

REVIEWS

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SIGMAR KOPP¹, HALINA PANEK², STEFAN IHDE³, BELA LIEB⁴

Clinical Problems with Implant Installation in Geriatric Patients

Problemy kliniczne związane ze stosowaniem wszczepów u pacjentów w podeszłym wieku

¹ Department of Prosthodontics, Faculty of Medicine, University of Rostock, Germany

² Department of Prosthodontics, Wrocław Medical University, Poland

³ Dental Clinic Gommiswald AG, Gommiswald, Switzerland

⁴ Department of Oromaxillofacial Surgery, Faculty of Medicine, University of Rostock, Germany

Abstract

The purpose of this overview paper is to analyze the literature to identify key articles in the effort to understand clinical problems in implantology in geriatric patients better. The authors were interested in the rate of use of implants in the distal arch regions in both the maxilla and the mandible as well as the rate of success with particular in this group of patients. Moreover, to identify acceptable techniques for accurately diagnosing, treatment selection and serious prognosis of this specific cohort with increasing demand of prosthodontic treatments. The authors performed a PUBMED and MEDLINE search to identify studies reporting on implant treatment in aged patients. The authors reviewed articles, which provided the general indications to use an implant treatment in elderly patients specifically. Moreover, the authors analyzed the papers discussing the implant failure or complications in aged patients and reporting on its incidence and etiology, as well as presenting the current treatment methods to eliminate the complications. The literature reviewed for this publication suggests that the endosseous anchorage of implants in the elderly patient is in many cases successful and enhances the quality of life for geriatric patients who are edentulous. There is a number of promising treatment approaches available for the practitioners (**Dent. Med. Probl. 2009, 46, 4, 486–493**).

Key words: dental implants, distal arch region, geriatrics, implant failure, implantology.

Streszczenie

Celem pracy było zanalizowanie piśmiennictwa pod kątem zidentyfikowania istotnych prac, które umożliwiłyby lepsze zrozumienie klinicznych problemów spotykanych w implantologii stomatologicznej u pacjentów w podeszłym wieku. W szczególności autorów interesowały częstotliwość wykonywania wszczepów w bocznych odcinkach łuku zębowego szczęki i żuchwy oraz odsetek pozytywnych wyników leczenia w tej grupie pacjentów. Celem pracy było ponadto zidentyfikowanie obecnie akceptowanych metod umożliwiających lepsze diagnozowanie, wybór odpowiedniej opcji leczenia i racjonalne prognozowanie w tej charakterystycznej grupie pacjentów z rosnącymi oczekiwaniami odnośnie do leczenia protetycznego. W tym celu wyszukano piśmiennictwo, wykorzystując bazę danych zgromadzonych na temat leczenia implantologicznego u pacjentów w podeszłym wieku w PUBMED i MEDLINE. W szczególności zanalizowano artykuły, które podawały wskazania do stosowania implantów u osób w podeszłym wieku, a także omawiały niepowodzenia i powikłania leczenia z zastosowaniem wszczepów z podaniem częstości występowania i przyczyn niepowodzeń oraz metod ich eliminowania. Zanalizowane piśmiennictwo w niniejszej pracy sugeruje, że stosowanie wszczepów śródkostnych u pacjentów w podeszłym wieku daje w wielu przypadkach pomyślne wyniki i poprawia jakość życia, zwłaszcza pacjentów bezzębnych. Ponadto wykazano, że klinicyści mają obecnie do wyboru wiele obiecujących opcji leczenia (**Dent. Med. Probl. 2009, 46, 4, 486–493**).

Słowa kluczowe: wszczepy stomatologiczne, tylne odcinki łuku zębowego, geriatrya, uszkodzenia implantów, implantologia.

The purpose of this overview is to search the literature to identify key articles in the effort to understand clinical problems in implantology in

elderly patients better. The authors were interested in the rate of use of implants in the distal jaw regions in both jaws and the rate of success with

Table 1. PubMed Search Summary**Tabela 1.** Podsumowanie wyszukiwania prac w PubMed dla 3 kluczowych określeń

Terms (Kluczowe określenia)	Hits (Liczba rekordów)
Search „aged, 80 and over” [MeSH] AND dental implants AND treatment outcome AND prosthesis failure (Szukaj „wiek 80 i więcej” [Mesh] i implanty stomatologiczne i wyniki leczenia i uszkodzenia protez)	17
Search „aged” [MeSH] AND dental implants AND treatment outcome AND prosthesis failure (Szukaj „wiekowy” [MeSH] i implanty stomatologiczne i wyniki leczenia i uszkodzenia protez)	43
Search „aged” [MeSH] AND dental implants AND distal jaw NOT overdenture (Szukaj „wiekowy” [MeSH] i implanty stomatologiczne i tylna część szczęk bez protez typu overdentures)	32

particular in this group of patients. Moreover, to identify acceptable techniques for accurately diagnosing, treatment selection and serious prognosis of this specific cohort with increasing demand of prosthodontic treatments.

The authors performed a PUBMED and MEDLINE search to identify studies reporting on implant treatment in aged patients (Tab. 1). An attempt was made to identify studies of high methodological quality (systematic reviews, RCT and cohort studies). Case studies were included due to the minimal literature identified on this topic. Literature reviews were included for background information. Key articles that were identified from this strategy were explored further by using MEDLINE'S "Related Articles" feature. In addition, bibliographies of retrieved articles were reviewed. There was no restriction on year published. The following strategy was employed to identify literature to meet the objectives: identify review articles describing treatment outcome in elderly patients. Topics such as survival analysis, dental restoration failure and common treatment methods were included. This literature analysis reviewed articles, which addressed the following topics: 1) provide a general background on risk factors for use or avoiding implants in elderly patients specifically; 2) analyze current treatment methods with implants in distal region of dental arch and describe a failure resp. complication in aged patients and reporting on its incidence, etiology and diagnosis.

General Risk Factors for Implant Use in Elderly Patients

There are alterations and accumulation of risk factors during lifetime making treatment of elderly patients specific and delicate. This is especially

true in implantology. The general definition of "aging" contains the "degeneration and dying" beginning with cells, tissues to the whole organism. But nevertheless aging belongs to life and has to be respected and dealt with in a responsible manner.

Anatomic Alterations

Remodeling process in bone, especially in edentulous jaws, leads to atrophy of the alveolar bone and transforming particularly the mandible into a hollow bone [1, 2]. The previously present spongy bone tends towards degeneration and is replaced by fat cells, while intra-bony blood supply is reduced [3]. The maxilla is also affected by alterations, making traditional implant protocols hard to apply, as the morphology of conventional implants does not fit the bones morphology. The maxillary sinus shows a life-long tendency to expand and to internally widen concave areas, both being a result of Frost's laws for bone formation. This often results in paper-thin bone in the distal maxilla [4]. So the available bone quality and quantity in width and height are significantly different when compared to younger patients. The expansion of the maxillary sinus seems to be pronounced, if tooth loss occurs early, i.e. in a time period, when the activation frequency for secondary osteons is high (ages 0–30 in Fig. 1).

Alterations in Physiology

In 1998 Burr et al. published a chart showing alteration of the activity of bone morphogenetic units (BMU) during lifetime [5]. Interestingly the activity of BMU of people aged 60 is on the level of 25 year old adults. The lowest rate at 40 years is first echoed by the end of 70s years. The decrease in the secretion rate of the salivary gland during lifetime, due to changes in hormone secretion, is dis-

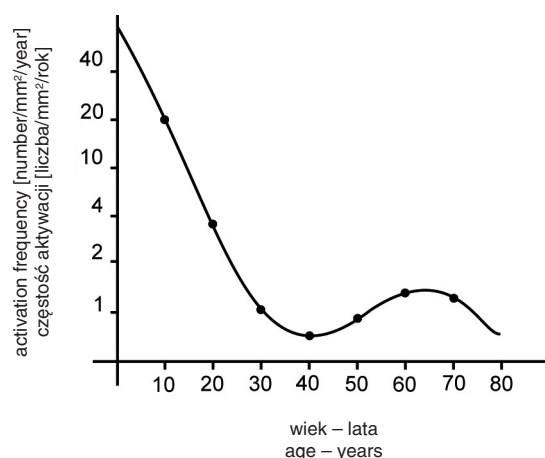


Fig. 1. Dynamic of BMU during lifetime according to Burr et al. [5]

Ryc. 1. Dynamika BMU w poszczególnych latach życia wg Burr et al. [5]

cussed controversially [3]. Dry mouth related problems may occur in higher incidence in the elderly.

Risk Factors Related to General Medical Treatment

There are possible accumulations of general diseases like cardiovascular, metabolic, degenerate and psychic diseases. Even metastasis of lung carcinoma in the mandible around recently placed implants is reported [6]. Also the drugs and therapies like radiation for managing general diseases have reactions and adverse reactions affecting dental treatments. The history of the bone site for implantological treatments has to be considered as well, i.e. in order to determine, of the local remodeling has ceased after any previous surgery. The same applies to residual teeth, endodontic treatments (with and without intra-bony residuals), existing implants, bone augmentations and the material used, habits, chewing patterns and the actual functioning of the TMJ. The adaptation to non-physiologic occlusal relations may cause difficulties when it comes to adapt to the restored situation. Transfers from fixed to removable prosthodontics and vice versa may cause adaptation problems as well and here the tongue position and the tongues motion pathways are to be considered as a major cause of difficulties. Tremor may cause not even harder hygienic conditions but also sea sickness like symptoms in the dentist during treatment. Parkinson patients need a long and specific care [7]. The limitation of hearing abilities, especially a patient's increasing disability to hear his/her own voice and thereby control his/her speech, are often the cause of problems with phonetic adaptation [8]. Even though oral osteo-

myelitis is rare and only rarely reported in connection with implant placement procedures, single reports on the occurrence of osteomyelitis as a consequence of peri-implantitis in a 72-year-old man are available [8].

Current Methods for Managing Elderly Patients with Implants

A common recommendation for treatment of elderly patients is an immediate loaded implant-retained overdenture representing a viable and cost-effective treatment often on just two implants on marbles, bars and magnets avoiding distal arch regions generally [9–43]. No age related increase of failures were found and reported in this restoration class [27]. This large number of articles on this restoration group may indicate a tendency to avoid distal arch regions in elderly patients generally. This is astonishing, because it is well known, that the distal areas have to bear 90% of the masticatory loads, while anterior tooth segments carry only the small rest.

These common treatments have also caves: anatomic variances like a lingual concavity or a severe slope in the lingual cortex might confer increased risks of lingual perforation in the interforaminal region, which carries along a large risk of intra-operative haemorrhage [44]. The commonly found arteria impar entering the bone lingual should also be mentioned. But even if distal arch regions are avoided for implant treatment, recommended constructions like bars may fracture [13]. Repair procedures like retrofitting and in mouth repairs as low cost repair methods are described [13, 15, 19, 25]. Some authors describe the additional use of implants in distal arch regions as vertical stops for mandible distal extension prostheses [45].

Treatments Including the Distal Arch Region as Implant Location

Combined overdentures on teeth and additional implants are describes and recommended by Hug et al [11]. Hybrid prostheses are functional even under immediate loading protocols [46]. This is a common follow up treatment to telescopic restorations on teeth only. Interestingly, 15 articles in the 1st search strategy of Table 1 (aged 80 and over) are from between 1991 and 1995, just two are published in 2008. If these articles were considered more focused, most of them were of no value for the current question. In 1993 Jemt

observed in a group of 48 patients, all more than 80 years old (mean age 82.7 years) at first implant surgery, receiving a total of 254 implants no higher failure rate than in younger cohorts [47]. Most patients had minimal post-placement problems, similar to what has been observed in younger patients. However, some patients (10%) experienced obvious problems with general adaptation and muscle control, which have not been observed in younger patients.

Another study from Jemt published in 1991 includes a total of 391 edentulous maxillae and mandibles consecutively treated with routine fixed prostheses, supported by 2,199 implants. The patients were followed for just 1 year (longer follow up publications are missing); the overall success rate was 99.5% and 98.1% for the prostheses and implants, respectively. While many problems occurred in both the maxillae and mandibles, there were also problems more typical for each jaw. Diction and fractures of resin teeth were more common problems in maxillae; cheek and lip biting was a frequent complication when mandibles were treated [48].

Twenty patients with periodontal involvement have been enrolled in a study by Machtei et al.: within the 12 month follow up period by five out of 49 implants failed and were removed; most of them during the first 6 months (90% overall survival rate). All of the implants (16) that had been inserted in the premolar region were successful, whereas three of nine implants in the molar region (33%) and two of 24 implants in the canine/incisor region failed ($P = 0.0278$). None of the other variables (smoking, arch, stability, implant length and diameter, and bone width) affected the outcome. Results in the molar regions suggested that careful consideration should be given to implants placed in these sites. Long-term success in these patients has not been addressed. Periodontal involvement, a condition found often in the group of elderly, seems to impair implant success [49].

Specific Strategies to Meet the Bone Conditions in Elderly Patients

Meeting the Local Native Bone

Shorter implants, e.g. 5 mm long sintered, porous-coated implants are reported to be successful in the population under report [50], even if the necessary length of implants is generally controversial discussed [51]. It has to be noted, that whenever short implants are used, their place of insertion is the atrophied basal bone, a bone portion which has very little tendency for further

resorption anyway. A described alternative for the use of longer implants is the tilted insertion [52–54]. Interestingly, the surface of the implants shows no significant influence on success [55].

One RTC study was found showing the early loading protocol of full-arch prosthesis in completely edentulous maxillae as a reliable alternative to the delayed protocol [56]. Also the pterygo-maxillary (tubero-ptyergoid) region is useful for implant anchorage [57–61]. The use of implant fixation in zygomatic region is an alternative. However specific disadvantages have to be taken into consideration [62–66]: the intra-oral mucosal penetration are of zygo implants is usually the palatal slope of the alveolar process of the maxillas in area of the 2nd premolar or first molar. Hence these implants significantly bother the movement of the tongue in its freedom, which may lead to a notable reduction of the quality of life for the affected patients. Transmandibular implants TMI are a very reliable alternative to endosseous implant procedures [67], however their application requires a surgical approach from outside the jaw and below the mandible and a skilled implantologist. The use of basal implants is a modern alternative to face the aged bone. High success rates were described even under immediate placement and loading conditions [68–72].

Modifying the Available Bone by Surgical Techniques

Augmentation techniques with autologous native bone from fibula, hip, calvarium and intra oral regions with various successes are described [73–77]. In the mandible the available vertical bone supply may be also increased by nerve lateralization. Vertical augmentation is often a challenge in the distal mandible and only few clinicians report success in larger numbers of patients. As a rule, vertical augmentations should only be performed using bone blocks, and because these blocks have to be harvested somewhere (if not obtained as demineralized bone blocks), collateral damages have to be taken into account. The acceptance for such time consuming and cost intensive treatments decreases with growing age [11, 25]. Note that length bone augmentations rarely meet the demands of the elderly, because this population often correlates treatment time to their expected life span and for this reason the willingness to undergo lengthy treatment protocols is reduced.

Reasons for Failures

Failures and complications in dental implantology may have different reasons. They may be of

surgical or prosthodontic origin, and often failures result from the accumulation of several smaller inadequacies. Therefore the planning including the correct anamnesis is really important for problem avoidance. The choice of well suitable materials, a coherent prosthodontic concept and enduring compliance seems to be important for long time success. Although practitioners may face problems when screws and implants fracture, the literature reviewed here did not address this problem. Tagger et al. [76] mentioned galvanic activity as a cause for implant fracture. These fractures occur in the area of implant and abutment contact. Moreover local overload, loosening of prosthetics screws in other implants or loosening of cemented connections do lead to fractures [15, 72].

Conclusions

There is no indication that implant treatments should not be performed in the elderly. Neither the age nor the age related diseases are the risk factors for implantology, although habits or nicotine abuse may affect the treatment outcome, especially because this abuse drastically reduces the

chances of a successful pre-treatment by bone augmentations.

The concept of immediately loading dental implants has the potential of being a viable addition to treatment modalities. The major decision-making challenge in managing depleted dentitions and complete edentulism in an aging society lies in differentiating the treatment outcomes, especially patient-mediated assessments (including economic analyses) of the various prosthodontic options available for older adults. The ability to chew properly is of great importance to maintain a healthy nutrition and improve oral comfort and quality of life, particularly in the elderly years. However, the demands of elderly patients differ from those of the younger. In younger populations dentures are rarely accepted devices, whereas the elderly population accepts wearing dentures and often only ask for denture stabilisation.

The literature reviewed for this publication suggests that the endosseous anchorage of implants in the elderly patient is predictably successful and enhances the quality of life for geriatric patients who are edentulous. There is a number of promising treatment approaches available for the practitioners.

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Address for correspondence:

Halina Panek
Krakowska 26
50-425 Wrocław
Poland
e-mail: Halina.Panek@kn.pl

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