Dental problems in the wind instrumentalist[1]

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A healthy mouth with intact functional oral tissue is essential to the wind instrumentalist. Since perioral pressures from playing wind instruments can cause tooth movement and increase muscle tone, orthodontic consultation should be considered when selecting instruments for young players. Maintaining the integrity of the dental arches through regular dental examination, preventative dental procedures, the use of lip shields, bonding materials, replacement prostheses, and splinting and supporting mobile teeth can circumvent loss of tooth structure, malpositioning of teeth, unnecessary tooth extraction, and loss of soft tissue. Complete dentures usually prevent playing; however, improved denture retention methods offer hope for continued playing. Xerostomia and oral cancer are potential problems that become more likely with age and are especially serious for the wind instrumentalist.

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Playing a wind instrument places exacting functional demands on the lips, jaws, teeth, and tongue. Disease of these vital structures can adversely affect the instrumentalist's performance and, in some instances, prematurely end a career.

The purpose of this article is to alert wind instrumentalists and health care providers to potential dental problems and to explain the dentist's role in their prevention and management.

Embouchure

The position of the lips and mouth in relation to the

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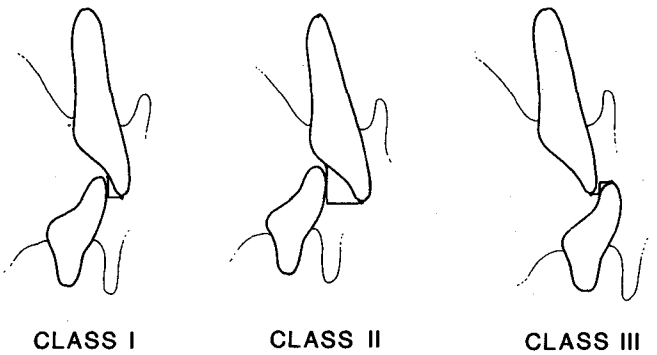

Fig. 1. Classification of dental occlusion. *Class I* = neutroclusion, *Class II* = distoclusion, and Class III = mesoclusion.

mouthpiece when playing a wind instrument is called the embouchure. It varies with the type of instrument and with the individual player.[1] The efficiency of the apparatus of the embouchure depends on the architecture of the scaffolding (i.e., jaws and tooth form and their position and relationship to each other).

Lips vary in length, thickness, muscle tone, and posture. The dental occlusion— the interdigitation of upper and lower teeth—is categorized as class I, II, or III and is determined by the position of each tooth in the dental arches, the upper and lower jaw as they relate to each other, and the base of the cranial skull (*Fig. 1*). The class I occlusion, also called neutroclusion, is the most common occlusion. There is good harmony between the teeth in the upper and lower jaw. The inclination of the upper and lower anterior teeth is such that their relationship to each other, when the dental arches occlude, presents a small overbite and overjet. Overjet is the distance from the incisal edge of the upper incisor to the labial surface of the lower incisor measured along the occlusal plane. Overbite is the distance from the incisal edge of the lower incisor to the upper occlusal plane. In the class II occlusion, also referred to as distoclusion, the lower teeth occlude more distally (posteriorly) and there is a larger overbite and overjet between the anterior teeth, usually due to the protrusion of the upper anterior teeth—the "Bugs Bunny" appearance. In the class III occlusion, also known as mesoclusion, the lower teeth occlude more mesially (anteriorly) and the relationship between the anterior teeth is either an edge-to-edge bite or a crossbite. When the lower anterior teeth protrude beyond the upper teeth, the chin has a prominent appearance—the "bulldog" appearance.

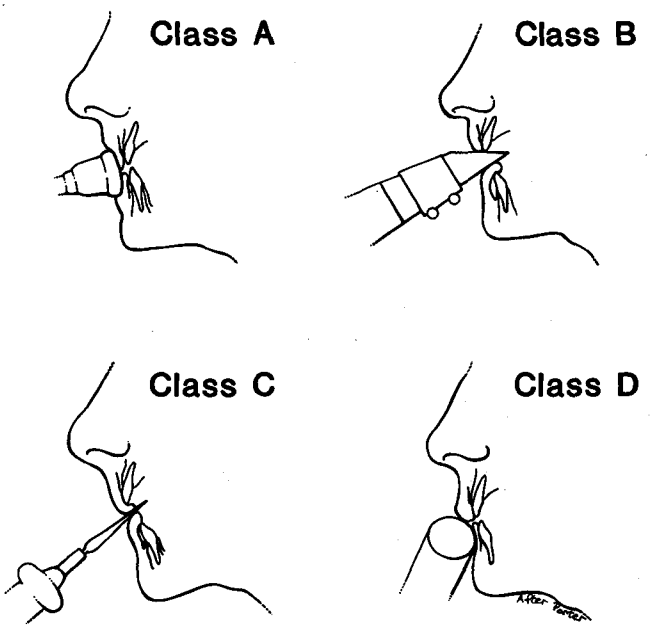

Fig. 2. The embouchure in each class of wind instrument demonstrates the relationship between the various mouthpieces, the lips, and the teeth. Adapted from Porter.[3]

Wind instrument classification

In 1939, Strayer,[2] an orthodontist and professional bassoonist, classified the wind instruments as follows:

- Class A: Cup-shaped mouthpiece of brass instruments (e.g., trumpet, horn, trombone, and tuba).
- Class B: Single-reed mouthpiece (e.g., clarinet and saxophone).
- Class C: Double-reed mouthpiece (e.g., oboe and bassoon).
- Class D: Aperture mouthpiece (e.g., flute and piccolo).

Porter,[3] in an outstanding and classical series of articles, diagrammatically demonstrated the embouchure for each of these classes. With class A instruments, the mouthpiece abuts against both the upper and lower teeth with the lips intervening. With class B instruments, the lingual and/or incisal edges of the upper anterior teeth are in contact with the mouthpiece, while the lower lip drapes over the incisal edges of the lower anterior

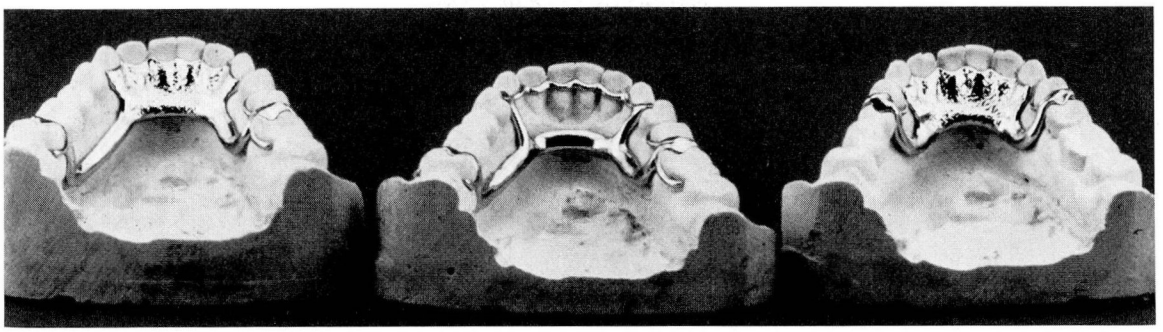

Fig. 3. Examples of removable partial dentures.

teeth. With class C instruments, both lips drape over the incisal edges, and in class D instruments, the mouthpiece abuts against the lower teeth with only the lower lip intervening (*Fig. 2*).

Potential dental problems and management

Pressure effects on occlusion

Engelman[4] measured perioral pressures during playing of wind instruments and concluded that only the brass intruments produced a significant lingually directed pressure. Forces produced by musical instruments, larger than those produced by average muscle contraction, acting long enough can help produce a malocclusion or, conceivably, help correct one. For this reason, many orthodontists believe the pressure exterted by a musical instrument should be considered in orthodontic rationale.

Review of the literature[4,5] documents the controversy that is present in regard to pressure effects on the occlusion. Scientific studies would ideally require a longitudinal serial study with a large population studied over a period of 20 years. Current statistical studies[5–7] indicate that the only significant effect of pressure on the teeth is on the overjet measurement, especially in class B instrumentalists. In adults, retroinclination of the lower anterior teeth was found to be about twice as prevalent in the wind instrumentalists than in the control group.[5] Long-term retention following orthodontic treatment is therefore recommended for these musicians. Permanent retention of the lower anterior teeth with a lingual arch from canine to canine or a removable chrome cobalt casting framework used when playing the instrument could manage this potential problem. *Figure 3* shows examples of three different designs of removable partial dentures, which provide retention of the prosthesis while supporting the lower anterior teeth against lingually directed pressure from the instrument mouthpiece. If periodontal disease, which is more prevalent after age 35, is present, then lingual support to resist the pressure exerted on the teeth is imperative. Herman[7] found no significant retroinclination of the lower anterior teeth in children. Instruments of all classes produce a decreased overjet except those of class B, which produce a definite increase in overjet caused by movement of the upper anterior teeth.

Most orthodontists consider the correct instrument to be an adjunct when attempting to move teeth, while a wind instrument not dentally suited can negate or hinder tooth movement during orthodontic treatment. Before selecting a wind instrument for a child, it is therefore recommended that an orthodontic consultation be obtained. Close follow-up and comparison of dental arch casts enable assessment of tooth movement.

Pressure effects on lips

Prolonged compression of the lips against the teeth may be painful and even cause ulceration. This is a common complaint where sharp edges or points of teeth, spaces between teeth (diastema), and unevenness from malposition or rotation of teeth are present.

Bruxing, an involuntary grinding of teeth, occurs mainly during sleep and is thought to be an expression of energy release from tension. Bruxing can result in abnormal loss of tooth crown with sharp uneven enamel edges that are potential cutting edges (*Fig. 4*). Early intervention can prevent extensive, expensive crown reconstruction with possible changes to the embouchure. Smoothing of the enamel edges and the use of a

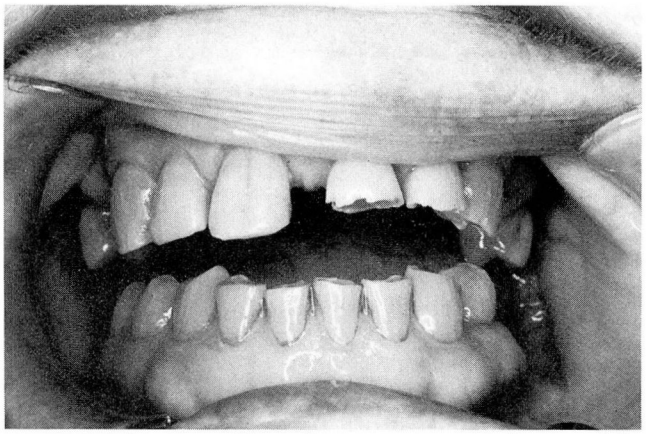

Fig. 4. Severe attrition of crown structure of upper right anterior incisors resulting in sharp irregular enamel edges and exposed dentine caused by bruxing.

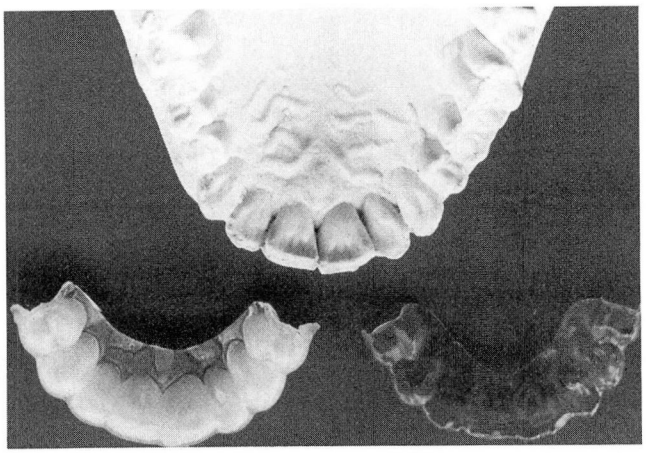

Fig. 5. A dental cast of the upper arch on which lip shields, fabricated from thermoplastic materials, are easily and accurately vacuum formed.

Fig. 6. Teeth with adequate periodontal support have been salvaged through endodontic and periodontal therapy. Gold castings have restored abutment contours providing improved support and retention for an overdenture.

bite plate (occlusal guard) on retiring to sleep prevents further attrition of tooth material. Modern dental restorative materials, bonding tooth-colored materials, enables restoration of slightly worn-down teeth, closure of small spaces, recontouring and shaping of rotated or malpositioned teeth. These conservative relatively inexpensive restorations provide an even scaffolding for the embouchure (*Fig. 4*).

Lip shields are also an effective measure for protecting the lips from trauma caused by pressure of the lips against unfavorable tooth form or position. They can be fabricated from thin thermoplastic material (Bioplast, 1.5 mm, and Imprelon, 0.5 mm, Great Lakes Orthodontics, Buffalo, NY) vacuum molded over a dental plaster-of-paris cast of the musician's dental arch. The shield fits accurately and tightly when placed over the teeth (*Fig. 5*).

Pressure effects on the musculature

In adult musicians, years of increased intraoral pressure can cause an incompetent soft palate with resulting nasal air escape as a rare complaint. The fabrication of a palatal lift appliance that enables the incompetent soft palate to make contact with the pharyngeal walls can correct this problem. The appliance requires a chrome cobalt frame casting with multiple occlusal rests and clasping for force distribution and retention.

Results of the Alameda study[8] showed that in children all of the wind instruments are helpful in developing muscle tonicity, particularly of the lips.

Loss of teeth

Posterior tooth loss can result in the air stream being more difficult to control. Tooth replacement by means of a fixed prosthetic appliance (bridge) is highly recommended to prevent such loss, but most importantly, to maintain the arch integrity, thereby preventing tooth movement, malpositioning, and potential periodontal complications.

Anterior tooth loss usually markedly affects the embouchure, and replacement should duplicate the absent teeth in form and position. A fixed prosthesis is preferable, but a more substantial natural tooth support than usual may be needed because of greater pressure application. Design of a removable prosthesis must provide adequate retention and distribution of the forces acting on the prosthesis. With excessive tooth loss, it be-

comes less feasible to recommend a fixed prosthesis and more difficult to retain a removable prosthesis. Loss of all the teeth requires complete dentures. Retention, to resist both increased intraoral and extraoral pressure, is extremely difficult if not impossible. Attempting to salvage two to five teeth through endodontic and periodontal treatment can prevent the complete edentulous state and provide improved support and retention for overdentures (*Fig. 6*). The use of connecting bars between remaining teeth, various attachments between the removable prosthesis, and the fixed prosthesis provides a fixed-removable prosthesis with enhanced retention that could prolong the musician's otherwise shortened career. The staple implant is highly successful (*Fig. 7*). Placement is through an extraoral surgical technique, and stabilization is achieved by an inframandibular plate containing three to five intraosseous posts and two transosseous posts on which a casting containing a cross arch stabilizing bar and two hingelike attachments fits. The denture is retained by an opposing attachment in the denture encaging the attachments on the casting.

The increased acceptance of improved implant systems (*Fig. 7*) that support and retain complete prostheses, provides hope of a continued career for those musicians rendered edentulous. The subperiosteal implant (*Fig. 8*) is one of the oldest proved implant systems available. Improved materials, design concepts, and technical advances have increased its use and acceptance. In grossly resorbed residual alveolar ridges, an accurate, bone-fitting titanium casting supports the denture rather than the residual soft tissue. Various intraoral design concepts connect, via four posts, the subperiosteal portion of the casting to the substructure section, which provides a means of attachment for the removable denture.

Periodontal maintenance

"Prevention is better than cure" is a saying that certainly applies to maintaining a healthy periodontal status. The wind instrumentalist, because of pressures exerted on the teeth and pooling of saliva in the floor of the mouth, is more prone to periodontal problems. Frequent visits (three or four yearly) are recommended to remove calculus and plaque and to evaluate periodontal pocket formation and tooth mobility. Regular visits can prevent tooth loss and ensure early intervention for tooth mobility by either splinting the mobile

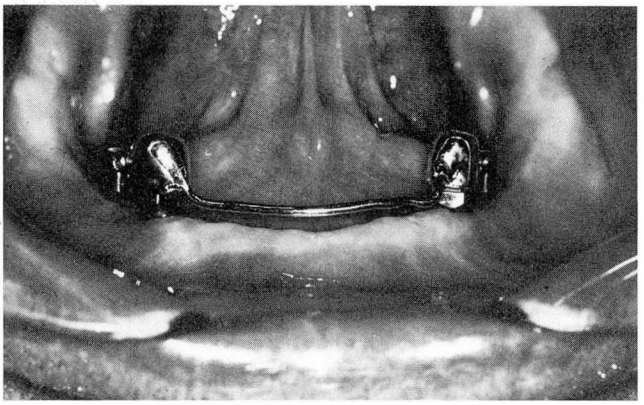

Fig. 7. The staple implant.

teeth together or providing resisting support by means of a removable prosthesis (*Figs. 2* and *8*). A swing-lock appliance (*Fig. 9A*) is a removable chrome cobalt casting framework that provides support on both the lingual and labial aspects of periodontally involved teeth. It consists of a fixed lingual section and a movable labial section, hinging from one end and encaging a lock at the other end. In the locked position, vertical fingers encage undercut areas on the tooth surface, thus providing labial support and retention for the prosthesis. The labial view (*Fig. 9B*) of the swing-lock appliance on a dental cast demonstrates the hinge on the right, the lock on the left, and the vertical fingers supporting the teeth and providing multiple retentive areas.

Xerostomia (dry mouth)

Xerostomia is frequently seen in the elderly, resulting from regressive atrophic changes, or

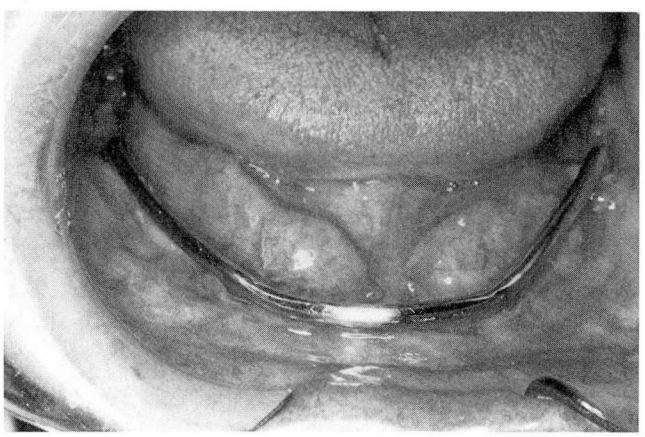

Fig. 8. The subperiosteal implant.

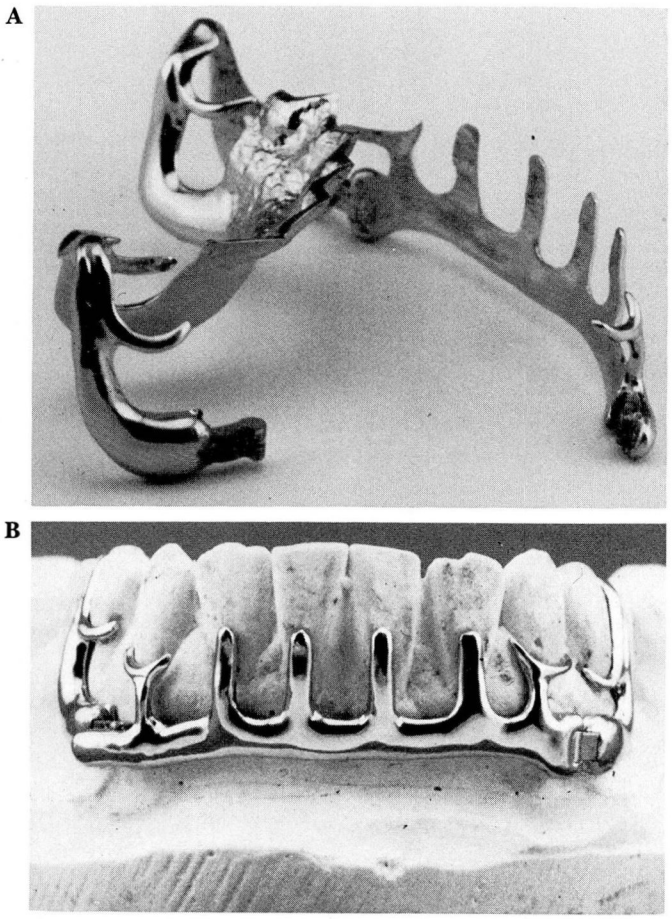

Fig. 9. **A.** A swing-lock appliance.
B. Labial view of the swing-lock applicance on a dental cast.

with diabetes, nephritis, pernicious anemia, and vitamin deficiencies. Administration of certain medications, such as rauwolfia derivatives, phenothiazine, chlorpromazine, belladonna, atropine, ephedrine, and scopolamine, decrease salivary flow.

Xerostomia can result in a burning sensation of the oral tissues, cracking of the lips, fissuring of the tongue, increased incidence of caries, and periodontal problems—conditions not conducive to the playing of a wind instrument. The treatment of xerostomia is difficult and not successful when it is due to loss of glandular function. Frequent sips of water on salivary substitutes (Xero-Lube, Scher-er Lab Inc, Dallas, Tex; Moistir, Kingswood Lab Inc, Carmel, Ind; Saliv-Aid, Copley Pharm Inc, Boston, Mass.) from well-concealed containers during intermittent periods of playing is helpful. A sialagogue (a drug that stimulates salivary flow) such as pylocarpine hydrochloride, in 5-mg doses, may be beneficial when glandular function is still present.

Oral cancer

Oral cancer accounts for 3% to 5% of all cancers, the most common sites being the lip, floor of the mouth, tongue, and soft palate—anatomical areas essential for the wind instrumentalist. Each year, 24,000 new cancers are diagnosed and result in approximately 8,000 deaths. The five-year survival rate is 70% for local confinement and 30% once spreading has occurred.[9]

Modalities for treatment are radiation therapy, chemotherapy, and surgery. Frequently, a combination of two or all of these modalities are used. Radiation therapy can result in xerostomia and its sequelae (radiation caries, or trismus of the masticatory musculature), resulting in limited functional movements. Surgery can result in gross disfigurement and functional disability, which could end a musical career. It is each dentist's primary obligation to have a high index of suspicion for oral cancer. A complete and thorough head and neck oral examination is mandatory for each new patient and on recall visits.

Conclusion

The wind instrumentalist's career is most dependent on the maintenance of a healthy oral environment. Because of potential oral problems, frequent dental examinations by a dentist who understands the patient's vocational needs are imperative. Early detection, preventative measures and current dental materials, techniques, equipment, and education can provide the wind instrumentalist protection and maintenance of the most important asset of his profession: the all-important embouchure!

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