, have been shown to have clinical significance **[7].**

Our study aims to determine the accurate diagnosis of Carcinoembryonic antigen and cancer antigens 125 in malignant pleural effusion.

METHODS

This observational descriptive cross-sectional study was carried out in the chest diseases department at Zagazig University Hospitals on 70 cases of pleural malignancies during the period from June 2023 to January 2024. Every patient provided written informed consent, and the study was authorized by the Zagazig University Faculty of Medicine Research Ethics Committee (International Review Board ZU-IRB#10815-24/5-203). The work has been completed in compliance with the Declaration of Helsinki, the World Medical Association's code of ethics for human subjects' research.

Inclusion criteria: Aged.>18, all patients with pleural malignancies were established by the conventional through Gold standard (cytological study or pleural biopsy)

Exclusion criteria: Patients who refused to participate in the study, Patients with incomplete data, cytological analysis or pleural biopsy specimens did not confirm MPE.

All patients were subjected to a detailed history, including personal history, present history of the disease, and family history of previous medication. A full clinical examination for all patients was done. Full physical examination, including measurements of vital indicators (heart rate, temperature, blood pressure, and respiratory rate) and symptoms (pallor, cyanosis, jaundice, and enlargement of lymph nodes). All malignant pleural effusion was obtained from lung cancer patients and metastatic cancer as ovarian pancreatic breast. Malignant cells in PE or on a pleural biopsy specimen were used to confirm the diagnosis of MPE.

Laboratory tests include the following laboratory investigation for all patients in the study. Complete blood picture. KFT (Blood urea and creatinine). Liver function tests. Sputum for AFB by ZN. LDH and protein in pleural fluid. Gram stain and bacterial culture on pleural fluid multimodal ZN for AFB The ADA level of pleural fluid. The pleural fluid was examined cytologically, and a tumour marker was assessed in the pleural fluid (Ca125.CEA).

Chest ultrasonography. Computed tomography. PET-CT. Cytology and pleural biopsy gold standard for MPE. Medical thoracoscopy.

PEs were examined for the presence of CA 125 and CEA (Abbott Ireland Diagnostics Division, Sligo, Ireland) using chemiluminescent microparticle immunoassay technology and sera in accordance with the manufacturer's guidelines. For 18 minutes, a 50µL paramagnetic particle coated with an antibody and a 10–30µL sample were incubated together. To form a reaction mixture, after adding and incubating, 50µL of antibody acridinium-labeled conjugate was added for 4 minutes after washing. The reaction mixture was supplemented with pre-trigger and trigger solutions after an additional wash cycle. Using the i2000 Optical System (Abbott, ARCHITECT Corporation, PA, USA), the chemiluminescent reaction that resulted was quantified in relative light units. In a single laboratory analysis, all assays were carried out on coded samples by investigators who were not informed of the patient's diagnosis. The lowest amounts of CEA and CA125 that can be detected are 1.0U/mL and 0.5U/mL, respectively. When the value of a specimen exceeds the range of measurement for the reagent kits, the specimen is diluted manually. Every sample underwent double analysis. A single skilled technician completed all tumour marker measurements in blinded samples once.

Fluid pleural Electrochemiluminescence immunoassay (ECLIA) (Sandwich concept) was used to estimate CEA. The assay took eighteen minutes to complete.

1st incubation: A sandwich complex is formed by the reaction of 10µL of material, a monoclonal CEA-specific antibody labelled with ruthenium complex, and a biotinylated monoclonal CEA-specific antibody.

2nd incubation: Biotin and streptavidin interact to bind the complex to the solid phase following the addition of streptavidin-coated microparticles.

The commercial ELISA kit was used to test CA125 in pleural fluid in units of millilitres (U/ml).

The best cut-off values for CEA and CA125 were found using receiver operating characteristic (ROC) curves. These values provided the highest levels of predictive, specific, and sensitivity for identifying the sources of malignant pleural effusion. The curve obtained will allow one to determine the area under the curve (AUC) and slope.

STATISTICAL ANALYSIS

Using SPSS version 26, the study results were gathered, examined, tabulated, and statistically summarized. Quantitative data were presented as means, standard deviations, and ranges when their distribution was found to be parametric, whereas qualitative data were expressed as numbers and percentages. When comparing two groups with qualitative data, the Chi-square test or the Fisher exact test was utilized in place of the Chi-square test if any cell's predicted count was less than five. The One-way ANOVA Test was used to compare more than two independent groups with quantitative data and a parametric distribution. The allowable margin of error was set at 5%, while the confidence interval was set at 95%. So, the p-value was considered significant as the following: $P > 0.05$ = non-significant (NS), $P < 0.05$ = significant (S), and $P < 0.001$ = highly significant (HS).

RESULTS

Table 1 showed that there was no difference in studied groups regarding age and sex distribution, $p>0.05$. At the same time, there was a significantly higher percentage of smokers in malignant pleural effusion cases, $p<0.05$.

Table 2 showed that there was a significantly high percentage of pleural effusion in both sides of the lung in malignant patients, $p<0.05$.

Table 3 showed that there was a significantly large amount of pleural fluid in malignant cases compared to benign cases, $p=0.0001$. Also, there was a significantly high Lactate Dehydrogenase (LDH), $p=0.0001$. TLC, $p=0.0001$. Lymphocyte, $p=0.0001$. Protein, $p=0.016$ in pleural fluid of malignant cases compared to benign cases, $p=0.0001$, $p=0.016$, respectively.

Table 4 showed that there was a significantly higher cancer antigen 125 and a carcinoembryonic antigen in malignant compared to benign pleural effusion, $p=0.001$.

Cancer Antigen 125 (Ca125) at cut-off level ≥12 shows a sensitivity of 71.4%, specificity of 62.9% and accuracy of 67.1 % to discriminate malignant pleural effusion from benign pleural effusion, as shown in **Table 5.**

Cancer Antigen 125 (Ca125) at cut-off level ≥12 shows a sensitivity of 71.4%, specificity of 62.9% and accuracy of 67.1% to discriminate malignant pleural effusion from benign pleural effusion. Carcinoembryonic antigen (CEA) at cut-off level ≥3 shows a sensitivity of 85.7%, specificity of 65.7% and accuracy of 75.7% to discriminate malignant pleural effusion from benign pleural effusion, as shown in **Table 6.**

Cancer Antigen 125 (Ca125) at cut-off≥12 and carcinoembryonic antigen at cut-off level ≥3 show sensitivity of 97.1%, specificity of 60.0% and accuracy of 78.6% to discriminate malignant pleural effusion from benign pleural effusion. This indicated that both cancer antigen 125 (Ca125) and carcinoembryonic antigen are highly suspicious of malignancy but have poor specificity, as shown in **Table 7.**

Table 1: Patient characters of studied groups**.**

Variables	Malignant group N=35	Benign group N=35	t	p
Age per years Mean ±SD Median (range)	 57.46±13.1 58(42-85)	 52.77±9.89 52(40-69)	1.68	0.096
Gender n (%) Males Females	 28(80.0) 7(20.0)	 23 (65.7) 12(34.3)	1.81[c]	0.179
Smoking n (%) yes no	 27(77.1) 8(22.9)	 6 (17.1) 29(82.9)	28.23[c]	0.0001*

Table 2: Side of pleural effusion.

variables	Malignant group N=35		Benign group N=35		χ^2	p-value
	No.	%	No.	%		
Side of pleural effusion	.	.	.	.		
bilateral	15	42.9	0	0.0		
Right side	9	25.7	21	60.0	21.17	**0.0001***
left side	11	31.4	14	40.0		

Table 3: Comparison between Pleural fluid analysis in malignant and benign groups

Variables	Malignant group N=35	Benign group N=35	you	p-value
Amount of fluid (cc) Mean ±SD Median (range)	 1571.43±356.92 1700(800-2000)	 707.14±84.14 700(600-800)	7.05	0.0001*
Lactate Dehydrogenase (LDH)	1119.43±476.8 900(280-1800)	389.74±241.69 365(125-940)	6.19	0.0001*
Protein Mean ±SD Median (range)	 3371.26±1272.03 3450(1000-5300)	 2328.86±1905.19 1315(630-4900)	2.42	0.016*
Glucose Mean ±SD Median (range)	 152.06±97.55 126(2-325)	 93.66±46.72 12(30-130)	1.89	0.059
TLC Mean ±SD Median (range)	 1246.4±743.5 980(840-3500)	 500.1±288.9 470(70-1020)	3.93	0.0001*
pleural fluid cellularity			χ^2	p
Lymphocyte n(%)	25(71.4)	14(28.6)	12.86	0.0001*
Neutrophils n(%)	6(17.2)	13(37.1)	2.69	0.101
Eosinophilia	4(11.4)	8(20.0)	0.97	0.32

Table 4: Comparison of cancer Antigen 125 and a carcinoembryonic Antigen in Malignant versus benign Pleural Effusion

variables	**Malignant group N=35**	**Benign group N=35**	you	p-value
Ca125 Mean ±SD Median (range)	257.61±610.99 14(9-3033.4)	11.09±2.59 10(8-15)	3.79	0.0001*
CEA Mean ±SD Median (range)	294.83±553.32 5.4(0.95-2193.8)	1.98±1.44 1(0.7-5)	6.12	0.0001*

Table 5: Performance of cancer Antigen 125 in diagnosis tumour pleural effusion54

Cut off level	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
Ca125 ≥12	71.4%	62.9%	65.8%	68.8%	67.1%

Table 6: Performance of carcinoembryonic Antigen in the diagnosis of tumour pleural effusion

Cut off level	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
CEA ≥ 3	85.7%	65.7%	71.4%	82.1%	75.7%

Table 7: Performance of both cancer antigen 125 and CEA in diagnosis of malignant pleural effusion

Cut off level	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
Ca125 ≥12& CEA ≥3	97.1%	60.0%	70.8%	95.5%	78.6%

DISCUSSIONS

Tumor tissue or malignant cells are present along with an accumulation of fluid surrounding the lungs, which is known as malignant pleural effusion (MPE). Breathlessness, discomfort, cachexia, and physical activity are symptoms of this serious health issue **[8]**.

50–65% of cases are of metastatic breast cancer in women and lung cancer in males of cases and are the main causes of MPE. However, mesothelioma, the most prevalent primary pleural tumour, is linked to MPE over 90% of the time **[9]**.

Despite advances in research on the mechanisms of MPE, improving diagnostic methods and treatments for this condition is still crucial. Managing MPE is mainly palliative, and the median survival period is only 3 to 12 months **[8]**. However, the emergence of molecularly targeted therapies presents new possibilities for diagnosing and treating advanced tumour cases. Therefore, exploring innovative diagnostic and therapeutic approaches for MPE is essential to improving patients' quality of life and extending their survival **[10]**.

Blood tests can detect molecular diagnostic markers such as Carcinoembryonic Antigen (CEA) and Cancer Antigen 125 (CA-125). Elevated levels of these proteins can indicate the presence of certain cancers. CEA is mainly associated with colorectal cancer, while CA-125 is linked to ovarian cancer. Measuring the levels of CEA and CA-125 is valuable in assessing the disease's presence, progression, or recurrence **[11]**. Carcinoembryonic antigen (CEA) in pleural fluid (PF) has been a reliable diagnostic marker for malignant pleural effusion (MPE) for a long time. It has a high specificity of more than 90% but a moderate sensitivity of 50%-80% **[12]**.

Some studies suggest that the ratio of CEA in the PF to the CEA in the serum may improve the accuracy of MPE diagnosis. However, it is unclear whether the CEA ratio provides additional

diagnostic value to the individual levels of CEA in the serum and PF and the suggestion of using more than one oncological marker at the same time to increase the utility of diagnosis. The serum CA-125 is also commonly used as a screening test for malignancy. CA-125 is expressed in a variety of coelomic epithelial cells found in the ovary, pleura, peritoneum, pericardium, endometrium, and fallopian tubes. Surgical procedures that affect mesothelial cells can also lead to elevated CA-125 levels **[13]**.

This case-control study evaluated the diagnostic value of Carcinoembryonic Antigen (CEA) and Cancer Antigen 125 (CA-125) in identifying malignant pleural effusion in 70 patients with gold-standard pleural malignancies between June 2023 and January 2024 at Zagazig University Hospitals' Chest Diseases Department.

According to the current study, there was no difference in the analyzed groups' distribution of sex and age ($p>0.05$). However, the percentage of smokers in cases of malignant pleural effusion was noticeably greater, which is consistent with the findings of the study by **Rahemi et al. [14],** which found that the age and sex distribution of the malignant and non-malignant groups were the same. Additionally, **Volarić et al. [15]** published findings that were equivalent to the ones obtained now.

The current study revealed a significantly high percentage of pleural effusion on both sides of the lung in malignant patients, similar to the results of Jany et al. [16], who reported a significantly high percentage of pleural effusion on both sides of the lung in malignant patients with a higher prevalence on the right side.

The current study revealed that patients with malignant pleural effusion exhibited more substantial effusion compared to those with benign effusions ($p<0.001$). Furthermore, the malignant pleural fluid demonstrated elevated levels of LDH, protein, and total leukocyte count (TLC), with a notable excess of lymphocytes ($p < 0.05$ for all). Similarly, **Choi et al. [17]** showed that the malignant pleural fluid demonstrated elevated levels of LDH, protein, and total leukocyte count (TLC), with a notable excess of lymphocytes.

Additionally, **Li et al. [18]** discovered that individuals with malignant pleural effusion had a significantly higher total leukocyte count (TLC), especially for lymphocytes. Lymphocyte-predominant pleural effusion is frequently linked to cancer and tuberculosis. It is defined by an exudative nature with lymphocytes making up more than 50% of the total white cell count.

Serum lactate dehydrogenase (LDH) is an enzyme that is present in various organs of the body. It is released in response to tissue injury caused by multiple conditions such as hemolysis, cancer, sepsis, and HIV infection. Although an elevated level of LDH is non-specific, extraordinarily high and isolated levels can indicate specific diagnostic groups **[19]**. However, **Wu et al. [20]** reported an insignificant difference between exudative benign and malignant effusion. This discrepancy might be attributed to variations in the degree of pleural endothelial injuries caused by malignant cells, influencing and fluctuating LDH levels accordingly.

The current study revealed that there was there was a significantly higher cancer antigen 125 (257.61±610.99 versus 11.09±2.59) and a carcinoembryonic antigen (294.83±553.32 versus 1.98±1.44) in malignant compared to benign pleural effusion ($p=0.001$). Results are in agreement with the **Volarić et al. study [15],** which found that malignant effusions had considerably higher pleural fluid contents of CEA and CA-125 than benign effusions ($p=0.001$). In a similar vein, **El Hoshy et al. [21]** discovered that the mean pleural fluid CA125 ranged from 23.8 to 98.7 IU/ml in the group with benign pleural effusion, while the mean in the malignant group was 309.27 ± 79.564. This difference between the two groups was statistically significant ($P = 0.000$).

The experimental data between the groups with benign and malignant pleural effusions was examined by **Han et al. [22].** There was a statistically significant difference ($P = 0.01$) in the expression level of CA125 between the analyzed groups: the malignant pleural effusion group's level was 142.64 (101.15 ± 178.72) U/mL, whereas the benign pleural effusion group's level was 92.64 (81.28 ± 106.08) U/mL. Additionally, **Rahemi et al. [14]** concluded that the malignant group's mean values of the tumour markers CEA and CA125 were significantly higher than those of the non-malignant group.

The current study revealed that Cancer Antigen 125 (Ca125) at cut-off level ≥12 shows sensitivity 71.4%, specificity 62.9% and accuracy 67.1 % to discriminate malignant pleural effusion from benign pleural effusion in the same line **El Hoshy et al., [21]** found that the pleural fluid CA125 had a sensitivity of 74.1% and a specificity

of 76.9% in the tuberculous group, with positive predictive and negative predictive values of 70 and 33.3, respectively. This indicates that CA125 is more specific than sensitive in identifying tuberculous effusion. Also, **Choi et al. [17]** concluded that the specificity of CA-125 for differential diagnosis between malignant and benign pleural effusion was 72%, with a cut-off level of CA-125 > 600 U/ml.

According to **Rahimi et al. [14],** the ideal cut-off point is the number that most accurately distinguishes cancer patients from non-cancer patients. For CA125 and CEA, the cut-off values were 486.00 u/mL and 6.90 ng/mL, respectively. The threshold values for CA15-3 were 39.55 u/mL, CA125 was 486.00 u/mL, and CEA was 6.90 ng/mL.

Cancer antigen 125 (CA-125) in blood and pleural fluid was evaluated by **Shalaby et al. [23]** in an Egyptian study as a non-aggressive diagnostic technique for differentiating between different forms of pleural effusions. The study evaluated 30 patients with different etiologies; the results revealed a statistically significant increase in pleural CA-125 levels in the exudative subgroup compared to the transudative subgroup. Malignant effusion was more prevalent than benign effusion, with tuberculosis being more frequent than other infections. The findings suggest that elevated pleural fluid CA-125 levels, highest in malignancy, followed by tuberculosis, can serve as a valuable marker for diagnosing pleural effusion.

The current study revealed that carcinoembryonic antigen (CEA) at cut-off level ≥3 shows a sensitivity of 85.7%, specificity of 65.7%, and accuracy of 75.7% in discriminating malignant pleural effusion from benign pleural effusion.

Using an immunochemiluminescence assay, **Khalaf et al. [24]** investigated the diagnostic utility of five pleural tumour markers for differentiating between benign and malignant pleural effusions. After analysing 281 patients, they discovered that carcinoembryonic antigen (CEA) and CA-125 were significantly elevated in malignant pleural effusions compared to benign ones. While the specificity of the combined markers varied, their sensitivity was excellent. The authors reported that their all-inclusive method, which includes both cytology and tumour markers, is valuable in accurately diagnosing both benign and malignant pleural effusions with an accuracy rate of about 98%. This reduces the need for more invasive procedures, with the exception of cases that need more research because of negative cytology and a positive panel of tumour markers.

Xu et al. [25] evaluated CEA levels in 60 malignant and 58 benign pleural fluids; 54 patients with malignant pleural effusion had levels of CEA greater than 5.5 ng/ml. The tumour marker Type II membrane protein RCAS and CEA together produced a 91.4% specificity and 98.3% sensitivity at this cut-off value. Conversely, **Žentiņa et al. [26]** found that the sensitivity and specificity of CEA were 58.2% and 92.4%, respectively, at a cut-off value of 6.58 ng/ml.

The current study revealed that Cancer Antigen 125 (Ca125) at cut-off≥12 and carcinoembryonic antigen (CEA) at cut-off level ≥3 show sensitivity of 97.1%, specificity of 60.0%, and accuracy of 78.6% to discriminate malignant pleural effusion from benign pleural effusion. This indicated that both cancer antigen 125 (Ca125) and carcinoembryonic antigen are highly suspicious of malignancy but have poor specificity.

Bielsa et al. [27] examined the pleural fluid of 224 patients with a confirmed malignant pleural effusion to identify different tumor markers, such as CEA and Ca-125. Researchers discovered that a combination of cytokeratin 19 CYFRA 21-1 fragments of >100 ng/ml and Ca-125 levels above 1000 U/ml was substantially linked to a poorer success rate.

The antibody known to be specific to tumour cells was CEA. It was commonly known that CEA was a TM for lung cancer, particularly lung adenocarcinoma, with excellent sensitivity and specificity **[28].** Additionally, CEA performs well in differentiating between benign and malignant PE **[29].** Not only did activated mesothelial cells produce PE CA125 in cases of carcinomatous pleuritis, but also carcinoma cells. CEA and CA125 expression in serum and PE were comparable in part 2. Serum CEA (18.95,72.6%), serum CA125 (98.05,85.7%), PE CEA (100,88.1%), and PE CA125 (600,95.2%) all had high median and positive rates. According to **Chen et al. (2020) [30],** the levels and positive rates of PE CEA and PE CA125 were considerably greater than those of blood CEA and serum CA125, respectively.

LIMITATIONS

Certain restrictions on this investigation were imposed. The patient populations in the non-malignant and malignant PE groups were comparatively modest. The disorders that cause PE

(malignant, parapneumonic, empyemic, and tuberculous exudates) varied relatively little.

CONCLUSION

The findings imply that CA125 and CEA markers, which have shown to be extremely successful as malignant markers, may be helpful in distinguishing between benign and malignant effusions. The levels of CEA and Ca-125 in the pleural fluid are considerably greater in cases of malignant effusion. Because of their relatively high accuracy when detected in pleural fluid, Ca-125 and CEA can be used as additional diagnostic criteria for the diagnosis of cancer.

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