

A case of type 2 diabetic adolescent with sleep apnea who was successfully stopped metformin after adenotonsillectomy

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Introduction

- ▶ Sleep deficit is the well known risk factor for obesity in children and adult due to increased ghrelin.¹
- ▶ In Korea, the prevalence of childhood obesity is increasing up to 10% in 2013 and nonalcoholic fatty liver disease (NAFLD) was 5.9% in 2015 and the prevalence of NAFLD and the degree of hepatic fibrosis were increased with the severity of obesity.²
- ▶ Adenotonsillar hypertrophy is the main cause of obstructive sleep apnea (OSA) in childhood, but obesity is the main cause of adult OSA in which hypoxia and sleep disruption increase the risk of endothelial dysfunction, hyperlipidemia, hypertension, insulin resistance, and cardiovascular complication.^{3,4}
- ▶ Adult type (type II) OSA is reported to be increasing in obese children.^{3,4}

Case (11 year old boy)

- ▶ **Chief complaint** : Polyuria, Polydipsia (onset : 2 weeks ago)
- ▶ **Family history** : Type II diabetes mellitus (Grand mother, Father)
- ▶ **Medical history** : Asthma, Allergic rhinitis, 3 years ago, adenotonsillectomy (AT) was recommended for tonsillar hypertrophy (grade 3) and snoring, but refused.
- ▶ **Physical examination** : Bwt 79.0kg (+ 3.3SD), Ht 152.0cm(+ 0.9SD), BMI 34.19kg/m² (+ 4.0SD), Blood pressure 100/60 mmHg, Tonsil size : Bilateral grade I, Mallampati score 1, Acanthosis nigricans(+ : armpits and neck)
- ▶ **Lab test** : Random blood glucose : 260 mg/dL, HbA1c 9.3 %, AST/ALT: 112 / 288 IU/L, HOMA-IR 18.3, hsCRP 0.1 mg/dL, TG 90 mg/dL Total Cholesterol 147 mg/dL, LDL Cholesterol 99mg/dL, HDL Cholesterol 37mg/dL, C-peptide(FBS) 2.2 ng/mL, Islet Cell Antibody negative, Anti GAD Ab 0.19 U/mL, Insulin 43.6 μ IU/mL
- ▶ **Hospital course**: Insulin and metformin therapy was started after evaluation for diabetes mellitus. Snoring and excessive daytime sleepiness were noticed. Polysomnography was done despite small tonsillar size. Moderate severe OSA was found with apnea-hypopnea index : 9.0/hr. Adenotonsillectomy was done at 11th HD. Tonsil size was revealed large (4.5x2.3x2cm, 4x2.5x2cm) at operative field. Insulin stopped and metformin started at 7th HD. Metformin stopped at 60th POD.

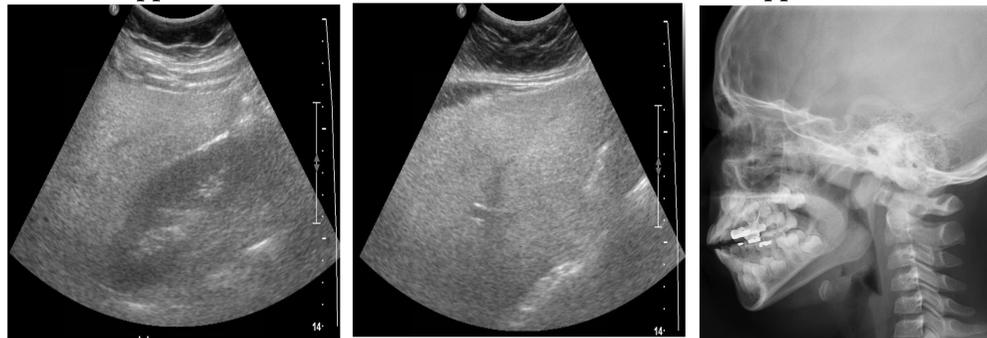


Fig 1. Moderate fatty liver in abdominal sonography, Tonsillar hypertrophy in PNS xray

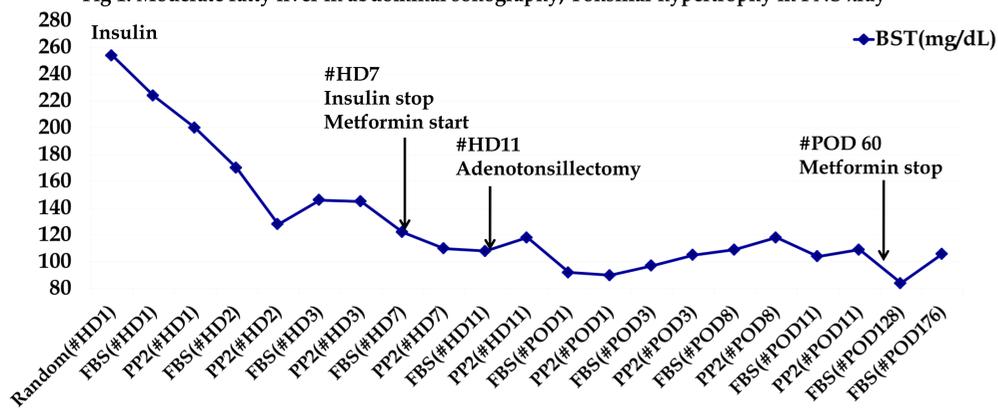


Fig 2. Blood glucose after insulin and drug treatment and adenotonsillectomy

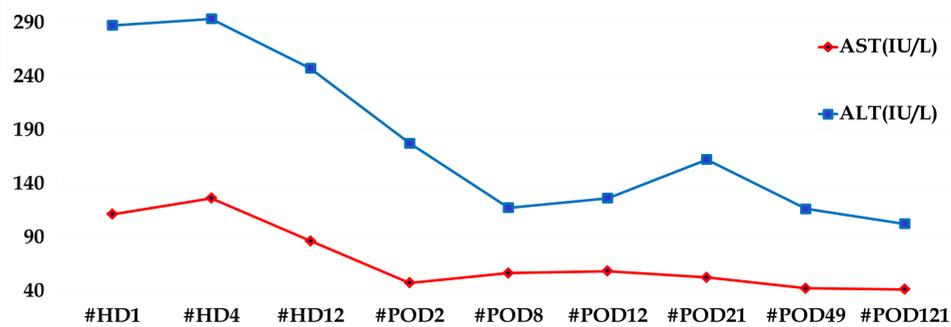


Fig 3. Liver function test trends after adenotonsillectomy

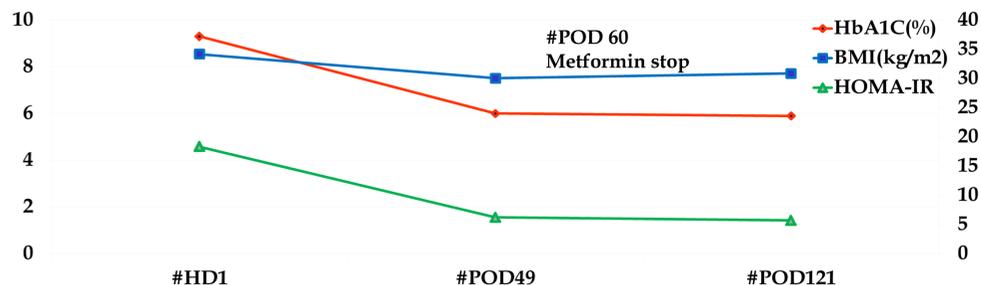


Fig 4. HbA1C and BMI and HOMA-IR trends after adenotonsillectomy

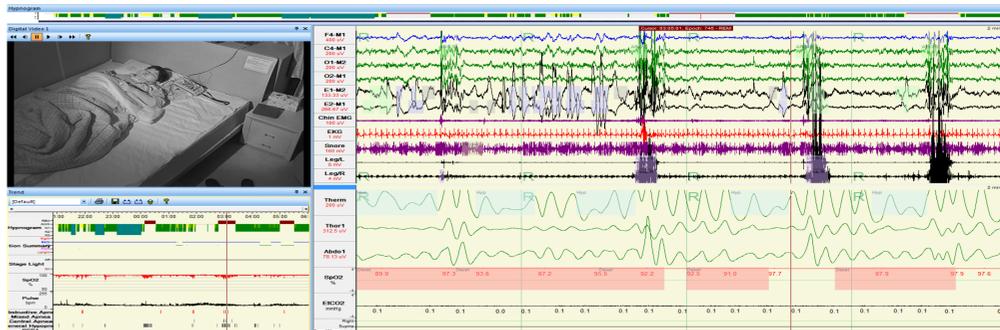
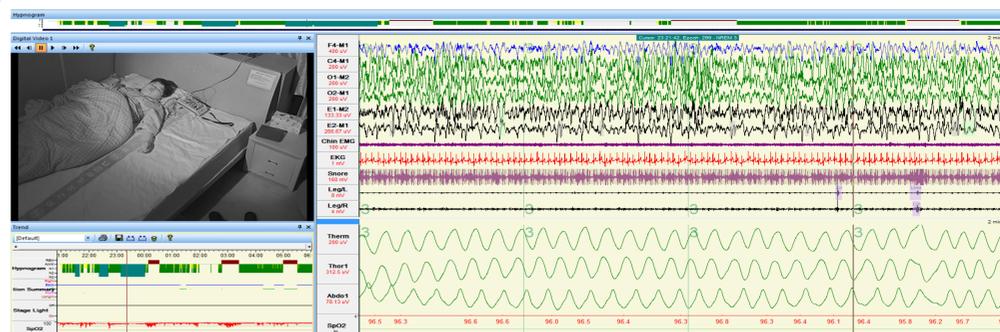


Fig 5. Polysomnography. There is no sleep apnea in the NREM sleep state, but sleep apnea frequently occurs in the REM sleep stage. AHI: 9.0/h (Obstructive 1.4/h, Central 0.6/h, Hypopnea 7.0/h), respiratory disturbance index (RDI) 7.0/h, Relative snoring time 28.8 %, Lowest oxygen saturation 83.7 %

Conclusion

- ▶ This case is a patient with obesity and type 2 diabetes improved blood glucose control and fatty liver after sleep therapy.
- ▶ Sleep problems are easy to be overlooked if not suspected, so early recognition and interventions for OSA can improve insulin sensitivity and fatty liver and other complications in obese OSA patients.
- ▶ It is necessary to screen the presence of sleep apnea in children and adolescents with obesity or diabetes, especially with family history of diabetes or hypertension to prevent the metabolic disease during adulthood even in the absence of overt adenotonsillar hypertrophy.

Reference

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