OCCLUSAL SPLINTS

DR JANINA CHRISTOFOROU
ORAL MEDICINESPECIALIST

CLASSIFICATIONS

- Okeson classified splints as:
  1) Stabilisation appliance/ Muscle relaxation appliance used to reduce muscle activity.
  2) Anterior repositioning appliances/ Mandibular orthopedic repositioning appliance
  3) Other types:
     a) Anterior/Posterior bite plane
     b) Pivoting appliance
     c) Soft/ resilient appliance (silicone)
- Dawson classified splints as:
  1. Permissive splints/ muscle deprogrammer.
  2. Non-permissive splints/ Directive splints
  3. Pseudo permissive splints (e.g. Soft splints, Hydrostatic splint)

USES

- bruxism/parafunctional habits,
- fatigued masticatory muscles,
- headaches,
- sore teeth, worn teeth,
- malocclusion,
- noisy and uncomfortable temporomandibular joints (TMJ),
- Protection of dentition and restorations.

WHAT SPLINT SHOULD I USE

- Depends on:
  - Findings from the examination
  - The differential diagnosis
  - An understanding of the effects of each splint design

MATERIALS

- Hard acrylic resin
  - self-cured (by chemical reaction) or
  - heat cured,
  - milled
  - = hard and rigid tooth-borne and occlusal surface.
- Soft or resilient
  - = somewhat flexible and pliable tooth-borne and occlusal surface.
- dual laminated
  - its occlusal surface consists of hard acrylic resin and the tooth-borne surface consist of a soft material.

EMERGENCY USE:


Soft splint

- An electromyography (EMG) crossover study by Okeson found:
  - Significantly reduced nocturnal muscle activity with the use of hard occlusal appliances.
- Another EMG study (Savabi O et al), found:
  - After the immediate insertion of a soft occlusal appliance during maximum clenching it was found that the masseter muscle activity was increased.

- Okeson JP. (1987) The effects of hard and soft occlusal splints on nocturnal bruxism. J Am Dent Assoc 114: 788-791.
- Savabi O, Nejatidanesh F, Khosravi S (2007) Effect of occlusal splints on the electromyographic activities of masseter and temporal muscles during maximum clenching. Quintessence Int 38: e129-132.

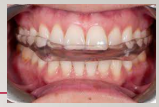
STABILISATION APPLIANCE

- Permissive splint
- The most commonly used type of occlusal appliance.
- Function:
  - to provide joint stabilisation,
  - protect the teeth,
  - redistribute the occlusal forces,
  - relax the elevator muscles, and
  - decrease effects of bruxism.

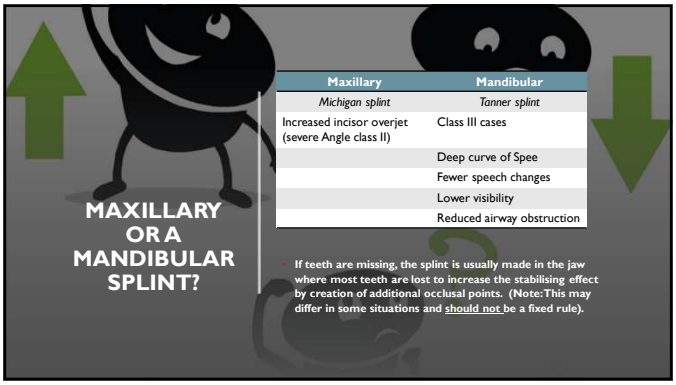
STABILISATION APPLIANCE

- Features:
  - The occluding surface of the appliance should occlude uniformly, evenly, and simultaneously with the opposing dentition.
    - Multiple even contacts on posterior teeth in the retruded contact position with lighter contacts on anterior teeth.
  - Can incorporate canine or anterior ramps to disocclude the posterior teeth during eccentric movements.
- It has the least adverse effects to the oral structures when properly fabricated.

STABILISATION APPLIANCE



- Uses:
  - May be effective in reducing TMD symptoms
  - Prosthodontics
    - elimination of discrepancies between seated joints and seated occlusion (CR = CO)?
    - a large surface area to distribute occluding forces
    - the opportunity to observe for occlusal and joint stability over time
      - Regular checking of changes to the occlusal contacts on the appliance

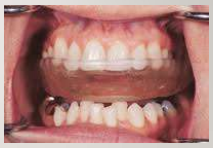


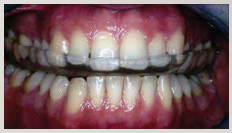
Maxillary	Mandibular
Michigan splint	*Tanner splint*
Increased incisor overjet (severe Angle class II)	Class III cases
	Deep curve of Spee
	Fewer speech changes
	Lower visibility
	Reduced airway obstruction

- **If teeth are missing, the splint is usually made in the jaw where most teeth are lost to increase the stabilising effect by creation of additional occlusal points. (Note: This may differ in some situations and should not be a fixed rule).**

THICKNESS OF A SPLINT

- Prevention of tooth wear-
  - minimal thickness for capabilities of the material.
- Splints that increased vertical dimension 4.4 mm and 8.2 mm were more effective in producing muscular relaxation in patients with bruxism and myofascial pain dysfunction patients than 1-mm splints. *(Manns. J Prosthet Dent. 1983)*
- On the basis of MRI measurements and clinical outcome, it was recommended that
  - 4-mm vertical splint thickness for disk displacement with reduction
  - 6-mm vertical splint thickness for disk displacement without reduction. *(Hegab, Oral Surg Oral Med Oral Pathol Oral Radiol. 2018)*

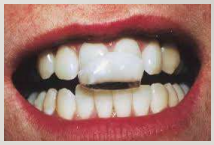




ANTERIOR BITE PLANE

- Engages only 2-4 maxillary incisors.
- Different designs
  - the Nociceptive Trigeminal Inhibition splint (NTI),
- Purpose:
  - to disengage the posterior teeth, thus eliminating the influences of the posterior occlusion on the masticatory system.
  - Thought to be effective in treating TMDs and headaches?

NOT ADVISED



- **The premise of the nociceptive trigeminal inhibition (NTI) splint**
  - Muscle clenching forces are reduced significantly when contact is isolated exclusively on the incisors.
  - Eliminating posterior teeth contact significantly reduces noxious sensory feedback, through the trigeminal afferents, from previously sore temporalis muscles, which can evoke sympathetic vascular changes intracranially.

NTI **VS** FLAT PLANE APPLIANCE

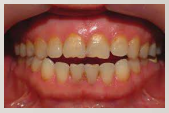
- A double-blind randomised parallel trial, compared the NTI to a flat plane appliance in TMD subjects with a headache,
  - found no differences between appliances over a three month period in respect to
    - muscle tenderness upon palpation,
    - patients self-reported TMD-related pain and headache, or
    - improvement on mouth opening.
- In another well-designed RCT,
  - the NTI was found to be less effective than the stabilisation appliance in the treatment of TMDs .

Jokstad A, Mo A, Krogstad BS. Clinical comparison between two different splint designs for temporomandibular disorder therapy. Acta Odontol Scand 2005;63:218-26.

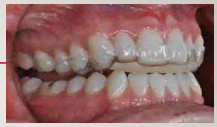
Magnusson T, Adiels AM, Nilsson HL, Helkimo M. Treatment effect on signs and symptoms of temporomandibular disorders— comparison between stabilisation splint and a new type of splint (NTI). A pilot study. Swed Dent J 2004;28:11-20

ANTERIOR BITE PLANE

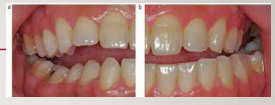
- **Adverse effects**
  - occlusal changes
    - the potential for overeruption of the posterior teeth resulting in an anterior open bite.
    - intrusion of maxillary anterior teeth which retain the appliance could exaggerate the problem of an anterior open bite.
    - unfavourable mobility of the teeth supporting the appliance.
  - Swallowing risk



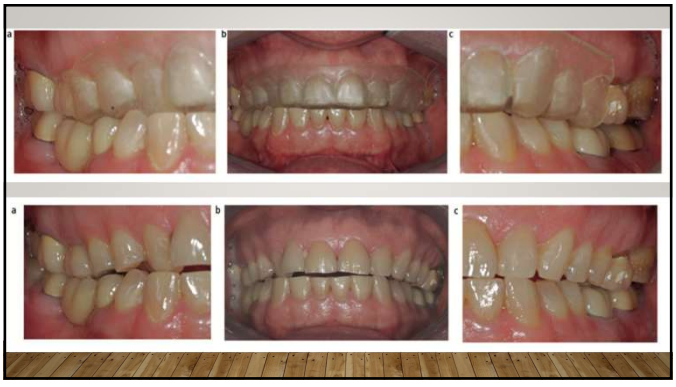
CASE



- 47 year old female
- H/O: Clenching which contributed to headaches
- Dentist advised on an anterior plane splint
- Reduced the headaches
- Then …… a referral came
  - Managing well with splint, but pain has recurred.



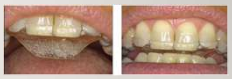
- Supraerupted posterior teeth
  - Only occluding on the 7's.
  - Also a periodontal patient
- So, what do you do?
- Had to wait for supraeruption of the anterior teeth
- Then fabricated a stabilisation appliance.



ANTERIOR REPOSITIONING APPLIANCE

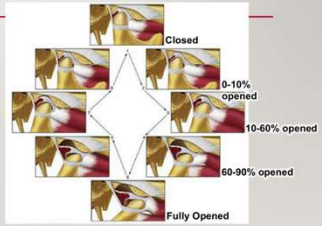
- Purpose:
  - to alter the maxillomandibular relationship so that a more anterior position is assumed by the mandible.
- Design
  - Acrylic guiding ramp added to the anterior third of the maxillary appliance that direct the mandible into a more forward position, upon closing.
  - Occlusal indentations in the protruded position.

Short Term Use only



ANTERIOR REPOSITIONING APPLIANCE

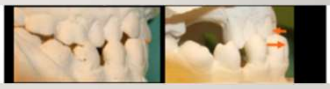
- Use:
  - treating patients with anterior disk displacement with reduction.
    - It was supposed that by altering the mandibular position in this manner, the anteriorly displaced disks could return back to its normal position (recaptured),
  - Acute trauma with retrodiscal oedema and chronic, painful disc displacement disorders
    - to keep the condyle away from the retrodiscal tissues so that the inflammation can subside.



From Okeson JP: *Management of temporomandibular disorders and occlusion*, St. Louis, 2012, Elsevier, p 19, Figure 1-31.

ANTERIOR REPOSITIONING APPLIANCE

- Adverse effects:
  - With long term use of this appliance, there are permanent and irreversible occlusal changes.
  - Should be used with caution only for short periods of time as a temporary therapeutic measure.



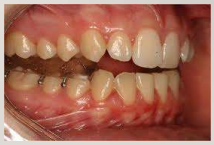
ANTERIOR REPOSITIONING APPLIANCE

ANTERIOR REPOSITIONING APPLIANCE

- Appliances for obstructive sleep apnoea

POSTERIOR BITE PLANE APPLIANCE

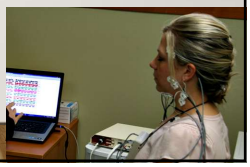
- Made to be worn on the lower arch.
- Design:
  - bilateral hard acrylic resin table located over the mandibular molars and premolars
  - creates a disocclusion of the anterior teeth,
- These appliances are intended to produce vertical dimension and horizontal maxillomandibular relationship changes.
- Adverse effects:
  - occlusion only on posterior teeth
    - allows overeruption of the anterior teeth
    - intrusion of the opposing posterior teeth,
    - **= Eventually lead to a posterior open bite.**



	Splint Type	Main indications
Full arch	Stabilization Splint	Myofascial pain and TMJ pains Bruxism associated toothwear Testing an increase of occlusal VD Tooth mobility from occlusal disharmony
Full arch	Anterior Positioning Splint	Disc displacement with reduction (clicking removed by protrusion)
Partial coverage	Anterior bite raising appliance	To create interocclusal space anteriorly
Partial coverage	Posterior bite raising appliance	To create interocclusal space posteriorly
Partial coverage	NTI-TSS 'Nocicpetive Trigeminal Inhibition-Tension Suppression System'	An alternative to the stabilization splint for myofascial pain and headaches but proof of efficacy limited.

NEUROMUSCULAR APPLIANCES

- Neuromuscular dentistry (NMD) have Advocated that by use of jaw muscle stimulators with jaw-tracking machines to produce an occlusal appliance that is at the ideal vertical and horizontal position of the mandible in relation to the cranium.
- Begins by relaxing the muscles around the jaw, using a Transcutaneous Electrical Neural Stimulation (TENS) device.
- A K7 machine is then used to find your optimal jaw position.
  - uses electromyography, sonography, and jaw-tracking scans to record muscle tension and listen to the jaw joint, while at rest and while functioning.



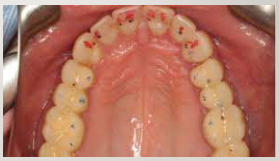
JUST TO PREVENT WEAR

MAKING AN APPLIANCE- STABILISATION APPLIANCE

- Clinical stages
  - Initial
  - Insertion
  - Recalls

CLINICAL OCCLUSAL ANALYSIS

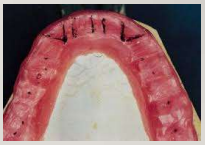
- Positional relationship of teeth in centric and eccentric jaw positions
- Muscle palpation
- TMJ assessment
- Evaluation of tooth wear



Item number: 963

TECHNIQUE

- Dental registrations
  - Impressions
    - Alginate / silicone impressions
  - Digital scanning
- Bite registration at the anticipated Vertical dimension
  - Can use
    - Leaf gauge
    - Lucia jig
- Mounting to check interocclusal separation / Digital software.

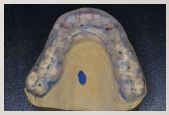


ADJUSTING THE SPLINT

- Armamentarium:
  - Articulating paper- red and blue held in millers forceps
  - Acrylic bur and exudate burs
  - Shim stock to check the heaviness of contacts
- Ensure that it is fully seated
- Check retention and stability
- Then check occlusion
- Shouldn't have much adjustment if the bite registration was correctly recorded and the laboratory didn't have to change vertical dimension.

ADJUSTING THE SPLINT

- Ensure that it is fully seated
- Check retention and stability
- Then check occlusion
  - 1. eliminate premature or deflective contacts
  - 2. establish uniform occlusion along entire occlusal surface of splint
  - 3. eliminate interferences in lateral and protrusive movements
    - Red for excursive contacts
    - Non-working side
    - Working side
    - Then protrusive interferences.
    - ENSURE MAINTENANCE OF THE HOLDING CONTACT



Problem	Cause	Solution
Instability	- Distorted impressions - Air bubbles in cast - Undercuts not blocked out	- Remake - Selective grinding of acrylic
Too retentive	- Too much overlap of acrylic - Proclination of anterior teeth - Undercuts not blocked out sufficiently - Polymerisation contraction of splint	- Shorten overlap - Ease the internal tooth fitting areas
Looseness	- No undercuts - Short clinical crown height	- Remake - Consider provision of clasps

RECALL APPOINTMENTS

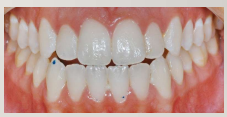
- Important
  - Rectify problems-
    - comfort,
    - occlusal changes
  - The splint must be continually monitored and adjusted.
    - When the muscles relax and/or inflammation subsides, the position of the teeth on the splint changes.
      - Helps to monitor temporomandibular stability

RECALL SCHEDULE

- See patient 1-2 weeks after the insertion
- After 3 months with no changes on the splint, a comfortable musculature, and no pain on loading, the patient is likely in a stable scenario. Then the following treatments can be started :
  - restorative dentistry,
  - orthodontics,
  - maxillofacial surgery, and segmental alveolar surgery.
- Longterm reviews
  - Especially check in youngsters who were yet to have 3rd molars erupted.

CASE:

- A lower stabilisation appliance was fabricated to reduce dental wear from nocturnal grinding.
- Recalled 2 weeks and then 6 weeks = each time had uniform occlusion on the splint.
- Recalled 4 months after insertion of a stabilisation appliance
  - Had noted improvement with the use of the appliance.
- Review noted a slight anterior open bite
  - Patient and her father felt that her occlusion was always like that.
  - Compared with the initial casts- an anterior open bite occurred.



= IDIOPATHIC CONDYLAR RESORPTION

- MRI of the TMJs:
- R TMJ: Evidence of prior erosion and remodelling of the articular surfaces, especially the sclerotic and irregular condylar stump. **This either represents the sequelae of idiopathic condylar resorption or juvenile idiopathic arthritis.**

SPLINT CARE

- Don't store in direct sunlight
  - Keep away from pets
- Never use toothpaste to clean the appliance
  - Liquid soap
- Never clean in hot water
  - Luke warm water
- Weekly soak for 15mins
  - Diluted white vinegar
  - Denture cleaning tablets

CONCLUSIONS

- Ensure patients don't make adjustments to their oral appliances
  - Occlusal changes
- Regular monitoring is required
- Casts and photographs are invaluable for comparisons during monitoring and treatment,
- There are many splints on the market- ensure that they are appropriately used
  - Correct situation
  - Patient compliance with instructions

THANK YOU

janinachristoforou@gmail.com