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REVIEW ARTICLE

Some dogmas related to prosthodontics, temporomandibular disorders and occlusion

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Abstract

It is the aim of this paper to give a few examples of dogmas related to prosthodontics and oral implants and to discuss the controversial role of occlusion in the aetiology of temporomandibular disorders. New knowledge is developing at a rapidly increasing rate in dentistry, as in other areas of society. Our lecturers at university taught us many useful things. But, as time goes by, what is still relevant? Some methods are so well established that they deserve to be called dogmas. It is implied that a dogma is not supported by strong evidence, even though it has existed and been practised for a long time. In the era of evidence-based dentistry it is appropriate to scrutinize such issues. A review of the current literature indicates that conflicting opinions exist concerning a number of common procedures in clinical dentistry, mainly due to a scarcity of good studies with unambiguous results. There is therefore a need for more high-quality clinical research in attempting to reach the goal of evidence-based clinical practice. The dental community should take an active part in this process.

Key Words: *Complete dentures, dental implants, dental occlusion, evidence-based practice, quality of life*

Introduction

Many methods used in clinical dentistry are so well established that they can be called dogmas ("beliefs or opinions, held to be true"), although they are often not supported by strong evidence. In the era of evidence-based dentistry it is appropriate to scrutinize such issues.

During the last few decades evidence-based practice has gained increased attention in medicine as well as in dentistry. Many common procedures in clinical dentistry are not supported by strong scientific evidence. It is generally agreed that the strongest evidence is found in randomized controlled clinical trials (RCTs). However valuable they are, such studies are difficult to design and implement and the results are not always easy to interpret and translate into clinical practice [1]. In several clinical disciplines, RCTs are non-existent or seldom found. This is a frequent finding in systematic reviews and in the international Cochrane reviews [2–4]. Even though evidence-based practice has been the focus of interest for decades, questions on the scientific criteria to which healthcare methods should be subject continue to be asked whenever best practice is discussed [5].

There are many reasons for this situation but the most important is the great difficulty of performing RCTs involving more extensive clinical treatments in humans. For example, although PubMed reveals >1000 studies on large fixed dental prostheses (bridges) on natural teeth, no RCT was identified comparing fixed dental prostheses/bridges made from different materials or using different methods of fabrication [6,7]. There is also no RCT comparing a three-unit bridge and a single-tooth-implant restoration when replacing a lost tooth [8]. Neither has any RCT been found comparing root-canal treatment followed by a crown or extraction and single-tooth implant treatment of compromised teeth [9,10]. This lack of studies at the highest level of scientific evidence is similar in all areas in clinical dentistry, and in clinical medicine as well [11].

The title of this paper promises a wide-ranging review but its aim is to present a condensed version of selected parts of this extensive topic.

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Material and methods

The article is a revised, extended and updated version of a lecture given at the International Association for Dental Research meeting in Barcelona on 16 July 2010. The lecture was partially based on previous reviews by the author [12,13]. Similar methods have been used for this paper as described in those reviews. MEDLINE/PubMed searches were conducted up to 12 August 2010 for articles on selected aspects of clinical procedures related to prosthodontics, temporomandibular disorders (TMDs) and dental occlusion, with a focus on the best available evidence. Since the literature in these areas is abundant (on 12 August, 2010 PubMed listed > 100 000 titles for the MeSH terms prosthodontics, temporomandibular disorders and dental occlusion), the review was limited to studies of the highest possible level of evidence. If publications of the highest levels, i.e. RCTs, were not available, other studies were considered. The selected areas included various aspects of complete denture fabrication, jaw registration methods, tooth loss and the health of the masticatory system, the role of oral implants in prosthodontic treatment, definitions and controversies related to TMDs and conflicting aspects of dental occlusion. Because of space limitations, the review is condensed and focused on specific aspects of the selected areas.

Prosthodontics

Fabrication of complete dentures

Prosthodontists have been quite successful in treating totally and partially edentulous patients in spite of the lack of strong scientific evidence for a number of common procedures. In textbooks and prosthodontic teaching it was for a long time an unopposed tradition to maintain that complex and sophisticated methods would lead to better clinical end results. However, such statements were opinions and not based on solid research.

A classical RCT, started as early as 1969, compared results of complex and simple methods used in the fabrication of complete dentures. No difference between the two methods was found regarding any comparison of denture quality, tissue response and patient satisfaction. This was demonstrated at delivery of the dentures as well as at repeated examinations of the two patient groups over a 20-year period [14–16]! One might think that the results of these well-designed studies, published in 10 articles between 1969 and 1993, would have changed the teaching of making complete dentures in favour of a simplified technique. However, not much seems to have happened for several decades. Most teachers and practically all textbooks have continued to teach the more complex techniques, implying that they give better clinical results, but still without presenting any evidence for such an opinion.

More recently, the possibility of simplifying complete denture fabrication has been evaluated by a few researchers. A 6-month RCT compared traditional and simplified methods of fabricating complete dentures. No differences between the two groups regarding patient satisfaction or prosthodontists' ratings of denture quality were found. The authors [17] concluded that the quality of complete dentures does not suffer when techniques are simplified to save time and materials! The results deserve to make dental educators reconsider their teaching regarding complete dentures.

An ambitious approach to find a minimum acceptable protocol for complete dentures used the so-called Delphi technique [18]. The method obtained ≥90% agreement among prosthodontists from 24 countries for a number of statements, but not for all. For example, there was no agreement on issues such as excursive contacts, the occlusal form of the teeth, specific occlusal schemes and the relationship of centric relation to centric occlusion. This was expected because of reported controversies in the literature [19,20]. Therefore an unspecific statement was formulated and gained 95% agreement: "It does not matter which type of teeth are used or which occlusal philosophy is used as long as the scheme chosen contributes to stability in function and parafunctions". There was 100% agreement that there should be even contact on all posterior teeth in the maximal intercuspal position.

Prosthodontic methods certainly vary greatly between countries but also between clinicians in the same country. The applied method to obtain a consensus among specialists was successful for several procedures in complete denture fabrication about which there were conflicting opinions. The results might be useful for simplification of teaching and clinical practice. The method deserves to be tested on a number of procedures lacking strong evidence in other areas of clinical dentistry.

Use of face bows. A detail considered necessary in complete denture fabrication as well as in other prosthodontic work has been the use of face bows. In Scandinavia, face bows have scarcely been used at all during the last two or three decades since no evidence of better clinical results with than without using them has been published [21]. During the last few years, several studies have confirmed that face-bow transfer does not offer clinically significant advantages compared to an average mounting according to the Scandinavian approach [17,22–27]. In contrast to the situation in the Scandinavian countries, where the teaching and use of face bows have

been abandoned, and in China, where 97% of prosthodontists reported that they seldom used them [28], the use of face bows is taught in 75% of U.S. dental schools [29]. Manufacturers present new face-bow designs, and articles and textbooks continue to recommend the use of face bows even in the new millennium [30–32]. This shows how difficult it is to change dogmas built on tradition and belief, even when good evidence exists.

It is sometimes argued that in complete denture fabrication we may manage without a face bow but, in special situations, e.g. when planning orthognathic surgery, the face bow is necessary. Recent analyses indicate however that even in these situations the method may be inaccurate and unreliable [33,34].

Over the years there have been many fierce debates on factors related to complete denture occlusion, such as tooth arrangement, tooth form and occlusal scheme. However, systematic reviews could not identify any controlled studies showing any significant difference between these factors in terms of treatment outcome. A number of psychosocial factors were suggested to be more important than prosthodontic and occlusal factors to the outcome [19,20]. After the publication of these reviews, one RCT indicated that subjects provided with complete dentures having lingualized or anatomic posterior occlusal forms exhibited significantly higher levels of self-perceived satisfaction than those with 0° posterior occlusal forms [35]. With respect to the numerous procedures used in complete denture fabrication, there are surprisingly few that are firmly evidence-based in spite of the strong emphasis that textbook authors put on details said to be important for a good clinical result [12,20,26].

Dental implants

Implants have revolutionized prosthodontic treatment. Even though it is now 45 years since Brånemark successfully placed the first titanium implants in an edentulous patient, it took another 17 years before the osseointegration principle was presented to North American prosthodontists and oral surgeons at the Toronto conference in 1982 [36,37]. Initial scepticism soon turned to enthusiasm, and the explosive development of implant dentistry started. A quarter of a century after the Toronto conference, >1 million dentists worldwide are ready to offer implant solutions to their patients. This has led to a market that is replete with numerous new implant manufacturers, new implant brands and new marketing strategies. This is certainly gratifying to many but it also leads to problems and apprehensions about where future development is heading [38,39]. Despite the rapidly growing literature on dental implants there is still a lack of evidence-based recommendations to guide dentists and patients in decision making.

The unprecedented success of various forms of implant treatment has led some people to believe that implants can solve all dental problems. There are, however, limitations and implants cannot solve all dental problems. The greatest obstacle is an economic one. Most edentulous people are poor and cannot afford the high cost of implant treatment [18,40]. However, even when cost was removed as a factor, more than one-third of older edentulous subjects refused an offer of free implants in order to retain their mandibular dentures [41].

Even though there are no RCTs comparing the outcome of restorations on implants with those on natural teeth [8–10], reviews on the long-time survival of these two treatment options have found fewer complications and higher 10-year survival in fixed dental prostheses compared to implant-supported prostheses [6,7,42–44].

At most dental conferences today, especially those concerning prosthodontics, maxillofacial surgery and periodontology, a large part of the programme is devoted to implants. This is somewhat surprising since the great majority of treatment in clinical dentistry does not involve implants but is performed with conventional dental therapy [45,46]. Even though epidemiological data are scarce, it can be estimated that the world prevalence of edentulous people who have received implant treatment is <0.1% [40]. In contrast to the situation in some European countries, where a decline in edentulous subjects in the coming decades has been predicted [47], it has been prognosticated that in the USA the number of edentulous jaws will increase from 34 million in 1991 to 38 million in 2020 [48]. The authors of the article mention only complete dentures, not implants, when discussing the treatment need. The reason is most probably that edentulous people belong to the poorest segment of the population and cannot ask for implant therapy. In this context it is of interest that the rate of edentulism is not associated either with the country's economy (Figure 1) or with the number of dentists per capita [49].

A recent review concluded that, despite a declining prevalence and low incidence of edentulism, from a global perspective, large numbers of edentulous individuals are in need of rehabilitation. Therefore, complete dentures will continue to play a central role in the rehabilitation of edentulism and thus research, teaching and specialist training in complete denture prosthodontics must continue, and should in fact be intensified rather than reduced [40].

Dental occlusion

Occlusion has been and is to some extent still a controversial issue in clinical dentistry. Many clinicians claim that occlusion is incomprehensible and that they have been terrorized by many of the strict

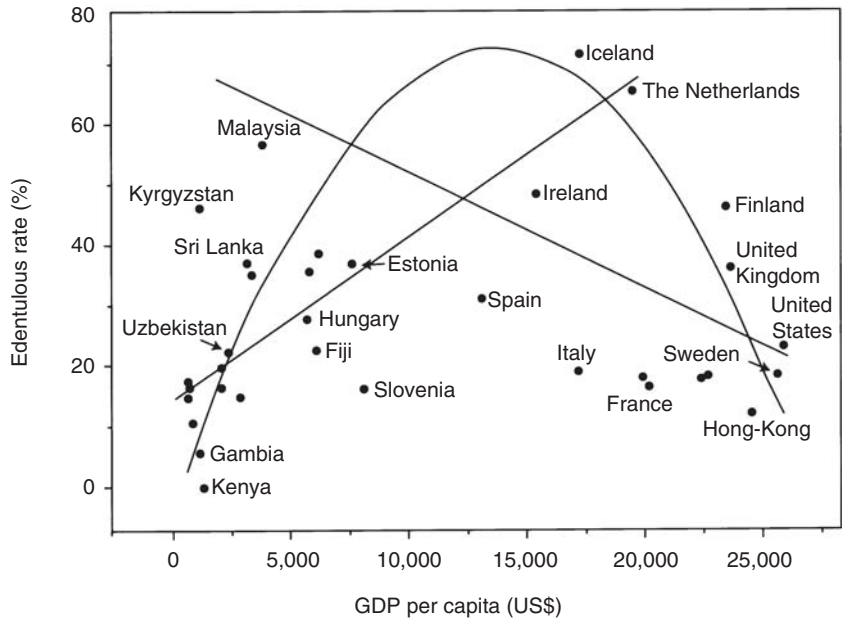

Figure 1. Edentulous rate of 70-year-old subjects and gross domestic product (GDP) for selected countries in the year 2000. Reproduced from Mojon [49], with permission.

theoretical recommendations on dental occlusion, including the concept of 'ideal occlusion'. Individuals with an ideal occlusion are seldom seen in real life, and the concept is mainly of theoretical interest. The occlusion of most of our patients deviates in one or more ways from the ideal, but may still function well. Such occlusions are physiologically acceptable and do not need any intervention [50,51]. This concept of a physiologic occlusion was originally formulated for the natural dentition and conventional prosthodontic therapy. It is not well known whether it is also applicable in implant prosthodontics. An interesting question is whether there is any difference between occlusion of restorations on natural teeth and of implant-supported prostheses. Based on the fundamental difference in bone contact between implants and natural teeth, the theoretical answer is yes, but clinically the difference seems to be of minor or negligible importance. Principles and methods of fixed prostheses on natural teeth can in general be used also for implant-supported fixed restorations. However, since this opinion does not reflect the highest level of scientific evidence, it should be regarded as transitory and may need modifications when new research results appear [13].

Therapeutic occlusion

Although numerous questions related to occlusal characteristics cannot be answered with certainty, dentists are every day performing diagnostic and therapeutic procedures, which include dental occlusion, e.g. simple fillings, crowns and removable and fixed prostheses, and implant-supported restorations. Among the many varying recommendations for therapeutic occlusions presented in prosthodontic textbooks, a concept of a functionally optimal occlusion originally presented between the 1950s and 1970s by Beyron [52,53] has gained much support over the years and can be considered to have stood the test of time [51]. Some general guidelines for a therapeutic occlusion have been formulated based on such recommendations (Table I) [21].

Admittedly, there is no strong evidence in support of the view that all these recommendations must be fulfilled for a successful outcome of prosthodontic treatment. They do, however, indicate a logical and practical approach adhered to by many authors, and have probably been helpful to many in achieving the primary goal of occlusal therapy, namely maintaining and/or improving optimal masticatory function and comfort, including stability of the occlusion. Whether they are sufficient (or necessary) is not known, either for conventional or implant prosthodontics. In a textbook on occlusion, which had the ambition of presenting an evidence-based approach, it was maintained that there are no controlled studies on the optimum features of a harmonious natural and/or restored occlusion [54]. It must be concluded that confusion remains concerning optimum occlusal relationships and it seems prudent to stop spiteful debates about the 'best occlusal scheme' until more evidence is available.

The outcome of prosthodontic treatment is often quite successful in spite of the fact that dentists use different concepts of occlusion. One of the most successful therapies in restorative dentistry is fixed dental prostheses (FDPs), i.e. bridges. Systematic reviews have found that the 10-year survival of such

Table I. Some general guidelines for a therapeutic occlusion [21].

Acceptable vertical facial height after treatment
Acceptable interocclusal distance with the mandible at rest
Stable jaw relationship with bilateral contact after relaxed closure leading to maximal intercuspation as well as after retruded closure
Well-distributed contacts in maximal intercuspation, providing axially directed forces
Multidirectional freedom of contact movements radiating from maximal intercuspation
No disturbing or harmful intermaxillary contacts during lateral or protrusive excursions
No soft tissue impingement during occlusal contact

reconstructions was 89% [44]. Even though these results were mainly based on FDPs made in specialist settings, a Swedish study showed that, after 14 years of service, 83% of FDPs placed by general practitioners were still functioning and fully serviceable [55]. The median survival time of FDPs can be assessed as >20 years [56,57], and even with a lack of RCTs the available results indicate that FDP therapy in general is extremely successful.

Shortened dental arches

The old dogma in prosthodontic decision making that tooth loss must always be replaced has been questioned. The shortened dental arch (SDA) concept [58] has proven to be worthy of serious consideration in treatment planning for partially edentulous patients. A review of the literature on SDA concluded that "shortened dental arches comprising anterior and premolar teeth in general fulfil the requirements of a functional dentition" [59]. The SDA concept has been well accepted in many parts of the dental community, but not in all, partly due to the scarcity of evidence concerning the management of SDA. An ambitious ongoing multicentre RCT is trying to assess the outcome and survival rates for two treatments in patients who are missing all molars in one jaw: removable dental prostheses; or no replacement according to the SDA concept. First tooth loss after treatment was the primary outcome measure. After 38 months there was no significant difference between the two treatment groups [60]. The authors conclude that if long-term results confirm the present observations this would strengthen the importance of considering patient preferences rather than the number of posterior teeth in clinical decision making.

How many teeth are required cannot be answered in general but must be evaluated individually with respect to the wide variation in occlusal morphology and individual adaptability present in the population [61,62]. Nevertheless, it seems that most of the recent literature accepts the opinion that acceptable dental occlusion is possible in subjects with a reduced dentition.

Occlusion may seem complicated but is seldom mysterious or difficult. Complex theories of occlusion and sophisticated instruments for jaw registration should be abandoned since they have never been documented to be necessary for successful clinical results. Occlusion can be managed successfully by using simple methods for jaw registration and different occlusal concepts. A good occlusion can be defined as being synonymous with a physiologic occlusion, i.e. it is comfortable for the patient, functions without problems and is stable and does not change [13,50,63].

TMDs

The literature on TMDs has over the years exhibited a great number of controversial opinions, which have created much confusion, especially regarding the diagnosis and treatment of TMDs. The numerous names given to TMDs during recent decades indicate different views on their aetiology, which have naturally had an influence on the management of patients. This initiated the creation of the Research Diagnostic Criteria for TMD (RDC/TMD) [64]. This system became so predominant in the TMD field that studies using other systems, e.g. the Helkimo indices [65], were not accepted for publication in several journals. Even if the RDC/TMD was an improvement compared to the previous lack of uniform definitions it was not without faults and some criticism was eventually published [66,67]. An extensive validation and revision process of the RDC/TMD was recently presented [68]. The merits of the revised version wait to be assessed.

For a long time, TMD patients were managed in prosthodontic clinics in many countries with a focus on occlusal aetiology [69,70]. During the last few decades, special TMD clinics have appeared in many places and the focus has changed to psychological factors and pain physiology [71,72]. An interesting development during the last few years is the increased attention paid to comorbidity between TMDs and a number of other disorders and conditions [73–77].

The role of occlusion in TMD aetiology

Occlusal disturbances were for a long time believed to be the dominant cause of TMDs. It is no exaggeration to say that for many clinicians the close relationship between TMDs and occlusion was a dogma. Elimination of so-called occlusal interferences with various types of occlusal therapy such as occlusal adjustment was taught in the dental schools and became

a common treatment modality for TMDs in general practice [78,79]. TMD patients often get better after different simple treatments, including occlusal adjustment, which strengthens the dentist's belief in an association between occlusal disturbances and TMDs. Only when RCTs were introduced into the TMDs field was it revealed that other therapies without an influence on the occlusion provide equally good or better results [80,81]. Systematic literature reviews have demonstrated that the association between occlusal factors and TMDs is weak and consequently there is seldom an indication for irreversible occlusal therapy in TMD patients [69,70,81]. Simple treatments, including brief information, counselling/reassurance, analgesic medication for pain relief and jaw exercises, will help the majority of patients with TMDs [71,82]. A recent Japanese study on TMD patients which compared the treatment outcome between two clinics, one focusing on occlusal therapy and splints, the other on patient education and physiotherapy, found better results for the latter [83]. A systematic review compared simple versus multimodal therapy in TMD patients [84]. It was concluded that patients without major psychological symptoms do not require more than simple therapy, such as brief information, self-care instructions, home remedies and over-the-counter drugs. However, even if the majority of TMD specialists agree that the role of occlusion in TMD aetiology should be de-emphasized, some recent studies have reported significant associations between occlusal factors and signs and symptoms of TMDs [75,76,85,86]. These authors have concluded that occlusion cannot be excluded when analysing the aetiology of TMDs. The conflicts seem to continue and more research is needed. To be able to resolve the classical controversy it appears necessary to find new ways to define, diagnose and analyse occlusal features of possible relevance. The results presented by these authors deserve to be evaluated at other research centres.

Management of TMDs

A review of the literature on clinical management of TMDs reveals a broad variation in treatment methods, including dental, psychological, surgical and others [82]. However, it was suggested early on that most TMD patients might be managed successfully through the application of some simple principles [71,87]. In the following, the review will be limited to the role of occlusal splints in the management of TMDs.

Occlusal splints/intraoral appliances. Many dentists have had difficulty abandoning their opinion of a close relationship between occlusal disturbances and TMDs as was previously taught in most dental schools. The good treatment outcome of occlusal splints is often put forward as an argument that the occlusion is aetiologically important. The name of the most common appliance, the stabilization splint, suggests that an improvement in the occlusion can explain the treatment effect. However, there are other possible mechanisms (Table II). An anterior bite plate with occlusal contacts only on the incisors and canines has proven to be as effective as a stabilization splint, at any rate in short-term trials [88,89]. The use of the so-called nociceptive trigeminal inhibition (NTI) splint, a mini-anterior appliance only covering a few maxillary anterior teeth, has been much debated recently. Systematic reviews have found such splints effective in the treatment of some TMD patients, but possible adverse effects must be considered [90–92]. Even more surprising is the fact that a so-called placebo or non-occluding splint that only covers the palate without touching the occlusion is largely as effective as an occlusal splint [92]. It has been proposed that, like crutches in orthopaedic treatment, occlusal splints are temporary solutions, and their outcome can be explained as, among other things, resulting from a placebo effect, the time factor and the fluctuation of the complaints [92,93].

A resilience appliance is another type of splint which is popular in general practice but one which has not however been evaluated as much as hard-acrylic appliances. In a series of recent RCTs the resilience appliance was also shown to have a positive treatment outcome, but without a significant difference compared with a non-occluding control appliance [94,95]. Another RCT compared three treatment groups: usual conservative dentist-prescribed self-care treatment without splint (UT); UT plus a hard stabilization splint; and UT plus a soft vinyl splint. All patients improved over time. None of the splints provided greater benefit than self-care treatment without splint therapy over a 12-month period [96]. The authors concluded that prescribing low-cost, non-splint, self-care treatment should be considered for most primary TMD patients.

In spite of the more critical attitude towards the traditional explanations of their efficacy, there is

Table II. Proposed mechanisms explaining the treatment effect of intraoral appliances discussed in the literature.

Occlusal disengagement
Stabilization of occlusion
Neurophysiologic effects on the masticatory system
Change of vertical dimension
Change of caput–fossa relation
Cognitive awareness of harmful behaviour (e.g. parafunctions)
Stress absorber/reduced load on masticatory system components
Placebo effect

currently almost a consensus among TMD experts that an intraoral appliance provides an efficient treatment in the management of many TMD patients. However, the mechanism of action is not clear, and the effect is probably not at all or only to a small extent influenced by the occlusion. It would seem prudent to call these devices intraoral or simply oral appliances rather than occlusal splints. However, it is obvious that intraoral appliances may not be necessary; a proper explanation of the probable diagnosis and low-cost, self-care treatment, including jaw exercises, should be the first option in the management of TMD patients. The great majority of primary TMD patients will be helped by this treatment approach [71,72,82,96]. A minority will not be improved and some may develop chronic problems and pain [87,97]. The management of chronic TMD patients is often difficult and should be performed in specialist settings [98]. In this context it might be appropriate to remember the wise words of Hippocrates (460–370 BC): "sometimes cure, often palliate, always comfort".

American Association for Dental Research statement on TMDs 2010. A new 'standard of care'. The TMD field has been considered as one of the most controversial areas in clinical dentistry. In the USA, conflicts between practitioners and TMD researchers have been especially fierce and have sometimes been called "a clash of cultures—between that of the researcher and that of the practitioner" [99]. Earlier attempts in the USA to provide guidance in the TMD arena have been criticized and not generally accepted. A committee from the Neuroscience Group of the American Association for Dental Research (AADR) has worked on a revised version to reach broader acceptance and, after a 3-year process, the AADR accepted the new statement in March 2010 [100]. The following is a condensed summary of the statement:

- Differential diagnosis of TMDs should be based on patient's history, clinical examination and, when indicated, imaging procedures (suggesting that adjunct diagnostic methods without good evidence should be avoided).
- Treatment of TMD patients should use conservative, reversible and evidence-based therapeutic modalities (which excludes occlusal adjustment).
- Professional treatment should be augmented by a home-care programme.

It is to be hoped that this statement can mitigate the turbulence in the TMD field in the American dental community. However, to call it "A new standard of care" can be questioned as such principles were recommended long ago and practised, at least in Scandinavia, for the last two to three decades [71,87].

TMDs and quality of life

Several studies have demonstrated that TMDs can represent a serious health problem in many patients because of pain and limitations of oral functions. It is therefore no surprise that a systematic review identified 12 studies showing that oral health-related quality of life was markedly impaired in TMD patients [101]. It is easy to agree that a well-functioning masticatory system is important!

Studies have indicated that many TMD patients are worried because they have not received a diagnosis or a good explanation of their symptoms [102,103]. A recent qualitative study corroborated these early observations and found that a lack of diagnosis caused uncertainty, with a negative impact on TMD patients' daily life. Patients reported that their symptoms even worsened due to anxiety over the source of their complaint. The authors concluded that it is important to give the patient a diagnosis as early as at the first point of contact [104].

Discussion and concluding remarks

Many 'old truths' in the fields of prosthodontics, TMDs and occlusion can be characterized as dogmas based more on belief than science. A few such dogmas have been exemplified in this article, but many more exist. Regarding prosthodontics the focus has been on the fabrication of complete dentures but it is easy to find a corresponding lack of strict scientific support in other areas of the discipline [12]. An important reason for the prolonged controversies in TMDs and occlusion is due to the fact that much of the research has been performed with ambiguous and imprecise definitions and has not provided unshakable results to convince all practitioners. Furthermore, even if there is strong evidence that a new method is better than a traditional one, it can take a long time before the new method is fully accepted. Studies have shown that it takes an average of 17 years to implement clinical research results in daily practice [105]. Although this assessment related to medicine, the situation in dentistry often shows a similarly slow and inefficient process.

In fact, only a minority of all opinions that govern activities in clinical dentistry, as well as in medicine, are based on strong evidence [11]. Reviews have suggested a similar lack of strong evidence for many procedures in other disciplines resulting in conflicting opinions, e.g. in periodontology, cariology and orthodontics [106–110].

Without good evidence it is unnecessarily difficult to make clinical decisions and much uncertainty is present. There is therefore a need for more research using systematic and controlled studies to be able to answer the many remaining controversial questions

and to improve the quality and security of clinical care. The scarcity of RCTs and the difficulty of conducting such trials will necessitate the evaluation of studies at a lower evidence level in order to draw any relevant conclusions. It is suggested that systematic reviews of the available literature can provide valuable guidelines for clinicians in terms of decision making [7,44,111]. Clinical practice should be based on the best possible evidence and include the clinical experience and expertise of the therapeutic team as well as the patients' wishes and preferences. The following harsh words from the director of The Swedish Council on Technology Assessment in Health Care (SBU) deserve to be considered by all therapists: "Any doctor or other professional caregiver who disregards evidence is a charlatan. Only with evidence as your foundation can you take an empathetic, value-oriented and individual approach to your patients" [5].

In a longer perspective, many of today's 'truths' will be questioned, and dogmas that lack strong evidence will eventually be abandoned. But to achieve this goal it is necessary for open-minded educators and researchers to question and analyse current practice methods in all areas of clinical dentistry. Future research must use the best possible study designs to resolve existing controversies and uncertainties. The dental community should take an active part in this process.

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