TREATMENT OF TRISMUS FOLLOWING RADIOTHERAPY IN NASOPHARYNGEAL CANCER (N.P.C.)

By R. Werner

SYNOPSIS

The different methods dealing with orthopaedic and surgical principles to overcome or to prevent mandibular trismus following radiotherapy of nasopharyngeal cancer are described and illustrated.

Radiotherapy for N.P.C. is to be considered as the treatment of choice. Whilst the Clinician and Radiotherapist are concerned primarily with the effect of radiotherapy on the tumour and its disappearance is the ultimate goal, mandibular trismus occasionally develops as a side effect.

I have seen a number of patients with this disabling condition, which is a result of postradiation fibrosis of the muscles of mastication and of the region of the temporomandibular joint.

The condition starts with increasing difficulty in opening the mouth, and if at that stage no immediate action is taken, the patient will develop a complete trismus, and therefore has acquired another pathological condition after the N.P.C. has been treated successfully.

The trismus not only hinders the patient from speaking normally and taking food properly, but also prevents the clinician from checking the effect of the radiation treatment of the tumour in the nasopharynx.

One of the main objectives in the N.P.C. treatment therefore besides the radiotherapy should be the prevention and constant observation for any tendency to trismus which can be assessed by measurement of the distance either between the incisal margin of the upper and lower incisors, or in edentulous patients by measurement of the distance between the top of the upper and lower alveolar bones after the patient has been told to open his mouth maximally.

If a tendency towards trismus is noticed, it can be coped with easily by incorporation of one removable *acrylic bite block* (monoblock), Fig. 1/2, either between the upper and lower jaw front teeth or the upper and lower jaw side teeth.

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As this is only a solid appliance and does not permit any jaw movements, another splint might be used instead. It consists of an *occlusal bite plate or labial and lingual (palatinal) retention for all upper and lower teeth.* The plates are *joined together by inter-maxillary springs* which are retained in all canine regions with its opening forward Fig. 3/4.

If there is no laboratory available to make such splints, a simple *flexible laundry spring clip* (Fig. 5) may be substituted. In such a case both ends of the handle of the clip are pressed together and placed between the anterior side teeth. After release the spring will then act as a dilator against the trismus.

Another way of overcoming trismus could be by using *wooden dilator screws of different sizes* (Fig. 6) which the patient places between his upper and lower side teeth. Screwing it into the oral cavity opens the mouth.

In a case of *advanced trismus* with only a few millimetres opening distance between the upper and lower jaw teeth, none of the above mentioned appliances can be used primarily. The patient will have considerable pain during any attempt at dilatation and therefore special care is necessary to open the mouth only gradually. This can be accomplished by the following appliances:—

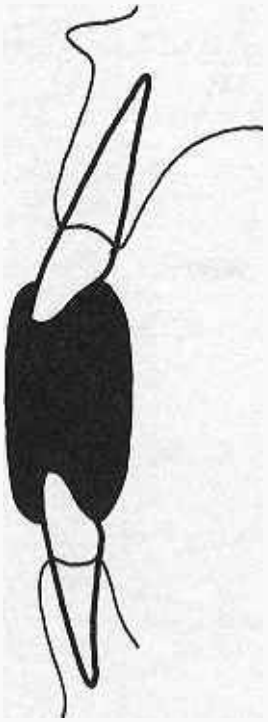
Interposition of *two acrylic plates* which rest at the occlusal surface of the upper and lower *front* teeth and which are joined together by a *maxillo-orthopaedic expansion screw* (Fig. 7). After careful use of the expansion screw the mouth opening may be increased by 5 to 7 millimetres. When this is reached,

an occlusal upper and lower jaw front teeth-splint with ventral open bite springs is indicated (Fig. 8).

If the intermaxillary distance between the side teeth permits, this *occlusal front teeth splint* might be *extended into the side teeth region* (Fig. 3).

In a case of *post radiation stomatitis* the patient cannot tolerate the bite springs intra-orally, then

an extra-oral occlusal expansion splint for upper and lower jaw front teeth (or all teeth) with wire



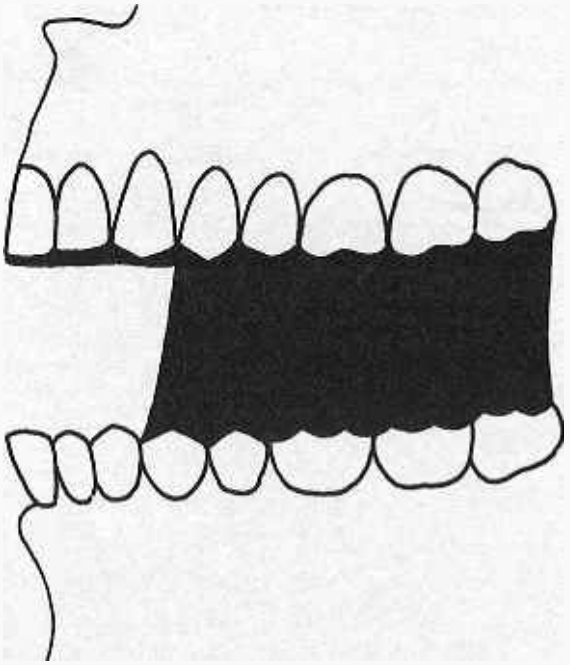


Fig. 2. "Monoblock" retainer for side teeth.

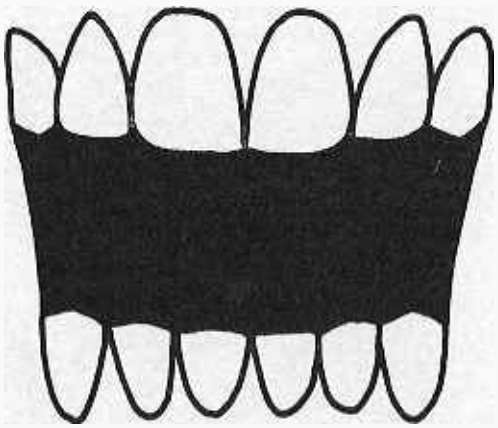


Fig. 1. "Monoblock" retainer for front teeth.

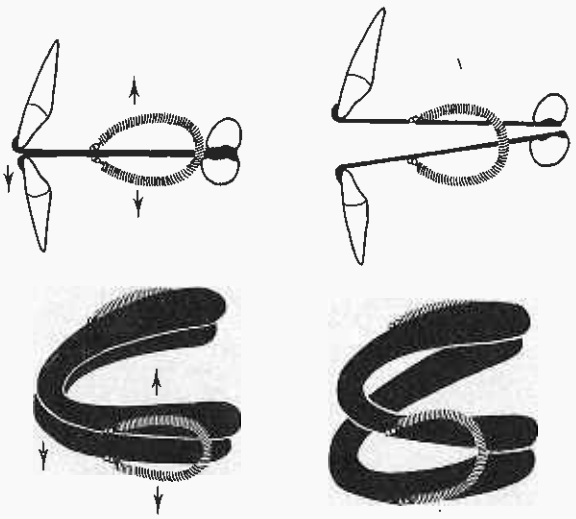


Fig. 3. Occlusal splint for all upper and lower jaw teeth with ventral open bite springs.

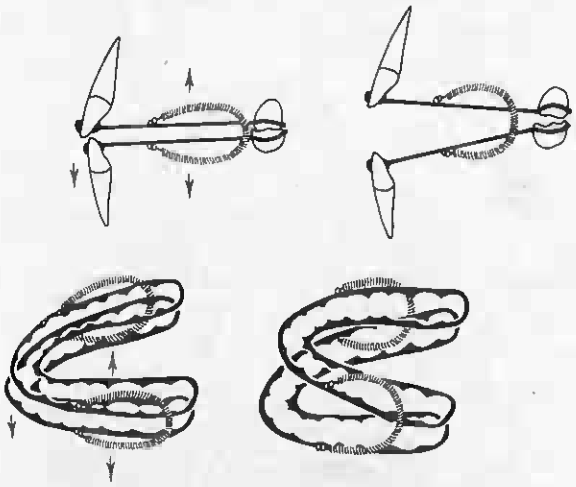


Fig. 4. Labio-lingual (Palatinal) bite raising splint for upper and lower jaw with ventral open bite springs.

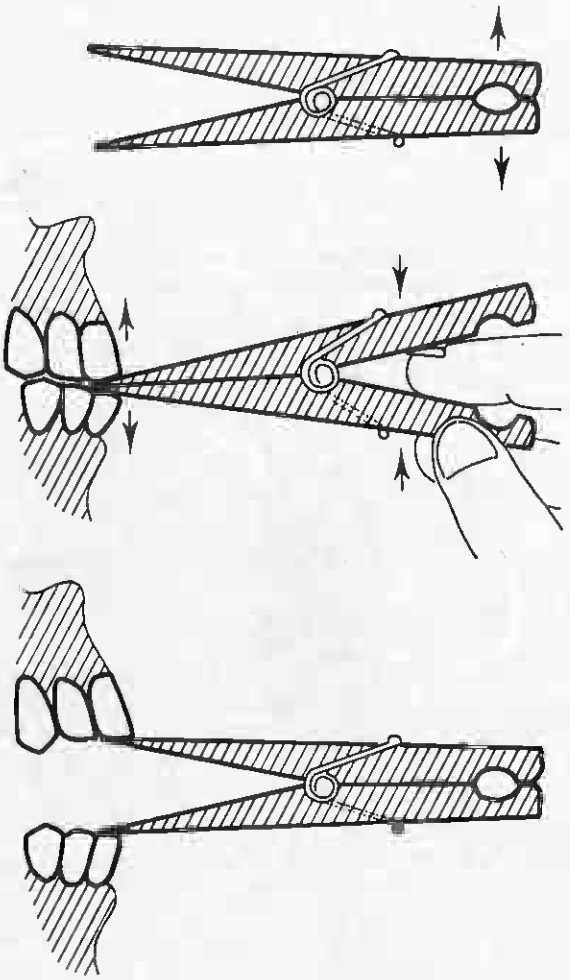


Fig. 5. Wooden laundry spring clip.

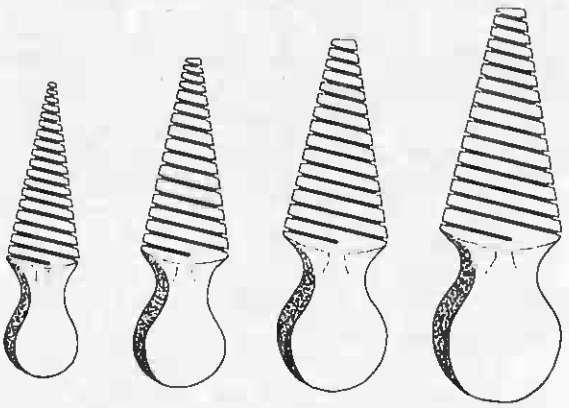


Fig. 6. Wooden dilator screws in different sizes.

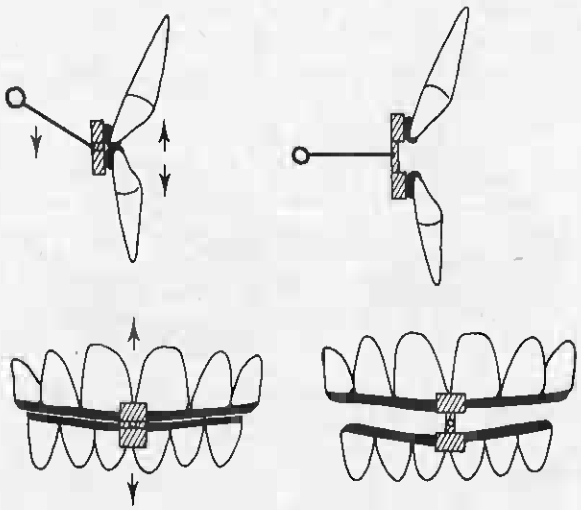


Fig. 7. Occlusal splint for upper and lower jaw front teeth with maxillo-orthopaedic expansion screw.

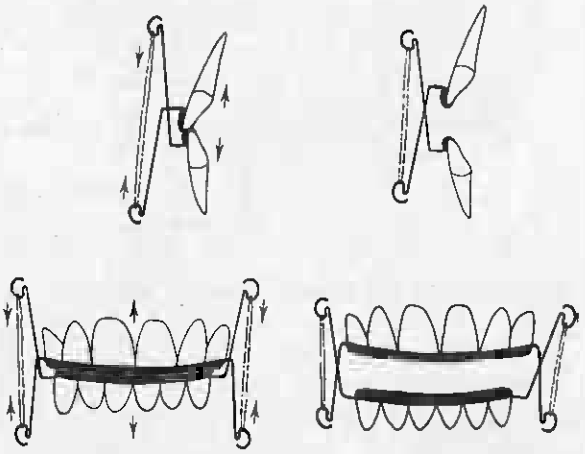


Fig. 9. Extra-oral occlusal splint for upper and lower jaw front teeth with wire arches and rubber band expansion.

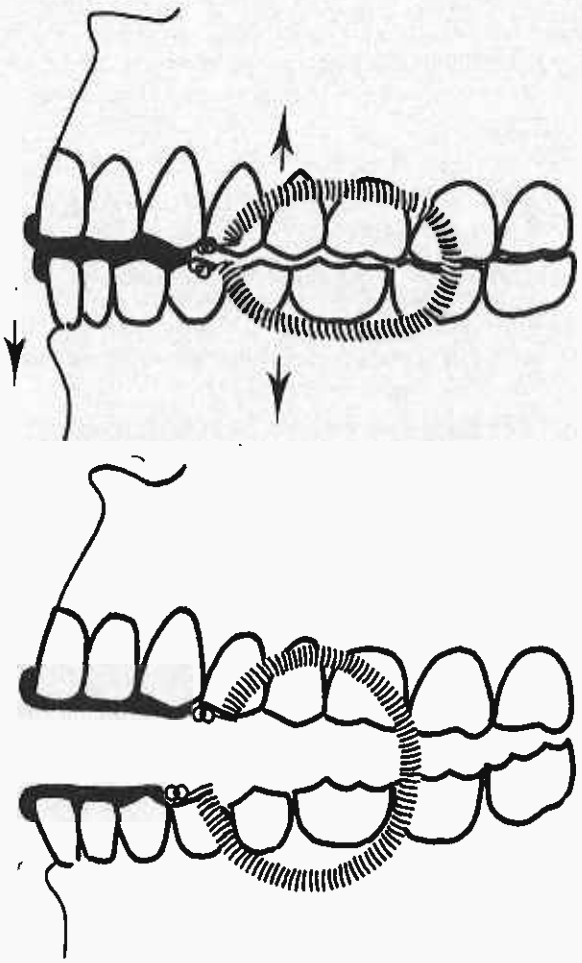


Fig. 8. Intra-oral occlusal splint for upper and lower jaw front teeth with ventral open bite springs.

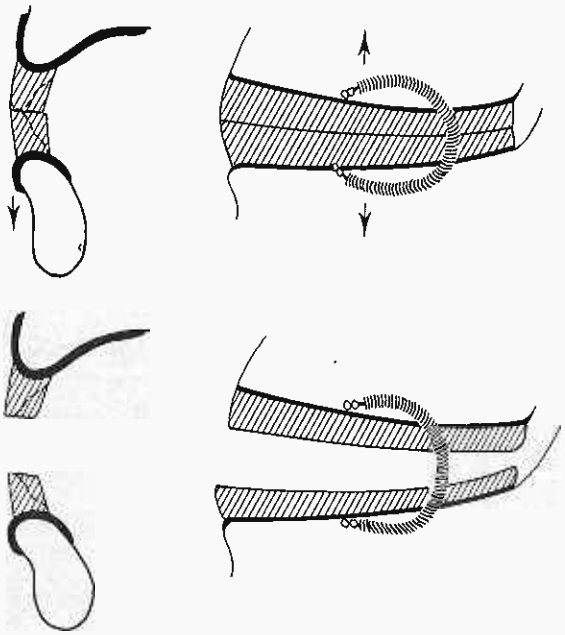


Fig. 12. Upper and lower jaw bite wall splint with ventral open bite springs.

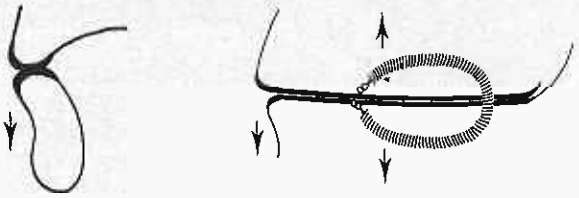


Fig. 10. Alveolar plates for upper and lower jaw with ventral open bite springs.

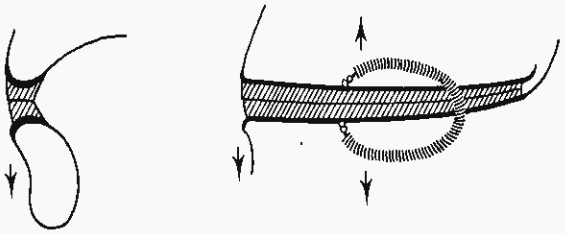
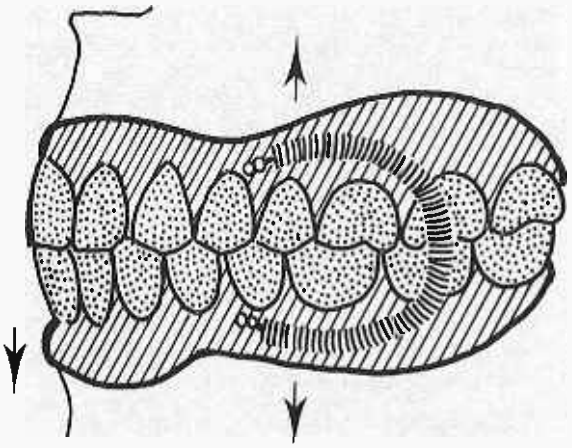


Fig. 11. Upper and lower jaw bite wall splint with ventral open bite springs. Bite raising not yet completed.



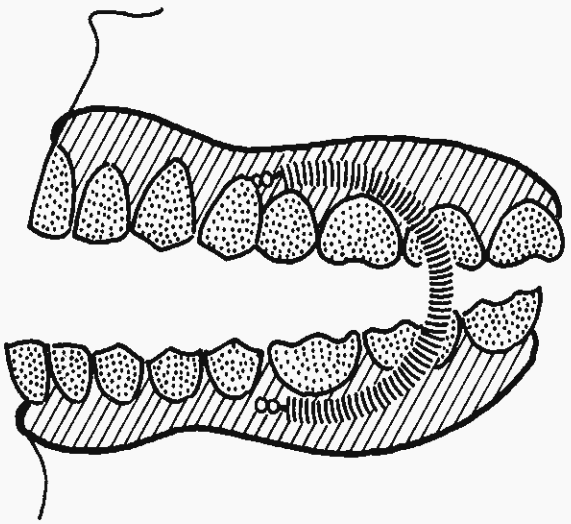


Fig. 13. Upper and lower jaw full dentures with ventral open bite springs.

arches and rubber band expansion might be used (Fig. 9).

If trismus appears in an *edentulous* patient then the alveolar bones of the upper and lower jaw may be very near to each other. Therefore *bite raising* is an essential precondition, not only to overcome the trismus, but also to incorporate dentures later on for oral rehabilitation.

The upper and lower jaw *base plate* covering the alveolar process (Stage A of *bite wall splint*) with ventral open bite spring may be used (Fig. 10).

After a greater intermaxillary distance is gained, an additional *low bite wall* is added to each of the two base plates (Fig. 11).

By increasing the height of the bite wall step by step as well as with the increase of the expanding force of both bite springs, the reconstruction of the bite height can be accomplished (Fig. 12).

Furthermore, after substitution of the bite wall splints with *upper and lower jaw full dentures*, and with incorporated ventral open bite springs, the patient has not only gained complete oral rehabilitation, but also possesses an appliance which acts further against trismic tendencies due to the presence of the bite springs (Fig. 13).

In case all these different maxillo-orthopaedic methods are not completely satisfying, then finally the additional reduction of the contracting masticatory muscle force might be useful with

bilateral resection of the temporalis muscle tendon at its insertion point at the coronoid process of the mandibula (Fig. 14).

The temporalis muscle with its vertical and horizontal fibres, and therefore acting as a closer of the jaw as well as retractor, after losing its mandibular fixation, reduces considerably the force responsible for the trismus.

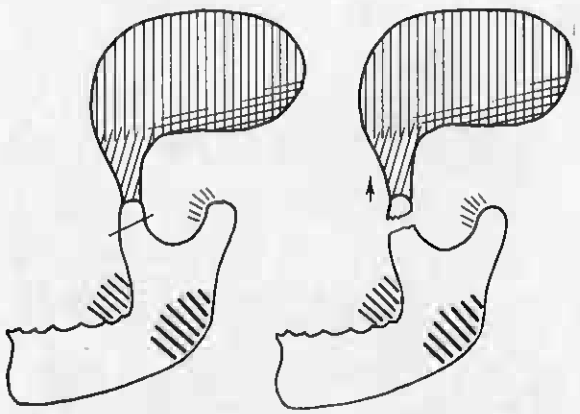


Fig. 14. Resection of coronoid process of mandibula with temporalis muscle tendon resulting in reduction of masticatory muscle action.

Selection of one or more of the above different methods acting against mandibular trismus should be taken into consideration for treatment, depending on the clinical and individual case requirements.

SCHEME

ORTHOPAEDICAL AND SURGICAL METHODS TO OVERCOME MANDIBULAR TRISMUS

1. **High Degree Trismus**
   - (i) Orthopaedic expansion screw in occlusal front teeth splint (Fig. 7).
   - (ii) Intra-oral occlusal front teeth splint with ventral open bite spring (Fig. 8).
   - (iii) Extra-oral occlusal splint for upper and lower jaw front teeth with wire arches and rubber band expansion (Fig. 9).
   - (iv) Wooden laundry spring clip (Fig. 5).
   - (v) Alveolar plates for upper and lower jaw (Stage A of bite wall splint) with ventral open bite springs (Fig. 9).
2. **Reduced Trismus**
   - (i) Upper and lower jaw occlusal splint for all teeth with ventral open bite spring (Fig. 3).
   - (ii) Upper and lower jaw occlusal splint for all teeth with extra-oral wire arches and rubber band expansion (Fig. 9).
   - (iii) Upper and lower jaw splint with labial and lingual (palatinal) retention and ventral open bite springs (Fig. 4).
   - (iv) Upper and lower jaw bite wall splint with ventral open bite springs (Fig. 11/12).
   - (v) Wooden dilator screws of different sizes (Fig. 6, might also be used as "functional retainers").
3. **Retainers**

   Monoblock Retainers
   - (i) Front teeth monoblock (Fig. 1).
   - (ii) Side teeth monoblock (Fig. 2).

   Functional Retainers
   - (i) See appliances mentioned under Reduced Trismus (Fig. 3/4/6/9/11/12).
   - (ii) Upper and lower jaw full dentures with ventral open bite springs (Fig. 13).
4. **Surgery**

   Resection of coronoid process of mandibula with temporalis muscle tendon (Fig. 14).

All appliances were made in the Maxillo-facial Laboratory, Department of Otorhinolaryngology.