Obstructive Sleep Apnea and Abnormal Cephalometric Measurements*

Implications for Treatment

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The position of the hyoid bone, which anchors much of the tongue musculature, is often abnormally low in patients with obstructive sleep apnea syndrome (OSAS). Cephalometric measurements, frequently used to measure SNA and SNB angles, can also provide information on the posterior airway space (PAS), the mandibular plane, and the hyoid bone. This information is useful in determining the appropriate surgical treatment for OSAS patients.

The obstructive sleep apnea syndrome (OSAS) is a complex problem that may involve oronasomaxillofacial abnormalities. We recently reported on the usefulness of obtaining systematic cephalometric roentgenograms when evaluating patients with OSAS. Evaluating the position of the mandibular plane (MP) with respect to the hyoid bone (H) may be of importance when dealing with OSAS. Before considering surgical treatment for OSAS, cephalometric measurements including not only the posterior airway space (PAS) but also the distance between the MP and the H should be obtained.

Material and Methods

Thirty randomly selected adult patients with documented OSAS were studied over a six-week period. All had an apnea-hypopnea index (AHI) (defined as the number of apnea and hypopnea divided by total sleep time and multiplied by 60) greater than 20 and at least one polygraphically-documented oxygen saturation reading below 85 percent during the nocturnal recording. Their objective complaints varied, but all reported daytime impairment qualified as daytime somnolence or daytime fatigue. This group was compared to a control group of 30 nonapneic, nonsnoring subjects. We then evaluated six new OSAS patients; five had undergone palatopharyngoplasty (PPP), and one had a combined PPP and horizontal mandibular sliding osteotomy. All six patients had an (AHI) greater than 30 and at least one oxygen saturation reading below 85 percent during the presurgical nocturnal polygraphic evaluation. The cephalograms of these six were also compared to findings from the control group.

Cephalometric Roentgenograms

Cephalograms were obtained while the patient, who was asked not to chew or swallow, was in a sitting position. The patient's eye looked directly forward from a natural head position so that the gaze was parallel to the floor with the x-ray cone exactly five feet from the film placed on the left side of the head. Cephalograms provided millimeter determination of craniomaxillofacial structures Fig 1. We have used this technique to determine the length of a patient's uvula and PAS. By drawing a line perpendicular to the MP (Fig 1) through the most anterior and superior curvature of the H, one can also establish the position of the H vs. the MP.

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RESULTS

Control Group (N = 30)

The mean MP-H distance in 30 normal adults was 12 ± 4.1 mm, range 4 to 20 mm. Their mean PAS was 14 ± 2.2 mm, range 11 to 18.**

OSAS Patients (N = 30)

Twenty-five patients had a MP-H measurement greater than 20 mm (mean 27.6 mm, range 21 to 36 mm); five patients had a normal MP-H measurement (mean 16.4 mm, range 13 to 20). Twenty-one patients had a PAS measurement equal to or smaller than 8 mm (mean 6 mm, range 3 to 8). Nineteen patients had both an abnormally small PAS and an abnormally long distance between the MP and H. Only three OSAS patients had both normal PAS and MP-H measurements.

Patients Studied After Surgery (N = 6)

Presurgery, all six patients had an (A + H) greater than 32 and at least 40 respiratory events with oxygen desaturation below 90 percent. Five underwent PPF alone; one had PPF with a mandibular horizontal sliding osteotomy.* Two patients improved after surgery with an (A + H) less than 15 and oxygen saturation readings greater than 90 percent on a nocturnal polygraphic monitoring. The other four had an (A + H) greater than 25 and at least one oxygen saturation reading less than 85 percent on the polygraphic monitoring. The three patients who had PPF alone were between 5 percent and 30 percent overweight. Although their PAS measurements were normal (10, 12, and 13 mm), their MP-H measurements ranged between 25 and 35 mm. The fourth patient, who had two surgical procedures, was 72 percent overweight. He had a small PAS (hence the mandibular horizontal sliding osteotomy) and a low H with an MP-H distance of 31 mm.

COMMENTS

Cephalometric measurements have proven helpful in determining treatment for OSAS patients,4,10 but little attention has been given to the distance between the MP and the H. Since the musculature of the tongue is partially anchored to the H, determining the anatomic situation of the bony structures surrounding the oropharynx is useful. In OSAS patients, the H is frequently abnormally low, often in conjunction with unusually small PAS measurements, which suggests that several bony structures surrounding the oropharynx can be involved in the anatomic disarrangement leading to OSAS. In our first group of 30 OSAS patients, the position of the H was low in 25; in our second group of six, it was low in the four who did not improve after surgery. When MP-H measurements indicate that the position of the H is abnormally low, surgical approaches, including one to correct the hyoid’s position, may be helpful in treating OSAS patients. Recent work in dogs indicates that this surgical approach is feasible.** In man, anterior-superior suspension of the hyoid has been combined with mandibular osteotomy to advance the base of the tongue.4

REFERENCES