MOUTH AND JAW PROTECTION IN CONTACT SPORTS

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INTRODUCTION

The use of mouth guards for boxers has long been accepted as virtually essential by those in official charge of the amateur sport, and a decision to make such use mandatory is envisaged at the next Congress of the A.I.B.A. In these circumstances a review of the types available is clearly desirable, as these range from proprietary U form channel shapes of semi-rigid plastic, capable of a degree of user adaption, to sophisticated types wholly dependant on dentist/technician servicing, from which can follow an assessment as to the extent they individually achieve the degree of protection required.

The basic criteria which any guard must satisfy to be rated as efficient, or even reasonably so, are:—

- (1) Freedom to breathe through the mouth.
- (2) Stability in vigorous activity.
- (3) Protection of the anterior teeth.
- (4) Protection against injuries from transmitted force as far as it may relate to posterior teeth, jaws, condyles, or cranium.
- (5) Minimal interference with speech (desirable in team games).
- (6) Ease of fabrication at an economic end-cost to the user.
- (7) Ease of reproduction if lost or damaged.
- (8) To be large enough to prevent it being inhaled or swallowed.

Analysing these, the first two criteria concern comfort for participants in any active sport, in default of which there will be reluctance to wear the appliance routinely, and although the first four vitally concern boxers, whose special needs are considered in this study, cricketers, hockey, squash and Rugby football players are also at risk, and are deserving of similar help.

THE DESIGN CONCEPT

It is significant that the consensus of opinion of dentists interested in this field — natural enough as the

repair of dental damage lies with them — is that a suitably designed upper guard can give a degree of protection to the lower teeth, as part of its basic function of protecting all the teeth in both jaws. The upper guard encases all the teeth and the intervening elastic cushion related to the opposing aspects of the lower teeth, minimises or eliminates injury from an upper cut blow (or any such similarly directed) by absorbing the force transmitted through the lower jaw and teeth to the upper jaw, condyles, and base of the skull. Such guards can be made wholly of a suitable resilient material internally stiffened to allow easy handling during insertion, or in composite form of a hard or semi-hard shell, with a layer of resilient material on either or both sides, boxers particularly liking the feel of resilient material as perceived by their lower teeth. In either case the efficiency of the appliance depends on the use of a resilient material having a high "bounce recovery" factor, this being of greater importance than would first seem apparent. Ability to absorb shock, characteristic of any elastic material, is easily understood, but if quick recovery after compression deformation is lacking, then the appliance will become loose, particularly in stressful activity, when there may be involuntary clenching apart from the impact of successive blows. These resilient and truly elastic materials are of various types, basically plastics of complex molecular structure, those normally available to the dentist tending to be very expensive, but an industrial silicone ("Silite 100" see appendix) capable of being manipulated by the dentist, is relatively cheap, and has a high bounce/recovery factor the value of which is noted above. It cures in the presence of air and moisture into an inert highly resilient material, thermostable, resistant to ageing, and completely tissue compatible. Granted the properties of this material, or any similar ones of like character, guards made wholly of it attain a high level of efficiency, but the relatively high end-cost common to such designs, which may involve considerable dentist and technician service from start to finish, will militate against their widespread use, essential though such types may be for cases of marked front teeth protrusion or where there is gross irregularity of the teeth in the dental arch. In this context end-cost to the user as detailed in Criterion 6 is of importance, as

the majority of guards of any type made to be efficient, require the taking of an impression of the mouth, which by law is restricted to a qualified dentist or a doctor, so that his fee must be added to that of the technician working with or for him, and to his instruction, the responsibility for the adequacy of the appliance lying naturally with the dentist himself. It will thus be seen that any device calling for a minimum of technician time, or of such simplicity that the dentist can follow through the processing side himself, will minimise the end cost, and this aspect has been kept in mind in the survey of what can be made available.

TYPES OF GUARDS

Proprietary Guards

The greater number sold "over the counter" (see Appendix) are channel section U shape forms, corresponding to the outline of the average dental arch. The material in such cases is usually ethylene vinyl acetate without added plasticiser which could leach out and destabilise the product. The makers describe a hot water softening treatment, whereby the user can mould it to his own mouth, but such an adaptation is unlikely to be approved by the British Dental Association as one case of loosening of such an appliance, with lodgement in the pharynx has already been brought to its attention. Most suppliers however do recommend that this adaptation is better done by a dentist working to a model of the subjects jaw, but even so the overall adaptation is not intimate, nor is the material, though semi flexible, resilient in the sense of power of absorption of the force of a blow. Some users become adept at maintaining such a device in position, and currently it may be adequate in meeting any provisional requirement for a protective device in young boxers, but in general it can hardly be said to meet the named criteria to an acceptable degree.

Modified Proprietary Guards

Efficiency of the above type following initial adaptation by the dentist, can be enhanced to the extent of meeting the second, third, and fourth criteria, by infilling or loading of the channel with "Silite 100", the material closely investing the teeth, thus ensuring stability, and by its thickness within the channel providing the essential shock absorber cushion. The fabrication technique is simple, and can be done by the dentist himself or by the technician with equal ease. The end-cost is naturally greater than that of a simple self or dentist adapted guard, but the overall efficiency is high and in this form can be recommended for boxers use. If the teeth are grossly protruding or markedly irregular, a useful degree of adaption of the preform is difficult to achieve, and if infilling is attempted the result can be a clumsy product, an "over lay" or fully flexible guard being best employed.

Overlay Semi Rigid Guards

These are processed in a semi rigid plastic investing all the teeth and gums in the same sense that a denture so fits, and can be regarded as an overlay denture in all material respects. The close adaption to all the surfaces of all the teeth, with any one tooth supporting its neighbours undoubtedly gives a high degree of protection against damage or dislocation of individual teeth. This type of appliance is elegant and comfortable to wear and as such this form is popular with many sportsmen, for example squash players who are at risk from an opponent's mistimed backhand stroke. It is true there is little cushioning effect to minimise or absorb transmitted force, and a modification is envisaged of embodying a resilient strip or layer in opposite relation to the lower teeth, or anteriorly as padding anteriorly between upper lip and gum. Bonding of these highly complex resilient materials to a semi-resilient substrate is, however, a continuing problem if a mechanical holdfast cannot be secured, but if overcome such a type of guard would meet the criteria for boxer's use in an acceptable manner.

Flexible Guards

If the teeth are protruding, grossly irregular or separated by gaps due to some being missing, a fully flexible design may be the only answer, indeed some such are favoured by dentists for general use, a range of resilient materials being employed. Silite 100 is a suitable material for such fabrications and compares well with very expensive specialist dental materials of like nature. Construction calls for a wax model of the proposed guard built up to give special protection at vulnerable points. Subsequent fabrication calls for a substitution process of the chosen material for the wax, and although simple, is time consuming for both dentist and technician the end-cost being consequently high. The dental literature makes ample reference to the work of dentists in this field, and the variety of resilient materials employed.

CONCLUSION

A variety of designs of gum shields are available incorporating the essential cushioning element. An industrial silicone has been found valuable in this context. Although proprietary guards are the least expensive in end cost they do not meet the criteria of efficiency to an acceptable degree though when modified by infilling with a resilient material meet the standard required. The advice and supporting services of the dentist and technician are essential, working in cooperation with those in charge of the sport.

APPENDIX

Proprietary Guards

- (1) "Mitre". Mitre Sports Fitzwilliam Street, Huddersfield, (English).
- (2) "Titan 120". Shield Mfg. Co. (American).
- (3) "Grasshopper Multifit" Frank Bryan Ltd., Worcester (English).

The above types when adapted by a dentist are suitable for infilling (see text).

- (4) Coe Redigard Available to dentists only (similar to above).
- (5) Coe Guard flexible preform type supplied with infilling material (available only to dentists).
- (6) Semi Rigid Complete Overlay guards (Sportsafety, Durham), supplied ready to wear on provision of dentists model of the users mouth.
- (7) Fully flexible Guards. These are made by a dentist to his own, or to an accepted design, based on a model of the users mouth.

All the above types specifically described in the text.

"Silite 100" (Devcon Products, Station Road, Theale, Berks.), 85 gm. tube, cost £1.35 suitable for making two complete all flexible guards for special cases or for infilling up to four or six proprietary guards. Details of manipulation of this material for the use of dentists and their technicians available from the authors R.C. and M.M., Dental department, St. Helier Hospital, Carshalton, Surrey.

As members of the British Dental Association have access to much excellent reference material concerning guards for all sports, none are given here.