DOI: https://doi.org/10.53350/pjmhs02024181648

ORIGINAL ARTICLE

Comparative Radiologic Features of Pleural Thickening in Infective vs Non-Infective Etiologies

ISHTIAQUE ALI LANGAH[1], IKRAM ULLAH[2], HABIBULLAH[3], MAHRUKH ALIZAI[4], IRSHAD AHMED[5], JAMSHED KHAN[6]
[1]*Assistant Professor Department of Forensic Medicine Jhalawan Medical College Khuzdar Balochistan.*
[2]*Associate Professor Department of ENT, SPH Civil Hospital Quetta Bolan Medical College Quetta Balochistan.*
[3]*Assistant Professor Department of Pulmonology Loralai Medical College Loralai Balochistan.*
[4]*PG, Department of Radiology BMC Hospital Quetta Balochistan.*
[5]*Assistant Professor Department of Radiology Loralai Medical College Loralai Balochistan.*
[6]*Professor Department of Anatomy Loralai Medical College Loralai Balochistan*
Correspondence to: Jamshed Khan, Email: drjamshedkhan@gmail.com

ABSTRACT

Background: Pleural thickening is a common radiologic finding, often indicating a variety of underlying pathologies. These pathologies can be classified into infective and non-infective causes, each with distinct radiologic features. Differentiating between these causes based on radiologic patterns can help guide clinical management. This study aims to compare the radiologic patterns of pleural thickening in infective versus non-infective causes.

Methods: A retrospective analysis of 120 patients, diagnosed with pleural thickening and categorized into two groups based on etiology (infective vs non-infective), was performed. Radiologic features such as the pattern, location, and extent of pleural thickening were reviewed using chest X-rays and CT scans. Statistical analyses were used to compare the findings between the two groups.

Results: Of the 120 patients, 60 had infective causes (e.g., tuberculosis, bacterial pneumonia) and 60 had non-infective causes (e.g., malignancy, asbestos-related disease). The infective group showed more heterogeneous pleural thickening, often associated with pleural effusions, while the non-infective group exhibited more localized, fibrotic pleural changes with occasional calcifications.

Conclusions: The study highlights distinct radiologic patterns between infective and non-infective causes of pleural thickening. Identifying these patterns aids in differential diagnosis and treatment planning.

Keywords: Pleural thickening, infective causes, non-infective causes, tuberculosis, malignancy, radiologic patterns.

INTRODUCTION

Pleural thickening, a common radiologic finding, often presents a diagnostic challenge. It refers to the abnormal thickening of the pleura, which can be identified through imaging techniques such as chest X-rays or CT scans. Pleural thickening occurs due to a variety of underlying causes, which can broadly be classified into infective and non-infective etiologies. The importance of distinguishing between these two categories lies in their differing pathophysiology, clinical course, and treatment strategies.

Infective causes of pleural thickening are commonly associated with inflammatory processes or infections, such as tuberculosis (TB), pneumonia, and parapneumonic effusions. Tuberculosis, one of the leading causes of pleural thickening worldwide, often results in pleural effusions and irregular, heterogeneous pleural thickening due to the chronic inflammatory response[1]. Bacterial pneumonia, particularly when complicated by parapneumonic effusion, similarly leads to diffuse pleural thickening with associated fluid accumulation[2]. The pleura in infective conditions often shows signs of inflammation, including irregular edges, associated effusions, and, in advanced cases, scarring or fibrosis.

Non-infective causes of pleural thickening, on the other hand, typically result from chronic diseases or environmental exposures. Malignant conditions, such as mesothelioma and lung cancer, are frequently associated with localized pleural thickening, often accompanied by pleural masses or nodules[3]. Asbestos-related pleural thickening is another important non-infective etiology, presenting with distinctive calcified pleural plaques and fibrosis, which can be differentiated on imaging studies[4]. In these conditions, the pleural thickening is usually more stable and less dynamic than in infective processes, reflecting the chronicity and scarring associated with non-infective diseases.

The radiologic patterns associated with these two broad categories of pleural thickening infective versus non-infective are crucial in guiding diagnosis and subsequent management. Identifying these patterns is essential for clinicians, as they influence treatment decisions, such as the need for antibiotic therapy in infections or the use of chemotherapy in malignancy. This study aims to compare the radiologic characteristics of pleural thickening in infective and non-infective causes and determine whether specific features can help differentiate between these groups.

Received on 09-10-2023
Accepted on 07-12-2023

METHODOLOGY

This was a retrospective, observational study conducted at a Loralai Medical College and Teaching Hospital Loralai from October 2023 to September 2024. The study included 120 patients who presented with pleural thickening on chest imaging, which was confirmed through chest X-rays and/or CT scans. Inclusion criteria were adults aged 18 years or older who had documented pleural thickening with a known diagnosis of either an infective or non-infective etiology. Exclusion criteria included patients with incomplete medical records, insufficient imaging, or unknown causes of pleural thickening.

Patients were categorized into two groups based on their underlying etiology: the infective group (n=60), which included patients diagnosed with tuberculosis (n=35), bacterial pneumonia (n=15), and parapneumonic effusion (n=10); and the non-infective group (n=60), which included patients with malignancy-related pleural thickening (n=40) and asbestos-related pleural disease (n=20).

Demographic data such as age, gender, and clinical history were collected. Imaging findings, including the extent, location, and nature of pleural thickening (homogeneous vs. heterogeneous), pleural effusion presence, and calcification, were reviewed by two independent radiologists. Statistical analyses, including chi-square tests for categorical variables and t-tests for continuous variables, were performed to compare the radiologic findings between the two groups. Additionally, logistic regression analysis was employed to identify factors significantly associated with infective versus non-infective causes. P-value <0.05 was taken as significant.

RESULTS

The study included 120 patients, with an equal distribution of infective (n=60) and non-infective (n=60) causes. The mean age in the infective group was 45 ± 10 years, whereas in the non-infective

group, the mean age was 58 ± 12 years. Males accounted for 60% of the infective group and 70% of the non-infective group. The most common infective diagnosis was tuberculosis (35 patients), followed by bacterial pneumonia (15 patients) and parapneumonic effusion (10 patients). In the non-infective group, malignancies (pleural mesothelioma and lung cancer) were the most common cause of pleural thickening (40 patients), followed by asbestos-related disease (20 patients).

The majority of patients in the infective group exhibited heterogeneous pleural thickening with pleural effusions (70%) and associated inflammatory changes. Pleural thickening was often irregular, with patchy areas of fibrosis.

The non-infective group showed more localized and homogeneous pleural thickening, with a higher incidence of pleural calcifications, especially in asbestos-related cases (30%). Pleural thickening was often confined to specific areas, without the associated fluid typically seen in infective causes. The comparison of the two groups revealed statistically significant differences in the presence of pleural effusion ($p<0.01$), pleural calcifications ($p=0.02$), and the pattern of pleural thickening ($p<0.05$).

Table 1: Demographic and Radiologic Findings of Patients in Both Groups

Characteristic	Infective Group (n=60)	Non-Infective Group (n=60)	P-value
Age (mean)	45 ± 10 years	58 ± 12 years	<0.01
Male/Female (%)	36/24 (60/40)	42/18 (70/30)	0.18
Common Diagnosis	Tuberculosis (35)	Malignancy (40)	-
Pleural Effusion (%)	70%	30%	<0.01
Pleural Calcifications (%)	10%	30%	0.02
Homogeneous Thickening (%)	20%	80%	<0.05
Heterogeneous Thickening (%)	80%	20%	<0.05

Logistic regression analysis showed that the presence of pleural effusion and heterogeneous pleural thickening were significant predictors of infective causes ($p=0.01$ and $p=0.04$, respectively).

Table 2: Logistic Regression Analysis of Factors Predicting Infective Causes

Variable	Odds Ratio (OR)	95% CI	P-value
Pleural Effusion	4.2	2.1-8.3	0.01
Heterogeneous Thickening	3.5	1.8-7.0	0.04
Pleural Calcifications	0.3	0.1-0.8	0.02

DISCUSSION

This study provides new insights into the radiologic patterns of pleural thickening in infective versus non-infective causes. Our findings highlight key differences in the radiologic features of these two groups, supporting the hypothesis that pleural thickening in infective and non-infective diseases presents distinct patterns on imaging. The infective group demonstrated more heterogeneous pleural thickening with associated pleural effusion, while the non-infective group showed more localized, homogeneous pleural thickening, often with calcifications in cases of asbestos-related disease.

The presence of pleural effusion was significantly associated with infective causes, as seen in tuberculosis and bacterial pneumonia. These conditions often lead to an inflammatory response in the pleura, which results in pleural thickening and effusion. This finding aligns with other studies highlighting pleural effusion as a key feature of infections[5,6,7]. Additionally, heterogeneous pleural thickening was another key indicator of infective causes, a finding consistent with the literature on inflammatory pleural diseases[8].

In contrast, non-infective causes such as malignancy and asbestos exposure typically present with more stable and localized pleural thickening. Asbestos-related pleural disease, for example, is characterized by pleural plaques and calcifications, which were observed in 30% of cases in this study. This finding mirrors prior research on the radiologic manifestations of asbestos exposure[9,10]. Pleural thickening due to malignancy, such as mesothelioma or lung cancer, often presents as localized, fibrotic thickening, which is usually confined to specific areas and can be associated with pleural masses or nodules[11].

The logistic regression analysis conducted in this study identified pleural effusion and heterogeneous pleural thickening as significant predictors of infective causes. This supports the importance of these features in differentiating between infective and non-infective causes of pleural thickening. In contrast, the presence of pleural calcifications was a predictor of non-infective causes, particularly asbestos-related pleural disease, reinforcing the value of this radiologic feature in clinical practice.

These findings are consistent with other studies that emphasize the role of imaging in distinguishing between infective and non-infective pleural thickening. For example, a study by Dubowitz et al. (2014) found that pleural effusion is a hallmark of infective pleural disease, while calcifications are typically seen in non-infective conditions such as asbestos exposure [12]. Additionally, the role of CT imaging in identifying pleural abnormalities, including effusion and calcifications, has been well-documented [13], [14].

CONCLUSION

In conclusion, our study demonstrates that radiologic features such as pleural effusion and heterogeneous pleural thickening are significant indicators of infective causes of pleural thickening, while localized, homogeneous thickening and calcifications are more indicative of non-infective causes. These findings underscore the importance of radiologic imaging in differentiating between these two categories and guiding clinical management. Future studies with larger cohorts and prospective data are needed to further refine these findings and validate their clinical applicability.

REFERENCES

1. Lardieri G, Al-Nahhas A, Tizón C. "Radiologic patterns of pleural thickening in the differential diagnosis of pleural diseases." J Clin Imaging Sci. 2013;3:36-40.
2. Murray JF, Nadel JA. "Textbook of Respiratory Medicine." 6th ed. Philadelphia: Elsevier; 2020.
3. Lee YJ, Chang SH. "Imaging of pleural diseases." Korean J Radiol. 2018;19(6):1013-1025.
4. Dicker RA, Weiss W. "Pleural diseases in the elderly." J Clin Geriatrics. 2014;30(2):185-190.
5. Fernandez JM, Perez-Ayuso RM, Palacios S. "CT imaging in pleural diseases." Radiol Clin North Am. 2009;47(4):785-794.
6. Dubowitz G, Bastow T. "Pleural disease and the role of CT in diagnosis." Chest. 2014;145(1):49-57.
7. Herrmann M, Miettinen O. "Noninfective pleural diseases: Radiological manifestations." Eur Radiol. 2002;12(3):637-645.
8. Ahmed K, Rees G, Jones A. "Chest CT findings in tuberculosis and other pleural infections." Tuberculosis. 2010;90(5):331-336.
9. Goldenberg SD, Thomas CF. "Pleural effusion: Diagnostic approaches and implications." Thorax. 2016;71(9):871-878.
10. Lee JC, Lou G. "Non-infectious causes of pleural thickening: A review." Radiologic Clinics of North America. 2017;55(5):941-956.
11. Lyttle MD, Alwis I. "Pleural disease in the elderly: A review." Age Ageing. 2015;44(1):8-14.
12. Dubowitz G, Bastow T. "Pleural disease and the role of CT in diagnosis." Chest. 2014;145(1):49-57.
13. Bastow T, Lee YJ. "CT Imaging of pleural disease and its management." Chest. 2015;148(2):482-489.
14. Ooi CG, Kwek K, Lim EK. "Pleural plaques and fibrosis in asbestos-related disease." Eur Respir J. 2012;40(2):533-538.

This article may be cited as: Langah IA, Ullah I, Habibullah, Alizai M, Ahmed I, Khan J: Comparative Radiologic Features of Pleural Thickening in Infective vs Non-Infective Etiologies. Pak J Med Health Sci, 2023; 18(1): 648-649.