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OBSTRUCTIVE SLEEP APNOEA SYNDROME IN MORBIDLY OBESE CHILDREN WITH SLIPPED CAPITAL FEMORAL EPIPHYSIS (SCFE)

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ABSTRACT

There is a increase in incidence of obesity in recent days and obesity is one of the etiological factor for SCFE and Sleep apnoea syndrome.During this study period we have taken 15 patients with SCFE, in that, 11patients were morbidly obese and 9 patients had sleep apnoea documented by polysomnography.We found that incidence of Sleep apnoea in patients requiring surgery for SCFE is 60%.Mean REM total sleep time 18%,oxygen saturation 82.8%,arousal index per hour 16.5.All 9 patients were treated preoperatively for sleep apnoea syndrome,so there were no complications during surgery for SCFE.

KEY WORDS: sleep apnoea syndrome, SCFE

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INTRODUCTION

The incidence of SCFE has been quoted as ranging between 0.71 and 10.8 per 1,00,000 children. SCFE is one of the most common adolescent hip disorders in Africa and American race. It typically occurs within 18 months of growth plate closure with bilateral involvement in 22-61% of children(1,2). The etiology of SCFE is unknown but a number of factors like mechanical insufficiency of an abnormally weak proximal femoral physis or by abnormal loading of a normal physis(3,4). Conditions that weakens the physis include endocrine abnormalities, systemic diseases such as renal osteodystrophy and radiation therapy. Abnormal loading is a result of mechanical factors, including obesity and anatomical variations in the proximal femur and acetabulum.

Obesity is a global problem and has been classified as a worldwide epidemic by the world health organization with 1 in 10 children worldwide classified as obese(5). A close correlation was observed between rising childhood obesity over the last 10 years and an increasing incidence of SCFE.

Obesity is a chronic disease with morbidity in childhood that extends into adulthood. Obesity – related co-morbidities affects almost every organ system. Diseases such as type 2 diabetes mellitus, polycystic ovarian syndrome, non-alcoholic steatohepatities were formerly thought of as occurring only in adults, but they are now seen in obese children. Dramatic increase have also been seen in the prevalence of upper airway obstructive sleep apnoea syndrome, hypertension, hyperlipidemia. Unique pediatric orthopedic issues such as Blounts disease and SCFE have emerged as real threat to obese child(6).

Although the association of obesity and obstructive sleep apnoea syndrome was first noted by Charles Dickens in his description of Joe, an obese, hyper somnolent boy in the Posthurnous papers of the pickwick club more than 100 years ago, it is in the only recent times that the extent of obstructive sleep apnoea hypoapnoea syndrome (OSAHS) in the obese pediatric population has been realized. OSAHS in children is defined as a disorder of breathing during sleep characterized by prolonged partial upper airway obstruction and/or intermittent complete obstruction that disrupts normal ventilation during sleep and normal sleep patterns(7).

MATERIALS AND METHODS

We studied 15 consecutive patients with SCFE who had undergone surgical treatment between October 2008 and December 2011 in NMCH & RC, Raichur. This included 8 boys and 7 girls, all were 9 years or more at the time of evaluation. A total of 11 patients were morbidly obese with a BMI greater than 95^{th} percentile for age.

There mean weight was 154kg (102-182). Each patient underwent a detailed sleep history, with questions to both children and their parents regarding snoring, mouth breathing, enuresis, daytime somnolence and witnessed apneic events.

A detailed general physicial examination was performed which included measurement of the circumference of the neck, oropharyngeal examination, adenoid tonsillar enlargement, height, weight and BMI measurements and complete hip evaluation.

All patients underwent polysomnographic assessment. It is a comprehensive recording of the bio physiological changes that occur during sleep. Variables determined include Measurement of the movement of the chest and abdominal wall by piezoelectric respiratory belts. Heart rate by electrocardiogram. End tidal levels of CO_2

- Temperature
- Bilateral electrooculography using 2 electrodes
- Electroencephalogram using six “exploring” electrodes and two “reference” electrodes.
- Electromyogram typically uses form electrodes to measure muscle tension in

the body as well as to monitor for an excessive amount of leg movement during sleep. Two leads are placed on the chin with one above the jaw and one below.

- Arterial O_2 saturation was assessed using pulse oximetry.
  Wires for each channel of recorded data lead from the patient and converge into a central box, which in turn connected to a computer system for recording, storing and displaying the data.

SLEEP VARIABLES: -The sleep pattern was assessed using standard techniques.

APNOEA INDEX: -It is defined as the number of period of apnoea per hour of total sleep time.

HYPOPNOEA: -It is defined as a decrease in nasal airflow equal to or less than 50% with a corresponding decrease in arterial O_2 saturation

RESPIRATORY DISTURBANCE INDEX: -It is defined as the number of the periods of apnoea and hypopnea per hour of total sleep time.

AROUSALS: -These are sudden shifts in the brain wave activity. There may be numerous factors including breathing abnormalities, leg movement, environmental noise etc.

AROUSAL INDEX: -It includes the total number of arousals per hour of total sleep time.

SLEEP EFFECIENCY: -The number of minutes of sleep divided by the number of minutes in bed. Normal – 85% - 90% or higher.

RESULTS

TABLE: 1
POLYSOMNOGRAPHIC DATA IN 11 PATIENTS

	MEAN	NORMAL
Respiratory disturbance rate	19.3	<5 events/hr
Sleep efficiency %	78	>90
REM total sleep times %	18	>20
O_2 saturation %	82.2	>90
Arousal index per hour	16.5	<5/hour

TABLE: 2
DETAILS OF 11 PATIENTS AND PHYSICAL FINDINGS

Mean age in years (range)	12.7 (10-16)
Mean weight in kg (range)	154 (102-182)
Mean BMI [kg/m^2]	57.5 (44-115)
Mean neck size in cm (range)	45.5 (38-59)
Mouth breathing %	18.18
Enuresis %	36.36
Daytime somnolence	45.45
Dyspnoea during sleep%	54.54
Enlarged adenoids and/or tonsils	63.63
Snoring	100%

All 11 patients had night snoring
5 (45.45%) having restless sleep

4 (36.36%) having episodes of enuresis
5 (45.45%) having daytime somnolence
5 (45.45%) having difficulty with school work
2 (18.18%) behavioral problem
6 (54.54%) difficulty of breathing during sleep
2 (18.18%) mouth breathing during the day
7 (63.63%) enlarged tonsils and/or adenoids
45.5cm mean neck size

DISCUSSION

OSAHS has only recently been recognized as a complication of obesity in children in whom it has a prevalence of 2%. [8,9] When untreated, sleep apnoea has significant health complication including hypersomnolence, behavioural disturbances including restlessness, hyperactivity and aggressive behaviour, increased risk of systemic hypertension, alteration in blood pressure regulation and stunting of growth(10-14).

It is also associated with increased peri-operative anaesthetic complication including difficulty with intubation and acute respiratory failure during the induction of anaesthesia. Post operative complication include hypoxia, airway oedema, obstruction of the upper airway, pulmonary oedema and respiratory failure(15-18).

9 children had sleep apnoea documented by polysomnography. The incidence of sleep apnoea in total series of children requiring surgical treatment for SCFE was 9 of 15(60%). 9 children had a mean RDI of 19.3 events per hour (0.4 to 69). The mean nadir desaturation was 82.82%. The mean arousal index was 16.5 awakenings per hour.

All 9 with sleep apnoea were treated by non-invasive positive pressure ventilation either in the form of continuous positive airway pressure or bilevel positive airway pressure. 3 patients required tonsillectomy and adenoidectomy to decrease obstruction of the airway in addition to non-invasive positive pressure ventilation.

After treatment for obstructive sleep apnoea, surgical correction of the SCFE was performed. All 9 patients underwent closed reduction and percutaneous cancellous screw fixation under image intensifier. There were no perioperative, pulmonary or anaesthetic complications. Patients with obstructive sleep apnoea have continued follow up.

SCFE and OSAHS have each been positively correlated with obesity. However, the incidence of sleep apnoea in patients with SCFE requiring surgical treatment in one series was 60%. This is higher than the estimated prevalence of 2%, since we have taken only morbid obese children in our study and children with above 9 years. Sleep apnoea is probably under diagnosed and when unrecognized there may be significant complications in relation to anaesthesia(19).

CONCLUSION

SCFE and OSAHS have directly related to obesity; which is directly related to metabolic disturbance. Strict diet control and active physical exercise with traditional modalities of treatments like Pranayama(breathing exercises) and yoga can limit the problems.
Orthopaedic surgeons should keep in mind that before taking patients for surgery with SCFE,they should ruleout OSAHS and if the patients are having OSAHS they should treat accordingly otherwise,there will be serious anaesthetic complications and postoperative complications that may result in death of patient. The importance of this disorder to an orthopedic surgeon cannot be over emphasized.

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