

# The hydrostatic splint: New muscle-directed TMJ-PDS treatment technique

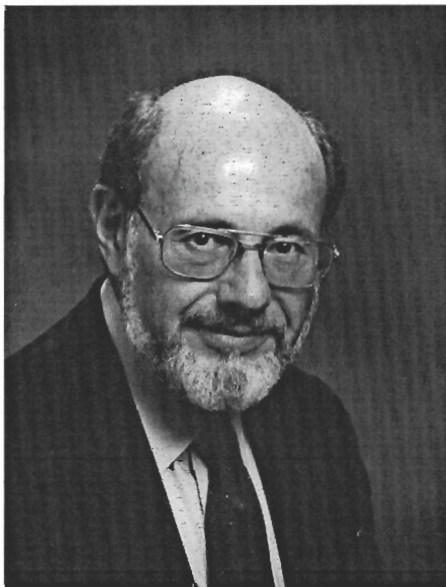
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*The relief of pain and the correction of etiological factors contributing to symptoms of temporomandibular joint dysfunctional syndrome is often a perplexing, elusive and futile goal. The hydrostatic splint, as described by Martin Lerman in this month's Miniclinic, may be a valuable addition to the diagnostic and treatment armamentarium of the clinician.*

*Generally, it is accepted that the elimination of tooth contact and the resulting proprioceptively established mandibular posture may result in dramatic improvement of temporomandibular joint dysfunctional symptoms with the possible elimination of pain which arises from myofascial imbalances.*

*Long-standing derangement of the components of the temporomandibular joint may have evolved into non-reversible damage of the soft tissue elements or degenerative bone disease of the hard tissues of the temporomandibular-mandibular joints. In the presence of such destruction, the exacerbation of symptoms may not be indicative of continued splint therapy. In the initial examination and diagnosis*



*one should carefully delineate the difference between reciprocal clicking and chronic crepitus.*

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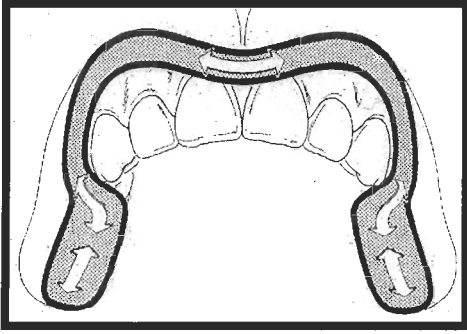
TMJ pain-dysfunction syndrome (PDS) treatment is one of the fastest growing problems in dentistry. Unfortunately, there is great controversy over how best to treat it. PDS treatment would be simplified immensely if it were possible to let the patient's *own muscles* determine optimal occlusion, mandibular placement, TMJ condyle-fossa relationship and muscle activity.

A newly available hydrostatic splint, the Aqualizer™<sup>1,2</sup> (Figure 1), now makes this possible. This small, flexible FDA-accepted, preformed disposable splint has a miniature built-in fluid system containing a small amount of distilled water.

The splint's hydrostatic action enables it to do what other splints cannot: it lets the patient's own muscles locate the occlusal prematurities and displacing contacts. This having been done, it then shows the clinician exactly where occlusal corrections should be made. This is accomplished by means of the diagnostic wear pattern which develops as the splint is worn and its fluid gradually lost. A hydrostatically directed wax-penetration method can be used to eliminate these interferences.

This inconspicuous splint can be worn day and night, except when eating.

**Figure 1.** The hydrostatic appliance's water flow pattern on upper arch.



The hydrostatic splint is ready for use directly from its package — no impressions are needed. It adapts itself instantly to the occlusion, so that no time is spent making adjustments to it. After the splint has been worn, the occlusal corrections indicated are made on the teeth or a rigid splint by hydrostatic occlusal adjustment.

### How the splint works.

The splint operates on a two-stage hydrostatic principle: full mandibular “float” and partial mandibular “float.”

In the first stage, full float (Figures 2 and 3), the layer of fluid the splint maintains between the upper and lower teeth gives the muscles a greater degree of control of the mandible than can *any* rigid splint. This enables the muscles to move the mandible to a more physiologic placement; one in which muscle strain, tension and adaptation are sharply reduced because all occlusal interferences are neutralized. The muscle pain symptoms of TMJ-PDS then usually respond with remarkable rapidity.

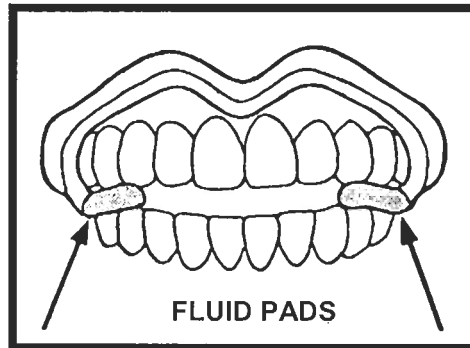
An initial period of full float is essential for relaxing and conditioning the muscles, for relief of both pain and spasm and to enable the muscles to identify the occlusal interferences accurately.

For definitive correction of occlusal interferences in chronic sufferers, the splint is worn full-time during the active PDS treatment period. For this treatment, the splint is designed to lose its fluid gradually over a period of a week or so (depending on the

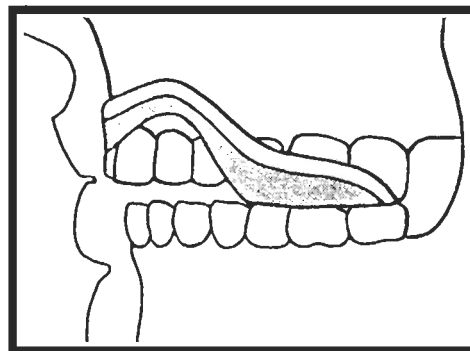
forcefulness and frequency of the patient's clenching). When the pain is only episodic, symptom control alone is provided by part-time splint wear, (no more than eight hours per twenty-four hour period).

For permanent relief, occlusal correction is required. The hydrostatic splint is used to make muscle-guided occlusal corrections to any occlusal surface. As fluid is lost, full float is transformed to a second stage — partial mandibular float, which identifies and locates the occlusal interferences to be corrected. The diminished fluid remaining in the splint during this stage prevents the typically undetected jaw displacement encountered in conventional adjustment techniques.

The partial float stage accurately reveals the locations of the displacing contacts for correction. The absence of fluid at the prematurities allows tooth contact *through* the splint's diminished fluid layer. This creates etch-marks on the splint. Occlusal interferences, ordinarily hidden, now



**Figure 2.** The hydrostatic appliance showing the fluid-filled pads between the U/L arches. Full mandibular float is illustrated, frontal view.



**Figure 3.** Lateral view.

become visible, showing exactly where adjustment should begin. This is an enormous improvement over the customary use of articulating paper or indicator wax, which shows *all* occlusal contacts, good and bad, without pinpointing those which should be corrected.

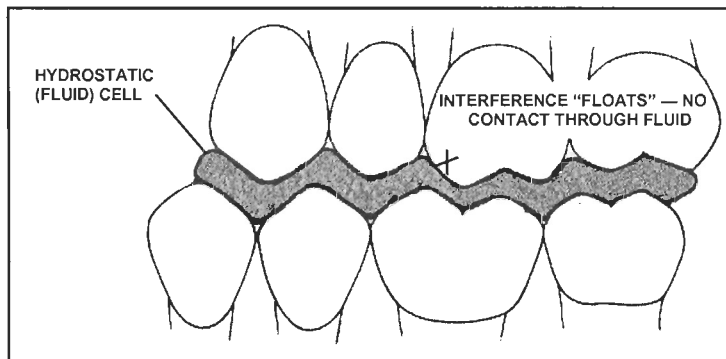
Muscle-occlusal interferences, once located hydrostatically, can easily be eliminated by equilibration. This procedure, repeated in a series of weekly hydrostatic splint-directed equilibration sessions, enables the clinician to correct occlusion to a much higher degree of neuro-muscular balance. The hydrostatic appliance thus acts as the key which “unlocks” the muscles and lets them “communicate” with the clinician.

### Broad application

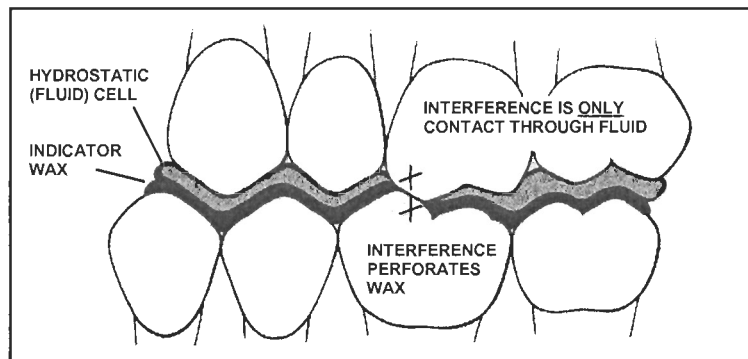
The hydrostatic splint is used not only in treating the TMJ-PDS's *primary* symptoms (masticatory muscle pain/tenderness, TMJ clicking, limitation/alteration of mandibular movement), but its widespread *secondary* symptoms (headache, facial pain, neck/shoulder pain, etc.) as well.<sup>3,4</sup> The splint also is valuable in treating other aspects of occlusion: correcting occlusion on natural teeth or full/partial dentures; all types of rigid occlusal splints; and establishing muscle-compatible mandibular placement for dentures, rehabilitation, orthodontics, etc.

### Occlusal support required for splint to be effective

Since the hydrostatic splint's effectiveness stems from its “floating” the jaw, the patient must have sufficient teeth to provide proper support for the appliance. This requires the two bicuspid and first and second molars in all four quadrants. However, mandibular “float” usually still occurs if only a single one of these teeth has been lost. Where more than one support tooth has been lost, occlusal support must be provided (temporary replacements are adequate) before the hydrostatic splint can be used effectively for that



**Figure 4A.** The hydrostatic appliance's action. Full mandibular float (left). An unbroken layer of fluid between the U/L arches. Note that the fluid layer, thinner at the occlusal interference, neutralizes it.



**Figure 4B.** Equilibration technique at the partial mandibular float stage. After one week's wear. The fluid layer thins as fluid is lost gradually with continuous wear. The interferences are now isolated from the

other contacts by their contact with the opposing occlusion through the fluid layer. With the occlusal surface covered by indicator wax, the interferences perforate the indicator wax through the worn appliance.

patient. Hydrostatic appliances are available in three different vertical dimensions: high, medium and low fluid volumes.

### Treating the TMJ pain-dysfunction syndrome

The hydrostatic splint greatly simplifies TMJ treatment by enabling the patient's own muscles to determine what is optimally physiologic for that individual. Self-correction by the muscles is consistently and profoundly effective. Relief of pain generally begins very quickly after insertion of the splint, often in minutes.

### The first appointment

Hydrostatic PDS treatment is very conservative. Initially, it is reversible simply by removing the splint. It is greatly time-saving. Hydrostatic PDS treatment at the first visit usually both establishes the diagnosis and quickly relieves the patient's muscle pain. This is the fastest possible approach to effective PDS treatment.

Patients are asked not to take any medication for their PDS pain on the day of their first appointment. In taking the history, make certain that organic pathology has been medically ruled out. After the clinical exam has been completed, a hydrostatic splint is inserted and the patient monitored for 30 minutes. Change in any symptom (head/face pain/neck/shoulder pain or stiffness, etc.) present at the time of

insertion supports the conclusion that the PDS is a factor in etiology of that pain. PDS treatment would therefore be indicated.

The most frequent change reported is diminution of pain. This is neuromuscular pain originating in the occlusion. An increase in pain, however, is seen in rare instances, and this too is significant. Exacerbation of a symptom generally signifies an already excessive occlusal vertical dimension. Since the hydrostatic appliance alters only the mandible's placement, both diminution and exacerbation of pain can be considered positive findings if altering only this single factor affects the pain in either character or degree.

If symptoms improve, treatment can begin as soon as muscle spasm is eliminated.

Note: Muscles must be restored to normalcy by first wearing the hydrostatic appliance for several days. All spasm must be eliminated before equilibration or splint adjustments are performed.

If no reaction is noted within the 30-minute test period, the patient should be dismissed and seen again after approximately 48 hours during which time the splint should be worn full time, day and night (except when the patient is eating or brushing the teeth).

At the next appointment, the response to wearing the appliance is evaluated. Any symptom change during this period can be considered supportive of a diagnosis of PDS. On

the other hand, absence of any change in symptoms increases the probability that the pain is of organic origin rather than from the PDS. Occlusal treatment is then contraindicated.

The above diagnostic procedure constitutes a highly effective and valuable patient screening method.

### Subsequent PDS treatment

The extent of subsequent treatment depends on whether PDS symptoms are episodic rather than chronic. If symptoms are relieved satisfactorily simply by wearing the splint for several weeks (replacing the worn splint each week) and if there is no recurrence after withdrawal of the splint, no further treatment may be needed.

Recurrence of PDS symptoms after withdrawal of the splint indicates a chronic condition. Chronic PDS requires that the occlusion be corrected to improve mandibular placement and relieve muscle strain.

Mandibular placement can be improved by a hydrostatically directed wax-penetration method. This method can be used to construct a muscle-directed occlusion on (1) the existing dentition (natural or replacement) following which no splint need generally be worn or (2) a long-term-wear rigid acrylic splint.

### Correcting occlusion

Accurately differentiating the harmful, displacing occlusal contacts from the

normal, desirable contacts is the advantage of occlusal correction with the hydrostatic appliance.

Once precisely pinpointed, these interfering occlusal contacts can easily and quickly be eliminated by the doctor using the hydrostatically directed wax-penetration method.

Any occlusal surface can be hydrostatically corrected: the natural dentition, denture, partial, restoration (following which no splint need generally be worn); or a rigid splint.

To precisely locate the interfering occlusal contacts, the hydrostatic splint is worn over the occlusion to be equilibrated/adjusted for one week. Over the course of that week, the hydrostatic appliance's fluid layer is thinning, that is decreasing the occlusal vertical dimension.

The wax penetration method is used to accurately locate the displacing contacts on the occlusal surface being adjusted.

To equilibrate the teeth (or bridgework or dentures), a hydrostatic appliance is worn full time, day and night (except when eating or brushing the teeth). When the patient returns after one week the water layer will have thinned and the interferences will be indicated by the wear patterns on the appliance. Use the hydrostatically directed wax-penetration method to eliminate these interferences.

To provide this type of muscle-directed occlusion in a reversible therapeutic mode, choose the rigid splint method. Construct a full-coverage, flat-plane acrylic splint with the occlusion roughed-in. When delivering this acrylic splint to the patient, issue a hydrostatic splint at the same time with instructions for both to be worn full time, day and night (except when eating or brushing the teeth).

When the patient returns after one week, use the hydrostatically directed wax-penetration method to locate and correct the occlusion.

If a rigid splint is to be adjusted, cover the entire occlusal surface with indicator wax. If the teeth (or bridgework or dentures) are to be adjusted, the arch to be equilibrated (either the upper or lower) is covered

with indicator wax.

The worn appliance is inserted together with the wax. The patient is directed to gently rub the teeth together in all excursions until the first three to four perforations appear in the indicator wax. The partial float provided by the water will protect the wax except on the grossest interferences. These interferences are not being floated and will perforate the wax through and off the thinning fluid layer. With a wax pencil, mark the location of these interferences directly on the occlusal surface through the perforations in the indicator wax. Strip off the indicator wax and equilibrate the pencil marks off the occlusal surface. If further treatment is needed, the patient is sent home with a new hydrostatic splint with the same wearing instructions.

This hydrostatically-directed wax penetration procedure is repeated at weekly intervals, each time disclosing and eliminating progressively more subtle interferences, until the patient is comfortable. This method is highly effective for quickly and accurately correcting hidden occlusal problems which have been displacing the mandible and causing the muscle pain. The benefit is consistent efficiency for the doctor and a more comfortable result for the patient.

## Summary and conclusion

The hydrostatic splint is a new TMJ-occlusion splint which, because of its built-in fluid system, simplifies TMJ-PDS treatment and occlusal correction, making both more consistently effective. It permits the patient's *own muscles* to quickly establish a more physiologic occlusion and mandibular placement.

TMJ-PDS treatment becomes easier because the worn (and now, fluid-less) hydrostatic splint becomes a muscle-directed "road map" that identifies occlusal prematurities and shows where corrections should be made. Pain, especially muscle pain, usually improves very quickly after initial insertion, often within minutes. The hydrostatic appliance provides the clinician with a much needed, safe, positive and rational treatment

technique for the TMJ-PDS.

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