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Review Article

Dental Restoration Considerations for Frail and Functionally Dependent Community-Dwelling Older Adults

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SUMMARY

This work aims to provide dental professionals with a complete concept of dentures for the geriatric population and to inform readers about the oral rehabilitation needs of this special needs group in consideration of their frailty and functional dependence. In a narrative review of the literature on dentures for the geriatric population, four aspects, including epidemiology of teeth missing, prosthetic treatment plans, dental restoration designs, and denture satisfaction/chewing function and nutrition/quality of life, were considered. As the population ages, the prosthetic treatment needs of geriatric adults have increased considerably. Dental implants or implant-supported overdentures may be included in the treatment plan options for this population. High-quality dentures can improve chewing ability and quality of life in older adults. However, elderly individuals, especially those who are frail or dependent, have special physical, mental, social, and economic conditions and medication needs. Therefore, policy-makers and dental professionals must understand the overall considerations of denture fabrication.

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1. Introduction

With the upsurge in the number of geriatric people, the special oral needs of this group have also increased. The restoration and aesthetics of missing teeth and the rehabilitation of pronunciation and masticatory functions are important topics in geriatric dentistry. The introduction of geriatric prosthodontics has been pivotal considering that tooth loss is a major concern for elderly individuals. Dental restoration standards for older patients must be tailored to the patient's motivation, function, cognition, medical condition, and socioeconomic background. Dental restoration requires a very high level of knowledge, empathy, and a patient-centered perspective. The cost and extent of public funding for prosthodontic treatment may influence the use of oral health care services and the choice of preferred prostheses among older adults, thereby contributing to oral health-related quality of life (OHRQoL). In addition, frail and functionally dependent older adults have a considerably more complex decision-making process than their counterparts because of their chronic systemic diseases and medications.

In the 1970s, Käyser¹ introduced the concept of the shortened dental arch (SDA), which is known by many dentists as premolar occlusion. The treatment of dentate older adults should focus on function-oriented SDA because it is more cost-effective than other treatment methods.² A multicenter randomized controlled trial followed patients with restoration with SDAs or removable partial dental dentures for more than 10 years to compare their OHRQoL and found no difference between the two methods.³

Preoperative considerations regarding prosthetics in frail and functionally dependent elderly individuals are clinically important and practical. However, a complete understanding of the subject remains limited. Therefore, the purpose of this review is to provide a comprehensive and in-depth examination of the prosthetic considerations for this population with special needs. This review would primarily benefit policymakers and professionals in delivering dental prosthetic treatment to older adults.

2. Methods

A narrative review of the literature on prosthetic treatment in older adults published over the past 10 years was conducted. Published manuscripts were searched for the Medical Subject Headings terms “prosthetic” and “older adult” and the subtitles “tooth loss,” “fixed dental restoration,” “removable partial dentures (RPDs),” “complete denture,” “dental implant,” and “implant supported overdenture.” The databases searched were PubMed, MEDLINE, and Google Scholar. The inclusion criteria were as follows: studies published from January 2013 to January 2023, regardless of language or region. The research type includes randomized control trials, cohort studies, quantitative studies with a control, and systematic reviews on prosthetic treatment. The exclusion criteria were studies that did not target older adults, commentaries, and qualitative studies.

3. Results

3.1. Epidemiology of missing teeth in the geriatric population

Table 1 shows the prevalence of edentulism (Ed) in home-dwell-

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ing older adults. In general, institutionalized older adults have poorer oral health and face more barriers to dental care access than independent older adults. In 2020, more than 60% of older adults in institutions in Romania had complete tooth loss in both arches. In 2018, a report indicated that 60% of older adults in Brazilian institutions had complete tooth loss.⁴ Table 2 shows the prevalence of edentulism (Ed) in institutionalized older adults.

In addition to age, low income, and educational achievement, smoking, number of medications, and presence of diabetes or cardiovascular diseases may increase the risk of tooth loss in single older adults.⁵ Cognitive function may be poorer in edentulous older adults than in other older adults.⁶ Edentulous patients without restorative treatment account for almost half of all edentulous patients possibly because older adults are underutilizing dental services due to financial constraints, limited mobility, and lack of dental facilities in institutions.⁷

3.2. Prosthetic treatment plan for geriatric patients

Many factors affect wound healing, host resistance, and chewing ability. Complicated medication may also affect dental treatment plans and patient prognosis. These factors must be fully considered before developing a treatment plan. Several treatments are usually available. All these options, along with their associated advantages, disadvantages, financial factors, risks, and prognosis, need to be discussed with the patient. The patient can provide informed consent only after they discuss their selected treatment plan with their doctor. Obtaining informed consent from frail older adults may be difficult because of hearing impairments or mental illness. This situation can be resolved with the help of family members or friends. However, the needs of the patient are often overshadowed by the wishes of the family.⁸ Additionally, financial factors or government grants can considerably affect treatment plans. Treatment plans may have to be modified because the oral condition and bodily function of a frail patient can vary greatly from day to day. In addition, for older patients, repairing missing artificial teeth or baseplate relining may be a pragmatic compromise.⁹ Oral and cognitive function must

Table 1
Prevalence of edentulism (Ed) in home-dwelling older adults.

Year	Area	Age	Ed (%)
2007 ^a	USA (disability)	Mean 79.1	43.1
2012 ^b	Turkey	≥ 65	52.5
2013 ^c	Hong Kong	≥ 65	5.6
2018 ^d	Taiwan	≥ 65	6.4

^a Saunders R, Friedman B. Oral health conditions of community-dwelling cognitively intact elderly persons with disabilities. *Gerodontology*. 2007; 24(2):67–76. ^b Nazliel HE, Hersek N, Ozbek M, Karaagaoglu E. Oral health status in a group of the elderly population residing at home. *Gerodontology*. 2012;29(2):e761–e767. ^c Department of Health. *Oral Health Survey 2011*. Dental Service Head Office, Department of Health; 2013. ^d Huang MS. *Oral Health Survey of Adults and Seniors, 2015-2016*. Ministry of Health and Welfare; 2018.

Table 3
Focus of considerations for dental restoration of missing teeth in older adults.

	Tooth/tissue supported		Implant supported	
	Fixed	Removable	Fixed	Overdentures
Older adults with missing teeth	Denture adaptation, maintenance, and subsidy policy	and subsidy	Time, implant surgery, and cost	Implant surgery and improvement of denture stability and retention
Dentists	Abutment condition	RPDs: abutment condition CD: alveolar bone condition	Indications for dental implant surgery	Number of dental implants and selection of attachments

RPDs: removable partial dentures; CD: complete denture.

be assessed when planning denture treatment for older adults who require long-term care.¹⁰

3.3. Designing oral prostheses for geriatric patients

In this work, the design of dentures for the geriatric patient is divided into two categories, that is, tooth/tissue- and implant-supported restorations, each with a fixed or removable design. The focus of considerations for dental restoration of missing teeth in older adults is presented in Table 3.

3.3.1. Tooth/tissue-supported restorations

3.3.1.1. Fixed dental restorations

Fixed dentures appear to be the first choice for partially edentulous patients. Tooth loss is remarkably associated with low tongue pressure. In contrast to removable dentures, fixed dentures may prevent the reduction in tongue pressure.¹¹ In a Swedish study on patients with a mean age of 70 years followed up for 10 years, the success rate of tooth-supported fixed dental prostheses (FDPs) was 52.6%. FDPs with post-core or cantilevers, especially when both are used, have more complications than that without. Porcelain fused with cobalt–chromium has more ceramic fractures than gold and titanium alloys.¹²

3.3.1.2. Removable partial dentures

Most elderly patients with missing distal extension teeth have higher rates of RPD use than other older adults.¹³ When bilateral edentulous areas are located posterior to the remaining natural teeth, the double Akers clasp (with two retentive clasp arms and two reciprocal clasp arms) RPD, followed by the telescopic crown retained RPD, is the most beneficial for the periodontal health of abutment teeth. Next is the distal clasp RPD rather than the cantilever bridge.¹⁴

Table 2
Prevalence of edentulism (Ed) in institutionalized older adults.

Year	Area	Age	Ed (%)
2006 ^a	Belgium	≥ 65	64.0
2006 ^b	France	≥ 65	27.0
2008 ^c	Brazil	≥ 65	42.6
2011 ^d	Taiwan	≥ 65	18.9

^a De Visschere LM, Grooten L, Theuniers G, Vanobbergen JN. Oral hygiene of elderly people in long-term care institutions – a cross-sectional study. *Gerodontology*. 2006;23(4):195–204. ^b Montal S, Tramini P, Triay J-A, Valcarcel J. Oral hygiene and the need for treatment of the dependent institutionalised elderly. *Gerodontology*. 2006;23(2):67–72. ^c Ferreira RC, de Magalhães CS, Moreira AN. Tooth loss, denture wearing and associated factors among elderly institutionalised Brazilian population. *Gerodontology*. 2008;25(3):168–178. ^d Tsai AC, Chang TL. Association of dental prosthetic condition with food consumption and the risk of malnutrition and follow-up 4-year mortality risk in elderly Taiwanese. *J Nutr Health Aging*. 2011;15(4): 265–270.

3.3.1.3. Flexible dentures

Currently available materials for flexible dentures include the following: 1) Acetyl resin, which is a polyoxymethylene that is twice as hard as nylon and often used in clasps for aesthetic reasons. 2) Valplast, which is easy to install can be applied in two appointments and may be recommended for older patients with nonextensible edentulous areas supported by teeth that do not experience strong masticatory loads.¹⁵ 3) Soft silicone gaskets, which are used around remaining natural teeth. A study showed that wearers of cobalt–chrome alloy RPDs can chew normal food, those of polymethyl-methacrylate and Valplast RPDs have limited food choices due to the instability of the RPDs and possible pain during chewing.¹⁶

3.3.1.4. Complete dentures

For traditional mandibular complete dentures, the incidence of maladjustment is high after 3 months and decreases after 6 months. After 6 months, ulcerative lesions and irregular denture wearing are risk factors for unfitness.¹⁷ However, complete dentures are unsuitable for older adults with hand disabilities or severe cognitive impairment.

3.3.2. Implant-supported restorations

3.3.2.1. Implant-supported fixed restorations

The long-term imaging follow-up of dental implants in older adults suggests that age does not affect implant survival.¹⁸ Since 2014, South Korea's National Health Insurance has covered dental implants and contributed to the improvement in the access to dental implants of the elderly in Korea.¹⁹

3.3.2.2. Implant-supported overdentures

For patients dissatisfied with mandibular complete dentures, two mandibular two-implant retained overdentures (IODs) with attachments are cost-effective options. Mandibular IODs have high long-term survival rates despite the increasing frailty and deteriorating oral hygiene of elderly adults.²⁰ Patients with completely edentulous jaws exhibit improved cognitive function after the use of an IOD.²¹ A single midline implant overdenture (SIOD) may be an option to reduce costs further.²² Bar-supported overdentures on four implants are often used to restore edentulous maxilla.²³

3.4. Denture satisfaction/chewing function and nutrition/quality of life

In southern Taiwan, the overall satisfaction of elderly individuals with full dentures is 71.4%, and pain and denture loosening are predictors of denture satisfaction.²⁴ Poor communication between dentists and patients is associated with dissatisfaction among patients with dentures.²⁵

Evidence has shown that in older adults, the restoration of missing teeth by using appropriate dentures can help improve chewing ability, nutrition, and quality of life.²⁶ The maximum voluntary bite force of dependent elders using mandibular IODs significantly increased.²⁷ Older people with reduced residual alveolar bone height show improved masticatory efficiency after the use of SIODs.²⁸

Patients treated with implant-supported single crowns or fixed partial dentures had better OHRQoL after treatment than before treatment.²⁹ The retention and stability of unacceptable complete dentures are important risk factors for OHRQoL in edentulous older adults.³⁰ In older adults with edentulous jaws, overall OHRQoL improved after complete denture treatment.³¹ Evidence suggests that

older adults with implant-supported overdentures have a better OHRQoL than older adults with conventional complete dentures.³² Moreover, SIODs increase maximal bite force and masseter thickness in elderly patients when compared with conventional complete dentures, resulting in improved OHRQoL.³³

4. Discussion

Tooth loss has an adverse effect on cognitive impairment³⁴ and is associated with poor gait performance in older adults.³⁵ The use of dentures can reduce the risk of social isolation, especially for those with severe tooth loss.³⁶ In older adults who wear dentures, the severity of tooth loss and the type and quality of dentures can affect not only masticatory function and OHRQoL but also overall health.³⁷ Frailty is associated with a lower number of remaining teeth in older adults.³⁸ Decision makers have an obligation to develop intervention policies that address tooth count issues to develop effective frailty prevention strategies for older adults.

Australia assesses the lifespan of complete dentures under public insurance over a 20-year observation period. Complete dentures are most often replaced after approximately 6 years of use. Single-jaw dentures have a shorter lifespan and a lower survival rate than paired dentures. This information will help third-party providers properly plan and fund denture services, allowing them to focus on improving denture benefits for seniors.³⁹ In general, dentists consider SDA to be a practical and useful treatment modality for older adults with prosthetic limitations. Consequently, SDA increases opportunities to allocate additional dental resources to preventive and diagnostic services in geriatric dentistry.⁴⁰

Given that long periods of institutionalization remain associated with missing teeth, oral health protocols should be established in long-term institutions to maintain oral health effectively during institutionalization.⁴¹ In Institutional settings, oral hygiene maintenance for older adults is often performed by caregivers, who often have little training or experience.⁴² Health policy-makers must recognize the need for trained and skilled personnel to care for older adults in institutions.⁴³ In institutionalized geriatrics, oral hygiene performed by dental professionals may help reduce the incidence of aspiration pneumonia and associated mortality, especially in older adults with swallowing disorders.⁴⁴ Hence, the prevention and treatment of oral diseases should be considered as a critical part of maintaining the overall health of older adults in institutions.⁴⁵

RPDs yield successful outcomes because they are easy to insert, adjust, and remove. However, the decision-making process is affected by factors, such as time, cost, and requirement for government subsidies. Dentists should make professional considerations based on the patient's own oral conditions. Even if the patient wears flexible removable dentures, regular visits to the clinic are necessary for adjustment.

In geriatric implant dentistry, interindividual variability in treatment plans becomes increasingly individualized with age. Dental implants can worsen the patient's general condition. Diseases requiring special attention include cardiovascular diseases, diabetes, osteoporosis, cancer, rheumatism, and malnutrition. The drugs used to treat these disorders may affect wound healing, osseointegration, and implant success. High survival rates are observed in the elderly population with implant-supported fixed dental prostheses, and noninvasive surgery is often performed. However, implants are not a solution for all geriatric patients due to barriers to implant placement in the elderly that often result from fear of surgical intervention, high cost, or medical condition. The cost-effectiveness of treat-

ment with implant-supported dentures is important and should be considered in geriatric dental practice.

5. Conclusion

The demand for dental prosthetic services for the geriatric population is increasing daily. The physical, psychological, medication, oral hygiene and maintenance ability, and socioeconomic statuses of geriatric patients are far different from those of young people. Dentists should consider all these aspects before fabricating dentures. However, poor experiences influence the willingness of older adults to receive newly fabricated dentures. Dentists should provide oral rehabilitation services to older patients and exhibit patience and empathy. The government's denture subsidy policy for the geriatric population should be widely accessible and focused on low-income groups. The findings of this review are expected to contribute to healthy aging of community-dwelling older adults by working together between dentists and care providers as well as community elders themselves to improve OHRQoL.

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