

Case report article

DOI: 10.59715/pntjmp.3.2.28

Obstructive Sleep Apnea and bodybuilding: A case report

Tran Duc Si

Pham Ngoc Thach University of Medicine, HCMC, Vietnam

Abstract

Background: Obstructive Sleep Apnea is a prevalent disorder that affects individuals across various age groups and lifestyles. Although OSA is commonly associated with obesity and sedentary lifestyles, it can also affect physically active individuals. Bodybuilding and obstructive sleep apnea should be interconnected due to factors such as changes in body composition and weight fluctuations.

Case Presentation: Here, we present the case of a 30-year-old bodybuilder with OSA and his successful treatment using Continuous positive airway pressure therapy. The patient presented with loud snoring, witnessed apneas during sleep and waking up in a panic, fragmented sleep, and excessive daytime sleepiness. The Apnea Hypopnea Index came from 81.8/hours to 0.2/hours using CPAP treatment.

Conclusions: Prioritizing quality sleep is essential for bodybuilders. Bodybuilders should consider undergoing sleep apnea screening, especially if they experience symptoms such as daytime fatigue, loud snoring, or waking during the night with gasping or choking. Timely diagnosis and treatment can help manage OSA effectively.

Keywords: Obstructive sleep apnea, continuous positive airway pressure, athletes, bodybuilder, case report.

Received: 20/02/2024

Revised: 18/3/2024

Accepted: 20/4/2024

Author contact:

Tran Duc Si

Email: sitd@pnt.edu.vn

Phone: 0906609518

1. INTRODUCTION

Obstructive Sleep Apnea (OSA) is a prevalent disorder that affects individuals across various age groups and lifestyles. It is characterized by recurrent episodes of complete or partial upper airway obstruction during sleep, leading to intermittent hypoxia, fragmented sleep, and excessive daytime sleepiness.

The mechanism of OSA may be due to a decreased lung capacity and an anatomical imbalance around the pharynx due to increased body size. When volume soft tissue surrounding the pharyngeal airway is increased by increase of fat or muscle mass, the parapharyngeal anatomy is unbalanced, resulting in pharyngeal obstruction.

Although OSA is commonly associated with obesity and sedentary lifestyles, it can also affect physically active individuals. Few research links OSA specifically with larger male strength and physique athletes: recreational and pro-bodybuilders, powerlifters, and strongmen.

However, some suggest that athletes (male athletes in particular), are more predisposed to sleep disorders. Within athletes, up to 45% have reported experiencing, or have shown signs of suffering from OSA. Nevertheless, previous OSA research in sport has focused mostly on collision sports (e.g., American football, rugby) [1,2].

Bodybuilding is a popular sport and lifestyle choice that involves intense physical training, disciplined nutrition, and a commitment to building and sculpting a muscular physique. While bodybuilding offers numerous health benefits, it is important to be aware of potential risks and complications that can arise. Bodybuilders often have a higher muscle mass compared to the general population. While these attributes contribute to a well-defined physique, they can also increase the likelihood of developing OSA. However, there was no report about the relation between OSA and bodybuilder found in literature.

In this article, we will explore the relationship between weight gain and obstructive sleep apnea on a former bodybuilder.

Patient Information

A Vietnamese, 30 years old former bodybuilder, Mr. NTN weighted 105 kg, carried ably on his muscular 6-foot-6 frame. He’s been pursuing this career for the past 15 years, as a result he has held a number of international awards. He has not significant individual either familial history of respiratory, cardiology nor mental health.

Clinical Findings and Diagnostic Assessment

He would snore and then stop breathing for lengths of time. The symptoms became more obvious whenever he deviated from the diet and gained weight quickly after each competition. The first instance occurred when he went from 85 kg to 100 kg in 2021. His body gradually adapted and his symptoms improved as he continued to diet and exercise. The second occurrence was when he reached 105 kg after the 2022 competition.

Following his coach’s advice, the man presented to the sleep clinic with complaints of loud snoring, witnessed apneas during sleep and waking up in a panic (the last only happened with sudden weight gain). He was

particularly bothered by excessive daytime sleepiness. Despite sleeping 8-9 hours a night and taking multiple naps during the day (1-3 times a day), he still felt sluggish and tired. He also complained of poor recovery after exercise, loss of appetite, brain fog, poor brain function during the day.

The Epworth Sleepiness Scale (ESS) score was 15, indicating excessive daytime sleepiness. The Mallampati score was 2 and he had no otolaryngologic abnormalities. He had no significant medical history and was not taking any medications, including steroids.

His body mass index (BMI) was 35 kg/m², and he had a muscular build with a neck circumference of 42 cm. The chest, waist and hip circumferences were 115 cm, 90 cm, and 105 cm respectively.

An overnight polysomnography (PSG) was performed, which revealed severe OSA with an apnea-hypopnea index (AHI) of 81.8 events per hour. The sleep study demonstrated frequent episodes of obstructive apneas, arousals, and significant oxygen desaturation. The detailed results were presented in table 1, figures 1 and 2. The patient was diagnosed with severe OSA and recommended to undergo CPAP therapy.

Table 1: The PSG reports

Respiratory summary:		
Recording time: 7h 22m	NREM stage: 71 %	Supine sleep: 86.4 %
Total awake time: 0h 38m	REM stage: 19.9 %	Sleep on left side: 6.2 %
Total sleep time: 6h 42m		Sleep on right side: 7.3 %
Sleep efficiency: 90.9 %		Prone sleep: 0 %
Respiratory Index:		
Apnea Hypopnea Index (AHI): 81.8 /hours		
Obstructive Apnea: 76.3 /hours	Mean: 27.3 seconds	Max: 90.5 seconds
Central Apnea: 0 /hours	Mean: 0 seconds	Max: 0 seconds
Mixed Apnea: 0.6 /hours	Mean: 34.4 seconds	Max: 47.6 seconds
Hypopnea: 4.9 /hours	Mean: 27 seconds	Max: 57.7 seconds
Oximetry – Heart rate		
Oxygen Desaturation Index (ODI): 84.2 /giò		
SpO2 max: 98 %	SpO2 < 90%: 132.8 minutes	Max. heart rate: 101 /minute

SpO2 mean: 91 %	SpO2 < 85%: 47.1 minutes	Mean heart rate: 64 /minute
SpO2 min: 66 %	SpO2 < 80%: 15.9 minutes	Min. heart rate: 44 /minute
Other index:		
Snoring: 180.7 /hours	Cheyne-Stokes: 0 %	
Snoring episodes: 5.9 %	Respiratory rate: 18.9 /minute	
Mean snoring amplitude: 74 dBC		

Therapeutic Intervention and Outcomes

The patient received CPAP treatment, experiencing immediate improvement after the first night with a sleep duration of 9 hours and 2 minutes using the Autoset mode. Within six months, all symptoms disappeared. Subsequent record analysis of the last month from the CPAP machine revealed consistent nightly use (100%), as summarized in Table 2. Since then, he has maintained a body weight of about 102 kg. The patient continues the CPAP treatment regularly with 98% days using CPAP (in which 92% ≥ 4 hours/night). Therapy reports from July to November 2023 did not change much even though the patient had a period of weight gain to 108kg in August.

Table 2: Patient’s clinical improvement during CPAP treatment

Duration	26/12/2022 - 26/12/2022	24/05/2023 - 22/06/2023
Usage days >= 4 hours	1/1 days (100%)	30/30 days (100%)
Average usage (total days)	9 hours 2 minutes	7 hours 39 minutes
Mode	autoset: 4 - 15 cmH2O	autoset: 4 - 15 cmH2O
Median Pressure (cmH2O)	9.4	8.3
Max Pressure (cmH2O)	12.2	13.2
Median Leaks - L/min	0.0	0.2
Max Leaks - L/min	39.6	26.6
AHI	2.4	0.2
AI	1.2	0.1
HI	1.2	0.1
Central Apnoea Index	0.1	0.0
Obstructive Apnoea Index	1.1	0.1

2. DISCUSSION

Obstructive sleep apnea is the most common sleep-related breathing disorder, led by the upper airway occlusion during sleep. The Mallampati score is one assessment to describe the relative size of the tongue base compared to the oropharyngeal opening. It has also been proved to correlate with OSA. For every one-point increase in the Mallampati score, the apnea-hypopnea index increases on average by more than five events per hour [3]. While the

Mallampati score was an independent predictor of OSA presence and severity, it was only 2 and so was not the sole etiology in this case.

It is assumed that obesity is the major cause of OSA, and that weight loss might be a part of the treatment [4]. The principal mechanism of OSA is collapse of the pharyngeal airway. Fat deposition around the airway is a possible mechanism whereby obesity may predispose to apnea. [5] The relation between BMI and OSA is documented [6] and BMI is also now used as

an index in the STOP-BANG Score for OSA screening. In this case, although the BMI meets the criteria of extreme obesity, the patient's waist is normal. So, he does not have central obesity. Indeed, he is an athlete. The patient's OSA may be due to the increase of volume of soft tissue surrounding the pharyngeal airway by increase of muscle mass and also of fat (only while suddenly gaining weight). Normally, bodybuilders build up the muscle by gaining weight and then by exercising and eliminating non-essential body fat. In this case, the symptoms increased during the first phrase but still exist during the second.

The OSA is characterized by recurrent complete or partial upper airway obstructive events, resulting in intermittent hypoxaemia, autonomic fluctuation, and sleep fragmentation. While the patient sleeps on back, their soft tissues in the back of the throat begin to relax as they breathe in, ultimately collapsing back to block the throat (upper airway). We speculate on the potential role of neck and chest muscle mass in the OSA mechanism. Some bodybuilders resort to bulking phases to gain muscle mass, which involves consuming excess calories. This can lead to weight gain, including fat accumulation around the neck area. A larger neck circumference can contribute to the narrowing of the upper airway, making it more susceptible to obstruction during sleep. We also wonder if the big and heavy upper body could lead to overload of respiratory muscles.

However, weight gain, in this context muscle development, is necessary for the patient's career. The CPAP treatment proves effective, significantly improving sleep quality. Indeed, sleep serves as a restorative period from the previous day's and a preparation period for the next day's work. This concept seems incredibly important for the athlete or bodybuilder due to the extreme amounts of physical exercise performed each day. Sleep has been shown to have a restorative effect on the immune system, the endocrine system, facilitate the recovery of the nervous system and metabolic cost of the waking state and has an integral role in learning, memory and synaptic plasticity, all of which can impact both athletic recovery and performance

[7]. Sleep presumably is a critical factor contributing to the balance of core body tissues: bone, fat, and muscle mass [8]. Further, Dattilo M, et al., hypothesized that sleep debt decreases the activity of protein synthesis pathways and increases the activity of degradation pathways, favoring the loss of muscle mass and thus hindering muscle recovery after damage induced by exercise, injuries and certain conditions associated with muscle atrophy [9]. Disturbances in sleep are believed to be a key symptom of overreaching/overtraining, often linked to increased training load, or indirect alterations to training scheduling [10]. But now OSA could be another remarkable sleep disorder in athletes. Bodybuilders should strive for a healthy body weight and avoid excessive weight gain during bulking phases. Regular monitoring of body fat percentage and neck circumference can help identify potential risks.

3. CONCLUSION

Sleep is exceptionally vital for one's recovery and overall performance, including athletes. Yet, excessive muscle mass could be related to OSA, at least at the neck, which may cause an anatomical imbalance around the pharynx.

Diagnosing OSA is not difficult but this disease is still underestimated in Vietnam. Although the bodybuilding community in Vietnam and the world knows a lot about OSA, most experts believe that not active people but only obese people are at risk of developing the disease. The purpose of this case report is to suggest that overweight individuals, whether muscular or obese, should be screened for OSA when suffering from sleep disorders. We propose that professional athletes (bodybuilders, powerlifters in particular) be also considered as an at-risk population for OSA. Screening and early disease detection can help ensure health and further improve their individual performance.

This is a case-report of a professional bodybuilder with the aggravation of OSA symptoms during the rapid weight gain periods after each competition. However other research should be carried out on an adequate sample to evaluate the long term complications of weight gain on bodybuilders.

Authors' contributions

D-ST: diagnosis, curation, conceptualization, acquisition and interpretation of data, drafting and revising of the manuscript.

Acknowledgements

Not applicable.

Funding

This is a retrospective case report, no extra fund needed.

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Ethics approval and consent to participate

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

Conflicts of interests

D-S TRAN is the patient's physician and is the only author of this case report. The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as an actual, potential and perceived conflict of interest.

Author details

Duc-Si TRAN

- Vice - head of Department of Family Medicine, Pham Ngoc Thach University of Medicine, Vietnam.
- Head of Sleep-lab, Advanced Training & High Technology Center, Pham Ngoc Thach University of Medicine, Hochiminh city, Vietnam.
- Deputy head of the Insomnia Association
- Deputy head of the HCMC Society of Sleep Medicine.

REFERENCES

1. Montero A, Stevens D, Adams R, Drummond M. Sleep and Mental Health Issues in Current and Former Athletes: A Mini Review. *Front Psychol.* 2022 Apr 7;13:868614. doi: 10.3389/fpsyg.2022.868614. PMID: 35465516; PMCID: PMC9023010.
2. Lastella M, Memon AR, Vincent GE. Global Research Output on Sleep Research in Athletes from 1966 to 2019: A Bibliometric Analysis. *Clocks Sleep.* 2020 Mar 30;2(2):99-119. doi: 10.3390/clockssleep2020010. PMID: 33089195; PMCID: PMC7445811.
3. Nuckton TJ, Glidden DV, Browner WS, Claman DM. Physical examination: Mallampati score as an independent predictor of obstructive sleep apnea. *Sleep.* 2006 Jul;29(7):903-8. doi: 10.1093/sleep/29.7.903. PMID: 16895257.
4. Kuna ST, Reboussin DM, Strotmeyer ES, Millman RP, Zammit G, Walkup MP, Wadden TA, Wing RR, Pi-Sunyer FX, Spira AP, Foster GD; Sleep AHEAD Research Subgroup of the Look AHEAD Research Group. Effects of Weight Loss on Obstructive Sleep Apnea Severity. Ten-Year Results of the Sleep AHEAD Study. *Am J Respir Crit Care Med.* 2021 Jan 15;203(2):221-229. doi: 10.1164/rccm.201912-2511OC. PMID: 32721163; PMCID: PMC7874414.
5. Eckert DJ, Malhotra A, Jordan AS. Mechanisms of apnea. *Prog Cardiovasc Dis.* 2009 Jan-Feb;51(4):313-23. doi: 10.1016/j.pcad.2008.02.003. PMID: 19110133; PMCID: PMC3427748.
6. Madrid-Valero JJ, Martínez-Selva JM, Ordoñana JR. Sleep quality and body mass index: a co-twin study. *J Sleep Res.* 2017 Aug;26(4):461-467. doi: 10.1111/jsr.12493. Epub 2017 Jan 19. PMID: 28101894.
7. Doherty R, Madigan S, Warrington G, Ellis J. Sleep and Nutrition Interactions: Implications for Athletes. *Nutrients.* 2019 Apr 11;11(4):822. doi: 10.3390/nu11040822. PMID: 30979048; PMCID: PMC6520871.
8. Stich FM, Huwiler S, D'Hulst G, Lustenberger C. The Potential Role of Sleep in Promoting a Healthy Body Composition: Underlying Mechanisms Determining Muscle, Fat, and Bone Mass and Their Association with Sleep.

Neuroendocrinology. 2022;112(7):673-701. doi: 10.1159/000518691. Epub 2021 Jul 27. PMID: 34348331.

9. Dattilo M, Antunes HK, Medeiros A, Mônico Neto M, Souza HS, Tufik S, de Mello MT. Sleep and muscle recovery: endocrinological and molecular basis for a new and promising hypothesis. Med Hypotheses. 2011 Aug;77(2):220-2. doi:

10.1016/j.mehy.2011.04.017. Epub 2011 May 7. PMID: 21550729.

10. Lastella M, Vincent GE, Duffield R, Roach GD, Halson SL, Heales LJ, Sargent C. Can Sleep Be Used as an Indicator of Overreaching and Overtraining in Athletes? Front Physiol. 2018 Apr 24;9:436. doi: 10.3389/fphys.2018.00436. PMID: 29740346; PMCID: PMC5928142.



Figure 1: Polysomnography (PSG) results show highly decreased SpO2 (95%) especially during REM sleep. Patient snores continuously and loudly almost all night (Mean snoring amplitude: 74 dB, max: 100 dB).

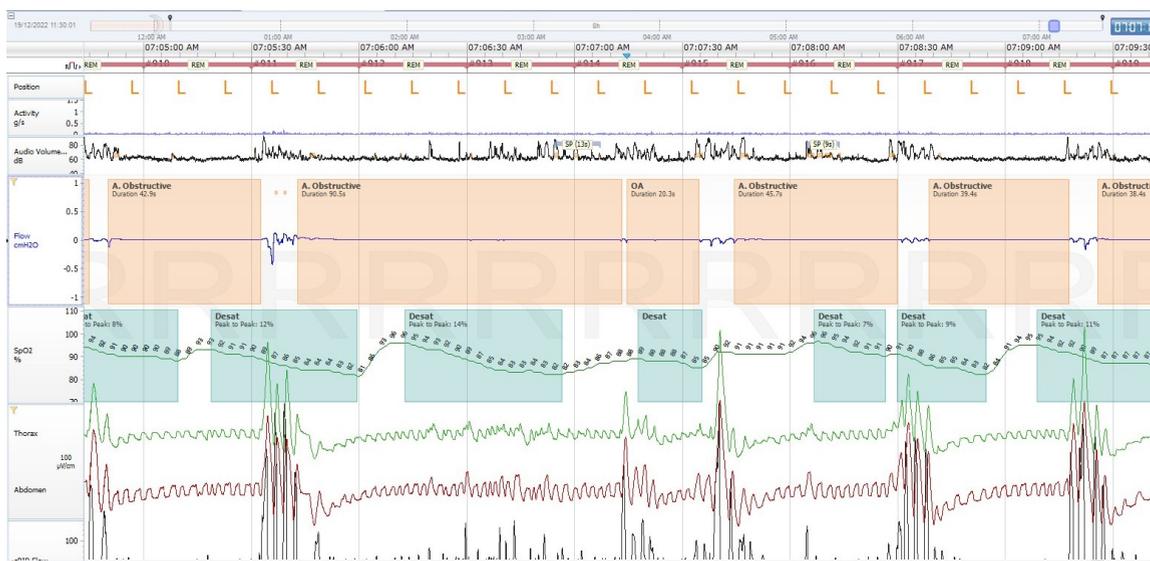


Figure 2: Polysomnogram (PSG) tracing shows repeated apneas and respiratory desaturation in the morning.