Increasing diversity in prosthodontic research

Dear Readers,

What do you think of when you hear the words “prosthodontic research”? The answer may depend on whether you are a clinician or a researcher in this field. Many dental clinicians perceive prosthodontic research to consist of dental prosthesis-related studies that evaluate materials and patient outcomes. These perceptions are natural and generally correct because from a textbook perspective, prosthodontists are specialists who replace patients’ missing teeth using removable or fixed dentures, crowns, and dental implants. However, researchers in this field also continually update the textbooks by adding new and necessary information to create future prosthodontic methods and technologies. In particular, studies in prosthodontics should account for the rapid changes currently occurring in social and economic environments, such as the expansion of the aging population and rapid progress of medical and dental technologies.

At the JPS Global Workshop Kyoto 2012, the leaders of prosthodontic organizations of several countries released a consensus statement defining the current focus of prosthodontic research [1]. In particular, they stated that “research is essential to address emerging societal needs resulting from increasing levels of comorbidity linked to aging in the world’s established economies” and that “research seeks to advance knowledge and technology while increasing access to care by making treatment more cost-effective”.

Historically, the field of prosthodontics originated from the idea of replacing patients’ missing or decayed teeth using artificial materials, such as removable dentures and fixed prosthetics. Originally, prosthodontic research therefore focused on how to improve such “replacement treatments” through the creation of dental prostheses, and advances in the field mainly occurred through the development of new materials. Concurrently, occlusion studies added both functional and mechanical improvements to dental prosthetics. By improving replacement techniques, prosthodontists thus became able to generate morphologically based restorations for missing teeth by the 20th century [2]. Thereafter, improvement of the material properties of dental prostheses and other dental materials, such as impression materials and dental cements, has continued to be a major topic in prosthodontic research to the present day.

However, social needs have extended to the improvement of stomatognathic function in patients who suffer from dysfunctional mastication, speech, or swallowing in association with either tooth loss or prosthetic treatments. In this regard, progress in stomatognathic research has greatly contributed to rehabilitation for patients with stomatognathic dysfunction, such as temporomandibular disorders (TMDs). Concurrently, the pathophysiology of pain has become a research topic in prosthodontics because it relates to TMDs and orofacial pain. The physiology of the stomatognathic system has recently included the dental sleep medicine [3] for the management of sleep bruxism and sleep apnea. However, scientific evidence for the superiority of specific treatments for improving stomatognathic function is still lacking [4]. After the 1990s, growing calls for evidence-based medicine resulted in the study of clinical epidemiology in prosthodontics, which is one of our journal’s target topics; in fact, we have tasked a statistical editor specifically with ensuring that published studies use appropriate statistical analyses [5,6].

In addition to stomatognathic dysfunction, social needs have also extended to the improvement of esthetic aspects of prosthodontic treatments. After the innovative discovery of titanium osseointegration in the 1950s, dental implant treatments were established in the late 20th century, which provided superior function and esthetic results for the prosthodontic treatments. As a result, the growing requirement for esthetic and functional reconstruction by the treatments introduced the new research field of regenerative medicine to prosthodontics [7]. Regenerative medicine in prosthodontics is now applying cutting-edge stem cell [8] and biomaterial research to recover missing alveolar bone, periodontal tissue, and even teeth and salivary glands [7,9]. Therefore, the conventional concept in prosthodontics, i.e., replacement treatment by artificial materials, may partly shift to a new paradigm of regenerative treatment by the patients’ own cells or bioengineered tissues in future prosthodontics.

The prevalence of esthetic implant and prosthodontic treatments also increased the popularity of fabricating crowns, fixed partial dentures, and implant abutments using...
ceramic or zirconia as an alternative to traditional metal materials, which in turn contributed to the promotion of “digital dentistry” using CAD/CAM technologies [10]. Such progress in digital dentistry is expected to lead to more cost-effective production of dental prostheses and avoid concerns associated with the conventional metal restorations such as metal allergies.

Subsequent to this historical transition and expansion of prosthodontic research, the current field of prosthodontics continues to branch out into additional research areas. The JPS Global Workshop Kyoto 2012 established that the discipline engages in research in the following fields: rehabilitation, aging, biobehavioral research, health services research, bioinformatics, biomaterials and tissue engineering, bioengineering, surface sciences, host response, regenerative biology, bone biology, neuroscience, and pain [1], clearly indicating the increasing diversity of prosthodontic research.

Accordingly, the editorial committee of our journal recognizes that the targeted topics of the journal must be diverse and continues to promote the following topics: clinical epidemiology and prosthodontics; fixed and removable prosthodontics; oral implantology; prosthodontics-related biosciences (regenerative medicine, bone biology, mechanobiology, microbiology/immunology); oral physiology and biomechanics (masticating and swallowing function, parafunction, e.g., bruxism); orofacial pain and TMDs; adhesive dentistry, dental materials, and esthetic dentistry; maxillofacial prosthodontics and dysphagia rehabilitation; and digital dentistry (see aims and scope of the journal).

It should be noted that the increasing diversity in prosthodontic research requires new research approaches that use unprecedented methodology. To provide scientific evidence for prosthodontic treatments, molecular and cellular biology techniques may be used to explore the mechanisms underlying biological phenomena corresponding to clinical treatments. In particular, information is still lacking on the host responses to prosthodontic treatments, such as changes in oral tissues on aging, the basic mechanisms of orofacial pain, the process of residual ridge resorption after tooth loss, the effects of mechanical stress on oral tissues and the inflammation, and the mechanisms underlying osseointegration and bone regeneration. A complete understanding of these mechanisms should lead to the development of next-generation treatments. Furthermore, molecular genetic analyses may lead to the introduction of tailor-made diagnostics for prosthetic and implant treatments to regenerate missing oral tissues efficiently and prevent further tooth loss.

Research in prosthodontics should not be limited to the conventional conceptual framework in existing textbooks. Accordingly, I have recently altered the name of my academic division to the Division of Molecular and Regenerative Prosthodontics, with the goal that our particular research focus on the molecular and regenerative aspects of prosthodontics will be adapted to the increasing diversity of the field. Similarly, my goal for the editorial board is to embrace the diversity discussed here with the continued growth of the Journal of Prosthodontic Research, thereby contributing to the establishment of next-generation technology for future prosthodontics.

Sincerely,

[References]


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