

COMPLETE PROSTHESES TREATMENT - PRESENT AND FUTURE PERSPECTIVESSorin Uram-Țuculescu^{1a}, Marian-Vladimir Constantinescu^{2b}¹Department of Prosthodontics, VCU School of Dentistry, Virginia Commonwealth University, Richmond, VA - 23298-0566, USA²Holistic Dental & Medical Institute - ROPOSTURO, RO - 020082 Bucharest, Romania^aDDS, MS, PhD, Associate Professor^bDDS, PhD, Professor, President

Received: October 28, 2017

Revised: November 04, 2017

Accepted: November 23, 2017

Published: November 24, 2017

Academic Editor: Sever Toma Popa, DDS, PhD, Professor, Faculty of Dental Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy Cluj-Napoca, Cluj-Napoca, Romania

Cite this article:Uram-Țuculescu S, Constantinescu MV. Complete prostheses treatment - Present and future perspectives. *Stoma Edu J.* 2017;4(4):282-288.**ABSTRACT**

DOI: 10.25241/stomaeduj.2017.4(4).art.5

Background: Background: Tooth loss is a public health problem across the globe, especially in low-income populations. Traditional complete denture treatment is time consuming, and less embraced by general practitioners.**Objective:** The purpose of this paper is to review data on prevalence, future projections, and treatment modalities for edentulism. Most edentulous patients receiving care are treated with conventional, tissue-supported prostheses. Possible ways to improve efficiency in complete denture treatment, and ameliorate access to care are investigated.**Data Sources:** Information was obtained mainly from PubMed, American College of Prosthodontists databases, and non-indexed sources.**Study selection:** Considering the scarcity of information on some topics (simplified complete denture fabrication methods, digital techniques), a wide range of papers were selected for analysis, from systematic reviews, randomized controlled trials, cross-sectional studies to case presentations, expert opinions, surveys, and dental organizations' reports.**Data extraction:** The web search included the following key words: edentulism, demographic, implant, removable, denture, simplified, digital, denturist.**Data Synthesis:** The future of traditional complete denture treatment remains questionable, considering the reduced appetite of general practitioners and patients for time consuming treatments. Simplified techniques deserve an increasing attention from practitioners and dental educators, as available data suggest that they produce similar outcomes, when compared to traditional methods. Digital technologies are expected to further improve treatment outcomes, within simplified protocols. As mid-level dental providers became a reality in some jurisdictions, denturism could be considered part of the solution, especially in underserved areas.**Keywords:** edentulism, prosthesis, simplified, digital, curriculum.**1. Introduction**

Despite significant advances in prevention and oral care, tooth loss remains a public health problem, especially in low income populations^{1,2} and the elderly.^{3,4} Access to care in the underserved segment of population is a long standing problem.⁵ Overall, the prevalence of edentulism is still high, even in developed countries.^{6,7,8}

While prevalence of edentulism is decreasing from decade to decade, the increase in senior population fuels the need/demand for complete prostheses for decades to come. The Dental practitioners are expected to face a serious task in providing care for a large number of edentulous patients, most of them seniors, with specific needs that have to be addressed accordingly.⁹ Upgraded treatments with documented benefits,^{3,10,11,12,13,14,15} including implant overdentures and implant-supported fixed prostheses are available, but are only address a

fraction of the edentulous population, due mainly to increased costs. As such, the tissue-supported complete prostheses appear to be the mainstay in the treatment of edentulism,^{3,6,12,13,16,17,18} despite the fact that they do not constitute optimal replacements for the lost function, with lower bite forces and altered masticatory muscle activity.¹⁹

Trends in the dental work force indicate that the ratio of dentists to the population in the U.S. will be in 2020 less than in was in 2010,²⁰ due to a faster increase in population, as compared to the increase in number of dental graduates. In addition to the shortage of dentists in the US,²¹ a shortage of dental technicians²² is expected to add to the already established issue of access to care.

Increased chair time expenditure for removable prosthodontics due to numerous steps makes denture treatment less attractive for practitioners,²³ as revenue per time unit is lower, compared to other

***Corresponding author:**

Associate Professor Sorin Uram-Țuculescu, DDS, MS, PhD, Department of Prosthodontics, VCU School of Dentistry, Virginia Commonwealth University, Wood Memorial Building, 3rd Floor, Room # 304 D, 521 North 11th Street PO Box 980566, Richmond, VA 23298-0566, USA, Tel: (804)-628-3742, Fax: (804)-827-1017, e-mail: suramtucules@vcu.edu

common restorative procedures. Increased number of trips to see the dentist also adds to patient's expenses.

Reduced space for complete dentures in dental schools' curriculum^{24,25,26} is likely to generate graduates less prepared for the treatment of edentulism.

Under these circumstances, it appears that the need/demand of complete dentures exceeds the offer of prosthodontic care within the limitations of existing dental care delivery systems, even in developed countries.

The purpose of this paper is to review data on prevalence and future projections on edentulism, also review treatment modalities for this condition. Possible ways to improve efficiency in complete denture treatment, and ameliorate access to care are also investigated.

2. Edentulism and demographics

The prevalence of edentulism in seniors observes a wide range internationally, from 11% in China, to 23% in Brazil, 24% in Indonesia, and 26% in the United States. In Europe, it varies from 15% to 78%.^{16, 27}

In the U.S., the prevalence of edentulism registered a decline during past decades,²⁸ which can be approximated by a 10% decline for each decade.²⁹ Using Census data and projections from 1996 (indicating a significant increase in adult population, especially adults over 55), Douglass³⁰ estimated that the adult population in need for complete dentures will increase by 2020 to nearly 37.9 million, even considering a utilization rate of dentures of about 90%.^{29,31} It was predicted that even if the estimated decrease in the prevalence of edentulism will follow previous trends, it will likely be offset by the 79% growth in the population over 55, triggering an increase of the need for complete dentures from 53.8 million (1991) to 61 million in 2020.³⁰ The fact that dentures need to be replaced periodically, in order to maintain reasonable function and the oral health related quality of life³² is also to be considered. Newer data indicate that during the past half century covered by surveys, the prevalence of edentulism in U.S. adults decreased from 18.9% to 4.9%.³³ As socioeconomic disparities increased during the same period, edentulism is currently concentrated in the low-income population.³³ The relative decrease in edentulism prevalence in the U.S. by 74% is comparable with data from other countries: 84% relative decrease in the U.K. over four decades.³⁴ A 57% relative reduction was noted in Finland,³⁵ 84% in Sweden,³⁶ and 61% in Australia,³⁷ during two-decade periods.³³

In the U.S., the rate of decrease in edentulism is expected to slow to 2.6% by 2050. Such decline is predicted to be partially offset by population increase and aging, indicating that the number of edentulous individuals will actually decrease by 30%, from 12.2 million in 2010 to 8.6 million in 2050.³³

In Europe, the prevalence of edentulism is also expected to decrease significantly during the next decades. The growth of the older segment of population is expected to counteract the trends in

prevalence, but the effect is not expected to be as dramatic as in the U.S.⁷

Prevention of edentulism is work in progress worldwide, with significant disparities, related mostly to access to care and education. Overall, it is likely that the elderly will lose teeth later in life,³⁸ contributing to an anticipated decrease in the need for tooth replacement, at least in some populations of the developed world.

3. Treatment modalities for the edentulous patient

Despite consistent advances in organ and tissue engineering,^{39,40} their current impact on the dental profession and practice is rather limited at best. Dentistry remains predominantly restorative nowadays, and the time when re-growing teeth will become mainstream is probably decades away.

The advent of dental implants more than half a century ago brought the hope to evade some of the shortcomings of conventional, tissue supported dentures. Constant development in materials and techniques enabled implant dentistry to become a predictable and lucrative enterprise. If cost were not a limiting factor, implant placement and restoration would be mainstream today, considering the excellent survival rates, even for implants being placed in predoctoral and residency programs.⁴¹

Most studies on implant treatment and oral function demonstrated an improvement of chewing function in the mandible.^{13,14,42,43,44,45,46,47} The implant restorations are well received within the stomatognathic system, with electromyographical activity values comparable to those of dentate subjects.⁴⁸

A systematic review by Fueki et al.¹¹ concluded that a mandibular implant-supported overdenture opposing a maxillary conventional complete denture provides significant improvement in the masticatory performance compared to the conventional upper and lower complete dentures for a limited population having persistent functional problems due to severely resorbed mandible.

After implant treatment, patients report high levels of satisfaction regarding various aspects

of their denture function and they are more satisfied than patients with similar problems who receive a conventional denture without implant support.^{13,44,49}

Lindquist & Carlsson^{50,51} found that treatment with implant-supported fixed prostheses, generated a significant improvement of the patients' assessment of their chewing ability, and of the results of chewing tests (particle size reduction and masticatory force).

While implant-supported/retained prostheses demonstrated superiority in terms of retention, stability and patient acceptance, especially with fixed restorations, their cost remains prohibitive for a large majority of edentulous patients. During the past decades, using a reduced number of implants was proposed in order to provide the most value for money in such cases, and possibly define a standard of care. The McGill consensus statement proposed a standard of care for edentulous patients, including a maxillary conventional complete denture opposing a 2 implant overdenture.¹⁵ The said standard was

treated with circumspection later,^{52,53,54,55,56} as there is no solid evidence to endorse a single standard of care for the treatment of the edentulous mandible pertaining to a specific treatment option. It was shown that patient choice has a greater influence on treatment outcome, as compared to the practitioner's bias towards a treatment option.⁵² Fitzpatrick⁵² emphasized that "the standard of care in the edentulous mandible is the intervention judged by the well-informed patient, in consultation with an appropriately trained and experienced dental health care provider, to best meet the needs and circumstances of the patient."

Efforts to reduce the costs and provide simplicity in implant overdenture treatment went even farther by investigating mandibular overdentures retained by a single implant.^{57,58,59,60,61,62}

Well over half a century in the dental implant era, a large majority of edentulous individuals continue to wear conventional, tissue supported complete dentures, and the need for such prostheses will stay for years to come.^{8,63,64}

4. Simplified denture fabrication protocols

Most U.S. dental schools teach a traditional protocol in complete denture fabrication, including a multi-step approach using preliminary and master cast impressions, semi-adjustable articulators, face-bow preservation, laboratory/clinical remount.^{65,66} Despite the fact that the traditional multi-step method is preferred by prosthodontists and taught in a large majority of dental schools, most general dentists use simplified techniques in order to reduce the number of appointments and the cost.^{8,16,63,64,67,68}

Shorter, less expensive but still acceptable treatment methods would benefit especially elderly patients with chronic pathology and less mobility.^{1,17,69,70,71}

Simplified denture fabrication techniques make treatment more attractive for both practitioners and patients.

Most simplified techniques will condense impression making in one appointment, which often includes jaw records also (without face bow registration), and sometimes anterior teeth selection/mock-up of anterior set-up. A critical review by Carlsson et al⁷² established that "there was no support for the frequent textbook statement that the two-step procedure is necessary and superior to the one-step method". A try-in procedure is optional during most techniques, so the finished dentures can be delivered in as little as two appointments. In addition, such methods are likely to be integrated in a digital workflow.⁷³

There were no significant differences noted in denture quality and patient satisfaction between dentures fabricated by using the traditional multi-step protocol and prostheses made by using simplified methods.^{1,6,8,16,63,64,68,74,75,76,77} The goal of such methods would be to reduce the number of appointments while still observing the principles of complete denture treatment.^{78,79,80} Such techniques are more cost effective,^{64,67,69} and it was reported that by using a simplified technique, the clinical time can be reduced by as much as 34%, compared to

conventional methods.⁶⁹ At the same time, patient satisfaction and prosthodontist rating of prosthesis quality were comparable between the two methods. Patients appreciated the reduced number of appointments.⁶⁹

Overall, there is no compelling evidence to suggest that complete dentures fabricated following the traditional multi-step, complex protocol provide better outcomes than dentures made using simplified techniques.⁸¹

It is worth noting that the study by Regis et al.⁶⁸ employed relatively young dentists. Such young practitioners reached good results by using the simplified technique, which indicates that experience is not a factor under these conditions.⁶⁸ In addition, it was found that even predoctoral students can make adequate complete prostheses by using a simplified method.⁸²

A one-step complete denture technique was also documented.⁸³ It employs prefabricated complete dentures templates with thermoplastic bases (which come in different sizes), which are adapted on casts, then relined chairside. While customization in tooth arrangements could be more like an afterthought, the one-step denture is regarded as a fast and cost-effective method for complete prosthesis fabrication.

5. Fabrication of complete prostheses using digital protocols

It took less than a decade for digital photography to reach mainstream and even take over professional photography at the beginning of the century. During the same period, CAD/CAM technologies soared in various industrial applications.

The digital methods in complete denture fabrication are not entirely new, as literature mentions such an approach as early as in 1994.⁸⁴ If we remember that it took more than three decades for digital protocols in fixed restorations to become mainstream, and considering that removable prosthodontics accounts for a significantly smaller portion of the dental business, it is likely that we will wait at least another decade for digital denture fabrication to become mainstream.

While the clinical steps remain essentially analogic, digital technologies in complete denture may address some of the disadvantages of conventional denture fabrication protocols, like increased number of treatment visits, and questionable adaptation of denture bases to the tissues due to polymerization shrinkage. Moreover, generating duplicate dentures appears simple and reliable with digital technologies. In the long run, digital technologies in complete denture fabrication are expected to help dealing with many other issues such as increased demand, access to care around the world, standardization in clinical research.⁸⁵

On the flip side, the costs associated with complete denture fabrication by digital means are still high, as compared to fully analog methods. With widespread acceptance, however, these costs are expected to fall, and likely become lower than expenses associated to the traditional methods.⁸⁵ Moreover, due to the reversible feature of complete denture treatment,

in case of failure of a digital protocol, a traditional approach can always be instituted, or a combination of the two.⁸⁵

A survey of U.S. post-doctoral program directors and predoctoral department chairs found that the use of digital technology in denture fabrication is incorporated in more than half of the graduate programs, while only 12% of the surveyed schools observe it in predoctoral education. It is estimated that up to 10% of complete dentures delivered in academic settings are processed by digital means.⁸⁶ The use of digital technologies for complete denture fabrication in predoctoral education was found to be an effective and time saving method. The process was preferred and used effectively by students.⁸⁷

6. Denturists and clinical dental technicians

Denturism was defined as the practice of fabrication and fitting of removable dentures by dental technicians, who perform both the clinical and laboratory stages of denture making.⁸⁸ In some countries, denturists are known as clinical dental technicians.

In the U.S. the practice of denturism is regulated in WA, OR, ID, MT, AZ, ME. Other states are seeking regulation (WY, TX, IL, IN, KY, TN, PA, VT, MA), with recent legislative action in CA, CO, OK, GA.⁸⁹

Denturists practice legally also in Canada, New Zealand, and Finland. There is an indication of illegal practice of denturism in Belgium, Greece, and the U.K.,⁹⁰ but it is probably much more widespread, especially in the developing world.

It was speculated that the development of denturism was mainly driven by dental technicians. Access to care was supposedly improved in the areas where denturists are allowed to practice.⁹⁰

The literature on the practice of denturism is scarce; more data are needed before making informed recommendations on what role should such a category of dental professionals play in the modern prosthodontic care delivery.

References

- Petersen PE, Yamamoto T. Improving the oral health of older people: the approach of the WHO Global Oral Health Programme. *Community Dent Oral Epidemiol.* 2005; 33:81-92. doi: 10.1111/j.1600-0528.2004.00219.x. [Full text linkss] [PubMed] Google Scholar (903) Scopus (385)
- US Department of Health and Human Services: Oral health in America: a report of the surgeon general - executive summary. 2000, Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health. [Full text linkss]
- Cooper LF. The current and future treatment of edentulism. *J Prosthodont.* 2009; 18:116-122. doi: 10.1111/j.1532-849X.2009.00441.x. Review. [Full text linkss] [PubMed] Google Scholar (75) Scopus (40)
- Felton DA. Edentulism and comorbid factors. *J Prosthodont.* 2009;18(2):88-96. doi: 10.1111/j.1532-849X.2009.00437.x. Review. [Full text linkss] [PubMed] Google Scholar (176) Scopus (74)
- Rodriguez TE, Galka AL, Lacy ES et al. Can midlevel dental providers be a benefit to the American public? *J Health Care Poor Underserved.* 2013;24(2):892-906. doi: 10.1353/hpu.2013.0084. [Full text linkss] [PubMed] Google Scholar (5)
- Carlsson GE, Omar R. The future of complete dentures in oral rehabilitation. A critical review. *J Oral Rehab.* 2010; 37(2):143-156. doi: 10.1111/j.1365-2842.2009.02039.x. [Full text linkss] [PubMed] Google Scholar (253) Scopus (118)
- Müller F, Naharro M, Carlsson GE. What are the prevalence and incidence of tooth loss in the adult and elderly population in Europe? *Clin Oral Impl Res.* 2007; 18(3):2-14. doi: 10.1111/j.1600-0501.2007.01459.x [Full text linkss] [PubMed] Google Scholar (323) Scopus (168)
- Kawai Y, Murakami H, Shariati B, et al. Do traditional techniques produce better conventional complete dentures than simplified techniques? *J Dent.* 2005;33(8):659-668. doi: 10.1016/j.jdent.2005.01.005. [Full text linkss] [PubMed] Google Scholar (100) Scopus (42)
- Mersel A, Peretz B. A behavioural approach in the treatment of elderly patients: a new philosophy. *Int Dent J.* 2003;53(1):51-56. [Full text linkss] [PubMed] Google Scholar (8) Scopus (1)
- Uram-Tuculescu S, Cooper LF, Foegeding EA et al. Electromyographic evaluation of masticatory muscles in dentate patients versus conventional and implant-supported fixed and removable denture wearers - a preliminary report comparing model foods. *Int J Prosthodont.* 2015;28(1):79-92. doi: 10.11607/ijp.3931. [PubMed] Google Scholar (4) Scopus (0)
- Fueki K, Kimoto K, Ogawa T, Garrett NR. Effect of implant-supported or retained dentures on masticatory performance: a systematic review. *J Prosthet*

- Dent. 2007; 98(6):470-477. doi: 10.1016/S0022-3913(07)60147-4. [Full text links] [PubMed] Google Scholar (140) Scopus (86)
12. Carlsson GE. Facts and fallacies: an evidence base for complete dentures. *Dental Update* 2006;33(3):134-136, 138-140, 142. [PubMed] Google Scholar (90) Scopus (44)
 13. Stellingsma K, Slagter AP, Stegenga B, Raghoebar GM, Meijer HJ. Masticatory function in patients with an extremely resorbed mandible restored with mandibular implant-retained overdentures: comparison of three types of treatment protocols. *J Oral Rehabil.* 2005; 32:403-410. doi: 10.1111/j.1365-2842.2005.01242.x. [Full text links] [PubMed] Google Scholar (92) Scopus (65)
 14. van Kampen FM, van der Bilt A, Cune MS, Fontijn-Tekamp FA, Bosman F. Masticatory function with implant-supported overdentures. *J Dent Res.* 2004;83(9):708-711. doi: 10.1177/154405910408300910. [Full text links] [PubMed] Google Scholar (189) Scopus (106)
 15. Feine JS, Carlsson GE, Awad MA et al. The McGill consensus statement on overdentures. Mandibular two-implant overdentures as first choice standard of care for edentulous patients. Montreal, Quebec, May 24-25, 2002. *Int J Oral Maxillofac Implants.* 2002; 17(4):601-602. Review. [PubMed] Google Scholar (342) Scopus (223)
 16. Heydecke G, Vogeler M, Wolkewitz M, Turp JC, Strub JR. Simplified versus comprehensive fabrication of complete dentures: patient ratings of denture satisfaction from a randomized crossover trial. *Quintess Int.* 2008;39(2):107-116. [Full text links] [PubMed] Google Scholar (69) Scopus (26)
 17. Owen PC. Appropriate: prosthodontics for the many, not just for the few. *Int J Prosthodont.* 2004;17(3):261-262, 231-235. [PubMed] Google Scholar (55) Scopus (41)
 18. Takanashi Y, Penrod JR, Lund JP, Feine JS. A cost comparison of mandibular two-implant overdenture and conventional denture treatment. *Int J Prosthodont.* 2004; 17(2):181-186. doi: 10.1016/j.prosdent.2004.06.016. [PubMed] Google Scholar (90) Scopus (60)
 19. Nitschke I, Meier L, Farella M, Palla S, Gallo LM. Nocturnal masseter electromyographic activity of complete denture wearers. *Gerodontology.* 2012;29(2):e595-601. doi: 10.1111/j.1741-2358.2011.00528.x. [Full text links] [PubMed] Google Scholar (0) Scopus (0)
 20. IOM (Institute of Medicine). The U.S. oral health workforce in the coming decade: Workshop summary. Washington, DC: The National Academies Press; 2009. doi: 10.17226/12669.
 21. Hill EE, Breeding LC. Who is teaching undergraduate prosthodontics in US dental schools? *J Prosthodont.* 2009;18(2):195-198. doi: 10.1111/j.1532-849X.2008.00382.x. [Full text links] [PubMed] Google Scholar (10) Scopus (5)
 22. Christensen GJ, Yancey W. Dental laboratory technology in crisis, part II: Potential solutions to the challenges facing the industry. *J Am Dent Assoc.* 2005;136(6):783-786. doi: 10.14219/jada.archive.2005.0263. [Full text links] [PubMed] Google Scholar (11) Scopus (6)
 23. Christensen GJ. Removable prosthodontics: a forgotten part of dentistry. *Alpha Omegan* 2006;99(1):26-28. [PubMed] Google Scholar (10) Scopus (6)
 24. Clark RKF. The complete denture crisis: a personal view. *Eur J Prosthodont Restor Dent.* 2005;13(3):98-99. [PubMed] Google Scholar (3) Scopus (3)
 25. Clark RKF. The future of teaching of complete denture construction to undergraduates. *Br Dent J.* 2002;193(1):13-14. doi: 10.1038/sj.bdj.4801472a [Full text links] [Free Article] [PubMed] Google Scholar (24) Scopus (17)
 26. McCord F. Understanding prosthodontics--where did it all go wrong? *Int Dent J.* 2003; 53(5 Suppl):335-339. doi: 10.1111/j.1875-595X.2003.tb00907.x. [Full text links] [PubMed] Google Scholar (11)
 27. Medeiros JJ, Rodrigues LV, Azevedo AC et al. Edentulism, denture use and need and associated factors in a Brazilian northeastern city. *Pesq Bras Odontoped Clin Integr.* 2012;12(4):573-578. doi: http://dx.doi.org/10.4034/pboci.v12i4.1661 [Full text links] Google Scholar (1) Scopus (3)
 28. Weintraub JA, Burt BA. Oral health status in the United States: tooth loss and edentulism. *J Dent Educ.* 1985;49(6):368-376. [PubMed] Google Scholar (210) Scopus (137)
 29. Marcus SE, Drury TF, Brown LJ, Zion GR. Tooth retention and tooth loss in the permanent dentition of adults: United States, 1988-1991. *J Dent Res.* 1996;75(2 Suppl):684-695. doi: 10.1177/002203459607502S08. [Full text links] [PubMed] Google Scholar (343) Scopus (195)
 30. Douglas CW, Shih A, Ostry L. Will there be a need for complete dentures in the United States in 2020? *J Prosthet Dent.* 2002; 87(1):5-8. doi:10.1067/mpr.2002.121203. [Full text links] [PubMed] Google Scholar (451)
 31. Redford M, Drury TF, Kingman A, Brown LJ. Denture use and the technical quality of dental prostheses among persons 18-74 years of age: United States, 1988-1991. *J Dent Res.* 1996 ;75 Spec No:714-725. doi: 10.1177/002203459607502S11. [Full text links] [PubMed] Google Scholar (133) Scopus (66)
 32. Peršić S, Strujic S, Strajnic L et al. Self-perceived esthetics, chewing function and oral health related quality of life in patients treated with new removable dentures. *Stoma Edu J.* 2016;3(1-2):92-97. doi: 10.25241/stomaeduj.2016.3(1-2).art.14. [Full text links]
 33. Slade GD, Akinkugbe AA, Sanders AE. Projections of U.S. Edentulism Prevalence Following 5 Decades of Decline. *J Dent Res.* 2014; 93(10):959-965. doi: 10.1177/0022034514546165. [Full text links] [Free PMC Article] [PubMed] Google Scholar (75) Scopus (37)
 34. Steele JG, Treasure ET, O'Sullivan I, Morris J, Murray JJ. Adult Dental Health Survey 2009: transformations in British oral health 1968-2009. *Br Dent J.* 2012; 213(10):523-527. doi: 10.1038/sj.bdj.2012.1067. [Full text links] [PubMed] Google Scholar (60) Scopus (37)
 35. Suominen-Taipale AL, Alanen P, Helenius H, Nordblad A, Uutela A. Edentulism among Finnish adults of working age, 1978-1997. *Community Dent Oral Epidemiol.* 1999;27(5):353-365. doi: 10.1111/j.1600-0528.1999.tb02032.x. [Full text links] [PubMed] Google Scholar (132) Scopus (73)
 36. Osterberg T, Carlsson GE, Sundh V. Trends and prognoses of dental status in the Swedish population: analysis based on interviews in 1975 to 1997 by Statistics Sweden. *Acta Odontol Scand.* 2000;58(4):177-182. doi: 10.1080/000163500429181. [Full text links] [PubMed] Google Scholar (115) Scopus (70)
 37. Sanders AE, Slade GD, Carter KD, Stewart JF. Trends in prevalence of complete tooth loss among Australians, 1979-2002. *Aust N Z J Public Health.* 2004; 28(6):549-554. doi: 10.1111/j.1467-842X.2004.tb00045.x. [Full text links] [PubMed] Google Scholar (62) Scopus (40)
 38. Mersel A. Prevention for the elderly patients. *Stoma Edu J.* 2014;1(1):10. doi: 10.25241/stomaeduj.2014.1(1).art.1. [Full text links]
 39. Neel EAA, Chrzanowski W, Salih VM, Kim HW, Knowles JC. Tissue engineering in dentistry. *J Dent.* 2014; 42(8):915-928. doi: 10.1016/j.jdent.2014.05.008. [Full text links] [Free Article] [PubMed] Google Scholar (65) Scopus (33)
 40. Sharma S, Srivastava D, Grover S, Sharma V. Biomaterials in tooth tissue engineering: a review. *J Clin Diagn Res.* 2014; 8(1):309-315. doi: 10.7860/JCDR/2014/7609.3937. [Full text links] [Free PMC Article] [PubMed] Scopus (22)
 41. Gebistorf MC, Bader CL, Takeichi T, Katsoulis J. Prosthetic reconstructions and referring implant survival in a postgraduate program: A retrospective study. *Stoma Edu J.* 2016;3(3-4):223-234. doi: 10.25241/stomaeduj.2016.3(3-4).art.13. [Full text links] Google Scholar (0)
 42. Bakke M, Holm B, Gotfredsen K. Masticatory function and patient satisfaction with implant supported mandibular overdentures: a prospective 5-year study. *Int J Prosthodont.* 2002; 15(6):575-581. [Full text links] [PubMed] Google Scholar (206) Scopus (110)
 43. Fontijn-Tekamp FA, Slagter AP, Van Der Bilt A et al. Biting and chewing in overdentures, full dentures, and natural dentitions. *J Dent Res* 2000;79(7):1519-1524. doi: 10.1177/00220345000790071501. [Full text links] [PubMed] Google Scholar (552) Scopus (327)
 44. Naert I, Gizani S, Vuylsteke M, Van Steenberghe D. A 5-year prospective randomized clinical trial on the influence of splinted and unsplinted oral implants retaining a mandibular overdenture: prosthetic aspects and patient satisfaction. *J Oral Rehabil.* 1999; 26(3):195-202. doi: 10.1034/j.1600-0501.1998.090304.x. [Full text links] [PubMed] Google Scholar (285) Scopus (188)
 45. Schmitt A, Zarb GA. The notion of implant-supported

- overdentures. *J Prosthet Dent.* 1998;79(1):60-65. [Full text links] [PubMed] Google Scholar (71) Scopus (39)
46. Pera P, Bassi F, Schierano G, Appendino P, Preti G. Implant anchored complete mandibular denture: evaluation of masticatory efficiency, oral function and degree of satisfaction. *J Oral Rehabil.* 1998;25(6):462-467. doi: 10.1046/j.1365-2842.1998.00260.x. [Full text links] [PubMed] Google Scholar (104) Scopus (59)
 47. Haraldson T, Jemt T, Stålblad PA, Lekholm U. Oral function in subjects with overdentures supported by osseointegrated implants. *Scand J Dent Res.* 1988;96(3):235-242. [Full text links] [PubMed] Google Scholar (165) Scopus (93)
 48. Tartaglia GM, Sforza C. Functional evaluation of implant supported prostheses. *Stoma Edu J.* 2014;1(1):41-47. doi: 10.25241/stomaeduj.2014.1(1).art.7. [Full text links] Google Scholar (0)
 49. Naert I, Alsaadi G, Quirynen M. Prosthetic aspects and patient satisfaction with two-implant retained mandibular overdentures: a 10-year randomized clinical study. *Int J Prosthodont.* 2004;17(4):401-410. [Full text links] [PubMed] Google Scholar (240) Scopus (154)
 50. Carlsson GE, Lindquist LW. Ten-year longitudinal study of masticatory function in edentulous patients treated with fixed complete dentures on osseointegrated implants. *Int J Prosthodont.* 1994;7(5):448-453. [Full text links] [PubMed] Google Scholar (95) Scopus (65)
 51. Lindquist LW, Carlsson GE. Long-term effects on chewing with mandibular fixed prostheses on osseointegrated implants. *Acta Odontol Scand.* 1985;43(1):39-45. doi: 10.3109/00016358509064138. [Full text links] [PubMed] Google Scholar (165) Scopus (118)
 52. Fitzpatrick B. Standard of care for the edentulous mandible: a systematic review. *J Prosthet Dent.* 2006;95(1):71-78. doi:10.1016/j.prosdent.2005.11.007. [Full text links] [PubMed] Google Scholar (120) Scopus (74)
 53. Zarb GA. Meetings and a goodbye. Editorial. *Int J Prosthodont.* 2005;18(5):365-367. [Full text links] Google Scholar (2)
 54. Carlsson GE, Kronström M, de Baat C et al. A survey of the use of mandibular implant overdentures in 10 countries. *Int J Prosthodont.* 2004;17(2):211-217. [Full text links] [PubMed] Google Scholar (52) Scopus (31)
 55. Palmqvist S, Owall B, Schou S. A prospective randomized clinical study comparing implant-supported fixed prostheses and overdentures in the edentulous mandible: prosthodontic production time and costs. *Int J Prosthodont.* 2004;17(2):231-235. [Full text links] [PubMed] Google Scholar (52) Scopus (36)
 56. Kronström M, Carlsson GE. Use of mandibular implant overdentures: treatment policy in prosthodontic specialist clinics in Sweden. *Swed Dent J.* 2003;27(2):59-66. [Full text links] [PubMed] Google Scholar (13) Scopus (10)
 57. Alsabeeha N, Payne AGT, De Silva RK, Swain MV. Mandibular single-implant overdentures: a review with surgical and prosthodontic perspectives of a novel approach. *Clin. Oral Impl. Res.* 2009;20(4):356-365. doi: 10.1111/j.1600-0501.2008.01666.x. [Full text links] [PubMed] Google Scholar (57) Scopus (23)
 58. Wolfart S, Braasch K, Brunzel S, Kern M. The central single implant in the edentulous mandible: improvement in function and quality of life - a report of 2 cases. *Quintessence Int.* 2008;39(7):541-548. [Full text links] [PubMed] Google Scholar (26) Scopus (12)
 59. Kronström M, Davis B, Loney R, Gerrow J. Mandibular overdentures supported by one or two unsplinted implants using the immediate loading protocol. Fukuoka, Japan: International College of Prosthodontics; 2007.
 60. MacEntee MI, Walton JN. The economics of complete dentures and implant-related services: a framework for analysis and preliminary outcomes. *J Prosthet Dent.* 1998;79(1):24-30. [Full text links] [PubMed] Google Scholar (75) Scopus (57)
 61. Krennmair G, Ulm C. The symphyseal single-tooth implant for anchorage of a mandibular complete denture in geriatric patients: a clinical report. *Int J Oral Maxillofac Impl.* 2001;16(1): 98-104. [Full text links] [PubMed] Google Scholar (96) Scopus (53)
 62. Cordioli G, Majzoub Z, Castagna S. Mandibular overdentures anchored to single implants: a five year prospective study. *J Prosthet Dent.* 1997;78(2):159-165. [Full text links] [PubMed] Google Scholar (155) Google Scholar Scopus (91)
 63. Cunha TR, Della Vecchia MP, Regis RR et al. A randomised trial on simplified and conventional methods for complete denture fabrication: Masticatory performance and ability. *J Dent.* 2013;41(2):133-142. doi: 10.1016/j.jdent.2012.09.008. [Full text links] [PubMed] Google Scholar (41) Scopus (22)
 64. Kawai Y, Murakami H, Takanashi Y, Lund JP, Feine JS. Efficient resource use in simplified complete denture fabrication. *J Prosthodont.* 2010;19(7):512-516. doi: 10.1111/j.1532-849X.2010.00628.x. [Full text links] [PubMed] Google Scholar (37) Scopus (17)
 65. Petropoulos VC, Rashedi B. Complete Denture Education in U.S. Dental Schools. *J Prosthodont.* 2005;14(3):191-197. doi: 10.1111/j.1532-849X.2005.03043.x. [Full text links] [PubMed] Google Scholar (38) Scopus (20)
 66. Petrie CS, Walker MP, Williams K. A survey of U.S. prosthodontists and dental schools on the current materials and methods for final impressions for complete denture prosthodontics. *J Prosthodont.* 2005;14(4):253-262. doi: 10.1111/j.1532-849X.2005.00051.x. [Full text links] [PubMed] Google Scholar (63) Scopus (32)
 67. Della Vecchia MP, Regis RR, Cunha TC et al. A randomized trial on simplified and conventional methods for complete denture fabrication: cost analysis. *J Prosthodont.* 2014;23(3):182-191. doi: 10.1111/jopr.12090. [Full text links] [PubMed] Google Scholar (15) Scopus (6)
 68. Regis RR, Cunha TR, Della Vecchia MP et al. A randomised trial of a simplified method for complete denture fabrication: patient perception and quality. *J Oral Rehabil.* 2013; 40(7):535-545. doi: 10.1111/joor.12063. [Full text links] [PubMed] Google Scholar (20) Scopus (9)
 69. Ceruti P, Mobilio N, Bellia E et al. Simplified edentulous treatment: A multicenter randomized controlled trial to evaluate the timing and clinical outcomes of the technique. *J Prosthet Dent.* 2017;118(4):462-467. doi: 10.1016/j.prosdent.2017.01.024. [Full text links] [PubMed] Google Scholar (0) Scopus (0)
 70. Owen PC. Guidelines for a minimum acceptable protocol for the construction of complete dentures. *Int J Prosthodont.* 2006;19(5):467-474. [Full text links] [PubMed] Google Scholar (32) Scopus (22)
 71. Ansari IH. A one-appointment impression and centric relation record technique for compromised complete denture patients. *J Prosthet Dent.* 1997;78(3):320-323. doi: 10.1016/S0022-3913(97)70033-7. [Full text links] [PubMed] Google Scholar (8) Scopus (3)
 72. Carlsson GE, Örtorp A, Omar R. What is the evidence base for the efficacies of different complete denture impression procedures? A critical review. *J Dent.* 2013;41(1):17-23. doi: 10.1016/j.jdent.2012.11.015. [Full text links] [PubMed] Google Scholar (27) Scopus (15)
 73. Goodacre CJ, Garbacea A, Naylor WP et al. CAD/CAM fabricated complete dentures: concepts and clinical methods of obtaining required morphological data. *J Prosthet Dent.* 2012;107(1):34-46. doi: 10.1016/S0022-3913(12)60015-8. [Full text links] [PubMed] Google Scholar (102) Scopus (53)
 74. Paulino MR, Alves LR, Gurgel BC, Calderon PS. Simplified versus traditional techniques for complete denture fabrication: a systematic review. *J Prosthet Dent.* 2015; 113:12-6. doi: 10.1016/j.prosdent.2014.08.004. [Full text links] [PubMed] Google Scholar (18) Scopus (12)
 75. Nuñez MC, Silva DC, Barcelos BA, Leles CR. Patient satisfaction and oral health-related quality of life after treatment with traditional and simplified protocols for complete denture construction. *Gerodontology.* 2015;32(4):247-253. doi: 10.1111/ger.12078. [Full text links] [PubMed] Google Scholar (14) Scopus (5)
 76. Duncan JP, Taylor TD. Simplified complete dentures. *Dent Clin North Am.* 2004;48(3):625-640, vi. doi: 10.1016/j.cden.2004.03.007. [Full text links] [PubMed] Google Scholar (17) Scopus (8)
 77. Nascimento DFF, Patto RBL, Marchini L, Cunha VPP. Double blind study for evaluation of complete dentures made by two techniques with and without face-bow. *Braz J Oral Sci.* 2004;3(9):439-445. [Full text links]
 78. Preti G, Notaro V, Bernardo S, Ceruti P, Gassino G. Benefits of the simplified edentulous treatment (SET) method in communicating with the laboratory. *Minerva Stomatol.* 2012;61(4):113-23. [Full text links] [PubMed] Google Scholar (5)

79. Preti G, Salerno M, Notaro V et al. SET: simplified treatment of edentulous patients. *Minerva Stomatol.* 2011;60(11-12):579-585. [Full text links] [PubMed] [Google Scholar \(5\)](#) [Scopus \(7\)](#)
80. Ceruti P, Bellia E, Aramini R, Gassino G. A novel method for defining and transferring to the laboratory aesthetic data of the edentulous patient: a randomized clinical trial. *Int J Prosthodont.* 2013;26(5):487-489. doi: 10.11607/ijp.3320. [Full text links] [PubMed] [Google Scholar \(3\)](#)
81. Critchlow SB, Ellis JS. Prognostic indicators for conventional complete denture therapy: a review of the literature. *J Dent.* 2010;38(1):2-9. doi: 10.1016/j.jdent.2009.08.004. [Full text links] [PubMed] [Google Scholar \(90\)](#) [Scopus \(40\)](#)
82. Duncan JP, Taylor TD. Teaching an abbreviated impression technique for complete dentures in an undergraduate dental curriculum. *J Prosthet Dent.* 2001;85(2):121-125. doi: 10.1067/mpr.2001.113699. [Full text links] [PubMed] [Google Scholar \(X\)](#) [Scopus \(X\)](#)
83. Wallace LN. One-step in-office immediate dentures. *Dent Today.* 2013; 32(8):72-75. [Full text links] [PubMed] [Google Scholar \(33\)](#) [Scopus \(17\)](#)
84. Maeda Y, Minoura M, Tsutsumi S, Okada M, Nokubi T. A CAD/CAM system for removable denture. Part I: fabrication of complete dentures. *Int J Prosthodont.* 1994;7(1):17-21. [Full text links] [PubMed] [Google Scholar \(108\)](#) [Scopus \(50\)](#)
85. Bidra AS, Taylor TD, Agar JR. Computer-aided technology for fabricating complete dentures: Systematic review of historical background, current status, and future perspectives. *J Prosthet Dent.* 2013;109(6):361-366. doi: 10.1016/S0022-3913(13)60318-2. [Full text links] [PubMed] [Google Scholar \(107\)](#) [Scopus \(50\)](#)
86. Fernandez MA, Nimmo A, Behar-Horenstein LS. Digital denture fabrication in pre- and postdoctoral education: a survey of U.S. Dental Schools. *J Prosthodont.* 2016; 25(1):83-90. doi: 10.1111/jopr.12287. [Full text links] [PubMed] [Google Scholar \(8\)](#)
87. Kattadiyil MT, Jekki R, Goodacre CJ, Baba NZ. Comparison of treatment outcomes in digital and conventional complete removable dental prosthesis fabrications in predoctoral setting. *J Prosthet Dent.* 2015;114(6):818-825. doi: 10.1016/j.prosdent.2015.08.001. [Full text links] [PubMed] [Google Scholar \(39\)](#) [Scopus \(19\)](#)
88. Smith NJ. The education and training of personnel auxiliary to dentistry. A submission to the Nuffield Foundation. *Br Dent J.* 1993;175(6):193-195. doi:10.1038/sj.bdj.4808269 [Full text links] [PubMed] [Google Scholar \(4\)](#) [Scopus \(3\)](#)
89. The National Denturist Association, USA [internet] 2017 [updated 2013; cited 2017 October 28]. Available from <http://nationaldenturist.com/affiliates>.
90. Kravits AS, Treasure ET. Utilisation of dental auxiliaries - attitudinal review from six developed countries. *Int Dent J.* 2007;57(4): 267-273. doi: 10.1111/j.1875-595X.2007.tb00131.x. [Full text links] [PubMed] [Google Scholar \(13\)](#) [Scopus \(12\)](#)

Sorin URAM-ȚUCULESCU

DDS, MS, PhD, Associate Professor
Department of Prosthodontics
VCU School of Dentistry
Virginia Commonwealth University
Richmond, VA 23298-0566, USA

**CV**

Dr. Sorin Uram-Tuculescu is an Associate Professor at the VCU School of Dentistry, Department of Prosthodontics, in Richmond, VA, U.S.A. He is involved in pre-clinical/clinical teaching, service and research. Uram maintains a part-time private practice focused on prosthodontics.

He authored/co-authored 7 textbooks, and participated in the elaboration of 50+ published papers and presentations.

Dr. Uram-Tuculescu lectures nationally on prosthodontic topics, patient management, ethics in dental profession.

Questions**Current trends in demographics and edentulism indicate that:**

- a. Prevalence of edentulism is increasing overall;
 b. Prevalence of edentulism is decreasing overall;
 c. The utilization rate of dentures is increasing overall;
 d. The utilization rate of dentures is decreasing overall.

The standard of care for the edentulous mandible is:

- a. Conventional complete denture;
 b. Implant overdenture;
 c. Implant supported fixed prosthesis;
 d. Not pertaining to a specific treatment option.

Simplified complete denture treatment techniques:

- a. Provide comparable outcomes, as compared to traditional techniques;
 b. Are generally more expensive;
 c. Require digital protocols;
 d. Should be reserved to specialists in prosthodontics.

Fabrication of complete denture using digital protocols:

- a. Is time consuming;
 b. Requires an optic impression;
 c. Follows simplified clinical protocols;
 d. Is mainstream in the developed world.