

A Prospective case study on an obese adolescent with obstructive sleep apnea (OSA) before versus One year after bariatric surgery

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Abbreviations: OSA: Obstructive sleep apnea; SDB: sleep disordered breathing; CDC: Center for disease control and prevention; GERD: Gastroesophageal Reflux Disease; BMI: body mass index; HOMA-IR: high Homeostatic Model Assessment for Insulin Resistance; CPAP: continuous positive airway pressure; ASMBS: American Society for Metabolic and Bariatric Surgery; AASM: American academy of sleep medicine; AHI: Apnea-hypopnea index; PICU: Pediatric Intensive Care Unit

Introduction

The prevalence of adolescent obesity is on the rise, recently reported by CDC is 20.6 % (12-19years) in the USA and around 25% in Qatar [1,2]. Adolescent obesity carries a high risk of respiratory morbidity and mortality outcomes, Among, this outcome is sleep disordered breathing (SDB). Obstructive sleep apnea (OSA) is one of the major comorbidity of SDB in obese adolescent with incidence ranging from 5.7% to 56% in different reports [3]. New evidence suggests that bariatric surgery is an alternative and effective option for weight reduction in severely obese adolescents [4-8]. However, the effect of this treatment on OSA outcome is not well recognized.

Case study

This is a 14 years old obese adolescent boy who was initially hospitalized for symptoms of snoring, orthopnea and restless during sleep at night. He also complained from dyspnea and easy tiredness with severe exercise intolerance during the day with poor self-esteem. Family noticed increasing weight gain and worsening of symptoms in the last 4 years before hospitalization. Multiple diet programs by expert's diet centers failed to reduce his weight. There was no history of headache, syncope or chest pain, wheezing and no symptoms suggestive of GERD. His mother had morbid obesity. On physical examination; he had normal blood pressure. His weight was 80 Kg (BMI= 39 kg/m² Z score= 3.54 SD) with grade IV acanthosis nigricans. His systemic examination including cardiac and respiratory systems was unremarkable. The patient was provisionally diagnosed with OSA and was started on night-time continuous positive airway pressure (CPAP). He underwent ECHO heart which ruled out pulmonary hypertension. Metabolically he had impaired glucose tolerance and very high Homeostatic Model Assessment for Insulin Resistance (HOMA-IR=22) with HbA1c=5.7%, elevated liver enzymes and normal lipogram. Diagnostic sleep study showed moderate OSA (AHI=7.6 AASM score) (Figure 1). He was discharged on CPAP during sleep. During, one year Follow up he complained of episodes of headache and poor school performance and

progressive weight gain (Age=14 years, wt=103 Kg, BMI 45 kg/m² Z score 3.81 SD), where at this point decision was made to be assessed for bariatric surgery. Patient was admitted to our tertiary surgical center for preoperative optimization and multidisciplinary approach of his medical condition including nighttime CPAP respiratory support, strict diet, family, and patient psychological support. Laparoscopic sleeve gastrectomy (LSG) operation was performed afterword at the age of 14 years. Patient did not have any immediate post-operative complication. He was observed in the PICU for 24 hours and was continued on night-time CPAP and discharged home within three days on CPAP with close follow up by bariatric surgery team. One-year post-operative follow up, his weight dropped to 57 Kg, with BMI 20 (46 kg weight lost, 47.4%). He had normal glucose tolerance and normal hepatic enzyme level. The one year follow up sleep study showed complete resolution of his OSA. (Figures 1 and 2). He also reported complete resolution of his OSA related symptoms with dramatic improvement of his daily activity, and school performance.

Discussion

Bariatric surgery has emerged to become the recommended weight loss treatment for severe obesity in adolescents. [4-9] peculiarly favorable come for those with obesity associated comorbidity such as our case [8,10]. We have found in our case that bariatric surgery has significantly dropped patient weight, with complete resolution of patient metabolic and OSA complication as documented objectively by follow one year post LSG surgery sleep study.

This case study is one of few reports which have looked objectively at OSA obesity co-morbidity in relation short and long-term post bariatric surgery outcome. Our patient suffered from constellation of symptoms related to his OSA which leads to physical and psychological sequences, this has promoted the indication for bariatric surgery along with his impaired glucose tolerance.

Previous studies has reported resolution of OSA symptoms post bariatric surgery, but off note, these studies did not specify how the diagnosis of OSA was made and no objective sleep study was done to

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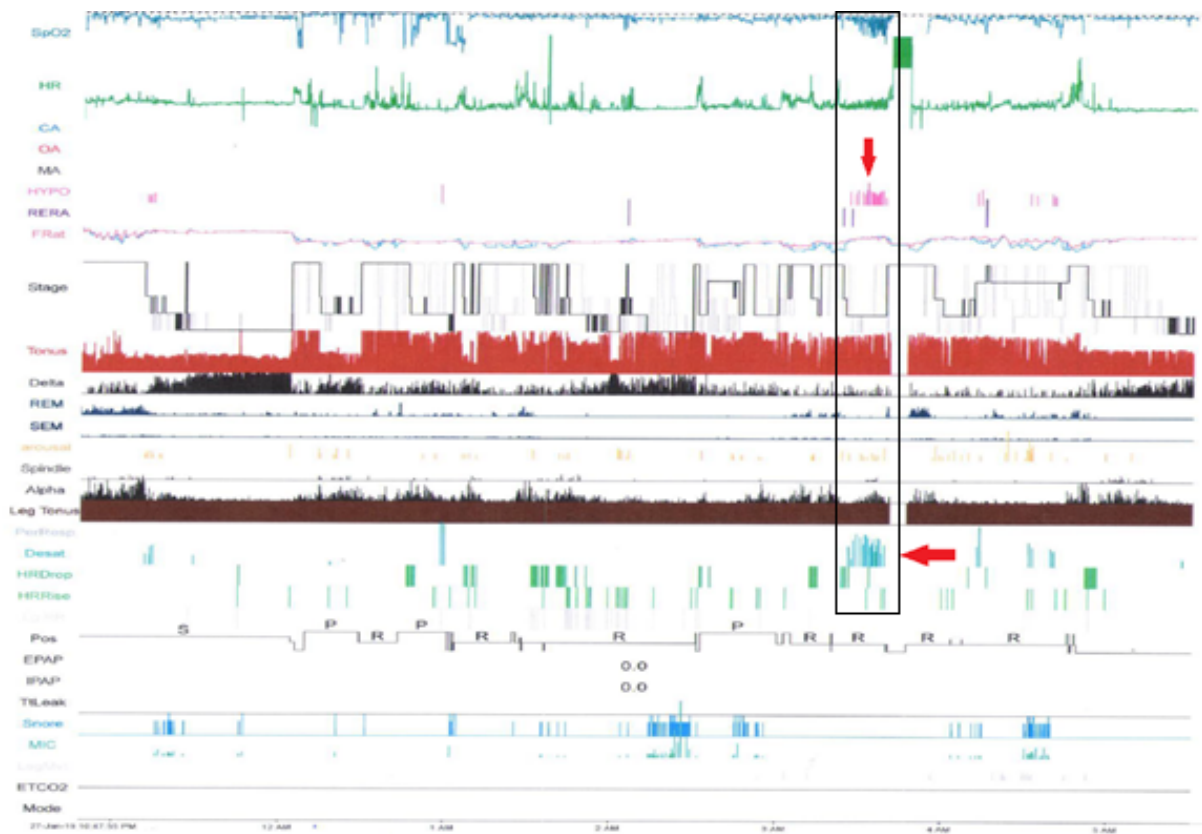


Figure 1. This diagnostic polysomnography for the patient was done off respiratory support and pre-operative which shows episodes of obstructive apneas and hypopnea

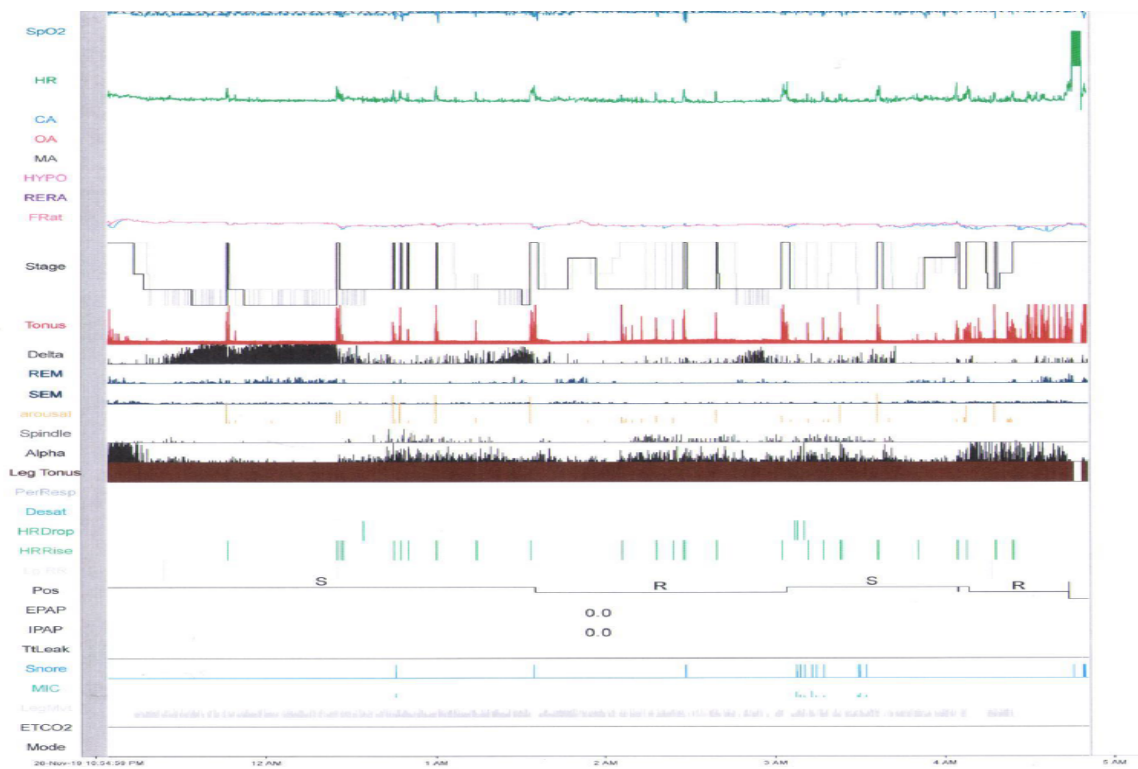


Figure 2. This diagnostic polysomnography for the patient was done off respiratory support and one year post-operative LSG which shows normal sleep architecture with the resolutions of the sleep apnea and hypopnea events

assess resolution of the OSA post-operatively [10,11]. In our case study the diagnosis of OSA in our patient was confirmed based on AASM scoring system which consider the gold standard for such diagnosis [12].

Although the mechanisms of OSA in obese adolescent patients is complex are not completely understood, multifactorial elements may contribute to the development this co-morbidity such as the physiological effects of obesity on the respiratory system, upper airway anatomy and lymphoid hypertrophy and possible underlining inflammatory processes [3]. It is unknown the effect of bariatric surgery in such elements but it seems it may play role in clinical reversal of such disease [13].

Our patient did not have any short or long-term complication during 30 days and one year post-operative follow up subsequently, such risk may occur in 8% of patients [7]. Our patient had lost a significant weight which is slightly higher to the mean drop of weight of what reported previously in other meta-analysis and retrospective studies [6,9,11]. Multidisciplinary teams approach and compliance on CPAP for a 6 month post LSG is the key player for such favorable outcomes [10].

Nevertheless, our case study reported objectively the resolution of OSA obesity related co-morbidity in an adolescent patient, this need to be done in a large case controlled population and possible longer duration sleep study follow up to document the sustainable effect of weight lost on such comorbidity.

Conclusions

This prospective case study showed that bariatric surgery has significantly dropped patient weight, with complete resolution of patient OSA that persisted for one year post-operatively. Multidisciplinary teams approach appeared to be key player for his favorable outcome.

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Conflicts of interest

The PI, Basel Habra and all associated authors, declare that there is no conflict of interest regarding the publication of this paper.

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