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C L I N I C A L R U B R I C

Some clinical thoughts on how I have managed cranio-mandibular disorders over 20 years of practice

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1 – INTRODUCTION

Managing cranio-mandibular disorders can prove to be difficult as the therapeutic protocols for them multiply and sometimes seem to contradict themselves, with splints, some types of surgical procedures, abstention from some types of mastication, postural exercises, occlusal equilibration, kinesitherapy, and behavioral psychology all having been proposed by ardent adherents as the ideal treatment. In this article we shall attempt to clarify these varying conceptions, basing our views on the physiopathology of this unique articulation as well as upon the objectives to be reached at the end of treatment.

Instead of speaking of the temporo-mandibular joint it seems to us preferable to refer to the dento-temporo-mandibular joint and for the articulation itself we shall distinguish between intra and extra-capsular malfunctions. In more simple terms, is the articular disc in place on the head of the condyle and biomechanically operational or are its collateral attachments stretched or broken and its biomechanics so altered that, without treatment, irreversible tissue damage will result? Are mandibular kinetics merely disturbed or are they totally limited? Is disc displacement recoverable on movement or isn't it?'

1 – 1 – From anatamo-physiology to physiopathology

When the teeth come into contact, the motion of mandibular elevation stops and opens joint space where the disc is positioned: vertical dimension of occlusion and vertical articulation are thus in harmony. During mandibular movements, the head of the condyle rotates inside the discal cavity, while the disco-condylar complex translates along the temporal eminence. In the act of chewing, the disc, a malleable and hinged shock absorber, permits the articular surfaces to meet. When the collateral ligaments rupture, the disc is displaced, and because of the collagenous nature of these attachments, this displacement becomes permanent.

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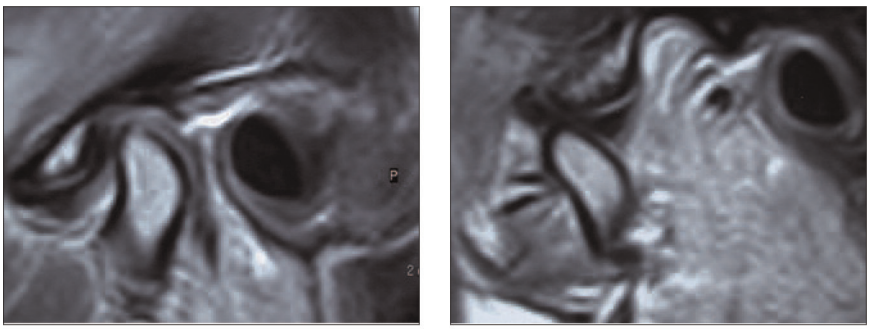

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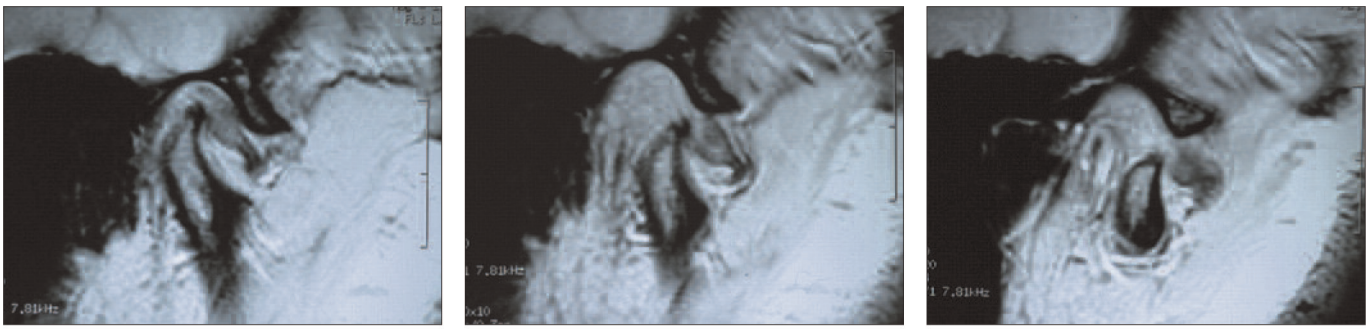
Figures 1a and 1b
Semi permanent anterior disc displacement.



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Figures 2a to 2c
Permanent anterior disc displacement.

Orthodontists differentiate partial displacements that Farrar has named antero-internal discal luxations or anterior discal luxations. They can be semi-permanent: discal luxation reduced by mandibular movement, or permanent: luxation unreduced. These are the principal malfunctions that alter TMJ (Figs. 1 and 2).

1 – 2 – This has as a consequence

The backward movement, then elevation of the head of the condyle in the glenoid fossa occur due to the action of the elevator muscles. The mandible has a clockwise rotation beginning with the most forward point of occlusion, thus it overloads the posterior occlusion and leads to wear, migration and, most often, intrusion of certain teeth that patients describe as occlusal discomfort: ''feels like my teeth are clenched''. This loss of vertical dimension of the posterior occlusion is irreversible without treatment (Fig. 3).

When blood-rich innervated post discal tissue is crushed, it provokes an inflammation responsible for pain, edema and hemorrhaging. Fibrosis will also begin to appear.

Figure 3
Model showing intrusion of posterior teeth.

The septic influx sent to the central nervous system by the receptors in this area stimulates the depressor and decompressor muscles: the head of the ptyergoid and especially the super-hyoid muscles and consequently the sub-hyoids that stabilize the hyoid bone. This helps us understand how a malfunctioning TMJ, via the hyoid bone, is going to have repercussions on the sternum, clavicle, scapula, the superficial and deep fascias as well as the duremerians. In a process known as the Littlejohn mechanics, the repercussions extend as far as the fourth spinal vertebra. The movement of opposing muscles maintains balance between the posterior para-vertebral chains. The discal blocking, if it cannot be bypassed by the mandibular condyle, will require, if there is no translation, an exaggerated rotation of the condyle. Due to wear of the disc surface, osteo-musculo-aponeurotic imbalances follow: cervical pain, cervico-brachia, etc.

To summarize, the loss of disc substance therefore causes occlusal modifications, local and remote neuralgia, kinetic disorders, joint noises, rearrangement of post-disc tissue and disturbances of the osteo-musculo-aponeurotic system.

The goal after joint treatment should be the elimination of painful episodes by recuperation of atraumatic dento-musculo-mandibular function. In such cases, compensating for the loss of disc substance and the decreased vertical dimension of posterior occlusion is indispensable; this requires articular therapy and bite stabilization. One without the other will not remedy this disorder.

Restoring discal substance can be performed by repositioning the condyle orthopedically, recapturing the disc, or thickening of the retro-discal area or by using arthroscopic access with a pexia for discal surgery. As for occlusion, we systematically observe changes ranging from posterior open bite to closing of the inter-incisal angle, and even anterior open bite. It is imperative to have occlusal balance in order to maintain the articular result.

2 – MATERIAL AND METHODS

Our study is based on a sampling of 100 patients ranging in age from 8 to 65 who are suffering from disc displacement. For certain patients, therapy started as far back as 20 years ago.

We have excluded from our study patients with blocked disc position who have isolated ''over rotation'' with posterior disc displacement at the end of opening their mouths or disc bonding problems.

We have excluded the following therapies:

- retro incisal appliances, maxillary plates, Lucia's jig, or an NTI shield. These treatments are entirely contra-indicated since they provoke a postero-lateral open bite, which then aggravates articular compression;
- behavioral, osteopathic or chiropractic therapies, which used in isolation, are only a supplemental therapy and do not treat the dento-temporo-mandibular area or involved tissue. These techniques are, however, very useful for comforting patients and help facilitate the motion of the condyles. No patient in the study wore orthopedic shoes or splints, prisms or any other posture-aid device in order not to overload the central nervous system during TMJ treatment, which consisted of:
- selective grinding which accentuates the loss of discal and dental substance;
- occlusal blocking which creates sectorial inocclusion and causes lingual interpositions leading to dental migrations, opening diastemas and lateral gliding during occlusion. The displacement of the head of the condyle is, in addition, totally random since occlusal blocking is created in the mouth by adhesion between components. Teeth, which bear the weight of occlusal blocking, are in danger of being intruded:
- For the same pathology depending on the treatment, we analyzed the results concerning certain neuralgias, the mandibular kinetics, joint noises, remote symptoms and ease of stabilization.

2 – 1 – Discal pexia

Arthroscopy can facilitate the insertion of a discal pexia, which helps eliminate possible intra-articular adhesions. It is a slightly invasive procedure requiring stabilization of occlusal contact during and after surgery. In fact, disc repositioning implies lowering and propulsing the mandible. A thermoformed activator made before the procedure, will be reinserted during the operation once the disc is in place and will be worn full time during the healing phase, including during masticating, for approximately 6 months.

Temporo-mandibular orthopedic procedures are performed by using relaxation activators to capture the disc and to increase bone density of the disc. Each activator is tested in the same way, using a semi-adaptable articulator programmed according to the anatomical data of the patient. It is made of auto-polymerisable transparent resin, for ergonomic and esthetic reasons, and used mostly for the mandible. The activators are smooth, with no deep indentations, in order to stabilize the mandible without constraining it, while simultaneously, allowing for mastication. Their thickness should not interfere with the open space for inocclusion. Anterior guidance is still achieved. But orthodontists never leave an anterior infraocclusion that could generate a lingual interposition. In the buccal area, the motivators descend into the posterior sectors following the major contours of the teeth in order to ensure their retention during mastication. In the lingual zone, motivators descend two to three millimeters below the tooth neck so as not to

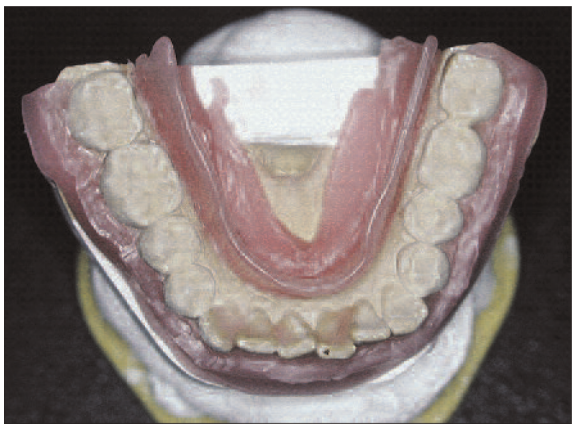

Figure 4
Limits of the splint.

Figure 5
Mandibular splint in place.

irritate the edge of the tongue (Figs. 4 and 5).

2 – 2 – The relaxation activator

It is still called the simple rotation activator or central relational activator even though this term centric relation is inadequate without the articular disc. The mandibular position is recorded as unforced rotation with moyco wax, used now in place of aluwax. The patient sits at a 45° angle legs uncrossed while the practitioner manipulates and rotates the mandible and guides it vertically. Orthodontists must be careful not to press on the alveolar process during manipulation or push the mandible backwards. The activator works to eliminate premature occlusal contact that could potentially occur, by distributing the occlusal forces and by modeling appropriate guidance of functional operation. The points of contact are punctiform and uniformly distributed; the tritural surface is smooth.

Figure 6
Registering pure rotation.

2 – 3 – The discal capitation activator

The mandibular condyle is repositioned within the discal cavity. This mandibular position is identified after axiographic analysis; three impressions are necessary in order to determine more precisely the coordinates of the point of disc displacement along the line of closure (Fig. 7).

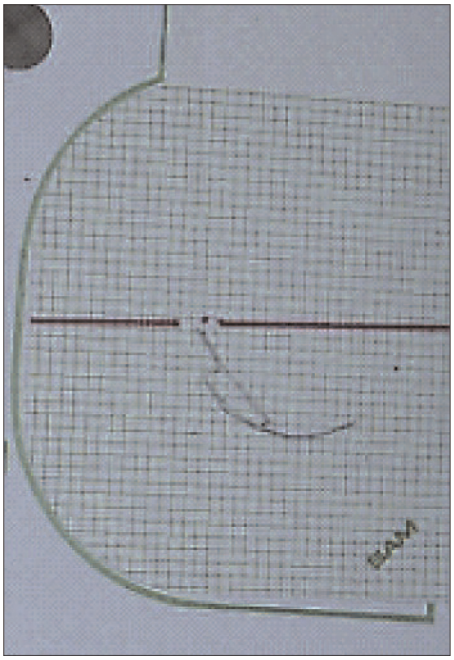

Figure 7
Axiogram of the coordinates of disc loss.

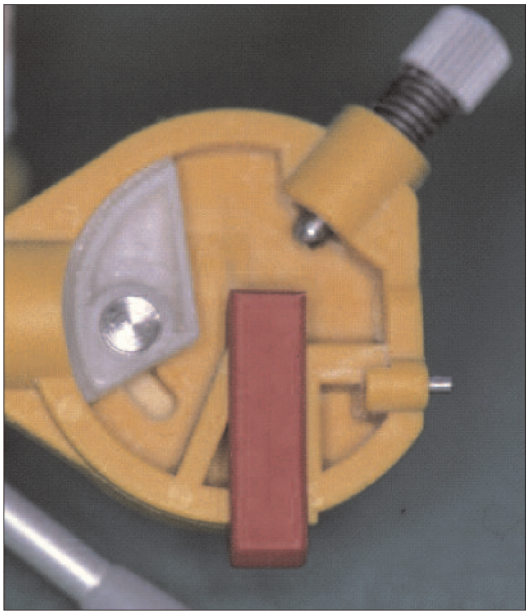

Figure 8
Propulsion block.

Orthodontists guide mandibular propulsion slightly beyond this point using the corresponding propulsion splint (Fig. 8). Practitioners never locate and record this position buccally; in fact, vertical force is mandatory for this type of displacement.

Only the articulator can make it systematically integrate. The risk here is excessive horizontal propulsion and thus permanently luxating the disc. This activator has some specific characteristics such as a raised canine zone used to secure an immediate disocclusion. Some anti-recoil spacers are located at the back of the canine area of the mandibular articulator. In these cases, we would rather fabricate a maxillary articulator with a retro-teeth wall to maintain the forward positioning.

2 – 4 – The activator for post-discal densification

The activator is made by interposing splints along the posterior portion of the condylar slope situated on the articular eminence of the temporal muscle (Fig. 9). The condylar displacement is obtained in measurements of .5 to 1 mm a month until the space is equivalent to the disc thickness (approximately 4 mm) or until total recuperation of the amplitude of opening: with a passage under the articular disc in case of permanent disc displacements. Before each activation, the orthodontist refits the simulator of the mandibular model: aluwax is applied on the articulator and the articular position is recorded. This procedure allows the practitioner to validate the preceding distension.

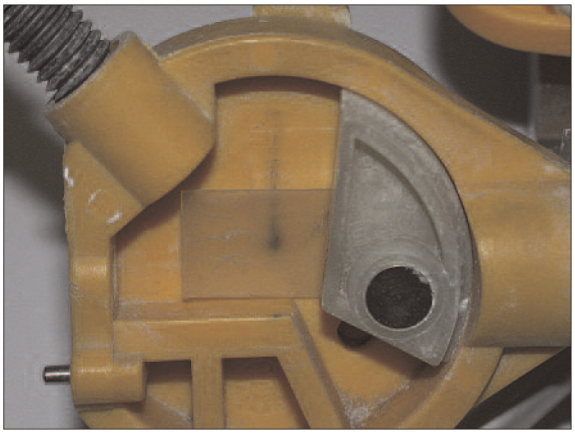

Figure 9
Distension block.

It sometime happens that patients nullify posterior interference by propulsing. In this case, the orthodontist should diminish or stop activation.

3 – THE RESULTS

TMJ treatment is over: the new mandibular position is achieved and is now irreversible.

Visible occlusal modifications are stable and reproducible: identical in the mouth and on the simulator fitting, performed during the last adjustment of the activator (Figs. 10 and 11).

Procedures for prosthetic or orthodontic stabilization are used to compensate any additional need of modifications: closing open bites and adjusting the contact points of the anterior segment of the dentition.

The protocol is always the same: the retention of the articular position by extending the coronary prosthesis using partial or total ceramic crowns made with a simulator. The orthodontist only chooses this option when the

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Figures 10a to 10c
The propulsion.

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Figures 11a and 11b
The distension.

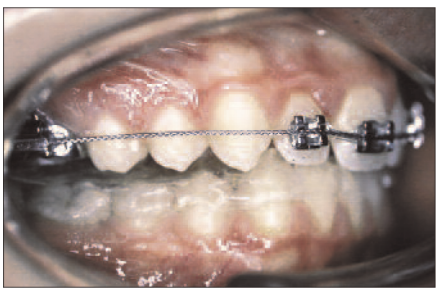

Figure 12
Still wearing the splint.

Figure 13
Temporary bite blocks.

Figure 14
Substitution splint.

patient is already wearing prosthesis or when prosthesis is necessary for clinical purposes. Most of the time, an orthodontic solution creates stabilization: the maxillary arch is treated and retained with an activator (Fig. 12). This is adjusted as dental displacements occur: sectorial recesses are managed by continually wearing the posterior splint.

The practitioner will have to remove the activator and to replace it with splints on the first and second molars or with a maxillary activator (Figs. 13 and 14) in order to install the mandibular apparatus. Anterior contact at this stage is indispensable in order to avoid lingual interposition. To optimize occlusion, the orthodontist modifies points of contact, adjusts extrusion of the posterior zone from mesial to distal and corrects inclinations and rotations. Having obtained these results, the practitioner removes the temporo-mandibular splint either by egression or using a permanent prosthesis for the tooth.

Out of the 100 patients represented in this study, 15 were not treated because they presented no symptoms

	Pure rotation splint	Post-discal lowering densification splint	Pexie discal arthroscopic retention splint
Wearing	night	continuous including mastication	continuous including mastication
Approximate treatment time	lifetime	1 year	6 months
TMJ pain	intermittent	yes	yes
Referred pain	intermittent	yes	yes
Amplitude of movement	unchanged	total recuperation of amplitude	total recuperation of amplitude
Ressauts of TMJ sounds	unchanged	reappearance of TMJ clicking	suppression of sounds and ressauts
Tissue recuperation	no	yes	yes
Occlusal consequences	none	posterior open bite slight change in anterior guidance	posterior open bite major change in anterior guidance
Stabilization of Treatment	none	obligatory	obligatory
Permanence of results	highly variable	good	weak

Table I
Results: displacements not reduced.

of neuralgia; 20 were fitted with a rotation activator intended for nocturnal use; 25 successfully had either orthopedic or surgical recapture of the disc; the rest were treated using post-disc densification.

Since 15 patients received no treatment, they obviously had undergone no dental procedures that could affect their occlusion. For 10 of the patients, we observed a worsening of articular noises, an onset of neuralgia and osteo-musculo-aponeurotic problems that were recurrent following osteopathic or chiropractic treatment. Two patients indicated that they experienced occasional blocking when opening the mouth. Five remained stable.

Among the group fitted with a rotation activators intended for nocturnal use, only 50% said that the treatment improved their condition and decreased their pain. The other half said that there was no improvement; so, the orthodontist suggested that they continually wear the rotation activator full time. Subsequently, all local neuralgia completely disappeared.

There are 5 adults and 20 adolescents represented in the recapture group. All of them suffered from class II skeletal malocclusion. Among the

	Pure rotation splint		Post-discal lowering densification splint	Retaining Splint pexie arthroscopic discal
Wearing	night	continuous including mastication	continuous including mastication	continuous including mastication
Approximate treatment time	lifetime	1 year	1 year	6 months
TMJ pain	intermittent	yes	yes	yes
Referred pain	intermittent	yes	yes	yes
Amplitude of movement	unchanged	unchanged	unchanged	unchanged
Ressauts of of articular	unchanged	suppression of sounds and ressauts	continuation of sounds, lessening ressauts	suppression of sounds and ressauts
Tissue recuperation	no	yes	yes	yes
Occlusal consequences	none	posterior open bite major change in anterior guidance	posterior open bite slight change in anterior guidance	posterior open bite major change in anterior guidance
Stabilization of treatment	none	obligatory	obligatory	obligatory
Permanence of results	highly variable	weak	good	Weak

Table II
Results of disc recapture.

adults, one female patient remained stable (when she turned 20), for another female, the recapture was partial: a faint mandibular clicking sound persisted in the morning and thus invalidated the treatment. For the remaining 3 patients, their initial symptoms reappeared 5 years after treatment, and required that they start treatment all over again.

As for the adolescents, 10 were stable at the age of 10; 5 had a reoccurrence of articular noises with no other symptoms; 5 others had a reoccurrence of noises and symptoms.

Out of the 40 patients treated by post-discal densification, 20 were still stable at the age of 10. For the 10 to 15 years old group, only 5 needed to wear a rotation activator 24/7 for 3 months and this resulted in balanced occlusion.

4 – DISCUSSION

The rotation articulator can be recommended to patients without necessarily compensating for discal loss. In fact, when the patient stops wearing it and the absence of condylar displacement does not cause any modification of tissue structure, this temporary activator has relaxed the muscles, harmonized occlusal contact and improved guidance function. Its use prevents the worsening of existing cranio-mandibular malfunctions when they are not excessively debilitating. It is mostly recommended for asymptomatic patients who do not wish to begin ''hardcore'' articular treatment. The time during which patients wear this type of activator can vary. However, it must be emphasized that wearing it full time eliminates painful symptoms in 90% of the cases.

The disc recapture activator is used less and less: long-term results are not convincing, the occlusal consequences of propulsion are often simply unmanageable, the stabilization of the propulsed position is difficult to maintain and the occlusal consequences of propulsion are quite often simply ungovernable, and stabilizing the mandible's anterior position is difficult. For these reasons from about 1980 to 1990 some practitioners attempted to guide the mandible to a more distal position by selective grinding but relapse from this position was inevitable! Success requires obtaining a fixed and reproducible position for the mandible. That is why practitioners today do not propose this procedure to young patients who still have growth potential: a splint operates like a mandibular activator. But we must not disregard however, the collagenous nature of the collateral ligaments attaching the disc to the head of the mandibular condyle. Today this type of movement is contra-indicated in adults.

Use of the post disc densification splint is, accordingly, the therapy of choice for cranio-mandibular malfunctions because it allows lowered condyles to pass under articular discs in cases of non-reducible disc displacement; stabilization of the new articular position is smooth and reliable and the permanence of results is good. The decompression suppresses the influx of harmful impulses soliciting the sub and super hyoid muscles and the TMJ no longer occupies itself with osteo-muscular-aponeurotic problems. On the other hand, practitioners should always warn patients that this device does not resolve the problem of joint noises.

The arthroscopic disc pexie is today used only rarely: practitioners cannot predict what new mandibular position will be obtained and propulsion is impossible to govern occlusally without orthognathic surgery.

On the other hand, for permanent disc displacements of long standing with good tissue restoration, arthroscopic lavage presents interesting possibilities because it can rid the TMJ of inflammatory factors and fibrous debris. Orthopedic treatment that is used as a follow up to this procedure operates smoothly.

5 – CONCLUSION

What can practitioners do and what can't they do for TMJ problems?

Therapeutic results for TMD do not restore *ad integrum* articular components to their original state. Recapturing the disc is a myth but densification of tissues distal to the disc is a clinical reality.

Protocols for TMJ therapy are relatively profound: patients must wear splints 24 hours a day even during mastication, the average length of treatment is about a year, and the permanence of results is not absolute even though they have seemed quite satisfactory. These remarks are based on more than twenty years of practice.

Well then, whom should we treat and when?

For patients with no symptoms of pain or function and who require no dental treatment, abstention would seem an obvious stance to adopt but practitioners should always bear in mind that signs of TMD may be present in locations well removed from the TMJ. When patients have limitations or pain in mouth opening, practitioners must direct their therapy to the source of these difficulties, the TMJ.

But confronted with serious irreversible changes to the occlusion as is the case with orthodontics accompanied by the extraction of bicuspid teeth for adolescents, we are obliged to make sure that the TMJ continues to function properly. Practitioners should watch over the TMJ for many reasons: the management of occlusal constraints during orthodontic treatment, obtaining an occlusion in harmony with articular determinants, the assurance of not aggravating initial articular compression in case of cranio-mandibular malfunctions and the certainty of physiological condylar growth.

We are also frequently called upon to deal with temporo-mandibular problems for patients that other specialists, chiropractors, osteopaths, and ENT physicians refer to us hoping we can provide TMJ equilibrium for them.

Practitioners should remember that if they give in to the desire of a patient with cranio-mandibular dysfunction not to have treatment for it before receiving extensive dental reconstruction they are taking a big risk. If a temporo-mandibular disorder appears overtly during or after the reconstruction, courts will hold them culpable, not the patient who refused the treatment. Courts will rule that patients are not competent to make such therapeutic decisions.

As practitioners we must provide patients with enough information to give us well considered informed consent and we are also obliged to discern as much about them as possible in order to make an informed diagnosis of and treat, if necessary, any cranio-mandibular disorder.