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Teeth, Mastication, Cognition, and Health—The Impact of Edentulism

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- Industrialized economies appear to prioritize dental esthetics before function, with the media acting as a major influence on how bodily appearance is perceived and rewarded.[1] Nonindustrialized economies, on the other hand, tend to do the reverse, because function is often the driver of survival. Under these circumstances, esthetic objectives have more modest expectations.
- The primary goals of mastication and swallowing are enhanced health resulting from improved diet and nutrition. Optimal occlusal design optimizes functional force distribution and controls loading between teeth. Anterior teeth have a large population of periodontal receptors, which have higher sensitivity (at low forces) to both static and dynamic loads when compared with posterior teeth. The latter have lower static and dynamic sensitivity for management of faster and stronger forces developed during chewing. A stable functional occlusion optimizes oral function and contributes to the maintenance of higher-level cerebral function or cognition.[2] Impaired mastication is linked to executive function and is related to *(1)* general level of brain activity or arousal controlled through the reticular activating system, which is impaired to varying degrees in aging[3]; *(2)* episodic memory; and *(3)* learning new information.
- Function with complete dentures, especially mandibular ones, is markedly reduced and often associated with pain and discomfort, impaired diet, and compromised nutrition and psychosocial health. The ongoing demand for improved management of edentulism poses a major challenge for our profession, particularly given the context of an increased aging population.
- The availability of implant therapy, catalyzed by the introduction of the osseointegration technique, transformed treatment options for edentulous patients. It also encouraged consensus statements regarding a presumed better "standard of care" for implant-supported mandibular overdentures. Published reports using data from oral health–related quality of life (OHRQoL) indices and psychologic profile questionnaires indicate that both implant-retained overdentures and fixed implant-supported prostheses are often preferred by patients[4] because of associated benefits of enhanced implant retention and stability.
- The term "osseoperception" was first proposed by Brånemark to describe the physiologic feedback mechanism responsible for the enhanced function and, by implication, the enhanced OHRQoL outcomes expected with implant treatment. The implication that bone contains proprioceptive feedback capability has been considered for more than three decades, and a consensus statement[5] defined osseoperception on a more global basis and with a hierarchy of feedback from diverse tissues. It was also emphasized that osseointegration-linked osseoperception was the key to rehabilitation of function, with rigid fixation and functional forces transferred to bone and associated tissues to activate a range of mechanoreceptor feedback to the sensorimotor cortex to modulate function.
- Trulsson[6] reported that periodontal mechanoreceptors signaled detailed information to regulate manipulative and power aspects of jaw function. Their loss results in reduced sensory feedback and more variable bite forces with reduced capacity to modulate bite force to food hardness. Edentulous patients rehabilitated with fixed implant-supported prostheses in both jaws function with reduced capacity to manage foods of different hardness and

show impaired adaptation compared with dentate patients. In industrialized economies, priorities for health management include the desire to retain youth, beauty, and optimum function. These are a byproduct of the education and knowledge revolution and have extended the survival instinct of the past to focus on self-preservation.
- Functional occlusal rehabilitation with dental implant therapy proves that osseoperception is achievable. However, data have confirmed that, although implant rehabilitation can predictably restore esthetics and function, it does not restore neurosensory equivalence with the natural dentition.

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Is Complete Denture Therapy Still a Viable Option in a Global Context?

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- The current world order is characterized by the one thing that perpetuates the existence of underprivileged individuals and communities: inequality. The World Health Organization (WHO) Commission on the Social Determinants of Health stated that "Inequities are killing people on a grand scale," and "In countries at all levels of income, health and illness follow a social gradient: the lower the socioeconomic position, the worse the health." It is a sad fact that almost half the world—more than 3 billion people—live on less than $2.50 a day[1] and that at least 80% of humanity lives on less than $10 a day. More depressing still is the fact that 22,000 children die each day due to poverty.
- Throughout the world, people are living longer; with age comes tooth loss, which our profession has been unable to prevent. Aging populations and communities without a necessary decrease in edentulism remain a harsh reality for the foreseeable future. Rates of edentulism, though, are hard to explain and vary widely among countries and in different communities within the same country. The comparatively new field of cognitive epidemiology[2] may help to explain some of these differences. Percentage rates must be viewed with caution and translated into real numbers. For example, it is estimated that 11% of people aged 65-plus years in China are edentulous—a staggering 22 million people.
- Being edentulous conforms to the WHO's criteria for disability and is also associated with intellectual and developmental disabilities across the age spectrum,[3] plus other comorbid factors. An association between food choices and inability to chew had already emerged as a threat to morbidity since the former were cited as most frequently associated with increased risk of systemic diseases, eg, coronary heart disease.[4] Moreover, an association between masticatory ability and cognitive function, with a suggested dementia link, has also been proposed.
- Current implant overdenture therapy has been proposed as the standard of care for edentulous patients. This popular professional conviction is vulnerable to a self-serving and simplistic label, apart from being grossly insensitive to the real global predicament of edentulism. A standard of care implies that (a) anything less is legally negligent and (b) anything more is overtreatment. It also ignores simple facts: *(1)* Not all patients are surgical candidates for systemic health or personal preference reasons[5,6]; *(2)* implant therapy is frequently unaffordable. It has been estimated that less than 0.1% of global edentulous patients have received implant dentistry—a compelling rebuttal of a "standard of care" conviction. Furthermore, healthy implant-treated patients can become sick patients, or similarly managed healthy elders end up as frail elders. These patients' oral hygiene demands will include challenging dexterity requirements and caregiver concerns leading to a need for reconsidering the merits of mucosa-borne complete dentures.
- It is important to remember that, in many dental schools, dental students have minimal experience in carrying out complete denture therapy for patients. Prosthodontic educators must continue to ensure that their students acquire the necessary skills to enable them to improve the quality of life of