Objectives: Determine relationship between soft tissue oropharyngeal measurements and sleep apnea severity.

Methods: A prospective series of adult patients undergoing surgical therapy for obstructive sleep apnea (OSA) was studied. Tonsil size (graded 0 to 4+) and median palatal size (oropharynx-size index) and lateral (posterior hard palate-free edge soft palate) dimensions of the soft palate were measured transorally at the time of surgery. From the preoperative polysomnographic and the medical record, respiratory disturbance index (RDI), lowest oxygen saturation (LSat) and body mass index (BMI) were determined. The relationship between both RDI and LSat and tonsil size and palatal dimensions was determined with univariate and multivariate linear regressions adjusted for BMI.

Results: 88 patients were enrolled. The mean±95% confidence interval values for the median and lateral soft palate lengths were 4.7±0.14 cm and 3.7±0.12 cm, respectively; the mean tonsil size was 1.8±0.3 cm. The mean RDI and LSat were 44.0±15.6 events/hour and 84.7±2.4%, respectively. On univariate regression, only BMI significantly predicted RDI (p = 0.003); median (p = 0.210) and lateral (p = 0.070) palate lengths and tonsil size (p = 0.860) did not. For LSat, both BMI and tonsil size were significant predictors (p = 0.001 and p = 0.017, respectively); median and lateral lengths did not (p = 0.251 and p = 0.376, respectively).

Conclusion: Adjusted for BMI, soft palate length does not predict sleep apnea severity well. Adjusted for BMI, tonsil size predicts LSat but not the RDI. These results highlight difficulties associated with correlating soft tissue structure with sleep apnea severity.

Introduction:

Obstructive sleep apnea (OSA) is a common sleep disorder that is thought to result from collapse of the upper airway during sleep. It has long been suspected that facial dysmorphosis plays an important role in this collapse. Sleep apnea is more prevalent in men with craniofacial anomalies. Despite the fact that craniofacial disorders are associated with sleep apnea, few studies have examined the relationship between craniofacial features and OSA. In this study, we tried to determine the relationship between oropharyngeal soft tissue measurements and sleep apnea severity by comparing measurements of tonsil and soft palate sizes with the respiratory disturbance index (RDI) and lowest oxygen saturation (LSat) in patients with OSA.

Methods:

1. A prospective series of adult patients undergoing surgical therapy for obstructive sleep apnea (OSA) was studied.

2. Tonsil size (graded 0 to 4+) and median palatal size (oropharynx-size index) and lateral (posterior hard palate-free edge soft palate) dimensions of the soft palate were measured transorally at the time of surgery (Figures 1A and 1B).

3. From the preoperative polysomnographic and the medical record, respiratory disturbance index (RDI), lowest oxygen saturation (LSat) and body mass index (BMI) were determined.

4. The relationship between both RDI and LSat and tonsil size and palatal dimensions was determined with univariate and multivariate linear regressions adjusted for BMI.

Discussion:

Obstructive sleep apnea (OSA) is a common type of sleep-disordered breathing which affects 2-4% of the middle-aged population (Youn et al., 1993). Some of the common signs and symptoms of OSA include nighttime loud snoring, witnessed apneas, excessive daytime sleepiness, and decreased cognitive function. Obstructive sleep apnea has been shown to increase the risk of diastolic hypertension, nocturnal dysrhythmias, pulmonary hypertension, venous failure, obstructive apnea, and stroke (Yamashiro and Kryger, 1994). In addition, patients with OSA have a 7-fold increase in the risk for motor vehicle accident (Findley et al., 1996).

The size of the upper airway is thought to play an important role in the pathophysiology of OSA (Davies and Stradling, 1990). This is determined by both the soft tissue and skeletal components of the upper airway. In our study, we focused on the soft tissue component of the upper airway, where the tonsil size and the soft palate dimensions were measured intraoperatively in OSA patients. We compared these measurements with the sleep study results (RDI, BMI, LSat) from the same patient to see if there are correlations between these 2 measurement variables.

In our study, we found that BMI significantly predicted the RDI on univariate regression analysis. This is consistent with the findings from a study by Youn et al. (1993), where the occurrence of sleep-disordered breathing in over 600 middle-aged adults was examined. They found that obesity significantly predicted a AH score of 5 or higher (p<0.001), and is an important risk factor for OSA. We did not find any significant correlations between the median and lateral soft palate lengths and the RDI. This is similar to the finding from a study by Min et al. (1997), where the length of the uvula is not correlated with the RDI. However, the lack of correlation between the soft palate length and LSat in our study is contradictory to the study by Min et al. (1997), where a significant correlation was found between these 2 variables (p<0.02). Interestingly, these authors also measured the horizontal width of the uvula, and found that the uvula width correlated significantly with the RDI and LSat.

When the tonsil size was examined in our study, it did not correlate significantly with RDI. This is contradictory to a study by Erdamar et al. (2001), where 85 patients with OSA were studied. These authors found that the size of the tonsils significantly correlated with RDI (p<0.004). They also found a large difference in the mean RDI between patients with grade 1 tonsils (22.6) and grade 2 tonsils (43.5). Similarly, in a study by Friedman et al. (1999) looking at 172 patients with OSA, tonsil size was also found to be significantly correlated with RDI (p<0.008). It is unclear why our result differed from the other 2 studies, since the study populations are similar. It is conceivable that our study population is too small to realize a significant correlation between the tonsil size and RDI, though the study by Erdamar et al. (2001) has a similar population size to our study (85 vs. 88 patients, respectively).

Even though it is commonly believed that the size of tonsils plays an important role in OSA and would correlate significantly with LSat on the polysomnography, no study to our knowledge has examined this relationship formally. In our study, we found that the size of tonsils did not correlate significantly with LSat in OSA patients (p=0.017). This is consistent with the finding that patients with OSA and tonsillar hypertrophy have improved LSat after tonsillectomy (Shin et al., 2000).

Conclusions:

1. Median and lateral soft palate lengths did not predict the severity of obstructive sleep apnea well.

2. Tonsil size predicted the LSat, but not the RDI.

3. These results highlight the difficulties associated with correlating soft tissue structure with sleep apnea severity.

References: