Outcomes of Adenotonsillectomy in Children with Down Syndrome and Obstructive Sleep Apnea

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Background: Obstructive sleep apnea (OSA) is common co-occurring condition in children with Down syndrome (DS) with an estimated prevalence of 66-76%,[1,2] compared to only 1-4% of the pediatric population without DS.[3] The American Academy of Pediatrics (AAP) recommends an adenotonsillectomy (T&A) as first-line treatment for pediatric OSA.[5] In an investigation of 75 children with DS, only 12% had a postoperative OAHI of less than one event an hour while 50% had an OAHI > 5 within six months after surgery.[9] The objective of the current investigation is to update postoperative outcomes at CHCO with a larger cohort.

Methods: A retrospective chart review was conducted forchildren with DS who underwent a T&A at Children's Hospital Colorado (CHCO). All patients had preoperative and postoperative PSG within 12 months of surgery. Primary outcomes included changes in obstructive apnea-hypopnea index (OAHI), mean oxygen saturation (SpO_2), and end-tidal carbon dioxide ($EtCO_2$). Analyses were performed using Wilcoxon Rank-Sum and Fisher's Exact tests, and linear regressions adjusted for age, sex, and BMI percentile.

Results: A total of 418 children underwent a T&A of which 236 met inclusion criteria. Demographic information is available in Table 1. Following T&A, children demonstrated marked improvements in their sleep & breathing patterns as well as gas exchange. The total sleep time increased by 17.7%. The OAHI decreased from 14.5 to 8.4, reflecting a median reduction of 42%. SpO_2 increased by 1.2%, while SpO_2 nadir improved by 8.5%. Additionally, mean end-tidal CO_2 decreased by 4.3% and mean heart rate declined by 7.5%.(see Table 2). The effect of T&A varied by preoperative OSA severity. Among children with severe OSA, 75% of patients experienced >50% reduction in OAHI, with only 4% showing postoperative worsening. Those with moderate OSA had a 61% rate of substantial improvement and 18% worsened (see Figure 1).

Discussion: T&A in children with Down syndrome and OSA was associated with improvements in OAHI, oxygenation, and sleep duration, with the greatest benefit observed in those with moderate or severe preoperative OSA. These findings support T&A as an effective first-line therapy in this population while highlighting the need for postoperative PSGs to evaluate persistent OSA.

Table 1- Demographics and Comorbidities

	T-A only (N=236)
Age at Surgery (y)	5.1218 [0.5, 18.14]
Sex	
Male	123 (52.1%)
Female	113 (47.9%)
Race	
White	143 (60.6%)
Black/African American	14 (5.9%)
Asian	4 (1.7%)
Other	60 (25.4%)
Unknown	3 (1.3%)
More than one race	12 (5.1%)
Prematurity	72 (31.6%)
Comorbidities	
Pulmonary Hypertension	70 (29.7%)
History of Pnuemonia	2 (0.8%)
Hypothyroidism	93 (39.4%)

Table 2- Changes in Polysomnographic Measures

	T-A only (N=236)
OAHI	
Pre	14.51
Post	8.41
Percent Change (%)	-42.04

Mean EtCO2	
Pre	44.64
Post	42.72
Percent Change (%)	-4.30
Mean SpO2%	
Pre	92.49
Post	93.6
Percent Change (%)	1.20
Min SpO2%	
Pre	78.5
Post	85.16
Percent Change (%)	8.48
Mean Heart Rate	
Pre	92.74
Post	85.77
Percent Change (%)	-7.52
Total Sleep Time	
Pre	332.78
Post	391.66
Percent Change (%)	17.69

Figure 1- OSA Severity Pre and Post T-A vs T-A + SGP

Preoperative OSA Category (n)	Preoperative OAHI mean (sd)	Patients with >50% reduction in postoperative OAHI	Patients with Increased OAHI
T-A only			
OAHI <1 (16)	.43 (.31)	4 (25%)	10 (62.5%)
Mild (54)	2.93 (1.13)	20 (37.04%)	25 (46.3%)
Moderate (49)	7.16 (1.55)	30 (61.22%)	9 (18.37%)
Severe (93)	27.53 (9.25)	70 (75.27%)	4 (4.3%