International Journal Dental and Medical Sciences Research
Volume 6, Issue 2, Mar - Apr 2024 pp 579-584 www.ijdmsrjournal.com ISSN: 2582-6018

A Current Update on Prosthodontic Trends: A Comprehensive Review

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Submitted: 12-04-2024 Accepted: 22-04-2024

ABSTRACT: Prosthodontics is a well-defined and broad dental specialty catering to a wide range of oral rehabilitative treatment needs of the community. It is continuously evolving consequent to the rapid advancements in dental biomaterials science, clinical and laboratory techniques, and technologies, education, research,therapeutics literature, and interdisciplinary developments. Are the current developments innovative enough to address the future changing clinical, educational, and research needs? This review attempts to provide a glimpse into the current concepts,techniques, materials, trends, and developments in the discipline of prosthodontics and its related fields with the aim of demonstrating how far we have come as a specialty. Also, the impact such developments may have on the theory and practice of the discipline in future is also reflected.The article deals with trends in the field of prosthodontics till date.

Keywords: Prosthodontics , Trends, Developments , Future Education , Research.

I.INTRODUCTION

Prosthodontics has continuously evolved as a result of progress in laboratory technology, biomaterial science, clinical techniques, and multidisciplinary advancements. Perhaps more than any other dental speciality, prosthodontics has shown itself capable of evolution in response to changing needs and will probably continue to change. In previous years. the goal of prosthodontic care has been defined as the improvement of oral function and the resolution of esthetic problems. The goal of prosthodontic care that we seek today is to enrich the quality of life of each patient by solving problems caused by disturbances of occlusion, chewing, swallowing, and appearance. To ensure that goal, the value of prosthodontics is to be enhanced by dispensing evidence-based clinical care evolving creative prosthodontics, strategic planning, etc. The future prospects of our discipline can be examined and understood only in the context of current trends and prospects.

[3]. In the past several years. prosthodontics has begun to establish itself as a "knowledge-based" speciality, and not just a "skill-based "speciality. This change will be the key foundation in our ability to prosper. Emerging concepts, materials. and technologies impact the education, research, and practice of prosthodontics. Many paradigm shifts and watershed events have signaled the end of historical boundaries in the dental profession such as osseointegration, internet, and tissue engineering. The purpose of this review is to illustrate the enormous advancements that has taken place in various related fields of prosthodontic theories and techniques in the last few years, and provide a contemporary perspective on how they might influence the course of evolution of prosthodontics to its next level

PROSTHODONTIC EDUCATION.

Prosthodontics ranked fifth as a specialty of choice among the graduates in a survey. To increase students' interest in prosthodontics graduate programs, prosthodontics faculty should consider a)introduces small-group, case-based discussion, seminars. (b) monitor students anxiety, and stress levels as well as provide positive feedback as they transition into clinics. (e) provide more prosthodontists teaching pre-doctoral students asmentors, (d) invite students to attend prosthodontic meetings for more exposure. (e) provide opportunities for predoctoral students to assist prosthodontics graduate students or

faculty,(f) establish prosthodontic study clubs. (g) shift curriculum hours from lectures to guided seminars (tutorials). (h) teaching in an interdisciplinary fashion rather than in a discipline-based approach, and (i) help students to become "Critical thinkers" rather than Information consumers"

Dental students ranked prosthodontics fourth for future salary and fifth for the impact on the profession". In a 10-year survey conducted among deans of US dental schools. it was observed that the prosthodontic speciality training programs continued to have lower applications and enrollment figures compared to orthodontics, endodontics, oral and maxillofacial surgery. and pedodontics. However, it was interesting to note the high demand for prosthodontic services. Two US dental schools offer dual specialty training in prosthodontics and periodontics in a five-year program .

[7,8]. Factors such as advances in implant, esthetic, and reconstructive dentistry. and literature on the need for prosthodontists in the future etc had some impact on increasing the applicant pool for prosthodontic training in the United States in the past ten years."

PROSTHODONTIC RESEARCH

[11].The mission of most schools of dentistry is to train competent clinicians for the community. Few schools make a concerted effort to educate future leaders. With too few faculty committed to mentoring and training the next generation of academic and professional leaders, who will develop and spearhead new advances in diagnosis, prevention, and therapy through effective Fundamental, translational, and clinical research. Trends in research, collaboration, and extramural funding since 1998 indicate: (a) significant increase in the amount of collaboration. (b) dental materials was the topic that received the most amount of funding. (c) majority of funding was from private companies. and (d) certain funded studies can introduce bias that is favourable for the company.Without a doubt, prosthodontic research is well-positioned to meet the expectations of an aging population, taking advantage of the principles of implantology, tissue engineering, stem cell biology, neuroscience, material sciences, genetics, genomics, and CAD-CAM. and modern imaging techniques. However, only a few prospective comparative clinical studies provided data to guide the clinical decision-making process."

[1]. The pervasive influence of digital computing technology has already had a great influence on dentistry and is likely to affect prosthodontics particularly, as the speciality has always been at the forefront of technological innovation The value of widespread availability of data, research tools like meta-analysis, and evidence-based treatment are all to be recognized and reinforced. Prosthodontists need to change their way of thinking about and acting on the future. They have to structure the new prosthodontics not only by improving traditional prosthodontic treatment including the development of new materials and clinical techniques, but also through the evolution of creative prosthodontics associated with the advancement of such related areas as brain science regenerative medicine, nanotechnology, bioinformatics, sleep science, and nutrition science. Further, the evidence-based approaches to prosthodontic care to be enhanced especially through epidemiological studies

PROSTHODONTIC LITERATURE

[15]. Growth in the literature on conventional prosthodontics was rapid in the 1960s, reaching a peak in thel990s, after which a gradual decrease occurred. The publications on removable prostheses were most numerous between 1975 and 1984, after which a substantial decrease occurred in implant prosthodontics publications were miniseule up to 1985, and increased dramatically thereafter. The literature related to temporomandibular disorder was copious between 1985 and 1994, but has subsequently diminished. The number of clinical studies showed a steady increase from less than 1% of all prosthodontic articles during 1965-1974 to 12% during 1995-2004 .An extensive review of prosthodontic studies up to the end of 2000 identified 92 to be randomised controlled trials, whose methodological quality of reports were commented as poor. In this case the trend during the last two decades of literature on implant prosthodontics increasing exponentially while other parts of the prosthodontic literature diminishing continues. It is predicted that there would be no literature on conventional prosthodontics within twenty years. The internet and digital publishing is changing the traditional form of scientific communication. However, for the next one or two decades, the printed paper versions of scientific journals and textbooks will prevail. The number of journals allowing open access to free full text versions are on the rise." There is strong downward trend in publications on complete dentures since mid- 1980s.

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THERAPEUTIC TRENDS

[18].Modern prosthodontics can affect the most wonderful solutions through oral rehabilitation, but prosthodontists are in danger of letting their advanced technology block out their vision of humanistic priorities. The international prosthodontic community should provide guidance into ways and means of helping the disadvantaged achieve an improved quality of life. The philosophy of "appropriatech" using appropriate technology (both methods and materials) to provide cost-effective treatment without sacrificing biofunctional and prosthodontic principles is hence introduced .By this, the socioeconomically weaker patients are assisted in regaining chewing function,esthetics,and quality of life through a Minimum Acceptable Protocol (MAP).18 Highest standards of practice and ethics shall be the guiding principles to any future changes in the delivery of prosthodontic services to the public.

FUTURE OF COMPLETE DENTURES

[15]. While there is a downward trend in edentulism in several countries, it is region-specific, confirming the overriding influence of socioeconomic factors on health status. Life expectancy is on the rise, and the ageing population more. Hence the need for complete dentures not likely to decline in the near future19 Satisfaction of patients with complete dentures is linked more to the good relationship between dentist and patient, than meeting of all technical specifications and quality of supporting tissues. As many as 65-90% of edentulous patients are satisfied with their complete dentures according to published studies. It is commented that: (a) edentulism is on the decline. (b) emphasis on learning skills in complete denture prosthodontics in undergraduate curriculum is reduced, (c) dental schools in many countries reported difficulties in finding adequate complete denture cases as teaching material, (d) future clinicians shall be ill-equipped to diagnose, plan, and effect needed treatment for edentulous patients, (e) at the practice level, difficult complete denture cases might be transferred to the specialist level. (f) journal space for complete denture steadily falling since mid- 1980s, (g) dental curriculum can include simplified methods of complete denture construction (3 visits complete denture technique). (h) Clinical Dental Technician, Denturists still remains a controversial issue (i) complete dentures are and will remain the mainstay of treatment,and (j) due to its central role education, research, and training in complete dentures to be intensified.

[32,33,34] Low energy laser application in the treatment of denture induced mucosal lesion,CAD/CAM for fabrication of complete dentures and biofunctional prosthetic system are few remarkable advances in prosthodontics.

REMOVABLE PARTIAL DENTURES

[21]. Due to high cost of alternate methods of tooth replacement. high demand for RPD exist .Despite its frequency of use ,RPD receives minimal interest in literature or at professional meetings. Chrome poor fit of RPD frameworks was blamed by dentist for destruction of supporting periodontal tissues. Other than material improvements. RPD framework fabrication basically remains the same as mid-1930s .Valid long-term data is lacking ,but acrylic resin RPD continue to be used. Laser Willing technology allow predictable unification of metal components. The popularity of fixed prosthesis and dental implants had a restrictive effect on the cast RPDs. The prognostic value of flexible RPDs is yet to be proven as the material is still in an upgradation phase.

[35].Optical surveying of cast for removable partial denture made the surveying procedure easy.

IMPLANT PROSTHODONTICS

Although deficiencies in study design have frustrated the generation of a desired evidence base for implant dentistry, the high short-term success and survival rates reported in published studies justify the use of implants as the primary method of replacing missing teeth.

[14,23]. Endodontic treatment and crown restorations of teeth of questionable prognosis are getting discarded and dental implants preferred instead." Implant overdentures supported by two implants has become the low cost alternative standard of care for edentulous patients, particularly in the mandible .The annual increase in the market is around 15% over the last few years with no decline expected in the near future .New implant designs and altered surface properties are being rapidly developed and launched.Future developments expected include bio-active surfaces and additives., as well as electrical and electromagnetic treatments that stimulate bone growth. It might be speculated that the interest in dental implants may abate as increased knowledge of human genetics and tissue engineering open the possibility of in vivo growth of teeth, perhaps making implants obsolete.

[36,37] Zygomatic implants , malo implants are other new advances of implant prosthodontics.

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MAXILLOFACIAL PROSTHETICS

[24]. The field of MFP is embracing the rapid explosion of technology. The notable developments are: (a) application of imaging techniques such as Digital Volume Tomography, CBCT, Digital Panoramic Imaging. and MRI, (b) 3D CAD-CAM, Rapid Prototyping, and Laser technology are revolutionizing the field of maxillofacial technology. (c) Colour matching of facial prosthetic elastomers to skin colour with portable spectrophotometer and computerized colour formulation developed, (d) osseointegrated implants broadened the treatment options,(e) "Active Prosthesis" such as blinking and moving eye. (f) exciting developments in tissue engineering likely to change the methods of reconstruction of tissue defects ; and (g) exclusive training centres for MFP are not regular and successful in its establishment in India.

TMJ DISORDERS

[25]. Diagnostics and therapeutics are getting better by novel developments like (a) use of local or systemic biomarkers to diagnose or monitor improvements in therapy,(b) imaging technology for earlier diagnostics, (c) use of biomedicine,biomimetics, and imaging to design and manufacture bioengineered joints.

[21]. The number of patients who suffer from TMD have considerably increased either due to stress factors or due to extensive full mouth rehabilitations without due considerations of occlusion. The diagnosis has recently improved with introduction of T scans and allied myographic facilities.

SHORTENED DENTAL ARCH (SDA) CONCEPT

[26]. One of the most significant developments to have influenced prosthodontic thinking in the past few decades was the introduction of the Shortened Dental Arch (SDA) concept.

[27]. Missing teeth is not necessarily the diagnostic criterion for replacement according to this concept. Many people can have acceptable oral function with partial dentition, ie anterior teeth and at least four occlusal units it adequate. Hence in treatment planning discuss "no treatment'' has become a viable treatment option

[14,23]. Partially edentulous patients can be managed either "actively" or "passively" with the SDA concept. In complex treatment plans.,the SDA approach offers the alternative of less treatment that is also less complicated, time consuming and expensive.

NEW AND EMERGING MATERIALS

[28]. Few emerging dental biomaterials which found its mention and details in the latest editions of textbooks are: (a) Stimulus-responsive ''Smart'' materials, (b) Self-assembling materials, (c) self healing (self repairing) materials,(d) Bio-active materials, and (e) Bio-mimetics

TECHNOLOGY AND PROSTHODONTICS

[28]. Modern technologies applied to the field of prosthodontics are: (1) CAD/CAM,(2) Clinical microscopy and magnification, (3) Robotics: (patent care,laboratory), (4) Imaging: - a) Radiography – i) In-office volumetric radiography ,(ii) interactive computer software-s implant etc .(b)clinical Dentistry - (i Intraoral impression ,(ii) cast duplication,(iii) Restoration fabrication ,(iv)custom dental implants , abutments,and restoratons ,(v) Guided implant surgery,(5) Occlusion: Analysis Eg. Tekscan, Cardiax compact, (6) Electronic shade matching, (7) Lasers-soft and hard dissue, (8) Nanotechnology, (9) Genetics, (10) Information management systems, (11) Rapid prototyping,(12) Virtual articulators,(13) CBCT,(14) Swept-Soured Optical Coherence tomography (SS-OCT), (15)Laser-induced Fluorescence,(16) Laser photothermal radiometry (PTR),(17) Ultrasonography, (18) Infrared spectroscopy for multiple inflammatory parameters. (19) 3D Printing Techniques, (20) Optical scanning of teeth(Digital impressions), (21) Direct metal Laser sintering (DMLS),(22) Tissue Engineering and,(23) Computer-aided Educational System (a) Haptic Technology, (b) Just-in-time Learning.

REFRAMING THE FUTURE OF PROSTHODONTICS

Prosthodontists have been remarkably reluctant to change, and a sort of'' Prosthodontic personality ''evolved. clinging to the old ways and failing to grasp the many new and challenging opportunities that were changing the face of the profession. As organized prosthodontists, all need to: (a) recognize their personal role as stewards of the specialty, (b) realize that the growth of speciality is not a spectator sports, and everyone needs to be involved, (c) have open-mindedness, recognition of the need for Change, willingness to develop new strategies,(d) lead by example by providing perpetual mentoring of fellow prosthodontist colleagues, (e) support efforts that will promote and grow the speciality, (f) inspire colleagues to conduct rigorous research, and (g) form a Research Intermedicus for Prosthodontic

Exchange (RIPE) to promote prosthodontic science and research mentorship worldwide.

[1]. The increasing rapidity of technological advances is being fueled by the tremendous corporate investments in the dental field. The marketing push will be on sales with the patient outcome a secondary goal. In the implant field, dentists are made "procedurally competent",but not "diagnostically competent". Dentistry is becoming a free for all procedurally. Prosthodontists by utilizing their knowledge, skill,and technologies must strive to maintain their identity and separation from other specialties as well as general dentists.

II.CONCLUSION

Prosthodontics was second only to oral surgery in its appearance as a dental specialty. Over its long history, it has proven to be a remarkably acceptable and innovative branch of the subject as it has evolved and responded to expanding and sophisticated patient needs and technologies. Unless we are abreast of the current trends and developments taking place in various fields relevant to the specialty, one will get isolated from the contemporary scientific arena with the risk of losing the perspective. The views as elicited in the above sections by various stalwarts and icons in the field illustrates the dynamic nature of our specialty. assessment of its current trends, innovative thoughts generated, emerging technologies etc, as well as how these are contributing to overall shaping the future of prosthodontics.

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