

by Dr. Aladin Sabbagh

## TMD Manual Functional Diagnostics and AquaSplint Therapy: A Novel Procedure for Simple Diagnosis and Effective Therapy of the TMJ/TMD

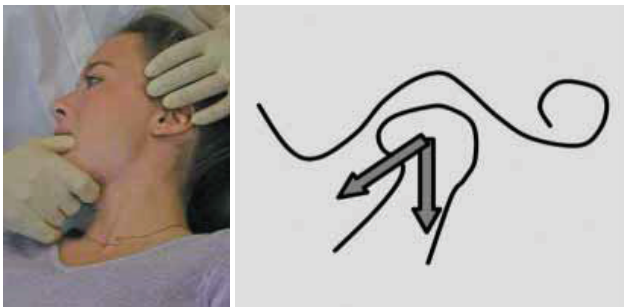


Fig. 1: TMJ screening/caudal traction.

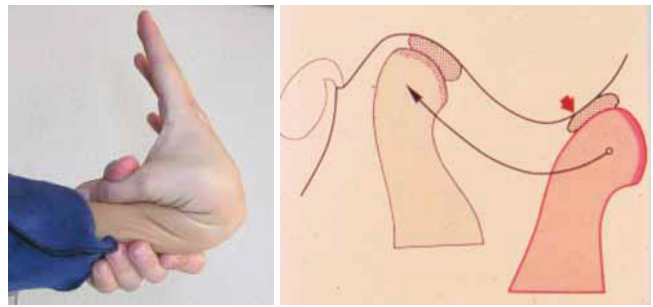


Fig 2 & 2a: General connective tissue laxity.

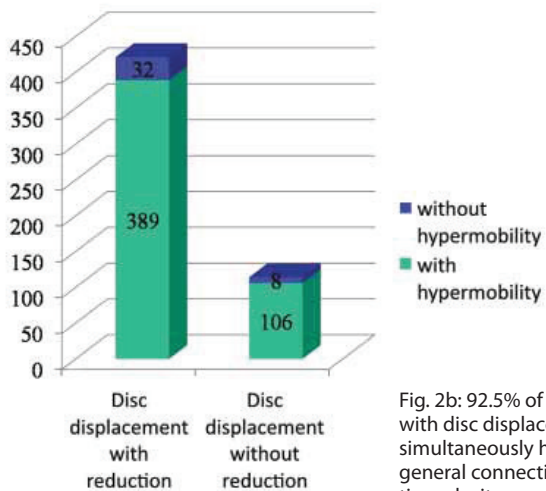


Fig. 2b: 92.5% of patients with disc displacement simultaneously had general connective tissue laxity.

**T**emporomandibular joint (TMJ) screening prior to occlusal rehabilitation is indispensable for preventive, therapeutic and forensic reasons.<sup>1</sup>

Daily practice calls for a simple and effective concept with clear conclusions in order to treat TMD (temporomandibular joint disorder) patients, and to avoid iatrogenic mishaps during dental therapy. Furthermore, planning and prognosis can be essentially improved in many cases.

Most diagnostic methods – from expensive axiographic and electromyographic measurements to sophisticated imaging techniques (MRT, CT, a.s.o.) – entail considerable costs in terms of time and expense. As these techniques mostly focus on the examination of special parts and structures, they cannot be considered as universal or standard

examination methods, even though they are indicated in some uncertain cases.

According to the Kiel concept, the Manual Functional Analysis (Bumann et al. 1989) provided the first substantial progress towards a practice-oriented concept (Fig. 1).<sup>2</sup>

On this basis, the AquaSplint concept was developed. In compact form, the established techniques of the Kiel concept are utilised for tissue-specific diagnostics.<sup>3,4,5</sup> Subsequently, the etiology and differential diagnosis are determined using the AquaSplint, which will significantly affect therapy decision and planning.

The previous hypothesis implying that TMD originates from the stomatognathic area is only partially correct.<sup>6</sup> In current literature, opinions widely differ on this issue. We believe that malocclusion may be among the causes of certain TMJ disorders, especially of pain due to compression. However, it rarely appears to be the only one. As generally known, there are patients who, despite extreme malocclusion, show hardly any or no discomfort at all, while other patients are severely affected sometimes despite minor, or lacking, occlusal discrepancies.

TMD results from an interplay of multiple factors:

- Malocclusion; TMJ overloading (compression, forced position, a.s.o.)
- Hyperactivity of the masticatory muscles (bruxism/pressing)
- Psychosomatic disorders; stress syndrome
- Joint hypermobility, particularly in combination with general connective tissue weakness (Fig. 2, 2a)<sup>7,8</sup>
- Trauma



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- Neck disorders/cervical spine syndrome
- Internal diseases (hormonal, circulatory disorders, rheumatism, a.s.o.)

Internal derangement of the TMJ results from joint hypermobility rather than from malocclusion. In a 12-year long-term study (1997-2009) from our orthodontic practice, all patients with diagnosed disc displacement (n= 535) were examined for their bite position, including manual examination of the wrist joint. Magnetic resonance images were obtained for uncertain cases. Anterior disc displacement with reduction was found in 421 patients, while 114 patients showed displacement without reduction. The association with connective tissue weakness was highly significant. Concomitant general connective tissue weakness was observed in 92.5% of the patients (Fig. 2b). In contrast, no significant association was revealed between malocclusion and the above-mentioned disc disorders.<sup>9</sup> Therefore, disc repositioning with occlusal rehabilitation might be a questionable approach. This type of therapy is often complicated, time-consuming and expensive, and not without risk in case of surgical repositioning. Moreover, this therapy apparently does not necessarily protect from complete disc displacement without reduction later on.<sup>8</sup>

Therefore, according to our current AquaSplint concept, clicking *alone* does **not** constitute an urgent need for therapy.

On the other hand, existing pain symptoms have to be examined as to whether they actually originate from the TMJ or masticatory muscles. Phantom or referred pain has to be excluded by tissue-specific manual diagnostics. The next diagnostic step should aim to determine whether malocclusion is the main cause of pain. This is most effectively achieved through (temporary) neutralisation/disengagement of the existing malocclusion using the AquaSplint. Thus, a possible forced bite is eliminated and the muscles become relaxed. In serious cases, manual and physical adjunct therapy should be applied.

A malocclusion-related TMD will usually respond to AquaSplint therapy within four weeks. Pain relief of at least 50% is a favourable pre-condition and indicator of promising orthodontic rehabilitation. Use of the AquaSplint often changes the bite. Subsequently, the resulting new and almost painless bite position requires orthodontic rehabilitation or at least stabilisation by means of an adjusted splint for night-time use.<sup>10</sup>

### AquaSplint classic

The AquaSplint classic is the only self-adjusting, customisable and pre-fabricated TMD splint that can be immediately inserted without preparations, impressions or registrations. The device consists of two water pads connected by a tube (hydrostatic aqua balance). The water pads are provided with an acrylic saddle, which

can be relined with a special long-term soft silicone. Such individualisation enables immediate optimum stability and comfort and, unlike conventional hard bite splints, offers the following advantages:

- **Immediate help/relief** without laboratory procedures or preparations.
- **Universal** and insertable in the patient's mouth within a few minutes; may also be used for children and adolescents.
- **Self-adjusting, no** grinding or frequent recall appointments required (thanks to the hydrostatic balance between the two water pads).
- **Replaces** the relaxation and distraction splint (**no** increased compression within the joint in contrast to splints with frontal bite piece/plan).
- High accuracy and comfort of fit through individual **relining**.
- **No more than 10 hours** of daily wearing (eight hours by night, two hours by day).
- **Excellent clinical results** and patient satisfaction owing to rapid pain reduction, comfort and advantageous positioning of the mandible (higher stability and less visibility compared to a maxillary splint).

In comparison to similar aqua pads, the AquaSplint classic offers the following advantages:

- Increased muscle relaxation: While conventional products must be held in position by permanent mouth closure or muscular activity that may interfere with sufficient muscle relaxation, the inherent stability of AquaSplint classic (relining) and the favourable positioning in the mandible enable improved muscle relaxation.
- The only self-adjusting, customisable TMD bite splint applicable even **during** orthodontic treatment (Invisalign or conventional brackets, provided that brackets are blocked out with protection wax) (Fig. 3, 3a).
- Longer lifespan (four weeks) with hardly any loss of fluid.
- Devoid of sharp edges.



Fig. 3 & 3a: Use of AquaSplint during orthodontic treatment.

### Indications

- Rapid pain relief, particularly in acute cases (e.g., accidents, trauma and disc displacement without reduction associated with markedly constrained mouth opening and difficult impression-taking).
- Muscle relaxation, particularly in cases of acute or intermittent teeth grinding (bruxism/pressing), e.g., during stress periods such as exams and acute psychological trauma (not suitable for chronic bruxism).
- Revelation/elimination of hidden functional disorders, premature contacts, forced bites.
- Simple pre-prosthetic/pre-orthodontic bite determination.
- High differential diagnostic validity and supportive therapy in associated diseases with multifactorial etiology (neck disorder syndrome, tinnitus, migraine headache, stress syndrome, sleep apnea, a.s.o.).

- Adjunct treatment supportive of osteopathic/physical therapy after trauma, surgery, limitations and blockades.

Due to the hydrostatic effect of the two water pads, jaw position/occlusal contacts become leveled and harmonious without grinding-in and adjustment (conventional bite splint); the mandible achieves self-balance.

This new pain-free/pain-reduced therapeutic position provides the basis for subsequent occlusal rehabilitation (prosthetic in vertical discrepancies; orthodontic in transverse and sagittal discrepancies) or for a long-term stabilising splint or long-term provisional management.

In addition, the three primary tasks of classic splint therapy are met: decoupling of pathological occlusion, tone reduction of hyperactive masticatory muscles, and reduction of enamel abrasion.

### Convenient and simple handling



Fig. 4: The saddle width can be adjusted when necessary through expansion, compression or cutting a part, to make it applicable to any tooth shape or crown/bridge, as well as brackets and bands.



Fig. 5: Bonding was applied to the inner surfaces of both saddles.



Fig. 6 & 6a: The specially-fabricated long-term resilient (soft) relining silicone is briskly sprayed onto the inner surfaces of both saddles with high pressure. Use of a dispenser is recommended due to the shore hardness 60 and in order to make work easier.



Fig. 7: Subsequently, the AquaSplint classic is inserted in the lower jaw (saddle on 35/36 or 45/46). A reverse "V" marks the middle of the tube and facilitates accurate positioning between 31 and 41. Strong contact between the tube and the gingiva should be avoided.



Fig. 8: Excess silicone can be removed after four to five minutes.



Fig. 9: The AquaSplint classic **cannot** be used as a permanent splint without an additional 0.5mm thin stabilising splint.

The Aqua Splint classic **cannot** be used as a permanent splint without an additional 0.5mm thin stabilising splint (Fig. 9), as undesired occlusal alterations/changes cannot be ruled out. The additional 0.5mm splint has proved to be a good compromise solution especially for patients who are unable or unwilling to wear a rigid bite splint any more after AquaSplint therapy. Furthermore, those additional thin splints clearly prolong the lifetime of the AquaSplint, particularly in bruxism cases. Usually, prosthetic/orthodontic rehabilitation or an adjusted permanent splint (as a compromise) should follow AquaSplint therapy if the malocclusion has been the main reason of the pain, and if there is a huge discrepancy between the old and the new therapeutic/painless occlusion. In some cases, occlusal rehabilitation is unnecessary, especially if the existing TMD mainly results from trauma or systemic disease rather than from malocclusion.

Should AquaSplint therapy fail to yield considerable improvement after four to six weeks, stomatognathic factors can be discarded as a main cause of disease. Unfortunately, such patients cannot be helped in the dental practice except for abrasion prevention. In these cases, interdisciplinary consultation involving other disciplines, such as ENT, orthopaedics, psychology or gynecology, is recommended.

### AquaSplint mini



Fig. 10 & 11: The AquaSplint mini can be inserted on either lower or upper jaw.

AquaSplint mini is a simplified version of the AquaSplint classic with the following features:

1. Low height as the saddle and silicon relining material are not needed. This is particularly indicated for TMD patients with an open bite.
2. Particularly preferred for non-dental colleagues – orthopaedic specialists, ENT specialists, osteopaths,

physiotherapists and pharmacists (there is no need for special dental relining).

3. The integrated wire can be bended individually to conform to the dental arch.
4. Can be inserted on either lower or upper jaw (Fig. 10 & 11).
5. An optimal and effective initial treatment that can be followed by the AquaSplint classic or occlusal rehabilitation or intervention.

Last years' experience with the AquaSplint concept has shown excellent clinical results and patient satisfaction, particularly due to rapid pain reduction, wearing comfort and favourable positioning of the mandible. Great advantages for the provider are the simple and quick diagnostic procedure, the effective therapy and the chance to dispense with impressions, registration, laboratory procedures and grinding-in. The new concept does enable us to provide the exact diagnosis and targeted therapy at a reasonable time and expense.

*The AquaSplint is a product of TeleDenta GmbH, Germany (www.teledenta.com) and exclusively distributed by Dental Imagination Pty. Ltd., Sydney, Australia (www.dentalimagination.com; email add: dentimag@optusnet.com.au). DA*

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### About the author



Dr. Aladin Sabbagh is an orthodontist and oral surgeon who graduated from the University of Damascus in 1987.

Dr. Sabbagh invented the SUS/Sabbagh Universal Spring, and he owns four patents in the EU/USA. He is the Chairman of the Association of German Orthodontists (BDK) in M. Franconia/Bavaria. He is an Honour Professor and a member of the Editorial Board of the VVA Health

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