PROBLEM SOLVING
AND
TREATMENT PLANNING GUIDELINES:
What we didn't teach you in dental school

DIAGNOSIS AND MANAGEMENT OF TMDS
AND OCCLUSION IN 2017:
Science or Smoke and Mirrors

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Thank you for the kind invitation to present at your Hawaii Dental Association Annual Meeting.

Also, a special thank you to Dr. Gary Umeda, dedicated members of the Hawaii Tanaka Study Group and Professors Kitagawa and Nakagi for their friendship and support for the past 15 years.

Why do we need an interdisciplinary approach to Problem Solving?

- Dental problems almost always present as interdisciplinary problems involving pediatric growth and development problems, periodontal, endodontic, restorative, orthodontic and or surgical problems.
- Dentistry in 2017 requires a New Playbook.
- Problem solving and treatment planning in 2017 requires dentists to broaden their area of study to include why malocclusions occur, how they are diagnosed (guidelines) and how these will guide your problem solving and treatment planning efforts.

Now that you have the “experience,” you should be able to relate to the new guidelines more easily.

“Experience is what you get, right after you need it”

We tend to learn more from our mistakes than from our successes because they make us “think” about the possible reasons why the errors occurred.

- “Balancing side tooth contacts should not be removed in 90 % of patients.”
- Dental schools focus their curriculum on how to perform a limited number of dental procedures and do not have the time in 4 years to teach most of today's guidelines.

Therefore, 90 % of what you know today, you learned after you graduated from dental school.

One of the problems facing dentistry today is that the recent graduates are enthusiastic but know only a little about a lot of subjects and lack experience, but their dedication will reward them in time.

The other problem is that many of the older graduates haven't been keeping up and continue to rely on what they learned in dental school. In fact many over the age of 55 don't use the Internet
to look for answers to dental and medical questions even though, Google Science and PubMed are readily available.
As Brian Fitzpatrick states below, When they have questions, they don't look it up by themselves, "They call and ask their friends." As doctors of dentistry, we must keep abreast of the literature and the new science by doing our own reading.

How much evidence do we have for the dental treatments that are being performed today?

“7% to 8% of all dental treatments are evidence based, and that greater than 50% of general dentists in their study, turn to friends and colleagues for evidence rather than looking in peer-reviewed journals, textbooks and electronic databases.”

Brian Fitzpatrick Int. J Pros Vol.21,No.4;2008:358-363

Read not to contradict or confute, nor to accept and take for granted, but to weigh and consider.

Francis Bacon

Your reading should also be reinforced with participation in an interactive study group where you are encouraged to bring your own patient cases, ask questions and participate.

Dental educators and the ADA and AGD have known this for many years, that is why the "participation" credits were designed by the AGD instead of lectures only. In lectures only, study club members would sit and listen to a different speaker each month, as the words would go in one ear and out the other, little was retained.

Today's programs are designed to be interactive. You must participate or, “you snooze, you lose.”

It's time to learn for yourselves and not rely so much on others. Both you and your patients will be the beneficiaries.

Thank you for attending today's program.

I will do my best to bring you a helpful review of Problem Solving and Treatment Planning concepts that are taught in my graduate programs.

Why should dentists have a better understanding of pain and temporomandibular dysfunction?

General Dentistry, Pros, Oper.:
- Clenching, bruxing may result in muscle soreness and myofascial pain which:
- May result in limited mouth opening
- Inability to make accurate interocclusal records causing multiple crown adjustments
- Produces transient interferences and malocclusions. Be careful with this one.

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• Post Tx. Muscle and TM joint soreness and dysfunction
• Occlusal instability- feels like bite changes
• Causes remakes and “do overs,” with loss of patient confidence and even lawsuits.

**Specialty Practices: Endo. Perio:**
Limited mouth opening will make molar endo. and perio. surgery very difficult and painful for the patient.

- Perio: Secondary occlusal traumatism with continued occlusal traumatism & mobility
- Endo: has resulted in Tx. of the wrong tooth
- Endo: Unnecessary redos.
- Post- op pain & dysfunction may result in angry patients and loss of referrals.
- Lawsuits

**Problem solving Pain Disorders: 101**
- What are the Basics Guidelines?
- You should know when to treat & when to refer. “When to Hold them or fold them”
- You should understand basic human anatomy and clinical neurology
- You should know the difference between pain caused by:
  - Muscle problems, TM Joint problems, Neuropathic pain problems (CNS)
  - Muscle problems: stages of muscle dysfunction, what is myofascial pain?
  - Localized TMJ arthritis (OA) and arthritis caused by systemic disorders (RA)
- Other medical disorders that affect the TM Joints; e.g. Auto-immune etc.
- You should understand basic pharmacology: dose dependent and medication specific rules when using NSAIDs, muscle relaxants and use of vapo-coolants in pain management. (“Don’t use Endo-Ice”)
- Tooth pain: Pulpal involvement, hyper-occlusion, cracked tooth, cracked root, referred pain to teeth from other teeth or extra-oral sources.

**Study casts as part of the Essential Patient Records will be included in the Occlusion Guidelines**
- "Study casts are a mandatory part of patient records."
- "If the dentist does not make study casts routinely, it is understood that he/she has a photographic memory and can recall every tooth contact on closure, every wear facet on every tooth, every open contact and skeletal inter-occlusal relation (anterior open-bite) with the opposing arch."
- Spend time to "observe" and examine the study casts, wear facets and wear patterns and skeletal arch relationships.
- Indications for study casts: mounted and un-mounted casts, accuracy of mountings
Centric records: indications, accuracy
Clinical Examination Guidelines:
Masticatory function and dysfunction: force management
Significance of the range of opening/closing, side to side and protrusive movements
Joint Loading Test (CR Recording)
Muscle palpation tests
TMJ palpation tests
Imaging: indications for FMXR, CBCT, MRI
When will FMXR and bite-wing x-rays suffice?
When are CBCT images required? - to demonstrate the osseous structures and any remodeling of the condyle or eminence, MRI’s cannot show this as well as CBCTs.
When are MRI Images required? - To demonstrate the soft tissue structures, e.g. the disc and disc movement, can’t see this on a CBCT.

Pain Management: 101
Pain is classified as either Physical or Psychological

Orofacial Pain: Axis I
- Axis I problems are the Physical Disorders which include:
  - Vascular
  - Neurogenic
  - Neuro-Musculoskeletal Disorders
  - TMDs, Musculoskeletal pain, Internal derangements of the TMJ and inflammatory disorders that affect the TMJs are in this category.
  - Neuropathic Pain and the Centrally Mediated pains

Orofacial Pain: Axis II
Axis II problems are the Psychological disorders which include personality Disorders:
Depression, Anxiety, Bi-polar disorders are the 3 most commonly seen disorders by dentists.

Classification of Temporomandibular Disorders (TMDs):

Masticatory Muscle Disorders
1. Protective Co-Contraction
2. Local Muscle Soreness
3. Myofascial Pain
4. Myospasm
5. Chronic Centrally Mediated Myalgia

Temporomandibular Joint Disorders:
Derangements of the Condyle-Disc Complex
a. Disc Displacement with Reduction
b. Disc Displacement without Reduction

Structural Incompatibilities
a. Adhesions
b. Deviation in Form
c. Subluxation
d. Spontaneous Dislocation
Tanaka Pain & Dysfunction model 1976-2017:
Developed and modified at the UCSD Medical Center and USC School of Dentistry by Dr. Tanaka with valuable help from UCSD faculty and the CRF Research Team. UCSD Faculty: W. Wiederholt MD, T. Davidson MD, M. Weisman MD, J. Harris MD, PhD; CRF Research Team: D. Hancock, DDS, JL Ozawa, DDS, L Yoshioka, DDS, D Lurye, DDS

Tanaka Pain Model: *The key question is, what medication reduces or eliminates the pain?*

The two most important Keys to Diagnosis are to 
"*Listen* to the patient and "Observe" the patient and the casts carefully

***Rule # 1:***
"*Pay Attention*” and "*Listen*” to the Patient!"

WHY?

"The patients will tell you what the diagnosis is by the words that they use to describe their problems.”

“I get this sharp, shooting pain in my tooth #28, that lasts for a half hour, then gets better, but comes back again if I touch the gums with my finger or a toothbrush, None of my strong pain pills, codeine, for my back pain will stop the pain, even the splint my dentist made me didn’t help.”

- Were you paying attention as the patient described the Pain?
- What type of pain is the patient describing in the next sentence?
- Vascular, Neurogenic, Neuro-musculoskeletal or psychogenic pain?
- Is it pain from tooth #28?
- What other key question should you ask?
- What is your diagnosis for the pain? ________________
- What treatment or referral would you recommend? __________
- What do you expect the prognosis will be with the proper medication?

**PATIENT ROUNDS 2:**
- The Patient Interview: When Two People Meet
- Clinical Neurology for Dental Specialists
- Neurologic Examination of the Patient in Pain
- Cranial Nerve Examination
  - Examination of the 12 Cranial Nerves:
    - Sensory & Motor Function & Pneumonics (Tanaka T)

**When Two People Meet: The Patient Interview**

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Listen and consider the following:
Neuro-musculoskeletal Pain: Myofascial Pain & Myalgia (75-80% of Pts.)
Tension Type HA (TTH), formerly called “Muscle Contraction HA”
Stages of Muscle Dysfunction and Myofascial Pain:
(1) Sustained muscle contraction,
(2) Myalgia, (Local muscle soreness)
(3) Myofascial Pain (can refer to other distant sites),
(4) Muscle spasm with tetanic contractions,#4 rarely seen by dentists, but possibly in
patients with cerebral palsy

“Stretch and Spray” for Endo, Perio, Restorative, Implant Procedures
“Be careful and do not spray the vapocoolant in the eyes or ears.”
Ethyl-Chloride, Gebauer Co.

How do Muscle Disorders affect the occlusion?
(Summary below by Tanaka.) See Okeson 6th ed. CV Mosby
(A)  Sustained muscle contraction: resulting from clenching, bruxing
(B) Protective muscle co-contraction: formerly “muscle splinting,” may result in limited
mouth opening and minor changes in the occlusion.
(C) Local muscle soreness: Pt. feels discomfort and or pain in the affected muscles,
occlusal changes noted, “confusion about the “bite” from one day to the next.
Limited mouth opening with “soft end-feel.”
(D) Myofascial pain: muscle pain at rest and when chewing, limited mouth opening with
soft end-feel, occlusal changes noted with confusion about the “bite.” Muscles may
shorten more on one side than the other side.
** Pain can be referred to another site near the affected muscles.
** Do not equilibrate the teeth during any of these stages.”

Palpation of SCM & Lymph Nodes:
• Palpation skills: palpate the facial muscles with moderate pressure against bone,
(temporalis & masseter).
• SCM: Be careful to hold fibers between your fingers but use light pressure in the carotid
triangle to avoid pressing on the Carotid bifurcation.
• Don’t press firmly on the carotid bifurcation (triangle), you may release the plaque
Palpation of SCM & Lymph Nodes in individuals older than 40 should be done with
gentle pressure on the bifurcation.
• Some of the plaque in the Carotid Artery becomes calcified & is hard as gravel in the late
stages.
• Vigorous palpation may dislodge the plaque.

Central Sensitization and Centrally Mediated Pain:
Neuropathic Pain and “Convergence” (Central Excitatory Effect)
• It may not be a Psychogenic pain. Patients were accused for years of being malingerers
and whiners attempting to get attention. Why because the doctor was not intelligent
enough to make the proper neuropathic pain diagnosis.
If a doctor resorts to name calling, he/she doesn’t have a diagnosis.
Continuous bombardment of painful sensory input to the higher centers may lead to a sensitization of the higher centers, resulting in a pain that now originates in the higher centers and continues to be felt in the original treated site.

An example, is an endodontically treated tooth that continues to illicit pain even after successful endodontic treatment.

Analgesics, NSAIDs and narcotics will not relieve the pain.

Neuroleptic drugs - Neurontin, Tegretol will usually relieve the pain, but do not prescribe either drug without first taking a thorough health history. There are contraindications and side effects in some patients and the author suggests referring the patient to a neurologist.

Neurogenic or Psychogenic Pain? (slide series)

- History: Chief Complaints, Patient has a 3 yr. history of “Persistent pain” in the upper left edentulous ridge. Pain started as a sharp, shooting pain in the upper left 2nd molar and has not been relieved by endodontic treatments or extraction of #15,14, & 13.

- Slide of self-adjustment of the teeth by a patient: “I've had so many occlusal adjustments that I finally went to Home Depot and bought some wet and dry sand paper and cut out some horse show shaped pieces and decided to just chew until it felt good myself.”

- “Don’t assume that the pain is “Psychogenic” because you can’t make the diagnosis.”

- Pain description: Will vary between patients and between appts. & may be inconsistent. Patient may not be aware of the above.

**If the diagnosis cannot be confirmed, do not initiate reversible treatments, (avoid occlusal adjustments).**

Dentists should have a common understanding of:
1. Medicine and the other Specialties in Dentistry,
2. How diseases and physical disorders affect the ability to treat dental disorders,
3. How are pain and occlusion involved in all of these?

Neuro-Musculoskeletal Pain:
Muscle disorders, local muscle soreness, Myofascial Pain & Myalgia

- This group is 75-80% of all patients
- Tension Type HA (TTH) 80% of Headaches
- Progression of muscle disorders that progress from clenching, bruxing, oral habits
- Protective muscle co-contraction (limited range)
- Local muscle soreness
- Myofascial Pain and pain referral to other sites
- Muscle spasm (rare)

The Muscles of Mastication: Palpation of the Temporalis, Masseter, Medial Pterygoid, Digastric: anterior and posterior fibers
Anatomy and Function of the Temporomandibular Joint

The dumbbell shaped disc should move with the condyle because of the shape of the disc?

What causes TMJs to click? (Tanaka, et al)
- Normal Mouth opening is 40-45mm and equal to two fingers between the U/L incisors.
- 3 Fingers is equal to 55-65mm opening which is a hypermobile opening.
- Is there an ideal condylar position in the fossa? (NO)
- Stages of Disc Displacement (Jeff Okeson DVD)
- Late stages of disc displacement (Jeff Okeson DVD)
- **Hypermobility: 55-70 mm.** (leads to overstretching the posterior attachment apparatus and joint laxity which allows the disc to migrate anteriorly and medially).

Does “clicking” mean that the disc is displaced? Studies by: Tanaka, Hancock, Ozawa, Yoshioka, Lurye, ACP 2005, AES 2008, 2014 AES, APS 2014
- Use a stethoscope to listen for TMJ sounds. **Note, a sound enhancing apparatus only makes the sounds louder, it does not diagnosis a TMJ problem. This apparatus is often used to convince the patient that they need various treatments.**
- 40%+ of opening clicks at 30-40mm occur as the condyle passes over the crest of the articular eminence. **Tanaka etal. (Test this by gentle palpation of the lateral pole of the condyle as the patient opens the mouth, and then feel the click as the condyle passes back over the eminence as the mandible closes).**
- There is a “late opening click,” and you will hear an “early closing click” almost immediately as the mouth starts to close back over the crest of the eminence.
- A displaced disc will usually click anywhere on opening but will almost always have a late closing click when the teeth are almost touching. **Tanaka, APS Amer. Prosth. Soc. 2014**

The Joint Loading Test:
- Ask the Patient before the Joint Loading Test if they are experiencing any TM Joint discomfort eating, chewing singing or talking? Instruct patient to keep eyes open during this test.
- If no, gently load the TMJs as in making a CR record, then ask the patient to open and close to 20mm several times.
- CR record is taken at closure point from 5mm of mouth opening
- If no discomfort, this is most likely no joint problem and dental procedures and you may continue with the dental procedure. Repeated below.
- Using the Bi-manual Dawson Technique, gently seat the condyles into the fossae.
- If the TMJs are able to accommodate the pressure, continue to seat the condyles into the fossae and then ask the pt. to open and close 10-15mm in a hinge motion.
- If the Pt. remains comfortable, you may continue the exam.
• If the TMJs are uncomfortable with even gentle pressure, one should consider reappointing the patient and referring the Pt. back to the referring dentist.
• * The joint loading test is valuable in diagnosing VME, vertical maxillary excess at the CR position with the condyles seated. Tanaka manuscript in progress

** TMJ Remodeling: **
Oral habits and tooth wear related to osseous remodeling of the TMJ *(Tanaka, APS 2015 Annual Meeting)*

** Joint Loading Test and Centric Relation Records ** *(Tanaka, manuscript in progress)*
* The status of the TMJ joints should be determined before making CR Records. and before initiating all dental procedures. 

What is the Relationship between Occlusion and TMD Symptoms and how can the clinician interpret and use these studies? 
Okeson reviewed the findings of 78 epidemiologic studies that investigated the relationship between occlusal factors and TMD symptoms. Pub Med search from 1979 - 2008

Are TMDs caused by Occlusal Interferences? 
The answer depends upon:
  1. How far the patient has to move the mandible to fit the teeth together, and….
  2. Is this amount within the “adaptive range” of the patient?
  3. Is the patient able to tolerate the range of adaptation, e.g. .5m or 2.1mm?
  4. What is the physical and psychological condition of the patient?
  5. Does the patient clench or brux?

Tanaka Summary of the effects of occlusal interferences: 
** The first question should be: What is causing the occlusal interference instead of: How am I going to treat the occlusal interference?**

*It is critical therefore, that the clinician understand the terminology when discussing temporomandibular disorders and occlusion*

*The presence or degree of the CR-MIP slide is not as important as what the individual does with the slide*

*If the individual does not engage in oral habits, (clenching, bruxing), they will rarely experience TMD signs and symptoms (Exceptions may include trauma & systemic diseases.)*

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Muscle Dysfunction and The Adaptive Centric Position

“70% to 80% of muscle dysfunction occurs because of sustained contraction and or emotional stress, not the slide from CR to MIP.” The doctor must ask him/her self, what altered the patient’s ability to tolerate the adapted occlusion?

Stages: (Okeson; Mahan et al)
1. Sustained contraction (clenching/bruxing)
2. Local muscle soreness
3. Myofascial pain – muscles are painful at rest and with movement.
   • Painful muscles can refer pain to adjacent sites.
   • Painful muscles can cause transient, altered tooth contacts on closure, seen as interferences and malocclusion.

Do not adjust occlusion in the presence of pain if you suspect the pain is related to one or more of the following:
- Systemic disorders, Trauma & Genetic Disorders
- Central (CNS) - Cerebral Palsy - sustained clenching; Bruxing
- Movement Disorders - Parkinsons, Huntingtons Disease, Tardive/Orofacial Dyskinesia from anti-psychotic meds. (Thorazine, Artane)
- Systemic disease – RA, inflammatory disease that alters the occlusion and destabilizes the occlusion.

Occlusal Forces and Muscle Dysfunction:
The response to occlusal loading forces is dependent on 3 basic factors:
- Time, Direction, and Load
  Other contributing factors are:
  • Facial type, (e.g. Brachyfacial, Dolicofacial), Gender, and Patient Age

What are the current etiologies and treatments for TMDs?
1. Muscle Disorders: current therapies include splint therapy, muscle relaxants (Flexeril), NSAIDs, behavioral factors.
2. Muscle disorders, myofacial pain, orthotics (splints) of varying types are effective for different reasons, behavioral Tx, (Efficacy of splints, ref. Dao et al J Pain, 1994)
3. Muscle and Joint disorders: current therapies include splint therapy, muscle relaxants, (Flexeril), NSAIDs behavioral therapy physical therapy, exercise and limited use of mild anti-depressants (Elavil & other OTC non-prescription medications)
5. Possible airway and sleep disorders: Park, Lavigne, Dement, Cruz

What are current treatments for TM Joint disorders?
(Local, OA, synovitis, NSAIDs effective; Systemic & Auto-immune joint disorders involving inflammation and active remodeling, require specific RA and other meds.)

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1. Current therapies include: splint therapy, muscle relaxants (Flexeril), NSAIDs (Ibuprofen, Naproxin sodium, Enbrel, Tetracyclines).

2. Splints may be used to provide a stable temporary base for the changing occlusion, not as a specific therapeutic treatment for inflammation.

References for Occlusal/ Inter-proximal Forces, and Crowding of Mandibular Incisors:

Gibbs, Lundeen, Mahan- diurnal forces
Nishigawa – nocturnal forces
Kasahara – Interproximal contacts when biting
Bando, Yamagawa – Interproximal forces
Duygu etal- Bite force & influential factors on bite force measurements Lit Rev:
Abstract: Maximum voluntary bite force is an indicator of the functional state of the masticatory system and the level of maximum bite force results from the combined action of the jaw elevator muscles modified by jaw biomechanics and reflex mechanisms. The measurement of bite force can provide useful data for the evaluation of jaw muscle function and activity. Eur J Dent April 4(2):223-232). USC

Diurnal and Nocturnal Occlusal Forces (Tanaka, manuscript in progress)

85 lbs. – max. diurnal bite force – anterior teeth
185 lbs – max. diurnal bite force- posterior teeth
95-200 lbs – nocturnal forces – anterior teeth
290-400+ lbs. –nocturnal force – posterior teeth
2x-3x+ -nocturnal forces are greater

58 lbs – Chewing forces
68 lbs - Swallowing forces

Occlusal Therapies:

- Occlusal Adjustment, Occlusal Equilibration, and Minor Occlusal Adjustments are frequently necessary when inserting crowns with occlusal coverage and require no special guidelines; for patients with VME and other skeletal disorders
- The occlusion should be worked out before the milling and fabrication of digital restorations
- Usually consider adjusting the distal buccal cusps of the max.1st and 2nd molars in a “working” movement. Ref. 6 Keys to Occlusion, Andrews, Larry
- Consider adding composite to the lingual of the max. canines for canine guidance,
- Complete Occlusal Equilibration is not indicated very often by GPs but should follow the BULL Rule.
- Pre-equil. a set of mounted casts before any adjustments.
- Don’t schedule equil. Appt. at 8:00am for nocturnal clenchers and bruxers.
- Make a splint over the final seated crowns to protect the teeth and restorations.

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References:
1. Incisor display at rest, a function of aging, Vig RG, Brundo GC JPD 39:502-504, 1978; Sackstein M 2008 Int J Pros
2. The mean positional changes of the maxilla during adult life, for both sexes combined: Behrents RG 1984
3. The human face will continue to grow from age 37 to at least 77. Mean dimensional changes in the mandible for males during adult life: from Behrents RG 1984 U. Michigan, A treatise on “The Continuum of Growth in the Aging Craniofacial Skeleton”

“How will continued growth alter the anterior guidance, e.g. overbite & over-jet?”

Aging and Oral Habits
1. The overjet will decrease from ages 37-77
2. The mandibular incisors will move lingually.
3. The maxillary incisors will move downward
4. Both arches will become shorter from anterior to posterior.
   Behrents R. 1984 Contemporary Orthodontics, 2007 Proffit, Fields, Sarver

Aging and Occlusion and esthetic concerns:
1. Less and less of the maxillary incisal edges will be visible as the patient ages.
2. A tendency toward a constricted anterior envelope will develop with increasing age.
3. Wear will be seen at the lingual of the max.incisors. & labial of mand. incisors.
4. Retrusive forces may lead to TMDs

Aging and Oral Habits
1. The overbite will increase with age.
2. The overjet will decrease with age.
3. When #1 and 2 occurs, the initial contact on closing will be more incisal with max. teeth
4. The incisal contact at full closure may be more lingual, resulting in retrusive forces on the mandible
5. HAs and neckaches (TMDs are frequently seen in patients with retrusive forces on the mandible.. Rec Tx: Orthodontic Tx.

Chewing envelope decreases
- HAs may be related to the occlusion
- Clinical signs: Fremitus, TMD (HAs, neckaches)
- Rec. Tx: NSAIDs, Splint Tx, Ortho, P.T., Chiro.

"THANK YOU FOR YOUR KIND ATTENTION."
I HOPE YOU HAVE A HAPPY AND HEALTHY 2017.

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IF YOU HAVE FURTHER QUESTIONS, PLEASE SEND EMAIL TO:
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SINCERELY,
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Splint Therapy for the Management of Muscle and TM Joint Disorders
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Hawaii Dental Association
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