Prosthetic Rehabilitation and the TMD patient: When and what?

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Professor and Head, Prosthodontics
University of Toronto

Themes to cover

1. Given question deconstructed and refocused
2. Describe current problems with TMD as a disease entity
3. Prosthodontic therapy, demand and dogmas
4. The current scientific evidence to answer the given question
5. Prosthodontic management issues relative to patients with a TMD history

An individual enough distressed by real or perceived symptoms localized to the stomatognathic apparatus to seek therapy from a health professional

An individual enough distressed by real or perceived symptoms localized to the stomatognathic apparatus to seek therapy from a *health professional:*

Dentist… Family Physician… Kinesiology … Naprapathy… Pain expertise… Pharmacotherapy .. Physiotherapy… Posturologists ++ ?…Craniosacral- / Sacro-occipital therapy ?

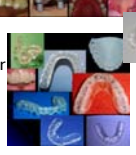
An individual enough distressed by real or perceived symptoms localized to the stomatognathic apparatus to seek therapy from a health professional

Prosthetic Rehabilitation and the TMD patient: When and what?

Rehabilitate and *habilitate* are different entities. Infer that something pre-existing has been lost, i.e., to be restored/readapted to former (health) state/condition. In dentistry, commonly applied to restore lost tissue. In other biomedical fields often to lost function.

Prosthetic therapies to restore primarily lost hard & soft tissues
Tissue/Tooth/ Implant -supported
Fixed / Removable dental prostheses

Prosthetic therapies to restore/readapt to a former functional state/condition
Splints; sleep apnea devices, maxillofacial prostheses, etc.)



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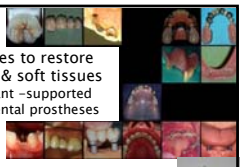

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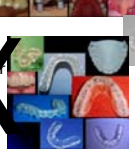

Primary refocused question to answer

Are patients undergoing therapy for their TMD problems affected by rehabilitation of form and/or function using a prosthetic therapy with regard to *precipitating or alleviating* their existing TMDs?

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Primary refocused question to answer

Are patients undergoing therapy for their TMD problems affected by rehabilitation of form and/or function using a prosthetic therapy with regard to *precipitating* or *alleviating* their existing TMDs?

Less focus: Can rehabilitation of form and/or function using prosthetic therapies *initiate*, alternatively *prevent* future TMDs?

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Themes to cover

1. Deconstruct and refocus the given question
2. Describe current problems with TMD as a disease entity

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Problem 1 – Clear understanding/consensus of the TMD disorder/disease subcategories?

- The Helkimo Index
  - (Helkimo, 1974)
- The Craniomandibular Index
  - (CMI, Friction & Shiffman, 1986)
- The Research Diagnostic Criteria for TMD
  - (RDC/TMD, Dworkin and LeResche, 1992)
- The Diagnostic Criteria for TMD
  - (DC/TMD 2010/2011(?))

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Problem 1 – Clear understanding/consensus of the TMD disorder/disease subcategories?

(ICD-10: K07.6)

Helkimo / CMI/RDC-TMD/DC-TMD index/criteria?

Entity separate from other health conditions?

- Pain local to oral, face, head, neck & shoulder, elsewhere (Diseases of the Nervous system (G00-G99)/ Musculoskeletal system and Connective tissue (M00-M99)
- Somatoform disorders (F45.8), e.g., Bruxism
- (Pathological) Tooth attrition (K03.0)
- Sleep Disorders (G47), e.g., obstructive sleep apnoea

Problem 2 – The inter-examiner reliability of assessing clinical signs and symptoms of TMDs is highly variable

Trained, Calibrated Examiners	
Clinical finding	**Degree of reliability**
Vertical mandibular opening (mm)	high
Lateral excursion (mm)	adequate
Opening pattern (left, right, left corrected, right corrected, straight)	low / unacceptable
Joint sounds (click, hard grating, soft crepitus, none)	adequate
Pain on palpation: intraoral & extraoral muscles	adequate
Pain on palpation: temporomandibular joint	low / unacceptable
Pain on mandibular movement	adequate
RDC Axis I diagnoses (various combinations of the above)	adequate

From: The Pain Symptom Research Web: http://painconsortium.nih.gov/symptomresearch

Problem 3 – Current measurements of subtle changes of the patients' TMD symptoms are rather crude with uncertain validity and/or poor reliability

- Pain: Patient VAS vs Palpation tenderness?

Frequency? Intensity? Unpleasantness? #/type drug?

- Quality of life / subjective improvement /comfort
- Functional criteria

Max. inter-incisal opening/ range of motion?

Chewing: Displacement, velocity, "pattern", border of envelope, etc.

- Joint sounds / quality & quantity; episodes
- Tissue condition

e.g. condyle positions in glenoid fossae /disc size & position, as determined by radiographic, MRI, cbCT or ultrasound imaging...

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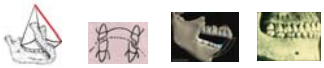

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We don't have a clear understanding why patients elect to undergo "prosthetic rehabilitation" of their teeth.

1. Self-esteem? ...young, beautiful, successful,...
2. Self-esteem?
3. Wish for a nicer smile?
4. Because they can show they can afford prosthodontic treatment?
5. Hope for improved chewing?
6. Other reasons?

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Dogmas in prosthodontics arrived by deductive logic Schuyler (35–63), Beyron (44–55), Pankey (48–80), Ramfjord (70–94), Dawson (80–10) ++

- Condyles resting in their most superoanterior position against the posterior slopes of the articular eminence
- Articular disks properly interposed between the condyles and the fossae
- Even and simultaneous contact of posterior teeth in CR
- Anterior teeth should contact and disclude the posterior teeth upon eccentrical movement
- In the upright head position the posterior teeth contacts more prominent than the anterior tooth contacts
- Provide the most shallow anterior guidance patterns that disclude posterior teeth
- Etc.

Great textbook:

Themes to cover

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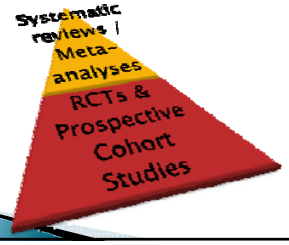
4. The current scientific evidence to answer the given question?

Usefulness of Medical Information to answer clinical questions



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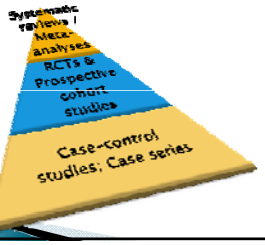
Usefulness of Medical Information to answer clinical questions



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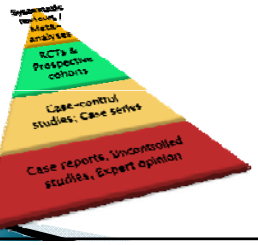

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Alternative PICO(S) questions:

Patient	Intervention	Comparative intervention /	Outcomes
TMD and desire for rehabilitation of oral form/function Modifiers: 1. Relatively Intact dentition 2. Loss of molar support 3. Edentulous jaws 4. Loss of VDO 5. Disc Displacement 6. Bruxing 7. General diseases			

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TMD and desire for rehabilitation of oral form/function Modifiers: 1. Relatively Intact dentition 2. Loss of molar support 3. Edentulous jaws 4. Loss of VDO 5. Disc Displacement 6. Bruxing 7. General diseases	**Partial fixed /removable** **Full fixed /removable** **Implant-retained & designs** **And/or with occlusion concept** **1. occlusal scheme design** **2. lateral guidance and mediotrusive balance** **3. anterior tooth arrangement** **Modifiers:** **– Canine vs group function** **– Tooth types (e.g. cusp angle)** **– Shortened Dental Arch** **– Intermaxillary relationship** **Vertical: VOD/rest position** **Horisontal: RCP –ICP distance**		

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TMD and desire for rehabilitation of oral form/function Modifiers: 1. Relatively Intact dentition 2. Loss of molar support 3. Edentulous jaws 4. Loss of VDO 5. Disc Displacement 6. Bruxing 7. General diseases	Will a: Partial fixed /removable Full fixed /removable Implant-retained & designs And/or with occlusion concept 1. occlusal scheme design 2. lateral guidance and mediotrusive balance 3. anterior tooth arrangement Modifiers: – Canine vs group function – Tooth types (e.g. cusp angle) – Shortened Dental Arch – Intermaxillary relationship Vertical: VOD/rest position Horisontal: RCP –ICP distance	**None** **Or** **Reversible** **Or** **Minimally invasive** **Or** **Alternative intervention**	

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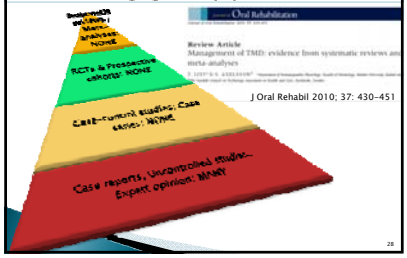
TMD and desire for rehabilitation of oral form/function Modifiers: 1. Relatively Intact dentition 2. Loss of molar support 3. Edentulous jaws 4. Loss of VDO 5. Disc Displacement 6. Bruxing 7. General diseases	Will a: Partial fixed /removable Full fixed /removable Implant-retained & designs And/or with occlusion concept 1. occlusal scheme design 2. lateral guidance and mediotrusive balance 3. anterior tooth arrangement Modifiers: – Canine vs group function – Tooth types (e.g. cusp angle) – Shortened Dental Arch – Intermaxillary relationship Vertical: VOD/rest position Horisontal: RCP –ICP distance	None Or Reversible Or Minimally invasive Or Alternative intervention	**a) Patient-relevant** **b) Clinical** **c) Surrogate** **d) Societal** **? Prosthesis longevity** **? Increase /decrease of TMD signs and symptoms**

Medical information addressing whether rehabilitation of form and/or function using prosthetic therapies precipitate or alleviate existing signs and symptoms of TMD?



J Oral Rehabil 2010; 37: 430–451

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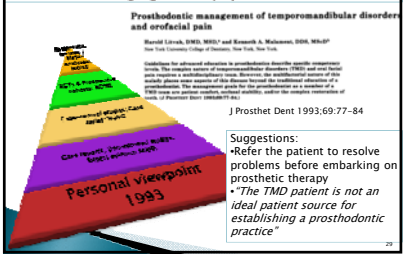
Medical information addressing whether rehabilitation of form and/or function using prosthetic therapies precipitate or alleviate existing signs and symptoms of TMD?

Prosthodontic management of temporomandibular disorders and orofacial pain



J Prosthet Dent 1993;69:77–84

Suggestions:
- Refer the patient to resolve problems before embarking on prosthetic therapy
- *"The TMD patient is not an ideal patient source for establishing a prosthodontic practice"*

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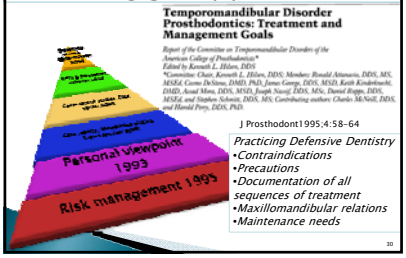
Medical information addressing whether rehabilitation of form and/or function using prosthetic therapies precipitate or alleviate existing signs and symptoms of TMD?

Temporomandibular Disorder Prosthodontics: Treatment and Management Goals



J Prosthodont1995;4:58–64

Practicing Defensive Dentistry
- *Contraindications*
- *Precautions*
- *Documentation of all sequences of treatment*
- *Maxillomandibular relations*
- *Maintenance needs*

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Medical information addressing whether rehabilitation of form and/or function using prosthetic therapies precipitate or alleviate existing signs and symptoms of TMD?

Prosthetic rehabilitation in patients with temporomandibular disorders

J Prosthet Dent 1996;76:418–23

Reviewed
- Decision-making in prostho.
- Controversies in pros.rehab.
- TMD patients in need of pros.
- Conclusions: Occams razor → Prosthetic parsimony

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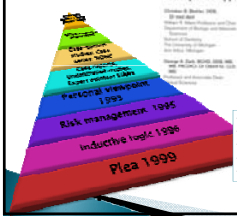
Medical information addressing whether rehabilitation of form and/or function using prosthetic therapies precipitate or alleviate existing signs and symptoms of TMD?

On the Management of Temporomandibular Disorders: A Plea for a Low-Tech, High-Prudence Therapeutic Approach



J Orofac Pain 1999;13: 255–61

- Many treatments –no cure
- *Patient heterogeneity*
- *Symptom management focus*
- *Guiding principles*
- *Challenges*

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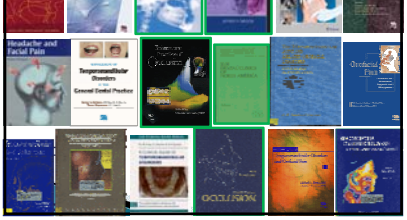
Textbooks 1994 to 2006

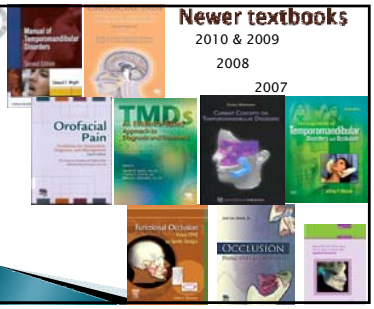


Newer textbooks

2010 & 2009

2008

2007



No evidence of effectiveness

is not equivalent to:

Evidence of no effectiveness

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Prosthetic Rehabilitation and the TMD patient: When and what?

A question that is no longer relevant …if ever it was:

Do patients with existing TMDs get better if the curative therapy consists of the provision of a tissue/tooth/implant-supported fixed/removable dental prosthesis?

Prosthetic Rehabilitation and the TMD patient: When and what?

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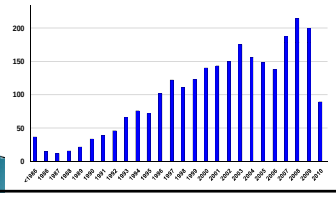
Do patients with existing TMDs get better if the curative therapy consists of the provision of a tissue/tooth/implant-supported fixed/removable dental prosthesis?

NO!

- Since 1975 approx. 2800 implant trials
- 3 reports include TMD as (insignificant) outcome
- NO reports identified where therapy associated with TMD/TMJ problems



Why have dentists traditionally believed that elements of the maxillo-mandibular complex caused or could cure TMD?

- "Orthopedic stability" of joint
- Altered propriosensory input to CNS
- Since 70-ies, "disk recapturing" using an anterior displacement splint advocated (Farrar, 1972)

E.g., Summer & Westesson. Mandibular repositioning can be effective in treatment of reducing TMJ disk displacement. A long-term clinical and MR imaging follow-up. Cranio 1997; 15: 107-20.

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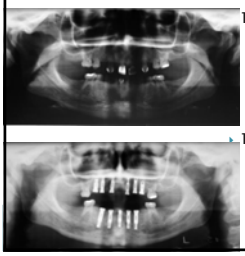
Anterior disk displacement

- Anterior repositioning of jaw by habitual 24-hour use of repositioning splint with the intention of promoting adaptation of retrodiscal tissues

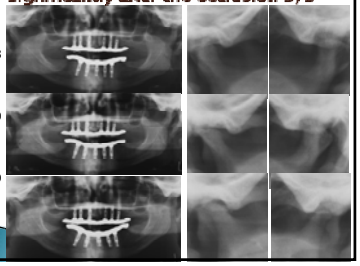
- Subsequent orthodontic or prosthodontic correction of space? Originally Yes
  - **YES:** Moloney ea 1986, Lundh 1997, Summer ea 1997
  - **NO:** Keeling ea, 1989, Tallents ea 1990, Parker 1993, Orenstein 1993, Okeson 1988
- Literature inconclusive - primarily due to vague / surrogate outcome reporting

Degenerative processes in the tmj can significantly alter the occlusion 1/3



Degenerative processes in the tmj can significantly alter the occlusion 2/3

Degenerative processes in the tmj can significantly alter the occlusion 3/3



Bruxism (ICD-10 F45.8)

Patients with bruxism having received a prosthodontic intervention have had:

- no effects on incidence or level of nocturnal or diurnal bruxism

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Patients with bruxism having received a prosthodontic intervention have had:

- no effects on incidence or level of nocturnal or diurnal bruxism

conversely,

Patients having received a prosthodontic intervention therapy have shown:

- no development of nocturnal or diurnal bruxism

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Bruxism & rehabilitation

Minimize risk of technical/mechanical problems:

- FDP: Minimize number of:
  - Units in FDP(s) (multiple short rather than long segments)
  - Pontics
  - Cantilevers (especially if non-vital teeth)
- High strength material versus aesthetic compromises
  - All-metal >> Metal ceramic >> All ceramic
    - Cobalt-chromium >> Gold-alloy -DELTA
- RDP: Bulk+composite fibre/metal reinforcement
- Consider full coverage splint during sleep

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Reduced Vertical Dimension of Occlusion

Is tooth substance loss without compensatory tooth eruption and/or alveolar crest height increase

1. ...that remain unchanged a risk factor for initiating TMD?

NO

Reduced Vertical Dimension of Occlusion

Is tooth substance loss without compensatory tooth eruption and/or alveolar crest height increase

1. ...that remain unchanged a risk factor for initiating TMD? Alternatively,
2. ..that is changed with a prosthetic solution a factor for preventing future TMD?

NO

Reduced Vertical Dimension of Occlusion

Is tooth substance loss without compensatory tooth eruption and/or alveolar crest height increase

1. ...that remain unchanged a risk factor for initiating TMD? Or 2. ...that is changed with a prosthetic solution a factor for preventing TMD?
3. ... that is changed with a prosthetic solution possible prognostic factor for precipitating or alleviating TMD?

Data are inconclusive

Reduced Vertical Dimension of Occlusion

Is tooth substance loss without compensatory tooth eruption and/or alveolar crest height increase

1. ...that remain unchanged a risk factor for initiating TMD? Or 2. ...that is changed with a prosthetic solution a factor for preventing TMD?
3. ... that is changed with a prosthetic solution possible prognostic factor for precipitating or alleviating TMD?

How much? How fast?

- Splints for determining VDO is debatable

Data are inconclusive

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Information and Communication and is essential!

- Patients should be specifically reminded that there is a chance of symptoms exacerbating during or after the prosthetic rehabilitation.
- Relapses can happen independently from the intervention and just by chance alone.
- Excessive time in patient chair may exacerbate symptoms. Use bite props and limit / break up the operation time

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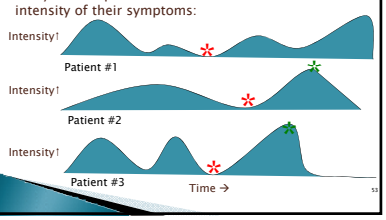
When is the timing of prosthodontic therapy appropriate for a patient with a past or current history of TMD?

Many have unpredictable recurrence and inconsistent intensity of their symptoms:



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Caveats if treating patients with current history of TMD

- The registration of the maxillo-mandibular relations can be incorrect if the movement range is affected
- Registration can also be hampered by voluntary or reflexive muscle splinting upon attempt to guide the mandible into centric relation

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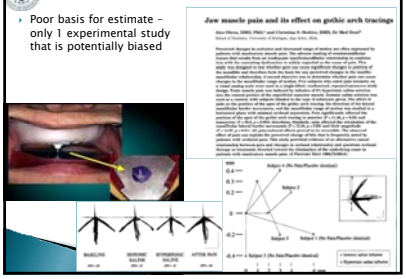
"How much incorrect registration?"

- Poor basis for estimate – only 1 experimental study that is potentially biased



Caveats if treating patients with current history of TMD

- The registration of the maxillo-mandibular relations can be incorrect if the movement range is affected
- Registration can also be hampered by voluntary or reflexive muscle splinting upon attempt to guide the mandible into centric relation
- The use of a splint can disrupt the existing neuromuscular engram so that the recording of centric relation can be facilitated

Do patients with current or past history of TMD have a different threshold for adapting to maxillomandibular relation changes?

- The literature is inconclusive

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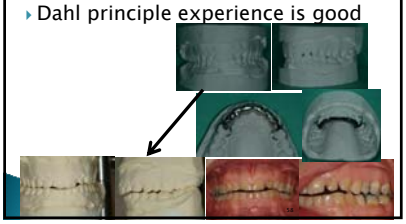
Do patients with current or past history of TMD have a different threshold for adapting to maxillomandibular relation changes?

- The literature is inconclusive
- Dahl principle experience is good



Do patients with current or past history of TMD have a different threshold for adapting to maxillomandibular relation changes?

- The literature is inconclusive
- Experiences using the Dahl principle is positive
- Precautionary steps are
  - Fabricate a robust semi-permanent FDP first for long term use
  - Always delay the final cementation

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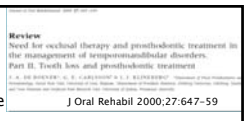
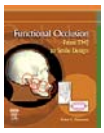
Classic paper from 2000 summarized the contemporary state of the science



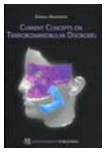
Review
Need for occlusal therapy and prosthodontic treatment in the management of temporomandibular disorders.
Part II. Tooth loss and prosthodontic treatment

J Oral Rehabil 2000;27:647-59



Dawson, P. 2007

Contrast perspectives in a very influential North American textbook



Prosthetic Rehabilitation in TMD Management. Chapter 28. *De Boever JA, De Laat A. 2010*

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Is our current interpretations of the basic research as a basis for clinical practices correct?

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Thank you for your kind attention

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