

Controversy in TMD: Putting the Issues in Perspective

Experts have long disagreed over management and measurement of temporomandibular disorders. This article applies critical reasoning to evaluate the different models for dealing with TMD's. Differences over definitions, research methodology and paradigmatic concepts are discussed. Huge deficiencies in the psychosocial model are identified. Validity construct utilizing objective measurement of biological phenomena is presented as a more logical approach.

Scientific Concepts

James Gleick, in his biography of Nobel Laureate Richard Feynman, entitled "Genius," wrote that Feynman "did not so much explain how the world was or why it was that way, as tell us how to confront the world." What was important to him was not knowledge of or knowledge about, but knowledge *how to*.

"I have approximate answers and possible beliefs and different degrees of certainty about different things, but I am not absolutely sure of anything. I can live with doubt and uncertainty and not knowing. I think it is much more interesting to live not knowing than to have answers which may be wrong," was Feynman's credo.

Science means different things to different people. Science is neither a list of facts nor the discovery of facts. For human beings to act in a scientific way, two things are essential -- fact and thought. Factual discovery is important, but the basis of science is the successful integration of the implications of any discovery into people's lives.

There is a progressive development in the understanding of science which begins with descriptions of observed phenomena or behavior and advances to study of underlying mechanisms, processes and then explanations. If a science is purely descriptive and phenomenologic without explanation of underlying processes and mechanisms, it is said to be "soft" which implies "less scientific."

A natural hierarchy exists in the sciences. Elementary particle physics is the most basic scientific discipline and, therefore, is the paradigmatic "hard" science. Chemistry, which is most concerned with the behavior of objects such as atoms and molecules derived from particle physics is next. Biology which reduces to both chemistry and physics for explanation of phenomena observed is more complex, but down a rung on the science ladder. Psychology, which attempts to describe the phenomenology and function of the mind, requires integration of physical, chemical and biological mechanisms, and, as such, is still more complex. It is often possible to provide correlation, but rarely mechanical or chemical explanations. Therefore, psychology is referred to as a "soft" science.

The search for knowledge is amorphous. Science is the pursuit of objective

knowledge about the "real world" of our experience. Objectivity of scientific statements is based on their testability, refutability or falsifiability. This criterion is the line of demarcation between science and pseudoscience. Said another way, the hallmark of a scientific statement is that it is vulnerable to refutation. A scientist cannot accept any statement as true because it does not seem possible (for any logical reason) to test it. The social sciences' claim of expertise depends on their ability to produce testable explanations and their survival under scrutiny.

Knowledge how to explain something. Epidemiological studies provide numerical facts on a sample group identifying statistical correlations, but they do not explain anything. Doctors, given a choice between equally weighted causal explanation and a statistical correlation, will almost invariably choose to rely on the explanation.

The concept of explaining scientific observation in terms of established fact at a more basic level is said to be reductionism. Thus an explanation of the behavior of a specific chemical, relative to what is understood about atomic structure is said to be reductionist. Explanation of biological behavior in terms of "known" physiological or biochemical facts is another example of reductionism.

Relating to Temporomandibular Disorders

In evaluating controversies over the management and etiology of temporomandibular disorders, one must understand more than just the conclusion of the researchers. The values, definitions, validity of the premises and methodology of the researcher are critically important, but one must also elucidate the validity of the science in the context in which it is being utilized.

Dworkin, in a 1993 NIDR conference, defined disease as "an objective biologic event involving disruption of specific body structures or organ systems caused by pathologic, anatomic or physiologic changes." He defined illness as "a subjective experience or self attribution that a disease is present, yielding physical discomfort, emotional stress, behavioral limitations and psychosocial disruption." He claims progressive pathophysiologic change *cannot* be reliably diagnosed in TMD's and concludes that, "TMD is more usefully characterized as an illness." Within his psychosocial model, TMD is a self-limiting condition with no evidence of progressive deterioration of physical structures or physiologic functions.⁴ Advocates of such a model claim to diagnose TMD, measure TMD prognosis and treatment and document disability by studying self-reports of pain, anxiety, hostility and depression. Pain is their gold standard. Their scientific diagnostic criterion, reduced to its lowest common denominator, becomes "you've got it if you say you've got it."

Methodology

There is an overwhelming consensus that temporomandibular disorders are

multifactorial. Epidemiological studies using pain as the sole criterion for treatment evaluation in a multifactorial problem such as TMD's constitutes poor methodology because there are too many other confounding factors. Diagnosis and treatment of TMD using self-reports of pain as the sole measurement tool also constitutes poor science. When self-report of pain is the only measurement tool in multidisciplinary treatment, improved subjective score does not relate what treatment modality was responsible for the result, nor which variables, other than pain, were affected. Simply put, if a doctor has no measurable parameters other than pain for evaluating TMD treatment, it is not known what was done to the patient.

Accuracy

How accurate is presence of pain as a research criteria for study of temporomandibular disorders? Clinicians are all too familiar with referred pain and poorly localized pain. All too frequently, patients present with complaint of orofacial pain in one arch, which the astute clinician correctly diagnoses as abscessed tooth in the ipsilateral opposing arch. This is an example of poorly localized pain. Temporomandibular disorder patients often manifest poorly localized pain. There are also patients who present with complaint of pain over the temporomandibular joint which upon closer examination is referred from trigger points at distant locations such as sternocleidomastoid or trapezius muscle. Relief of pain over the TMJ by lidocaine injection in the trigger point in trapezius or SCM confirms that the TMJ pain was referred. Referred pain in temporomandibular disorders is not an infrequent finding.

Given these phenomena, mere presence of pain as criteria for study of TMD has inherent shortcomings and must be regarded as inaccurate. Also, the vagueness of pain, its unreliability of quantification and variation of perception reflects deep methodological error when used as the basis for a gold standard.

Untestable

As long as there are patients who lie about pain for financial and psychological gain, and patients who have psychosomatic pain which is as real to them as pure neurogenic pain, how is a scientist to determine the difference?

Self-reports of the patient's pain are inherently untestable and, therefore, decidedly unscientific. Adding questions to the report form whose answers pinpoint biologically inconsistent phenomenology may trip up some of the liars, but not the smart ones. Tests based solely on the patient's self-report of pain are no more reliable than a lie detector test and these have long been deemed inadmissible as scientific evidence in courts of law. If one cannot determine what percentage of the population is lying, it is logically impossible to scientifically surmise specificity and sensitivity of such tests and their validity must be regarded as nil.

Self-reports of pain may be significant to the doctor in certain instances for evaluating case management. It is, after all, complaint of pain that brings the patient into a health practitioner's office and pain relief is usually a primary goal. TMD patients manifest many more complicated signs and symptoms than just pain, however. Few health professionals direct treatment of diagnosed TMD's solely at pain. In cases where all other modes of management have failed, based on objective measurement and scientific treatment and pain management is the last resort with no simultaneous treatment to confound data, self-reports of pain may be meaningful. But, they are still not scientific because they are not refutable.

Epidemiologic methodology may be valid for studying social science behavior, but the behavior must be observable and testable. Dworkin, in defining TMD's as illness, with primary diagnostic criteria being the patient's complaint of pain has no observable, testable phenomenology. Doing epidemiological research based on this non-science and then attempting to establish appropriate research criteria for TMD pushes the limits of ludicrousness.

Proper Definition

Gould's Medical Dictionary (1979) defined disease as a response to injury, sickness or illness; a failure of the adaptive mechanism of an organism to counteract adequately the stimuli or stresses to which it is subjected, resulting in disturbance in function or structure of any part. Diagnosis involves analysis of the scientific evidence of what is wrong with a patient and why, and applying a tentative name to the disease. Clinicians treating TMD's as diseases of maladaptation do not cure the patient as in infectious diseases.

Utilizing the stress model of Hans Selye, clinicians treat diseases of maladaptation by strengthening the body's own defense mechanisms and decreasing stressors to create an environment in which the body can get rid of pain, heal itself or get better. In the model utilized by most clinicians, illness merely refers to TMD symptomatology and does not define the disease.

Validity Construct

Scientific activity is the development of special methods of searching for and discovering an explanation of a given observation or phenomenon. TMD's are multifactorial disorders which have physiological components. Understanding TMD is based on knowledge of the proper functioning of the muscles, discs, bone, vasculature, nerves, teeth and ligaments, and a psychological component. The effort then must be to measure that which is measurable to relate unhealthy function to healthy function. The therapeutic goal is to establish an ideal towards which to direct treatment for each established diagnosis.

The goal of this approach is construction of a coherent world picture and the fitting of particular facts within the framework. When defining complex behavior, it is necessary to specify a level of detail to which the system is described by employing language, knowledge and understanding shared and known beforehand. Explanatory knowledge goes beyond phenomenologic description into search for understanding of the hidden mechanisms by which nature works.

There are accurate, reliable, objective noninvasive electronic measurement devices to establish the patient's physiologic status before, during and after treatment. Sound biologic principles are the basis to guide the clinician toward the ideal. They are analogous to cephalometrics, the gold standard in orthodontics. The doctor makes a presumptive diagnosis based on the standard history, physical exam and imaging. Objective measurements may corroborate or contradict the tentative diagnosis, but they never in and of themselves make a definitive diagnosis. There are too many variables in diagnosis of TMD's. In TMD's, there is also the possibility of multiple disorders being present simultaneously.

Now a reexamination of the question, "Is the data from electrokinetic, electromyographic and electrosonographic measurement worth capturing?" This author is suggesting that validity construct is an appropriate analytical approach. If one hypothesizes the ideal that a clinician strives for in treatment of TMD's of muscular origin, one can then test the reliability and validity of the standards that have been arbitrarily set. If the results repeatedly are closer to these ideal standards after treatment than before and the patient's symptomatology improves, then logically its validity has been established.

The assumptions for such a validity construct are:

- 1) muscle in rest position should be "relaxed" as demonstrated by low electrical activity measured by EMG,
- 2) healthy musculature and joints should function smoothly and not dyskinetically,
- 3) healthy oral musculature of both right and left sides should function in balance with high electrical activity as measured by electromyography in centric occlusion,
- 4) healthy joints should function silently,
- 5) healthy movement from rest position to centric occlusion should not have a distal component of movement.

Should such assumptions prove to be correct in clinical and research testing, then patients would be better off undergoing this painless, noninvasive testing than not. These hypotheses would have greater validity and scientific credibility than any previous "gold standard" predicated solely on the patient's self-report of pain, and would thus become the new gold standard.

Research Results

The Scandinavian group of Moller, Sheikholeslam, Riise, Lous, et al, produced a series of papers using bipolar surface EMG which logically establish certain points:

- postural hypertonicity of myogenous TMD patients,
- surface electrodes are applicable to study of the action of temporalis and masseter muscles,
- maximal EMG activity is generated in clenched intercuspal position,
- *postural* activity increases in anterior temporalis muscles when experimental occlusal interferences are introduced,
- experimental occlusal interferences disturb the almost symmetric bilateral pattern of activity in anterior temporalis and masseter in maximal clench,
- EMG recorded electrical activity with maximal bite is stronger in control groups than symptomatic patients,
- postural activity of the temporalis and masseter was reduced after treatment,
- increased postural electrical activity and pain coincide for the temporalis and masseter and both EMG activity and pain decreases in response to treatment.

It would certainly seem that this research confirms validity construct regarding electromyography as a scientifically valid tool in contrast to epidemiological studies of patient's self-report of pain. Similar validating studies are available for electrokinetic and electrosonographic measurements as evaluation tools in certain TMD's.

Epidemiological research based on patient self-report of pain involves statistical analysis of non-science rather than analysis of human biology. No good science can be presented in the literature to support the legitimacy of pain as a gold standard. In reality scientific methodology has been perverted to support it. Numerous clinical studies have been written supporting the accuracy, efficacy and benefits of noninvasive electronic measurement in management of TMD's. Subjective literature papers attacking these evaluation tools have perverted scientific methodology.

There are flaws in the epidemiological argument being used by the opponents of objective electronic measurement. Arguments **against** the use of noninvasive objective electronic instrumentation in TMD's are flawed because of their inappropriate use of epidemiology and improper use of logic.^{32,33,34,35} Based on employment of weak social science methodology for clinical science research, lack of disease criteria or definition, and the extensive use of scientific double talk and perversion of scientific principles, arguments against clinical use of noninvasive measurement must be disregarded as invalid.

The validity construct for noninvasive objective electronic measurement in TMD must be respected for its scientific validity, accuracy and reasonable biologic

rationale. In lieu of any other such *scientific* rationale, it must be considered the gold standard for evaluation of TMD treatment.

TMD

Psychosocial Model

TMD defined as illness

no pathophysiologic changes

reduces to pain (pain=gold standard)

generic treatment

reduce pain, behavior modification,
reduce psychological stress

self-limiting

subjective measurement

patient's self-report forms

epidemiology as research methodology

treatment evaluation dependent on
definition of "normal"

inference based (statistics)

non scientific

pain is non-testable irrefutable

soft data

patient exam, history not necessary

malocclusion is non-factor

Selye Model

TMD's defined as diseases

pathophysiologic changes noted and
significant

reduces to physiology, endocrinology,
pathology

treatment directed at etiology specific
diagnosis

not self-limiting if pathophysiologic
changes are noted

objective measurement

electronic, histopathologic, biochemical

ethology, validity construct for research

treatment directed to ideal

evidence based (physiologic
measurement)

scientific

based on scientific measurement of
observed phenomena

hard data

examination and history essential and
important

malocclusion is significant factor in
some myogenous TMD's

**SUMMARY OF MAJOR DIFFERENCES IN PSYCHOSOCIAL MODEL
COMPARED TO SELYE STRESS MODEL AS APPLIED TO
TEMPOROMANDIBULAR DISORDERS**