A Conversation with ChatGPT about Pleural Effusion

Srinivas Sadanand Pai*

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Dear Editor,

A conversation with ChatGPT (Chat Generative Pre-trained Transformer) about pleural effusion.

Artificial intelligence (AI) offers a complementary route in deciding about the prognosis, decision-making, estimating mortality rates, and the development of drugs related to pleural effusion. Wang et al. have come up with an AI model that can help differentiate between malignant pleural effusion (MPE) and benign pleural effusion (BPE).[1] The proposed mechanism is that AI looks at the computed tomography (CT) scan in small patches instead of one big picture. It also examines the image at different scales. In the above study, 362 new patient studies from a separate hospital were used to verify the generated AI model, which showed some degree of reliability.

One such AI language model is ChatGPT. It was developed by OpenAI in 2022. It can analyze uploaded pictures, give travel suggestions, help students understand difficult concepts, and much more. It uses processes like natural language processing (NLP) to respond like humans do.

Abnormal buildup of fluid in the pleural space is called pleural effusion. A small amount of pleural fluid is required to encourage smooth movement of the lungs during respiration. This balance, however, can be upset by a number of medical conditions, which results in an abnormal buildup of fluid. Nearly 1.5 million patients are affected by this condition annually.[2] Pleural effusion is a sign of higher rates of morbidity and mortality in some groups.[3] Hence, it is essential to know the cause of pleural effusion. The entire treatment revolves around the underlying cause of pleural effusion. However, there are challenges in treatment as it has diverse etiologies varying from heart failure to malignancy.

Particularly, one such topic of interest is differentiating BPE from MPE. Pleural nodules, circumferential pleural thickening, mediastinal pleural thickening, and parietal pleural thickening of >1 cm are examples of contrast-enhanced CT features in MPEs. The sensitivity of CT is not high in differentiating the two etiologies (18–53%).[1] Hence, it is important to look for an additional tool that can help differentiate MPE from BPE with ease.

We asked ChatGPT some questions regarding pleural effusion and how to differentiate benign from MPE. The following was the response:

Question	*Answer*
1. What is pleural effusion?	Abnormal excess fluid in pleural space due to disrupted balance of fluid formation and absorption, causing lung compression and dyspnea
2. What are the types of pleural effusion?	Transudative (systemic pressure imbalance: CHF, cirrhosis, nephrotic) and exudative (local inflammation/malignancy: TB, cancer, pneumonia, PE). Special forms: chylous, hemorrhagic, empyema
3. How to distinguish transudative vs exudative pleural effusion?	Light's criteria: exudate if any: PF/serum protein >0.5; PF/serum LDH > 0.6; PF LDH > 2/3 upper normal serum limit
4. How to differentiate tubercular vs nontubercular pleural effusion?	TB: lymphocyte-predominant, ADA > 40 U/L, high protein (>3 gm/dL), ± low glucose, high LDH, pleural biopsy granulomas. Non-TB varies by cause (malignancy: cytology+; parapneumonic: neutrophils, very low pH/glucose)
5. How to differentiate benign vs malignant pleural effusion?	Malignant clues: positive cytology, bloodstained fluid, pH < 7.2, low glucose, high LDH, recurrent large effusion, nodular pleura on CT/US, trapped lung. Benign: resolves with underlying cause, cytology negative, no pleural thickening/nodules

As one can see, the answers to the questions about pleural effusion were fairly accurate. However, the use of AI in differentiating MPE from BPE should be taken with a grain of salt. There is something called overfitting phenomenon, where AI performs well on the data it learned from but fails when exposed to new patients or different clinical settings. Hence, it is important to add it up with clinical judgment as well as laboratory parameters.[4]

In a nutshell, AI has the potential to offer valuable assistance in looking for the probability of MPE by combining clinical and imaging modalities into meaningful risk predictions. Its use may help clinicians identify patients who have MPE. However, tissue confirmation remains the gold standard for establishing malignancy. AI-generated algorithms must therefore be viewed as triage tools that support rather than replace diagnostic pathways. For successful clinical translation, healthcare providers should possess a clear understanding of AI methodology, validation standards, and limitations. Multidisciplinary oversight will ensure that AI strengthens clinical decision-making and improves patient care without introducing new risks.

Orcid

Srinivas Sadanand Pai https://orcid.org/0009-0006-0469-3539

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Assistant Professor, Department of Respiratory Medicine, Kasturba Medical College, Mangalore, Manipal Academy of Higher Education, Manipal, Karnataka, India; *Corresponding Author

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