

Contemporary possibilities for dentition reconstruction in edentulous geriatric patients

Współczesne możliwości odbudowy uzębienia u starszych bezzębnych pacjentów

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Abstract

The paper presents up-to-date possibilities for the treatment of edentulous geriatric patients by using implant-supported removable dentures. The reader is introduced to the problems related to extra- and intraoral changes in geriatric patients. Several solutions are presented for prosthetic management of an edentulous mandible and a maxilla using intraosseous dental implants. Informing the patient of the advantages of removable dentures and explaining how they differ from conventional complete dentures is the responsibility of the dentist undertaking reconstructive treatment within the oral cavity. Functionally efficient overdentures ensure psychosomatic comfort during chewing and speech articulation, leading to the improvement of the patient's life quality. The patient's advanced age is not a contraindication to the application of intraosseous implants as abutments supporting prosthetic restorations. Due to the considerable atrophy of the mucous and osseous foundation which compromises the conditions for the support of conventional removable dentures, the use of implanted abutments in the maxilla and/or mandible is a particularly advisable solution. Dental implants offer a wide range of prosthodontic solutions by providing support for fixed or removable dentures, with the latter possessing greater applicability due to the extensive atrophy of bone structures in geriatric patients.

Keywords: edentulousness, intraosseous implants, complete dentures, geriatric age, overdentures.

Streszczenie

Przedstawione zostały współczesne możliwości leczenia bezzębnych starszych pacjentów przy użyciu ruchomych implantoprotez zębowych. Artykuł omawia problemy związane z zewnątrz- i wewnątrzustnymi zmianami u osób starszych. Zaprezentowano kilka rozwiązań protetycznego zaopatrzenia bezzębnej żuchwy i szczęki z wykorzystaniem protez opartych na wszczepach śródkostnych. Informowanie pacjentów o zaletach implantoprotez ruchomych i wyjaśnianie różnic w stosunku do protez konwencjonalnych jest rolą stomatologa przystępującego do leczenia rekonstrukcyjnego w jamie ustnej. Czynnościowo skuteczne protezy nakładowe (overdentures) zapewniają psychosomatyczny komfort podczas żucia i artykulacji mowy, poprawiając jakość życia pacjenta. Zaawansowany wiek pacjenta nie jest przeciwwskazaniem do zastosowania wszczepów śródkostnych jako filarów podpierających odbudowy protetyczne. Z powodu znacznej atrofii błony śluzowej i podłoża kostnego, która pogarsza warunki dla podparcia konwencjonalnych protez, użycie implantowanych filarów w szczęce lub/i żuchwie jest szczególnie korzystnym rozwiązaniem. Stomatologiczne wszczepy stwarzają szeroki zakres protetycznych rozwiązań poprzez podparcie statycznych, jak i ruchomych uzupełnień, przy czym te ostatnie oferują większe możliwości zastosowania dzięki uwzględnieniu zaawansowanych zaników struktur kostnych u pacjentów geriatrycznych.

Słowa kluczowe: bezzębie, wszczepy śródkostne, protezy całkowite, podeszły wiek, protezy nakładowe.

Gerodontology, a branch of dentistry dealing with geriatric patients in an interdisciplinary manner, takes into consideration the anatomical, morphological and functional changes in the chewing apparatus which progress with age and affect the rehabilitative capacity of this group of patients. Since demographic projections indicate that by 2050 the number of people over 65 will comprise at least 20 per cent of the world's population – in the case of Poland this figure will be even higher reaching as much as 25 per cent of the population by 2030 – there is a growing interest in geriatric

dentistry [1]. The loss of or excessive damage to dentition, atrophy of osseous structure, dislocative changes in the mandible and functional disorders all constitute a form of disability which diminishes the well-being of the elderly, including those who frequently use removable dentures resting on the mucous membrane. With the passing of time, the capacity to adapt to the ongoing changes is reduced and patients often tend to have difficulty adapting to complete or partial removable dentures which become unsatisfactory if not unacceptable [2]. Among edentulous patients, or those with

excessive dentition deficiencies, the failure to use a complete set of removable dentures or the fact that these have been used for a long time without systematic checks contributes to the following morphological and functional changes:

- significant atrophy of osseous structures in the alveolar processes and cores of both jaws, even in patients who do not suffer from osteoporosis
- thinness and poor receptiveness of the mucous membrane which covers the atrophied foundation (low resilience), combined with reduced regenerative capacity
- apparently flat hard palate, resulting from the atrophy of maxillary alveolar processes
- atrophy of maxillary tubers with a low posterior wall behind them
- low resilience of the glandular part of the palate responsible for the functional suction of conventional dentures
- narrowed area of the immobile mucous membrane (particularly in the mandible)
- hardened oral cavity fundus obstructing suction
- overgrown tongue, particularly at its base as a consequence of compensation for teeth lack
- dryness of oral cavity tissues (xerostomia)
- weakened tone of the orbicular oris and masseter muscles
- substantial disproportion between the size of mandibular and maxillary edentulous alveolar process arches
- prominent interior osseous edges in the mandible (oblique lines)
- apparent transposition of mandibular mental foramina onto the supporting surface of the denture.

Various intraoral changes in the prosthetic foundation or disorders of mucous and salivary glands make it difficult to produce functional suction in conventional complete dentures, frequently preventing their effective use [3–6].

Morphological changes in the oral cavity are irreversible and require the adaptation of the present state to functional demands. The improvement of functional efficiency of the chewing apparatus, reduced in the course of degenerative changes, is vital for maintaining a proper function of the digestive tract, and its condition greatly influences the health of the entire body. Thus, the optimization of reconstructive treatment is a necessary condition for the improvement of the efficiency of the stomatognathic system. At present, the National Health Fund provides edentulous patients only with acrylic removable complete dentures. These prostheses, however, are based on the mucous membrane and mandibular and/or maxillary osseous structures, and can only perform their role to a largely limited extent, since during the chewing or swallowing function occlusive and biting forces

are transferred onto tissues which lie under the dentures in a highly unphysiological manner. With fully-dentate patients, the physiological transfer of chewing forces proceeds from the periodontium onto the alveolar bone, and the entire surfaces of the periodontal apparatus in the mandible and maxilla are approximately the same, equaling 45 cm². In edentulous patients, conventional complete dentures in the maxilla rest on the mucous and osseous foundation with an area of approx. 23 cm², whereas in the mandible this area is half or one third of that [1]. Such a situation is unfavorable to the improvement of comfort in using dentures, particularly the lower denture, due to its limited supporting surface. The lack of adequate retention and stabilization, painful sensation caused by injuries in the foundation tissues, and the discomfort of the tongue when forming food boluses further hinder the efficient use of these dentures [5, 7, 8].

As patients age, the mucous membrane of the oral cavity becomes thinner, less elastic and paler due to the limited number of vessels in the dermis and submucous layers, and the fact that the nourishment of the mucosal cells deteriorates, decreasing its resistance to infections and mechanically delaying regenerative healing processes [1, 3]. When properly made, dentures not only enhance the aesthetics and functionality of the chewing apparatus, but also prevent its destruction and thus facilitate the prevention of negative intra- and extraoral changes. Such dentures should maintain proper vertical and horizontal relations between the mandible and the maxilla, as well as support the soft tissues of the face, in particular the orbicular oris muscle, and fill the areas subject to atrophy caused by the loss of dentition or extensive use of old dentures. The patient's adaptation to the dentures is influenced by various factors, especially the local anatomical and morphological conditions, the motor activity of the chewing apparatus, psychical condition, sociological factors and a number of clinical and laboratory procedures, such as the technological discipline and skills of the technician and the expertise of the dentist administering the treatment.

Based on long-time clinical observations, the commonly used complete acrylic removable dentures can be considered far from satisfactory due to limited retention, unphysiological support in mucous and osseous foundations, horizontal mobility with regard to the foundation (up to several millimeters), restricted chewing efficiency and frequent phonetic impairment [8–11]. Making patients aware of the possibility to reconstruct their dentition using intraosseous dental implants is the responsibility of the dentist.

This paper presents clinical cases of patients where modern and more functional prosthetic restorations were used, anchored in dental implants. The number and placement of intraosseous dental

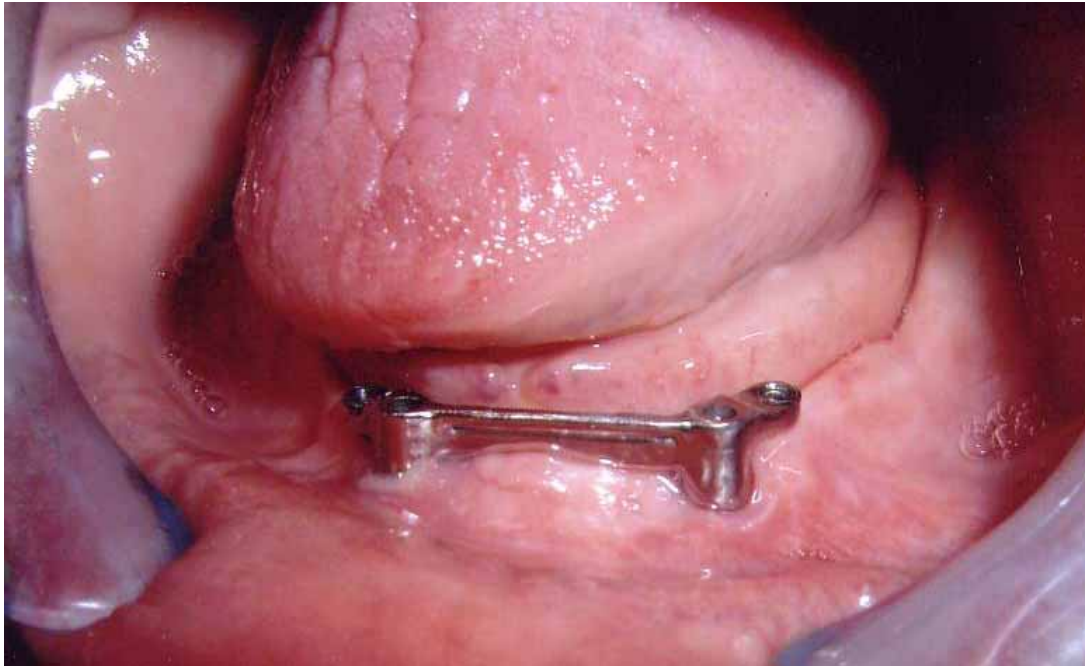


Figure 1. Metal structure supported by 2 implants provided with CEKA Revax retention elements

Rycina 1. Metalowa struktura oparta na 2 wszczepach zaopatrzona w elementy retencyjne CEKA Revax

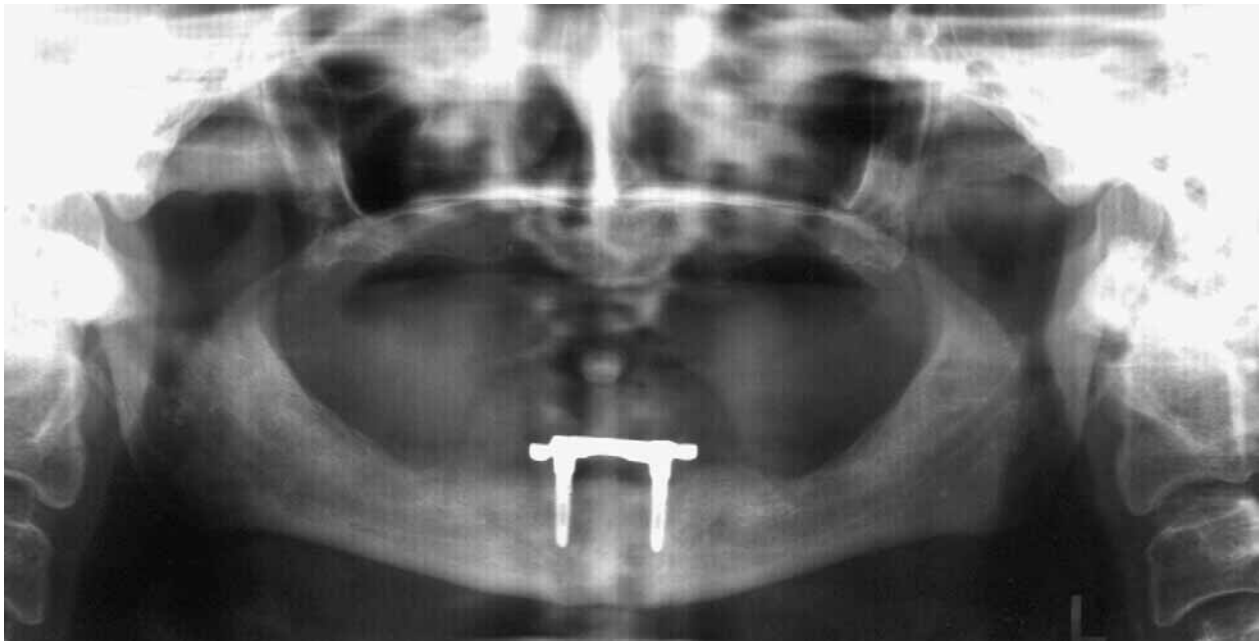


Figure 2. Pantomographic image of metal retentive structure in mandible of same patient

Rycina 2 Zdjęcie pantomograficzne struktury retencyjnej w żuchwie u tego samego pacjenta

implants in the osseous structures of the alveolar processes or cores of the jaw bones determine the application of various types of fixed or removable dentures. While the former require an even distribution of at least 5–6 intraosseous implants on the arch of the alveolar process, removable dentures in the mandible may be based on as few as three or even two implants constituting the retention for the overdenture. These are preferable in elderly patients, not only because of the challenging anatomic conditions in the osseous structures of the

foundations or a limited risk of injuries related to the operation, but also due to economic reasons.

A toothless jaw whose alveolar process undergoes vertical atrophy mostly on the side adjoining the tongue creates difficult conditions for a successful therapy using conventional removable processes as a consequence of the overgrown tongue, low osseous structures and limited capacity of the often dry mucous membrane (Xerostomia) typical of geriatric patients. Implanted abutments, mostly in the interforaminal section of the



Figure 3. Complete mandibular denture mechanically attached to intraosseous implants, successfully stabilized on foundation

Rycina 3. Całkowita proteza w bezzębnej żuchwie mechanicznie zakotwiczona skutecznie na podłożu za pomocą śródkostnych wszczepów



Figure 4. Clip-bar metal retentive structure supported by 3 intraosseous implants (patrices)

Rycina 4. Belkowa struktura retencyjna z metalu oparta na 3 wszczepach śródkostnych (patryce)

mandible, ensure proper retention and stabilize the denture, receiving the occlusive and biting forces and transferring them directly onto the osseous structures without causing damage to the mucous membrane. There is a range of retentive solutions for this type of overdentures. The most common are mechanical retentions on a bar connecting 2

or 3 implants, locator attachments, magnets, ball attachment retentions or other precise anchoring components such as CEKA Revax, ASC-52, VKS or Rein 83. The simplest of them, removable dentures based on as few as 2 implants, are sufficient to greatly improve the functionality of the chewing apparatus and limit the osseous atrophy of the fo-



Figure 5. Mucosal surface of a complete lower denture with clip-bar metal retentive matrices in saddle
Rycina 5. Dośluzowa powierzchnia całkowitej protezy dolnej z metalowymi zatrzaskami retencyjnymi na belki umieszczonymi w jej siodło



Figure 6. Two metal structures supported by implanted abutments in lateral parts of maxilla
Rycina 6. Dwie metalowe struktury oparte na implantowanych filarach w bocznych rejonach szczęki

undation. An increase in the number of implanted abutments facilitates the efficiency of reconstructive treatment by better supporting and anchoring the denture [1, 7, 9, 10].

Based on the author's documentation and more than 20 years of experience, the possibilities for the dental implant treatment of edentulous patients are presented.

For an edentulous mandible it is sufficient to use 2 implanted abutments to achieve functional effects, whereas an edentulous maxilla requires a minimum of 4 implants for a successful overdenture implantation. The placement of implants on the dental arch of the maxilla depends on the size of the osseous structures which are frequently limited by extensively pneumatized maxillary sinuses

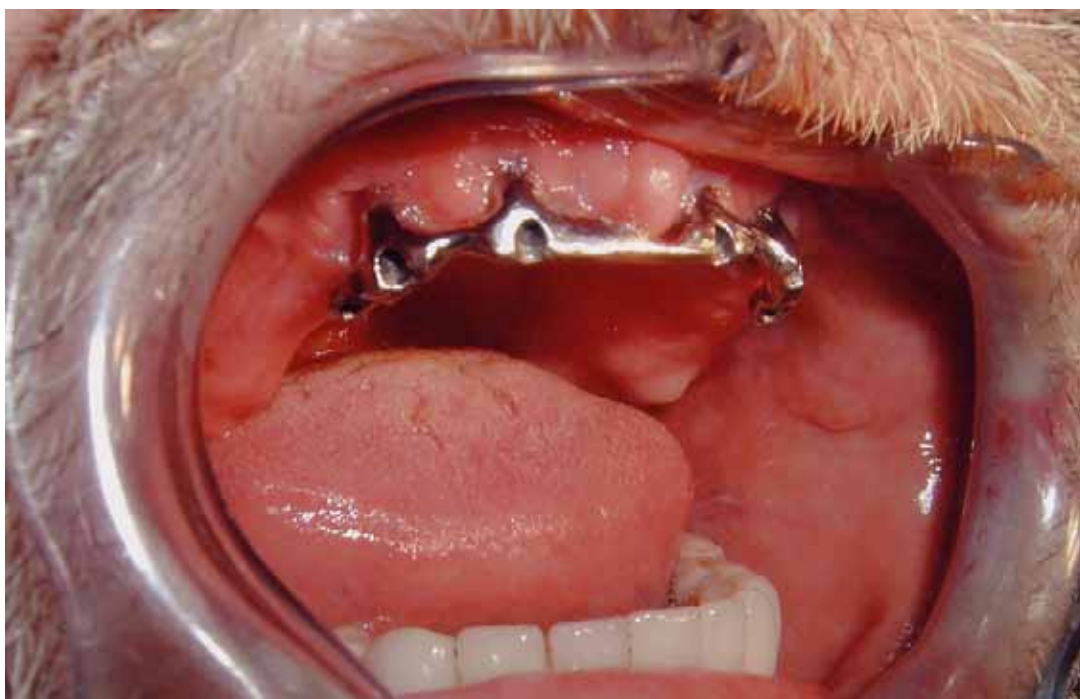


Figure 7. Metal structure supported by 4 implanted abutments in anterior section of maxilla

Rycina 7. Metalowa struktura oparta na 4 implantowanych filarach w przednim rejonie szczęki

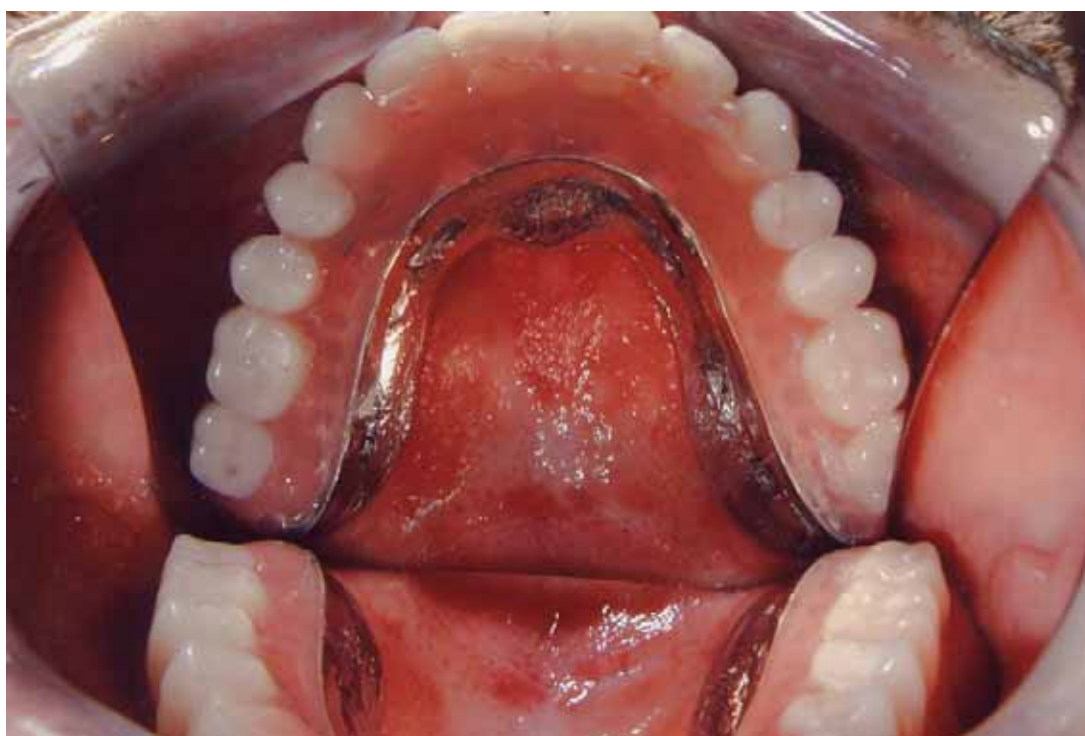


Figure 8. Complete maxillary overdenture with exposed central part of hard palate

Rycina 8. Całkowita proteza szczęki typu overdenture z odsłoniętą środkową częścią podniebienia twardego

or by the considerable atrophy of the alveolar process in the subnasal area. Although it is possible to augment the osseous foundation through osseous transplants (e.g. from the wing of the ilium or the mental area), provision of substitutive osseous material or lifting of the maxillary sinus fundus,

these procedures considerably extend the duration of treatment and are not generally accepted by geriatric patients due to the scope of the operation and limited regenerative capacity. Therefore, in the case of elderly patients, it is advisable to place implants in healed osseous structures by



Figure 9. Model of edentulous maxilla with metal structure supported by 4 intraosseous implants located in area of canines and molars

Rycina 9. Model bezzębnej szczęki ze strukturą metalową wspartą na 4 wszczepach śródkostnych umieszczonych w rejonie siekaczy i zębów trzonowych



Figure 10. Mucosal surface of complete upper denture with clip-bar metal retentive matrices in saddle

Rycina 10. Powierzchnia dośluzowa górnej protezy całkowitej z metalowymi matrycami zatrasku typu clip-bar umieszczonymi w jej siodle

simple surgical procedures. Complete dentures in the maxilla based on intraosseous implants have one important advantage: in contrast to traditional upper plate dentures which extend as far as the soft palate (covering the entire hard palate with a 2 mm thick plate), they leave the whole mid-part of the hard palate uncovered. That allows for proper phonetic articulation, the shaping of food bo-

luses, perception of taste and temperature, thus improving the general well-being of denture users [6–8, 12].

Conclusion

The patient's advanced age is not a contraindication to the application of intraosseous implants as abutments supporting prosthetic restorations. Due

to the considerable atrophy of the mucous and osseous foundation which compromises the conditions for the support of conventional removable dentures, the use of implanted abutments in the maxilla and/or mandible is a particularly advisable solution. Intraosseous implants effectively improve the retention and stability of such prostheses as well as the reception of chewing forces, thus enhancing the psychosomatic state of the elderly patient. It is the obligation of the dentist who undertakes reconstructive dental treatment to inform the patient about this form of treatment and to present the differences between traditional complete dentures and implant-supported prostheses.

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