Case report

Severe Kyphosis Patients with Tuberculosis and Chronic Obstructive Pulmonary Disease - A case report

ABSTRACT

Background: Severe kyphosis in advanced age, with a higher incidence observed in women and in elderly males afflicted with pulmonary tuberculosis (TB) and chronic obstructive pulmonary disease (COPD) can pose a significant risk to their overall well-being and potentially endanger their lives.

Methods: A 59-year-old male with respiratory problem, chronic back pain, and walking disorder was admitted to the emergency room with symptoms of shortness of breath that had been worse in the previous three days. According to the patient's mother, the patient's chest had been bent or arched since he was three years old but had never been referred to a hospital or undergone any medical treatment. Anti-tuberculosis and COPD treatment with physiotherapy during the first 3 months was quite encouraging because now the patient can do light activities and work again.

Results: Delays in spinal correction are caused by a lack of early detection capabilities from an early age and late referral to the hospital. Because of his advanced age, the patient was not able to have thoracic surgery; instead, he received thoracic manual treatment in addition to physiotherapy at a distant facility with restricted surgical capabilities. Rather, physiotherapy, which included thoracic corrective exercises and scapular posture. Correcting thoracic posture, enhancing structural alignment, and increasing thoracic rigidity are the main objectives of this activity.

Conclusion: Patients with severe cases of kyphosis require early detection of bone abnormalities by primary health center staff. Corrections can be made to prevent reduced body function, musculoskeletal disorders, and quality of life.

Keywords
Severe kyphosis, Tuberculosis, COPD, Physiotheraphy

INTRODUCTION

Severe kyphosis is defined as a curvature of the kyphosis angle that exceeds the usual range. Increased kyphosis angle is caused by decreased muscle strength and degenerative changes in the spine. Almost 40% of people with severe kyphosis may suffer from spine fractures.[1-3] In elder people, the prevalence of severe kyphosis ranges from 20% to 40%, with higher incidence observed in women.[4,5] Severe kyphosis was associated with negative health outcomes such as decreased lung function and physical ability, chronic back pain, a twofold increase in the risk of falling, and a worse quality of life.[6]

According to the Global Tuberculosis Report 2020, Indonesia was responsible for 14% of all tuberculosis cases worldwide.[7]Back and chest pain are common symptoms of spinal tuberculosis.[8,9] Surgical interventions for spinal fractures such as vertebroplasty and kyphoplasty are undertaken because they are minimally invasive and have a sagittal corrective impact of about 70%.[10,11] Physiotherapy, which includes manual therapy, taping, and bracing, should always be the first line of treatment for thoracic Severe kyphosis, and it should be started as soon as feasible.[12] Thoracic Severe kyphosis therapy attempts to restore physical function, reduce pain, and reduce excessive anteroposterior curvature.[13] The resultant damage from COPD, combined with the aging process, will have a deleterious impact on the entire body in elderly adults with thoracic kyphosis.[14,15]We present severe kyphosis patients with tuberculosis and COPD in this study.

CASE SUMMARY

A 59-year-old male was admitted to the emergency room with symptoms of shortness of breath that had been worse in the previous three days and complaints of shortness of breath for the previous year, which became worse when the patient undertook activities. The patient has been cough, fatigue, and chronic back discomfort. The patient denied loss of appetite, weight loss, or fever. He has been using a cane for many years and frequently falls if he does not use a cane. He had been smoking since he was 18 years old and worked as a parking attendant for more than 30 years at public fuel stations. According to the patient's mother, the patient's chest had been bent or arched since he was three years old but had never been referred to a hospital or undergone any medical treatment. Physical examination of the lungs revealed crackles, wheezing, and prolonged expiration, a heart rate of 110 beats per minute (bpm), respiratory rate of 28 bpm, and oxygen saturation of 85%. He was sent to intensive care unit and treated with nonrebreathing mask oxygen therapy, NaCl 0.9% infusion, aminophylline, ipratropium bromide-albuterol sulfate inhalation, budesonide inhalation, methylprednisolone injection, levofloxacin, omeprazole, furosemide, digoxin, rifampicin, isoniazid, pyrazinamide, and ethambutol based on body weight. The blood work showed leukocytes 28,230 cells/ul, and the sputum examination/molecular quick test results were positive for tuberculosis. **Figure 1** shows a tenting right hemidiaphragm and kyphotic thoracic vertebrae on a lateral chest x-ray. The patient's health improved after the fifth day of therapy and was discharged from the hospital after ten days of treatment. Due to the restricted resources in the hospital, the patient performed a Cobb angle measurement with a simple goniometer/ruler to measure the kyphosis curvature before leaving the hospital, and the results of the examination revealed that the thoracic flexion curve was more than 107 degrees. When this patient bends over, a hump is noticeable (**figures 2a and 2b**). Outpatient treatment for tuberculosis and COPD is maintained. Due to the patient's age, limited hospital operating

facilities for surgery, and refusal to be referred to a hospital with full facilities because it was too far away from his home, the patient finally underwent thoracic manual physiotherapy and was evaluated after 3 months. The outcomes of the combination of antituberculosis and COPD medications, together with physiotherapy, are extremely positive, as the patient can now perform mild tasks and has resumed work.

DISCUSSION

This is our first case, an elderly patient with severe kyphosis, TB, clinical COPD, and short stature. The patient's severe kyphosis had gone undetected and untreated since childhood. He was never advised to be referred to the hospital for medical treatment. According to Kado et al., severe kyphosis is more prevalent in women, and the majority of kyphosis angles increase with age.[16] Scheuermann's sickness is a juvenile form of severe kyphosis, defined by a defect in the cortical development plates of the vertebral bodies, which weakens the vertebral bodies and causes pinching, culminating at the end of growth and cartilage formation is no longer active.[17]

This patient had suffered from chronic back pain for years and walked slowly, using a cane to avoid falling. He had smoked since 18 years old and worked as a parking attendant at a public fuel station for more than 30 years. Thoracic severe kyphosis may result in musculoskeletal, neuromuscular, and sensory disorders, aging process progression, pain, dysfunction, breathing issues, restricted spine range of motion, osteoporotic fractures, reduced mobility, slower walking, poor balance, and exhaustion.[18-21] This is our first time case, an elderly patient with severe kyphosis, TB, clinical COPD, and short stature. The patient's severe kyphosis had gone undetected and untreated since childhood. He was never advised to be referred to hospital for medical treatment. According to Kado et al., severe kyphosis is more prevalent in women, and

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In this patient, a lateral chest x-ray revealed a tenting right hemidiaphragm and kyphotic thoracic vertebrae. Chen et al. Study was unable to measure the Cobb angle before surgery using an X-ray coronal sequence due to a calcified abscess, but they were able to measure the kyphosis angle with an X-ray sagittal sequence.[22] Cobb angle measurements were performed on this patient using a simple goniometer, which was regarded to be the most accurate approach to determining kyphosis curvature.[23] The superior vertebra of the fourth thoracic vertebrae (T4) is typically less visible due to the excessive protrusion of other components. As a result, the usual angle ranges from T4 to T12.[24]

In this situation, the patient was unable to undergo thoracic surgery due to his age, and the limited surgical facilities of the hospital. Instead, the patient was treated with antituberculosis and COPD medications, and physiotherapy, including thoracic correction exercises and scapular posture. The fundamental goals of this activity, which includes thoracic manual therapy and thoracic correction exercises, are to correct thoracic posture, improve structural alignment and rigidity of the thorax. Scapular posture helps patients with thoracic severe

kyphosis. When the kyphosis angle surpasses 80°, surgery may improve lung function and sagittal plane balance.[25] Frankel scores worsened in 3 patients and did not improve in 5 patients in Wong et al.'s trial with early surgical intervention in 16 patients.[26] According to Chen et al., severe kyphosis and spinal cord tuberculosis require surgery to relieve compression, and after several weeks of halo traction, excellent orthopedic surgical treatment results.[27]

Physiotherapy is usually the first line of treatment for thoracic severe kyphosis, and it should be started as soon as possible.[12] The primary goals of therapy for patients with thoracic severe kyphosis are to alleviate pain and improve physical function by eliminating excessive antero-posterior curvature. The early detection and treatment of severe kyphosis may reduce the incidence of fractures, falls, and functional deficits. Breathing exercises improve lung capacity and physical exertion tolerance. Gait training and balance workouts improve general fitness and reduce the likelihood of falling.[13] According to an international survey, patients with thoracic severe kyphosis react favorably to conservative treatment.[28]

CONCLUSION

We feel this case may shed new light on the treatment of severe kyphosis with tuberculosis and COPD. We administered TB and COPD medication as well as physiotherapy thoracic manual treatment may improve structural alignment and stiffness of the thorax, because the patient declined to be referred due to their age, delayed treatment and restricted hospital facilities. Three months later, the patient's condition had improved clinically. Lessons learned in this case are the importance of health workers in primary health center screening and detecting bone abnormalities at an early age and immediately referring patients to the hospital with full facilities so that corrections can be made early to prevent decreased body function, musculoskeletal disorders, and quality of life.

DATA AVAIBILITY

All relevant data have been included in the manuscript. Further details and information about the case are available upon request.

REFERENCES

1. Baumgartner RN, Waters DL, Gallagher D, Morley JE, Garry PJ. Predictorsof skeletal muscle mass in elderly men and women. *Mech. Aging Dev*, 1999;107:123–36. doi: 10.1016/S0047-6374(98)00130-4

2. Hinman MR. Comparison of thoracic kyphosis and posturalstiffness in younger and older women. *Spine J*, 2004;4:413– 7. doi: 10.1016/j.pinee.2004.01.002

3. Schneider DL, von Muhlen D, Barrett-Connor E, Sartoris DJ. Kyphosisdo not equal vertebral fractures: The Rancho Bernardo study. *J Rheumatol*, 2004;31:747–52.

4. Kado DM, Huang MH, Karlamangla AS, BarrettConnor E, Greendale GA. Hyperkyphotic posturepredictions mortality in older community-dwellingmen and women: a prospective

study. *O'clockGeriatr Soc*, 2004;52:1662-1667. http://dx.doi.org/10.1111/j.1532-5415.2004.52458.x

5. Takahashi T, Ishida K, Hirose D, Nagano Y, Okumiya K, Nishinaga M, et al. Trunk deFormity is associated with a reduction in outdooractivities of daily living and life satisfaction incommunity-dwelling older people. *OsteoporosisInt*, 2005;16:273-279.

6. Koele MC, Lems WF, Willems HC. The clinical relevance of Severe kyphosis : A narrative review. *Front Endocrinol*, 2020;11 (5):1-7

7. *Global Tuberculosis Report.* WHO, 2020. https://www.who.int/publications/i/item/9789240013131

8. Moon M. Tuberculosis of the spine. Controversies and a new challenge.*Spine*, 1997;22(15):1791 – 7. doi: 10.1097/00007632-199708010-00022

9. Diwakar L, Ghaffar N, Hare A, Lynn W, Ash S. Low back pain: thoughts oftuberculosis. *BMJ*, 2006;333(7560):201. doi: 10.1136/bmj.333.7560.201

10. de Nijs R. Spinal tuberculosis. *Lancet*, 2011;378(9807):e18. doi: 10.1016/S0140-6736(11)61482-7

11. Debnath U, McConnell J, Kumar S. Single-stage combined anteriorcorpectomy and posterior instrumented fusion in tuberculous spondylitiswith varying degrees of neurological deficit. *Int J Spine Surg*, 2021;15(13):600 – 11. doi: 10.14444/8081

12. de Mauroy JC, Vallèse P, Fender P, Lecante C. Historical Lyonaise brace treatment for adolescent Severe kyphosis. Results of 272 cases reviewed minimum 2 years after removal of the brace. *Scoliosis*. 2010 Sep;5(1):O69.

13. Katzman WB, Wanek L, Shepherd JA, Sellmeyer DE. Age-related Severe kyphosis: its causes, consequences, and management. *Journal of Orthopedic & Sports Physical Therapy*. 2010;40(6):352-60.

14. Goncalves MA, Rodovalho PL, Bellini AJ, Bruggemann AKV, Mazo GZ, Paulin E. Thoracic kyphosis comparison between a patient with chronic obstructive pulmonary disease and a healthy individual by flexicurve method. *FisioterPesq*, 2015;22(3):333-9

15. J Van Dort M, Driessen JHM, Romme EAPM, Geusens P, Willems PC, Smeenk FWJM, Wouters EFM, van den Bergh JPW. Thoracic kyphosis on chest CT scans is associated with incident vertebral fractures in smokers. *J Bone Miner Res*, 2019;34(5): e3672.

16. Kado DM, Prenovost K, Crandall C. Narrative review: Severe kyphosis in older persons. *Ann Intern Med*, 2007;147(5):330-8

17. de Mauroy JC. *Kyphosis physiotherapy from childhood to old age*. Physical Therapy Perspective in The 21s Century, *IntechOpen*, 2012.

18. Lewis JS, Valentine RE. Clinical measurement of the thoracic kyphosis. A study of the intra-rater reliability in subjects with and without shoulder pain. *BMC MusculoskeletDisord*, 2010;11:39.

19. Edmondston SJ, Singer KP. Thoracic spine: anatomical and biomechanical considerations for manual therapy. *Manual Therapy*, 1997;2(3):132-43.

20. Culham EG, Jimenez HA, King CE. Thoracic kyphosis, rib mobility, and lung volumes in normal women and women with osteoporosis. *Spine*, 1994;19(11):1250-5.

21. Greendale GA, Nili NS, Huang MH, Seeger L, Karlamangla AS. The reliability and validity of three non-radiological measures of thoracic kyphosis and their relationship to the standing radiological Cobb angle. *Osteoporosis International*. 2011,22(6):1897-905.

22. Chen L, Liu C, Ye Z, Liang T, Huang S, Chen J, et al. Multiple spinal tuberculosis with severe kyphosis: a case report. *Frontiers in Surgery*, 2022; 9:815514. doi:10.3389/fsurg.2022.815514

23. Roghani T, Zavieh MK, Manshadi FD, King N, Katzman W. Age-related Severe kyphosis: update of its potential causes and clinical impacts-narrative review. *Aging Clin Exp Res*, 2016;29:567–77. doi: 10.1007/s40520-016-0617-3

24. Fon GT, Pitt MJ, Thies AC Jr. Thoracic kyphosis: range in normal subjects. *Am J Roentgenol*, 1980, 134:979–83. doi: 10.2214/ajr.134.5.979

25. Shahi P, Chadha M, Sehgal A, Sudan A, Meena U, Bansal K, Batheja D. Sagittalbalance, pulmonary function, and spinopelvic parameters in severe posttubercular thoracic kyphosis. *Asian Spine J*, 2021;doi: 10.31616/asj.2020.0464

26. Wong YW, Samartzis D, Cheung KMC, Luk K. Tuberculosis of the spinewith severe angular kyphosis: mean 34-year post-operative follow-upshows that prevention is better than salvage. *Bone Joint J*, 2017;10:1381 – 8.doi: 10.1302/0301-620X.99B10.BJJ-2017-0148.R1

27. Wang L, Chen QL, Lu TS, Yao SD, Pu XW, Luo CS. Study on safety andclinical efficacy of osteotomy after halo pelvic traction in severe scoliosisaccompanied with split cord malformation. *Zhonghua Wai Ke Za Zhi*, 2021;59(5):370 – 7. doi: 10.3760/cma.j.cn112139-20200904-00686

28. Weiss H, Turnbull D. Kyphosis (Physical and technical rehabilitation of patients with Scheuermann's disease and kyphosis). *International encyclopedia of rehabilitation*. 2010. https://www.physio-pedia.com/Scheuermann%27s_Kyphosis

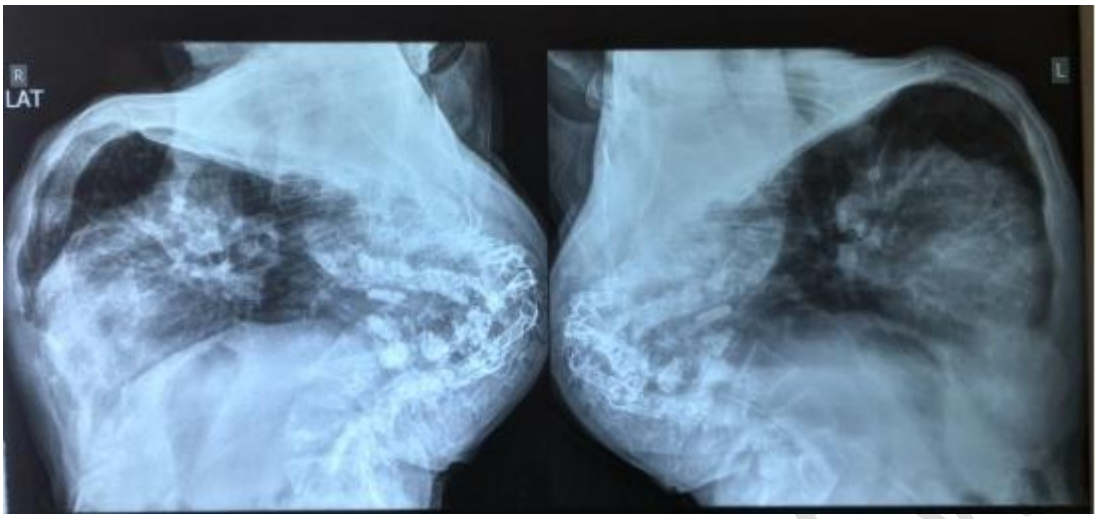

Figure 1. Lateral Chest X-ray

Figure 2a. Hyperkyphosis from lateral view

Figure 2b. A bump in hyperkyphosis patients, is visible when bending over