A case report of two OSA patients with cervical spine abnormality and relevant literature review

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Abstract

This article reported two cases of adult patients diagnosed as severe obstructive sleep apnea (OSA) in the Therapy Center of Sleep-disordered Breathing of the Eye, Ear Nose & Throat (ENT) Hospital of Fudan University. Both patients were found with invisible cervical spine structural abnormality. The unknown correlation between the development.

Introduction

This article reported two cases of adult patients diagnosed as severe obstructive sleep apnea (OSA) in the Therapy Center of Sleep-disordered Breathing of the Eye & Ear Nose & Throat (ENT) Hospital of Fudan University. Both patients were found with invisible cervical spine structural abnormality. The unknown correlation between the development of OSA and cervical spine abnormality inspired the researchers' interest to explore. Written consent was obtained from the patient prior to the writing of the case report. The study is approved by Ethics Committee of Eye & ENT Hospital, Fudan University (No. 2021060).

Case report

The first case was a 58-year-old male patient registered during Oct 26^{th} to Oct 28^{th} 2020, with complain as Snoring during sleep for 8 years, aggravated with apnea for 3 years. The anthropometric data and physical examination are in Table 1. The patient had no history of chronic heart disease, hypertention, type 2 diabetes or other chronic diseases. He had a history of cervical spondylosis and received surgical treatment as cervical internal fixation 7 years ago. The upper airway computed tomography (CT) showed: 1. Posterior displacement of the soft palate, resulting in narrowing of the anterior and posterior diameters of the oropharyngeal cavity. 2. Postoperative changes of the cervical spine (Figure 1). An overnight polysomnography (PSG) test was performed and the result suggested: the apnea hypopnea index (AHI) was 44.6 /hour, the supine apnea hypopnea index (sAHI) was 60.5 /hour, the nocturnal minimum oxygen saturation (minSat%) was 83%. The pressure titration was performed for one night, and the 90% treatment pressure of the continuous positive airway pressure (CPAP) was 13 cmH_2O.

The second case was a 70-year-old male patient registered during May 29^{th} to June 1^{st} 2019, with complain as Snoring during sleep for 20 years. The anthropometric data and physical examination results are in Table 1. The patient had no history of chronic heart disease, hypertention, type 2 diabetes or other chronic diseases. The upper airway CT showed: 1. Obvious osteophytes were seen at the anterior edge of the cervical vertebra, 2. The compression and protuberation of the posterior pharyngeal wall were seen from the nasopharynx, oropharynx and posterior cricoid region, 3. The cross-sectional area of the relative pharyngeal cavity become narrowing (Figure 2). The laryngoscopic findings revealed a significant bulge in the posterior laryngopharyngeal wall with small papilloma (Figure 3). The patient denied any ostealgia or other neurological symptoms, and had no history of medical intervention or treatment for this condition.

The PSG result suggested that the AHI was 72.5 /hour, and the sAHI was 74.4/hour. The minSat% was 81%. Pressure titration was performed and the 90% treatment pressure of CPAP was 12 cmH_2O.

The Epworth Sleep Scare (ESS) of both cases was 8 and 13, respectively. A good compliance of CPAP therapy and significant improvement of subjective symptoms were reported after treatment. The post-treatment AHI decreased to 11 /hour and 8.8 /hour, respectively. CPAP therapy were recommended. Both patients had very good compliance of CPAP, and had been receiving regular follow-up.

Discussion

These two male patients were both diagnosed as severe OSA. No typical physical finding such as an elevated tongue position, obvious jaw recession or a high BMI were found in the out-patient department. The most positive findings were the anatomical abnormalities of cervical spine, which inspired our interest to further explore the correlation.

The literature research focused on OSA and cervical spine disorder was conducted. The progression of OSA condition was associated with history of cervical fusions and osteophytes. The cervical spondylosis was reported as a rare risk factor for OSA[1]. Sonnesen *et al* .[2] in Denmark recruited 57 OSA patients, 21.1% of whom were found to have coexistent cervical spine fusion abnormalities. Pham *et al* .[3]tried to examine the association between OSA and cervical spine pathologies, postural changes and pain and they speculated that the mechanism might be: 1. The fusion of the cervical spine reduced the retropharyngeal space, 2. Bone spurs or osteomas aggravated the retropharyngeal compression, 3. Decreased cervical compliance and mobility aggravated the OSA severity[2]. The postural depending cervical forward bending and head extension were also reported as significant independent risk factors for OSA severity[4].

In this case report, both patients had high AHI, SAHI and high CPAP therapeutic pressure, and no other postive physical findings, which gave us the reason to speculate that their OSA condition was related to the cervical spine abnormalities. Cervical spine mobility caused by cervical internal fixation and the spinal osteophytes reduced upper airway space. We also speculate that surgery to improve anterior cervical protrusion or cervical hyperplasia may be able to reverse OSA. Still, well-designed prospective studies are needed to validate these changes and guide ENT physicians to propose more targeted treatment plans when treating OSA patients with combined cervical spine lesions. Furthermore, we hope that the characteristics of both cases may draw attention of orthopedic surgeons, especially physicians of spine surgery, to confirm whether their patients had any complaint of snoring or sleep apnea. An overnight PSG test could be suggested before and after spine surgery. Chung*et al.* [5] included OSA patients who underwent cervical or thoracic spine surgery. Higher probabilities of comorbidity, more difficulties in postoperative recovery, and an increased risk of pulmonary embolism and deep vein thrombosis were found, encountering diseases or surgical operations that could seriously affect cervical spine compliance and mobility. Relevant evaluation of OSA would be essential to avoid adverse impact on sleep breathing, and more positive therapeutic outcomes might be obtained.

Conclusion

Cervical spine disorders may contribute to the development of OSA, and could even be the only cause of OSA in patients without common risk factors. The combined occurrence of OSA and cervical spine disease requires the joint attention form otolaryngologists and spine surgeons.

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Author Contributions:

Anrong Sun: Provided the idea of case report, co-participated in the compilation of case information and drafting the manuscript.

Huiping Luo: Co-participated in the compilation of case information and drafting the manuscript.

Rui Fang: Provided ideas for writing and revised the manuscript.

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Table 1. Clinical characteristics of two cases.

	Case 1	Case 2
BMI (kg/m^2)	23.4	23.6
Friedman tongue position	II°	II°
Tonsil grading	I°	I°
Jaw recession	N/A	N/A

BMI: the Body Mass Index.

Friedman tongue position: the patients were told to breathe in a calm down condition and the tongue was in a natural position. I°: The entire uvula, tonsils and the post-pharyngeal wall could be seen. II°: Visualization of the complete soft palate and/or partial uvula and tonsils. III°: Some of the soft palate but not the distal of soft palate was seen. IV°: The entire soft palate was hide and only the hard palate could be seen.

Tonsil grading: Using the Brodsky grading scale, classified into 5 grades: 0°: Post-tonsillectomy condition. I°: the tonsils were hidden in the pillars. II°: the tonsils were beyond the anterior pillar and between 25% and 50% of the pharyngeal space; III°: the tonsils were beyond the pillars but not to the middle and occupied >50% and up to 75% of the pharyngeal space. IV°: the tonsils occupied >75% of the pharyngeal space.

Table 2. PSG results and CPAP parameters of two cases.

	Patient 1	**Patient 2**
AHI (/h)	44.6	72.5
SAHI (/h)	60.5	74.4
minSat% (%)	83%	81%
AHI after all-night CPAP (/h)	11	8.8
90% therapeutic pressure of CPAP (cmH_2O)	13	12

AHI: apnea hypopnea index; SAHI: supine apnea hypopnea index; minSat%: the nocturnal minimum oxygen saturation; CPAP: continuous positive airway pressure

Figure Legends.

Figure 1: The upper airway CT of Case 1. Narrowing of the anterior and posterior diameters of the oropharyngeal cavity and postoperative changes of the cervical spine were shown.

Figure 2: The upper airway CT of Case 2. Obvious osteophytes seen at the anterior edge of the cervical vertebrae resulted in the compression and narrowed antero-posterior diameter of the nasopharynx, oropharynx, larynpharynx and posterior cricoid region.

Figure 3: The laryngoscopic findings of Case 3. A significant bulge in the posterior laryngopharyngeal wall with small papilloma was shown.