

Initial Therapy by Stabilization Splint in Patients with Complete Dentures

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Summary

Patients often wear inadequate complete dentures that become functionally unacceptable due to marked abrasion of the prosthetic teeth and resorption of the denture bone foundation. Symptoms of dysfunction in the temporomandibular joint may also occur. Because of the uncontrollably reduced vertical dimension of complete dentures and the treatment of the signs of temporomandibular dysfunction, as confirmed by magnetic resonance imaging, wearing of a stabilization (vertical) splint is indicated. The splint is made in an articulator where occlusal relationships are checked and corrected. During the therapy the patient's subjective symptoms and objective findings are monitored. Successful initial therapy is a precondition for success in final prosthetic treatment by complete dentures.

Key words: *complete dentures, initial therapy, stabilization splint.*

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Complete dentures and the masticatory system

Complete dentures are a prosthetic treatment aid in total edentia, where the patient's acceptance and treatment course are dependent on the biological disposition and technical limitations. With the increased average life expectancy, more edentulous patients are likely to change several pairs of complete dentures during their lifetime. As the patients often do not show subjective reasons for replacement, the need arises to approximately establish the right timing for replacement of old dentures. Prolonged wearing of a complete denture reduces the vertical dimension as a result of the resorption of the denture bone foundation and the extensive abrasion of the pros-

thetic teeth. The inevitable consequence is disrupted occlusal stability, as well as lost corresponding contacts in centric relation. The denture foundation is exposed to additional traumatization. Therefore, complete dentures should be replaced every 5 to 7 years (1-7).

Reasons for fabrication of new dentures are: compromised aesthetics of the existing dentures, inadequate mastication, inarticulate speech and occurrence of dysfunction symptoms in the masticatory system.

Elderly patients manifest numerous morphological and functional changes in the masticatory system tissues. Some of which are linked to the condition of complete edentia and consequential alter-

ations in the structures of the edentulous jaw and the temporomandibular joint. Age also brings salivation problems, one of the retention factors, increased sensitivity of the denture foundation mucosa and arthritic changes in the working surfaces of the temporomandibular joint (crepitation and pain on mandibular movement). By careful anamnesis and preparation of the patient success is possible in the treatment of patients with complete edentia (8-11).

Clinical examination and diagnostic procedures

In the clinical examination an assessment of the functional condition of the existing dentures is taken into account. The altered vertical dimension confirms the adaptive potential of the temporomandibular joint usually occurring during prolonged wearing. Symptoms of crepitation and pain in the area of the temporomandibular joint indicate the need for preliminary therapy.

Signs of derangement are identified by manual functional analysis and tissue-specific diagnosis of single structures. The myogenous factor is excluded. The degree of the joint surface adaptiveness is examined by dynamic compression with translation. A primary indicator is the occurrence of crepitation on ventrocranial strain imposed by dynamic manipulation. A frequent diagnosis in an elderly population is osteoarthritis - based on the clinical sign of crepitation, accompanied by pain (12-14).

Magnetic resonance imaging (MRI) is a non-invasive diagnostic method in radiology. It is applicable for almost all systems and organs, especially the joints and the locomotor system. In dental medicine MRI is used for diagnosing functional disorders in the temporomandibular joint and imaging the structure of soft tissues. It is the method of choice in diagnosing the position of the articular disc, as well as progressive and regressive changes (Figure 1, 2). Magnetic resonance imaging is one of the methods used to confirm the finding obtained by manual functional analysis (15, 16).

Occlusal splint

The occlusal splint is a form of initial therapy for functional disorders and gradual correction of deranged vertical intertemporomandibular relationship

between the existing complete dentures. Indication is made to assess the need for initial therapy. The type of occlusal splint, the laboratory fabrication procedure and the treatment course are determined.

When wearing the occlusal splint, the occlusal contact and mandibular function are temporarily changed. The object is to achieve even contacts of the posterior teeth, as well as to ensure the centric and therapeutic position of the mandible through the maximal intercuspal position. In initial non-specific therapy the splint is effective when the patient is wearing it and neuromuscularly accepts the occlusal change (17, 18).

Stabilization splint

The specific feature of therapy by the stabilization splint is ensuring the occlusal stability through replication of occlusal relief (fossae and cusps) of the dentition where the splint is planned. A stabilization splint is indicated for stabilization of the dentition (intertemporomandibular relationship) and occlusion, for replacement of a relaxing (Michigan) splint, in case of osteoarthritic changes in the temporomandibular joint. It is a form of initial prosthetic therapy in the case of pronounced abrasion of the remaining teeth and regulation of vertical dimension, in post-orthodontic, surgical treatment, etc. (19).

Wearing a splint is a reversible form of therapy whereby the vertical and horizontal intertemporomandibular relationship is altered and the incisor-and-canine-guided occlusion is tested. In correction of a reduced vertical dimension the splint should normalize myogenic tonus and improve neuromuscular co-ordination. Depending on the possibility of neuromuscular adaptation and the degree of derangement of the vertical intertemporomandibular relationship, the interocclusal distance is recommended to be increased for the splint thickness by about 2 mm several times successively (20).

The splint is planned on the upper dentition to ensure improved occlusal stability. Aesthetically it is more acceptable on the lower dentition, as it hampers speech to a lesser extent, although complications are possible during its wearing. An unstable splint seat leads to parafunction and may result in the break-up of the structure as well as an unfavourable relationship between the occlusal contacts and masticatory forces (18, 19).

Laboratory fabrication of the splint

The method of choice in laboratory fabrication of stabilization splints is the Gutowski method (21, 22). Models are mounted on an articulator (e.g. SAM 2) with specific registration in the retruded contact position (RCP), approximately at the splint level. Model contacts are checked in RCP. If no anterior teeth contact exists, it must be achieved by waxing the palatine processes and the incisal edges of the upper canine and anterior teeth. Contacts are thus achieved in the incisor-and-canine-guided occlusion.

Splint rims on the upper model comprise the anterior teeth, about 2-3 mm over the incisal edges on the labial surfaces, and on the buccal surfaces over the lateral teeth equator (Figure 3). The splint rim on the palate is about 20 mm away from the teeth. A layer of wax is placed within the splint margin on the palate up to the cervical rim of the lateral teeth and an optimal splint thickness is thus ensured (Figure 4).

Putty (e.g., Coltène Speedex®) is laid over the occlusal surfaces and incisal edges of the teeth and the entire area of the upper model palate which is returned into the articulator. The lingual area on the lower model is filled. The articulator is then closed so that the incisal pin touches the incisal table (Figure 5). In the impression material the upper dentition and palate are impressed (Figure 6). The putty is then externally adapted to the incisal edges and labial surfaces of the upper teeth and left to harden. The articulator's incisal guide pin is raised by 5-6 mm to obtain sufficient space for the splint between the putty and the upper dentition.

Transparent acrylate (e.g. cold-curing methyl methacrylate resin Schütz Dental - Futura Jet®, Figure 7) was used. The space between the impressed replica of the upper dentition and the upper model is filled in three stages for a better overview of the procedure and to avoid undesirable contraction. The wax plate is adapted distally from teeth 13 and 23 on the palate to the splint margin and over the occlusal and buccal surfaces of the premolars and molars (Figure 8). The acrylate is applied to the entire anterior area of the palate, the incisal and labial teeth surfaces. The articulator is closed so that the incisal pin touches the incisal table, and secured by

a rubber band. Preparation of one of the lateral sides follows through the removal of wax. By applying the dough the articulator is closed, excess wax is removed from the buccal surfaces and the contact between the table and the pin is secured by a rubber band. The other lateral side of the splint is treated in the same manner.

Delivery and subsequent care

On delivery the complete denture is checked for snug fit and splint retention - with no swing or additional destabilization of the denture. Regardless of possible control of the occlusion by direct grinding-in inside the mouth, any alteration in the occlusal relationship between the teeth and the splint is recommended to be carried out by applying the remount procedure in the articulator (Figure 9, 10). Upon delivery of the splint a control check-up and remount procedure are desirable after 3 to 9 days of wearing. Any subsequent examination of the occlusal relationships should be carried out by a remount procedure (21).

A vertical splint is worn permanently, along with complete dentures. Since a splint on the lower denture makes speech easier and provides improved aesthetics, with partially preserved dentition both the upper and lower splints can be accommodated. The patient is thus enabled to wear the splint day and night, as well as during meals. Hygiene of the dentures and splint is a must (17).

During the therapy, subjective reactions are monitored with the increased vertical dimension, symptoms of disorders in the temporomandibular joint, as well as the patient's feeling of comfort in wearing the splint. After all, the splint is a foreign body in the mouth and such a relationship reflects the patient's positive attitude towards it. Occlusion is checked by a remount procedure inside the articulator.

Conclusion

A significant advantage of MRI diagnostics is the possibility of imaging in the desired plane without moving the patient, and the display of the tem-

poromandibular joint soft tissues, which makes it the best method for imaging the articular disc. To reach the final diagnosis, MRI finding is compared to anamnestic data and the clinical finding (23).

The treatment of choice for degenerative joint diseases (osteoarthritis and osteoarthrosis), depending on specific symptoms manifested by the patient, comprises, in addition to fabrication of an occlusal splint, medications and physical therapy. Non-steroid antiphlogistics are mostly prescribed in the acute stage, whereas muscle relaxants may contribute to the success of treatment when the degenerative disease is accompanied by myalgia. The principle underlying therapeutical exercises is improving the mandibular function, and includes active and passive motion, manual treatment and relaxing exercises which have proved useful in treating the symptoms of osteoarthritis. In rare cases the treatment options are arthrocentesis and surgery (14, 24-26).

Among the conservative treatments of temporomandibular dysfunction the primary procedure of choice is the initial therapy by the occlusal splint. The splint keeps apart the dental arches to avoid wrong guidance on the bevels of occlusal surfaces, eliminate premature contacts, relax the muscles, remove traumatization and achieve the physiologic position of the temporomandibular joint. Neuromuscular disorders and tension are also removed, the neuromuscular reflex of mouth closing and the condylar position within the temporomandibular joint are reprogrammed. Splint therapy is a non-invasive and reversible initial therapy that can clarify the cause-and-effect relationship and ensure the success of the definite treatment.

Degenerative diseases are more frequent in elderly patients with pronounced loss of teeth, or complete absence of them. In complete denture wearers the occurrence of temporomandibular dysfunction is rarer, whereas in about one third of them occlusion disorder was found, especially of the reduced vertical dimension. In such cases fabrication of an oc-

clusal splint is recommended prior to definite treatment (27). A mobile vertical splint can also be the means of reversible alteration of the intertemporomandibular relationship as the prosthetic treatment of choice in elderly patients who are not ready to accept new complete dentures (15).

Fabrication of a stabilizing (vertical) splint is initial prosthetic therapy for patients with reduced vertical dimension. The stabilization splint provides: adaptation of the craniomandibular structures by raising the vertical dimension, occlusal stability, neuromuscular reprogramming and condylar self-positioning within the articular fovea, elimination of dysfunction symptoms and signs of degenerative joint diseases. Initial splint therapy facilitates the definite prosthetic treatment - fabrication of complete dentures - within the splint-achieved relationships of single craniomandibular structures: the patient accepts the raising of the vertical dimension, while the temporomandibular dysfunction symptoms are eliminated.

Vertical splint therapy can be carried out in several phases through a gradual increase in the vertical dimension. If the findings of the control check-up are positive, the interval before the subsequent check-up will be longer. As initial therapy preceding the fabrication of new complete dentures, the splint is worn daily for a few months. The definite treatment should not be postponed for more than 6 months (28).

Subjective symptoms and objective finding are monitored during the patient's check-ups. Patients are advised to come for a check-up with the splint in situ, especially the upper one, expressing thereby their wish to continue with the therapy. The objective finding relies on examination of the splint base and possibility of developing parafunction. Changes in the occlusal contacts, occurrence of interference of contacts, due to wear of the canine-guided contact surfaces, weakening retention over a prolonged period of wearing and possible fractures of the splint parts are also monitored during the therapy (19).