A MODIFIED MAXILLARY MOUTHGUARD

N. P. CHANDLER, FDS, FFDRCSI, N. H. F. WILSON, PhD, MSc, BDS, FDS, DRD, RCS and B. S. DABER

Department of Conservative Dentistry, University Dental Hospital of Manchester

ABSTRACT

Custom made maxillary mouthguards made from thermoplastic materials using dental impressions give valuable protection to the teeth and jaws of participants in contact sports. A bimaxillary mouthguard has been described which offers enhanced protection, but with considerable increase in cost. This paper describes a modification to current maxillary mouthguard design that is comfortable to wear, inexpensive to make and which may provide protection comparable to that of a bimaxillary type, while retaining other desirable features of the more complex appliance.

Key words: Mouth protectors, Dental prosthesis design

It is now accepted that custom made mouthguards are more satisfactory than those produced commercially which are adapted to fit the mouth approximately. Custom made mouthguards are usually fitted over the maxillary teeth, and are made by moulding thermoplastic sheets of ethylvinylacetate over stone models by means of compressed air or vacuum. Illustrated details of their construction have appeared in this Journal (Upson, 1982).

The material is available in a range of thicknesses, which are prescribed somewhat arbitrarily according to the age of the patient, the sport in question and the level to which it is played. The protection is greatest from frontal impacts, and includes: (Andreasen, 1981)

1. Reduced risk of damage to anterior teeth.
2. On traumatic mandibular closure, reduced risk of:
 - a. oral lacerations
 - b. damage to posterior teeth
 - c. fractures of the mandibular condyle
 - d. concussion.

Problems related to mouthguard wear, such as nausea, dry mouth and breathing difficulties, remain the principle reasons for lack of mouthguard use (Upson, 1982). Bimaxillary mouthguards were first reported by Chapman (1983). With such appliances both dental arches are covered, with the jaws opened to a position termed "the position of heavy breathing", in the knowledge that under extreme exertion about two-thirds of the respiratory minute volume is oral. The desired jaw opening for the patient is determined in the dental chair following a series of breathing exercises and is measured between the incisor teeth. Openings of 7-10mm are commonly recorded (Chapman, 1986). In addition to improving the oral airway this type of mouthguard has been shown radiographically to separate the elements of the temporomandibular joint, and should thereby reduce force transmission to the base of the skull from mandibular impacts (Chapman, 1985).

In use bimaxillary mouthguards are found to be bulky, and in some cases less comfortable to wear than mouthguards of single arch design which allow some freedom of jaw movement. They are also more expensive as the need for a lower impression and the recording of jaw relationships increases dental chairtime, and the more

complex laboratory work greatly increases the cost of manufacture.

A modified maxillary mouthguard with the airway and protection benefits of bimaxillary mouthguards, but with improved comfort, reduced dental chairtime and only minimal increase in cost is described.

METHOD

A stone model is poured from an alginate impression of the subject's upper teeth. The impression must be well extended both into the labial sulcus and posteriorly to at least the molar region, and the hard palate should be recorded accurately. To provide the oral airway 1.5 and 3.0mm thick strips of ethylvinylacetate,* which are cut to the width of the teeth, are heated carefully over a Bunsen burner and adapted to the biting surfaces of the teeth, extending posteriorly from the distal aspect of the canines. Trials have suggested that 4.5mm is the optimum thickness. The thickness of the sheet of ethylvinylacetate which is subsequently adapted over the entire model determines the protection from anterior impacts. This sheet of the material should be at least 3mm thick, although multiple sheets may be used to increase this to a maximum of 6mm. Adaptation of the final sheet(s) is carried out using a suitable forming machine†. The guard is then removed from the model and carefully trimmed with scissors to the desired extension. On the palate the guard should extend at least 10mm beyond the gingival margin for comfort and retention. The cut margins of the guard are finished using heatless non-clogging stones in a dental laboratory handpiece.

To ensure the correct jaw opening, the finished guard is

Fig. 1

Address for correspondence:

Mr. N. P. Chandler
Department of Conservative Dentistry
University Dental Hospital of Manchester
Higher Cambridge Street
MANCHESTER
M15 6FH

adjusted in the mouth under dental supervision. Following thorough heating in warm tapwater (between 50 and 60°C) it is placed in the mouth and the patient instructed to close normally, thus biting into the softened material and creating indentations in the guard which accommodate the lower teeth. This must be repeated several times to limit later distortion and possible displacement in use. The illustration Fig. 1 shows the mouthguard in place and demonstrates the oral airway.

Players of a variety of contact sports have been supplied with these appliances. Without exception they have reported that it is comfortable to wear and several have remarked on the ease of mouth breathing during strenuous exercise. An additional benefit, not recorded previously in the literature, is elimination of dental sensitivity which may otherwise be a problem during repeated forced inspiration in cold weather.

While a long-term study would be necessary to determine the protective qualities of the appliance,

particularly with regard to laterally directed impacts, it is suggested that this modification using familiar materials provides a mouthguard with several benefits over current designs.

*Drufosoft, Dreve, D-4750 Unna Industriepark, Germany.

†Drufomat, Dreve, D-4750 Unna Industriepark, Germany.

References

- Andreasen, J. O., 1981. *Traumatic Injuries of the Teeth*. 2nd ed. Munksgaard, Copenhagen.
- Chapman, P. J., 1983 "Mouthguards in Sports". *Sport Health* 1: 13-15.
- Chapman, P. J., 1985 "The bimaxillary mouthguard: improved protection against orofacial and head injury in sport". *Aust.J.Sci.Med.Sport* 17: 25-28.
- Chapman, P. J., 1986 "The bimaxillary mouthguard: a preliminary report of use in contact sports". *Aust.Dent.J.* 31: 200-206.
- Upson, N., 1982 "Dental injuries and the attitudes of rugby players to mouthguards". *Brit.Journ.Sports Med.* 16: 241-244.