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Pseudo-Saber-Sheath Trachea Sign in Ankylosing Spondylitis

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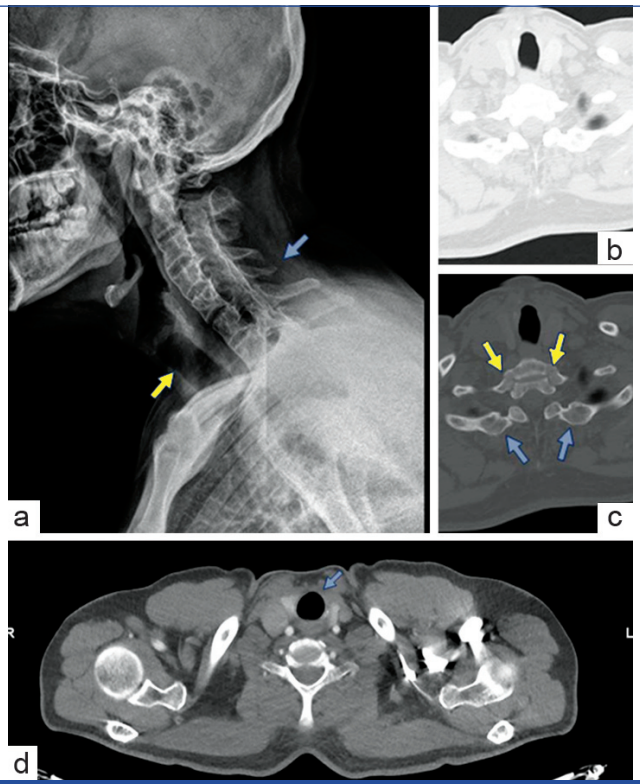
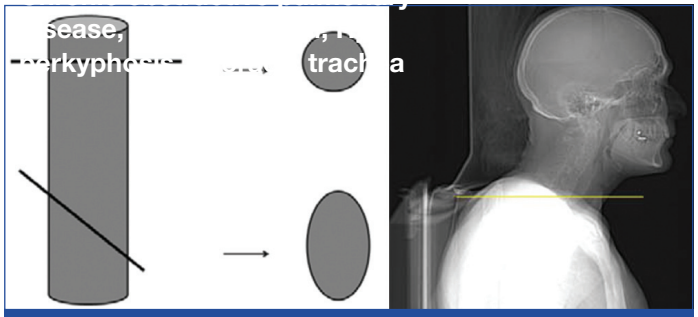
A 42-year-old male, a non smoker, with a history of weight loss for three months and intermittent back pain for the past two years (on and off in nature), with no history of fever, no significant past medical or family history, and no associated co-morbidities, underwent a Computed Tomography (CT) chest examination.

Clinical examination of the cardiorespiratory system was unremarkable; however, the patient demonstrated hyperkyphosis at the cervico-dorsal level. CT chest showed clear bilateral lung parenchyma, no significant abnormality in the mediastinum or pleural structures, and no significant lymphadenopathy. However, the cervical trachea was elongated in the anteroposterior direction. Additionally, there was multilevel ankylosis of the costovertebral joints, costotransverse joints, and facet joints in the dorsal spine, evident on the bone window.

These findings were suggestive of Ankylosing Spondylitis (AS). The patient had hyperkyphosis with a resultant oblique course of the cervical and intrathoracic trachea, which spuriously appeared as an increased sagittal/anteroposterior diameter of the lower cervical and upper thoracic trachea, with an ovoid appearance on cross-sectional imaging [Table/Fig-1,2].



[Table/Fig-1]: a) Lateral cervical spine radiograph shows hyperkyphosis of the upper spine (blue arrows) and resultant acute descent of the cervical trachea into the thoracic cavity (yellow arrows); b) Axial CT image at the level of thoracic inlet in lung window shows apparent anteroposterior widening of trachea; c) Axial CT image at the level of thoracic inlet in bone window shows ankylosis of costovertebral (yellow arrows) and costotransverse joints (blue arrows) on both the sides; d) Axial CT image of a different normal patient at the level of thoracic inlet in mediastinal window shows normal round contour of trachea (blue arrow).



[Table/Fig-2]: Cross-section of a cylinder at right angles to its axis would be a circle, but, if the cross-section is oblique to the long axis, it will be oval. (As evident in the topogram).

The trachea is a tubular air conduit between the larynx and bronchi and extends from the level of the sixth cervical (C6) vertebra, just below the cricoid cartilage, upto the carina at the level of the fourth to fifth dorsal (D4-5) vertebra or the sternal angle, where it bifurcates into the right and left main bronchi [1]. Being composed of "C"-shaped cartilaginous rings anteriorly and a membranous posterior wall sealing the open ends, the trachea resembles the alphabet "D" in cross-section [2].

The cross-sectional shape of the trachea changes with the phase of respiration, assuming an "O" shape during deep inspiration and a crescent-like shape during end expiration due to outward and inward bulging of the posterior tracheal membrane, respectively [2,3]. Numerous pathologies affect the trachea, particularly the cartilaginous portion, leading to alterations in its cross-sectional appearance [3]. Not only pathological conditions, but also dynamic intraluminal pressure changes, play a significant role in determining the tracheal shape visualised on cross-sectional imaging modalities such as CT and Magnetic Resonance Imaging (MRI) [3].

One such example is Chronic Obstructive Pulmonary Disease (COPD), where repeated cough-induced degeneration of the cartilage leads to progressive reduction of the lateral diameter of the trachea, accompanied by elongation of the anteroposterior dimension. This results in a Saber-sheath appearance, in which the ratio of the sagittal to coronal diameter of the trachea exceeds 2:1. This appearance is seen exclusively in the thoracic trachea [3]. In contrast, the cervical trachea remains unaffected.

A similar appearance of the trachea, with apparent increase in the anteroposterior dimension, can also be seen on cross-sectional imaging in patients with AS [4]. AS predominantly affects enthesial sites in the axial skeleton and follows a long, debilitating clinical course, which can render the patient hyperkyphotic due to varying degrees of ligamentous ossification and bony fusion, particularly in the upper spine [5]. Clinically, hyperkyphosis can be readily appreciated as a gap between the occiput and the wall when the patient attempts to stand with the heels and back against the wall [4].

Patients with established spinal ankylosis often present with cervical hyperkyphosis, resulting in an oblique descent of the cervical trachea into the thoracic cavity. Unlike the Saber-sheath trachea, there is no

lateral narrowing of the tracheal lumen in these cases. Correlation with the CT topogram can further demonstrate the angulation of the CT sections relative to the long axis of the trachea.

Knowledge of this entity not only helps in avoiding misdiagnosis of Saber-sheath trachea or COPD, but also aids in identifying underlying kyphosis or ankylosis of the cervical and upper thoracic spine.

REFERENCES

[1] Furlow PW, Mathisen DJ. Surgical anatomy of the trachea. Ann Cardiothorac Surg. 2018;7(2):255-60.
[2] Shepard JO, Flores EJ, Abbott GF. Imaging of the trachea. Ann Cardiothorac Surg. 2018;7(2):197-209.
[3] Ciccarese F, Poerio A, Stagni S, Attinà D, Fasano L, Carbonara P, et al. Saber-sheath trachea as a marker of severe airflow obstruction in chronic obstructive pulmonary disease. Radiol Med. 2014;119(2):90-96.
[4] Vosse D, van der Heijde D, Landewé R, Geusens P, Mielants H, Dougados M, et al. Determinants of hyperkyphosis in patients with ankylosing spondylitis. Ann Rheum Dis. 2006;65(6):770-74.
[5] Zhang H, Zhou Z, Guo C, Wang Y, Yu H, Wang L. Treatment of kyphosis in ankylosing spondylitis by osteotomy through the gap of a pathological fracture: A retrospective study. J Orthop Surg Res. 2016;11(1):136.

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