International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979; Impact Factor: RJIF 5.72
Received: 02-12-2020; Accepted: 03-01-2020
www.allsubjectjournal.com
Volume 7; Issue 2; February 2020; Page No. 10-13

Effect of Adenotonsillectomy on cardiopulmonary functions

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Abstract
Objective: to investigate and demonstrate changes in cardiopulmonary functions pre & post-operative in children suffering breathing difficulties due to adenotonsillar hypertrophy and scheduled for adenoteonsillectomy.
Patients and methods: This study was carried out on 80 children from both genders with ages ranging from 3-14 years suffered from adenotonsillar hypertrophy complicated with obstructive sleep apnea [OSA), and upper airway resistance syndrome were scheduled for adenotonsillectomy. All cases followed up for 3 months after operation**.**
Results: As regarding to echocardiography & Sp_{O2} was the same at pre & post-operative assessment. The snoring, difficult breathing, adenoid hypertrophy &nocturnal enuresis showed statistically significant decrease postoperatively [P <0.001). While the appetite, social activity showed statistically significant increase in patient postoperatively [P<0.001).
Conclusion: Adenotonsillectomy may have serious impact on improving some annoying manifestations like loss of appetite, nocturnal enuresis or even on affecting the daily normal life activities of a large scale of pediatric population.

Keywords: adenoidectomy- Adenotonsillectomy- nocturnal enuresis- obstructive

1. Introduction
The most commonly performed ear, nose and throat (ENT) procedure in pediatric population including Adenoidectomy, tonsillectomy and adenotonsillectomy [1]. And this surgery was a safe day case intervention for recurrent otitis media and recurrent tonsillitis [2, 3].
Many complications are caused by Adenotonsillar hypertrophy including cardiovascular system deterioration as pulmonary hypertension, growth retardation, learning and cognitive deficits [4].
Today, the most common indication for adenotonsillectomy in the United Kingdom was obstructive sleep apnea (OSA). As 12% of children aged 4–5 years snoring regularly and 2–3% of them suffer from obstructive sleep apnea [5-7].
The complications of obstructive sleep apnea ranged from cardiorespiratory Compromisation secondary to Corpulmonale up to psychological, social and Developmental complications [6, 8].
We conducted this study to investigate and demonstrate changes in cardiopulmonary functions pre & post-operative in children suffering breathing difficulties due to Adenotonsillar hypertrophy and scheduled for adenoteonsillectomy.

2. Materials and methods
This study was carried out in department of otorhinolaryngology Aswan Insurance hospital and Magdy Yakub cardiac surgery hospital in Aswan during the period February 2017 to February 2019 after approved by AL Azhar Assuit faculty of medicine ethical commitment March 2O17. 80 children from both genders with ages ranging from 3-14 years suffered from adenotonsillar hypertrophy complicated with obstructive sleep apnea (OSA), and upper airway resistance syndrome were scheduled for adenotonsillectomy. All cases followed up for 3 months after operation.
Age more than 16 years and patients with upper airway obstruction due to causes other than Adenotonsillar hypertrophy were excluded from the study.

2.1 Examination
Every patient was submitted to history taken by their parents or relatives, including personal history, patient complaint, present history including asking patient about onset, course, duration of complaint, upper respiratory obstruction symptoms(snoring, difficulty breathing, sleep apnea), dysphagia, recurrent infection, symptoms of complication of hypertrophy (appetite, social improvement, nocturnal enuresis, school improvement, general condition), history of congenital anomalies, cardiac symptoms as cyanosis, ask about general medical condition and other ear, nose and throat (ENT) symptoms., general disease as diabetes mellitus (DM), past history of throat disease, trauma, operations, general examination, full otorhinolaryngology examination and investigation as Plain X ray lateral view of nasopharynx, pulse oximetry, echocardiography which conducted performed pre-operative and 3 months post-adenotonsillectomy.

2.2 Statistical analysis
The data was analyzed using IBM SPSS Statistics 24.0 program. Quantitative variables were presented as mean, SD and range. Categorical variables were presented as frequency and percentage.

3. Results
Demographic data
Age of included cases ranged from 3 – 14 years old with mean value of 8.5± 2.1years. As regarding to age grouping, there were 9 patients ranged between (3-5) years in percentage of 11.3%, 28 patients ranged between (6-8) years in percentage of 35.0%, 39 patients ranged between (9-11) years in percentage of 48.8% and 4 patients ranged between (12-14) years in percentage of 5.0%. This means that the

majority of the cases were ranged between (9-11) years (48.8%). The majority of the cases were female in a total number of 50 female patients with percentage of 62.5% and 30 male patients in percentage of 37.5%.

Pre-&postoperative data (Echocardiography, SpO2)

As regarding to echocardiography, there were 80 patients in normal state with percent of 100% at preoperative assessment, 80 patients in normal state with percent of 100% at postoperative assessment. Therefore, echocardiography was the same at pre & post-operative assessment. As regarding to SpO2, the mean value was 96.1 ± 0.91 at preoperative assessment and was 96.1 ± 0.91 at postoperative assessment. Therefore, SpO2 was the same at pre & post-operative assessment (Table 1).

Table 1: Comparison between pre-&postoperative data (Echocardiography, SpO2)

Items		Pre-operative	Post-operative	P-value
Echocardiography no (%)	Normal	80(100%)	80(100%)	-
SpO_2	Mean ± SD	96.1 + 0.91	96.1 + 0.91	-

Pre & post-operative data (snoring & difficult breathing and x-ray skull)

As regarding to snoring, there were 55 patients with snoring in percentage of 68.8% and 25 patients without snoring in Percentage of 31.3% at preoperative assessment while at postoperative assessment there were just 3 Patients with snoring in percentage of 3.8% and 77 patients without snoring in percentage of 96.3%. The comparison between snoring at pre & post-operative assessments showed statistically significant decrease in patient with snoring postoperatively (P <0.001). As regarding to difficult breathing, there were 56 patients with breathing difficulty in percentage of 70% and 24 patients without breathing difficulty in percentage of 30% at preoperative assessment while at postoperative assessment there was no Patient with breathing difficulty in percentage of 0.0% and 80 patients without breathing difficulty in percentage of 100%. The comparison between difficult breathing at pre & post-operative assessments showed statistically significant decrease in patient with difficult breathing postoperatively (P<0.001). As regarding to X-ray skull, there were 64 patients with adenoid hypertrophy in percentage of 80% and 16 patients without adenoid hypertrophy in percentage of 20% at preoperative assessment while at postoperative assessment there was no Patient with adenoid hypertrophy in percentage of 0.0% and 80 patients without adenoid hypertrophy in percentage of 100%. The comparison between adenoid hypertrophy at pre & post-operative assessments showed statistically significant decrease in patient with adenoid hypertrophy postoperatively (P <0.001) (Table 2).

Table 2: Comparison between pre & post-operative data (snoring & difficult breathing and x-ray skull)

Items		Preoperative	Postoperative	P-value
Snoring no (%)	Yes	55 (68.8%)	3(3.8%)	<0.001*
	No	25 (31.3%)	77 (96.3%)	
Difficult breathing no (%)	Yes	56 (70%)	0(0%)	<0.001*
	No	24 (30%)	80(100%)	
X-ray skull no (%)	+ve adenoid hypertrophy	64(80%)	0 (0%)	<0.001*
	-ve adenoid hypertrophy	16(20%)	80(100%)	

*denote significant

Pre & post-operative data (appetite, nocturnal enuresis and social activity).

As regarding to appetite, there were 60 patients with good appetite in percentage of 75% and 20 patients with bad appetite in percentage of 25% at preoperative assessment while at postoperative assessment there were78 Patients with good appetite in percentage of 97.5% and 2 patients with bad appetite in percentage of 2.5%. The comparison between the appetite at pre & post-operative assessments showed statistically significant increase in patient with good appetite postoperatively (P<0.001). As regarding to social activity, there were 50 patients with good social activity in percentage of 62.5% and 30 patients with bad social activity in percentage of 37.5% at preoperative assessment while at postoperative assessment there were 73 Patients with good social activity in percentage of 91.25% and 7 patients with bad social activity in percentage of 8.75%. The comparison between the social activity at pre & post-operative assessments showed statistically significant increase in patient with good social activity postoperatively (P<0.001). As regarding to nocturnal enuresis, there were 25 patients with nocturnal enuresis in percentage of 31.3%% and 55 patients without nocturnal enuresis in percentage of 68.8% at preoperative assessment while at postoperative assessment there were 5 Patients with nocturnal enuresis in percentage of 6.3% and 75 patients without nocturnal enuresis in percentage of 93.8%. The comparison between the nocturnal enuresis at pre & post-operative assessments showed statistically significant decrease in patient with nocturnal enuresis postoperatively (P <0.001) (Table 3).

Table 3: Comparison between pre & post-operative data (appetite) nocturnal enuresis and social activity)

Items		Preoperative	Postoperative	P-value
Appetite no (%)	Good	60 (75%)	78 (97.5%)	<0.001*
	Bad	20 (25%)	2 (2.5%)	
Social Activity no (%)	Good	50 (62.5%)	73 (91.25%)	<0.001*
	Bad	30 (37.5%)	7 (8.75%)	
Nocturnal enuresis no (%)	Yes	25 (31.3%)	5 (6.3%)	<0.001*
	No	55 (68.8%)	75 (93.8%)	

*denote significant.

4. Discussion

Hypoxaemia and hypercarbia which developed as complication from chronic upper airway obstruction can lead to respiratory acidosis and pulmonary hypertension, which in turn may cause Corpulmonale. However, cardiopulmonary complications can completely reversed by adenotonsillectomy [9].

Our results showed statistically significant improvement after 3 months postoperatively. regarding to snoring& difficult breathing (P=0.000 for both). Meanwhile, radiological findings showed improvement in adenoid

hypertrophy in about 80% of patients, in a statistically significant way (P=0.000).

Many studies supported our observations. One of them by Kabyemera *et al* (2016) evaluated the patient suffered from history of mouth breathing, snoring, and apneic spells during sleeping secondary to adenotonsiller hypertrophy (ATH). They observed that, the nasal symptoms and signs had completely disappeared after operation [9].

Also, in prospective, interventional study by Mahajan *et al* (2016) which conducted on 25 children with either adenotonsillar or tonsillar hypertrophy, they revealed clinical improvement of snoring in 84 % and mouth breathing in 72 % of patients after three months postoperative [10].

And in agreement with current results, the Orji and Ezeanolue (2012), study, the pre-surgery adenoidal-nasopharyngeal ratio was 0.76 ± 0.08, while the post-operative value was 0.33 ± 0.10 and the difference was significant ($P < 0.001$). With the significant improvement in snoring by 2.0 points and in mouth breathing which improved by 1.7 points ($P < 0.0001$) [11].

As regarding appetite, nocturnal enuresis &social activity we found a statistically significant difference between pre-&postoperative assessment ($p<0.001$).

In harmony with our study, 100 patients with obstructive symptoms secondary to adenoids and tonsils hypertrophy studied by de Alcântara *et al*., there was also an improvement in 75% of the cases after surgery [12].

In the Hashemian *et al* (2010) study, 60 children who underwent adenotonsillectomy as case group and 60 healthy children as control group, they showed that, adenoidectomy & tonsillectomy can increase appetite and it can be one of the factors inducing acceleration of growth rate [13].

In another prospective study by Kovacevic *et al* (2014) showed that, nearly half of the patients had complete resolution of nocturnal enuresis within 1 month after adenotonsillectomy [14].

In contrast, Mitchell *et al* (2004) study found the hyperactivity, child attention and concentration, parents' concern and frustrations with their children do not reveled any improvement after the surgery [15, 16].

In current study, SPO2& echocardiography were the same at pre-&postoperative assessment in all the study subjects. Despite that our patients had clinical signs of cardiopulmonary involvement.

In contrary, Kabyemera *et al* (2016) observed that, symptoms and signs of severe hypoxemic pulmonary hypertension which completely resolved 3 months, six and twelve months after adenotonsillectomy, with normalization of all echocardiography findings [9].

In contrast, Mahajan *et al* (2016) revealed. Blood oxygen saturation significantly improved after adenotonsillectomy in sixteen participants who had adenotonsillar hypertrophy (P <0.05). Also, pulmonary flow acceleration time (P <0.05).In this group, tricuspid regurgitation was improved by surgery in 7 participants from total of 10 found have tricuspid regurgitation preoperatively (P <0.05) [10].

5. Conclusions

Adenotonsillectomy has a crucial role in improving the quality of life in patients with adenotonsillar hypertrophy. Cardiopulmonary assessment is a very important step in Preoperative evaluation of patients selected for adenotonsillectomy and may influence the decision making regarding to the timing of the operation.

6. Recommendations

All children with Adenotonsillar hypertrophy and scheduled for adenotonsillectomy should have preoperative cardiopulmonary assessment. More studies on larger scale of patients are recommended with larger period of careful follow up. Indications of adenotonsillectomy should include any cardiopulmonary changes that resulted from longstanding airway obstruction.

7. References

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