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Complete denture rehabilitation in patients with Down syndrome – clinical challenges and adaptive strategies

Rehabilitacja protetyczna z zastosowaniem protez całkowitych pacjentów z zespołem Downa – wyzwania kliniczne i strategie adaptacyjne

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Summary

Down syndrome is commonly associated with craniofacial and oral anomalies, including macroglossia, maxillary hypoplasia, and neuromuscular dysfunction, which may contribute to early tooth loss and complete edentulism. Prosthodontic rehabilitation in these patients represents a significant clinical challenge due to anatomical, functional and behavioral limitations. This report presents the clinical management of a 40-year-old male patient with Down syndrome and moderate intellectual disability who presented with complete edentulism. The patient was rehabilitated with conventional bi-maxillary complete dentures using adapted clinical protocols.

Treatment complexity was increased by macroglossia, muscular hypotonia, dyskinetic movements, and reduced patient cooperation. Therefore, several modifications were implemented throughout the treatment process,

Streszczenie

Zespół Downa jest często powiązany z nieprawidłowościami twarzoczaszki i jamy ustnej, w tym makroglosją, hipoplazją szczęki i dysfunkcją nerwowo-mięśniową, które mogą przyczyniać się do wczesnej utraty zębów i całkowitego bezzębia. Rehabilitacja protetyczna u tych pacjentów stanowi istotne wyzwanie kliniczne ze względu na ograniczenia anatomiczne, funkcjonalne i behawioralne. W niniejszym doniesieniu przedstawiono postępowanie kliniczne u 40-letniego mężczyzny z zespołem Downa i umiarkowaną niepełnosprawnością intelektualną, u którego stwierdzono całkowite bezzębie. Pacjenta rehabilitowano za pomocą konwencjonalnych dwuszczękowych protez całkowitych, stosując określone protokoły kliniczne.

Złożoność leczenia zwiększała makroglosja, hipotonia mięśni, ruchy dyskinetyczne i zmniejszona współpraca pacjenta, stąd w całym procesie leczenia wprowadzono kilka modyfikacji, w

including simplified impression techniques, the use of functional border molding adapted to patient tolerance, careful jaw relation recording, and a customized approach to tooth arrangement to enhance prosthesis stability and retention. Behavioral management strategies and shorter clinical sessions were also essential to ensure treatment acceptance.

The outcome demonstrated satisfactory functional and aesthetic results, with improved mastication, phonation and patient comfort. This case highlights the importance of individualized prosthodontic approaches, clinician flexibility, and regular follow-up in managing patients with special needs, ultimately contributing to improved oral function and quality of life.

tym uproszczone techniki wycisków, zastosowanie funkcjonalnego formowania pobrzeża dostosowanego do tolerancji pacjenta, dokładne rejestrowanie relacji szczęk oraz indywidualne podejście do ułożenia zębów w celu zwiększenia stabilizacji i retencji protezy. Strategie monitorowania zachowania pacjenta i krótsze sesje kliniczne były również niezbędne do zapewnienia akceptacji leczenia.

Wynik wykazał zadowalające efekty funkcjonalne i estetyczne, z poprawą żucia, fonacji i komfortu pacjenta. Przypadek ten podkreśla znaczenie zindywidualizowanego podejścia protetycznego, elastyczności lekarza i regularnych kontroli w leczeniu pacjentów ze specjalnymi potrzebami, co ostatecznie przyczynia się do poprawy funkcji narządu żucia i jakości życia.

Introduction

Down syndrome, also known as Trisomy 21, was first described by John Langdon Down in 1866.[1] In 1959, French pediatrician and generalist Dr. Jerome Lejeune discovered an extra chromosome 21 in patients with Down syndrome when compared to normal individuals, hence the name given as Trisomy 21.[2] Down syndrome is the most common chromosomal disorder in humans and the most common cause of mental retardation. The extra chromosome is responsible for various physical and developmental characteristics, as well as several associated conditions and systemic disorders, including hypothyroidism, eye problems, epilepsy, deafness, otitis, obstructive sleep apnea, heart diseases, gastrointestinal malformations and disorders, and mild to moderate intellectual disability.[3,4]

In addition, genetic conditions contribute to dental and oral manifestations. Among the typical and immediately recognizable features are brachycephaly, epicanthic fold, slanted eyes, narrowed eye slits, cataracts and strabismus, flat nasal bridge, hypotonic orofacial musculature, decreased occlusal vertical dimension, malformations and tooth structure anomalies, macroglossia, a fissured and protruding tongue, congenitally missing teeth, malocclusion, tooth wear, periodontal disease, reduced salivary flow and a high incidence of dental caries.[5-7] The dental clinician should consider these factors while treating Down syndrome patients.

Edentulism is frequently observed among disabled patients, and prosthetic treatment in this population is often more complicated compared to healthy patients due to anatomical variations and difficulties related to patient cooperation;[8] therefore, careful assessment and adapted management with complete removable prostheses are required, often involving specific behavioral approaches, additional clinical sessions and the use of specialized materials and equipment.[7]

This paper aims to illustrate, through a clinical case report, the prosthetic management of a completely edentulous 40-year-old patient with Down syndrome, and to highlight key clinical considerations in this specific medical context to improve oral health and quality of life.

Case report

A 40-year-old male with Down syndrome (DS), accompanied by his mother, was referred to the Department of Prosthodontics with the chief complaint of an inability to chew, and gastrointestinal problems related to his oral condition. The patient presented with moderate intellectual disability.

He had limited comprehension and was able to communicate only a few words, without forming complete sentences. Therefore, his mother communicated on his behalf. The patient also expressed fear of pain associated with dental treatment.

No history of drug allergy, seizures or systemic disease was reported, and the patient was not taking any medications. His medical history confirmed the diagnosis of Down syndrome.

Extraoral examination revealed characteristic phenotypic features of Down syndrome, including a square facial appearance with a concave lateral profile, frontal bossing, and upward-slanting palpebral fissures. The patient also exhibited small, low-set ears (Fig. 1 and Fig. 2). In addition, the hands were short and broad with short fingers (Fig. 3).

Intraoral examination revealed several characteristic findings. The patient presented with a high-arched palate and a square-shaped maxillary arch (Fig. 4). The residual alveolar ridges were poorly formed, with an enlarged mandibular arch due to centrifugal resorption (Fig. 5). The mucosa covering the mandibular ridge was thin and sensitive. In addition, macroglossia with a fissured tongue was observed. The patient also exhibited angular cheilitis, a dry and open mouth posture, and limited mouth opening (Fig. 6).

The treatment plan included the fabrication of conventional complete dentures, with special attention given to impression taking and jaw relation recording. The patient was managed using an empathetic approach that included well-scheduled appointments, patient desensitization to dental instruments and materials using the Tell–Show–Do technique, effective communication, and the establishment of a trusting rapport.

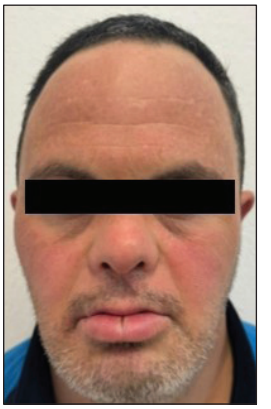

Fig. 1. Pretreatment extraoral frontal view.

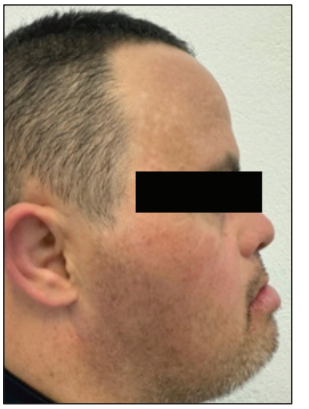

Fig. 2. Pretreatment extraoral lateral view.

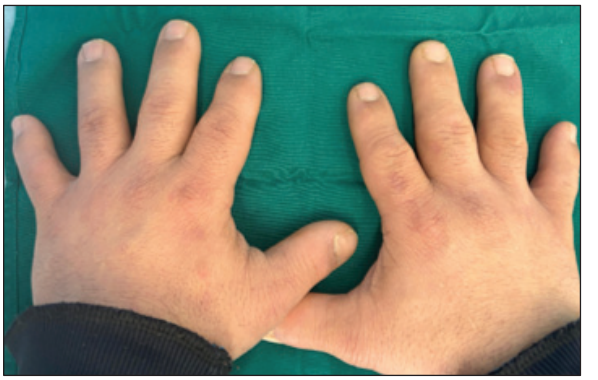

Fig. 3. Specific digital aspect of the patient.

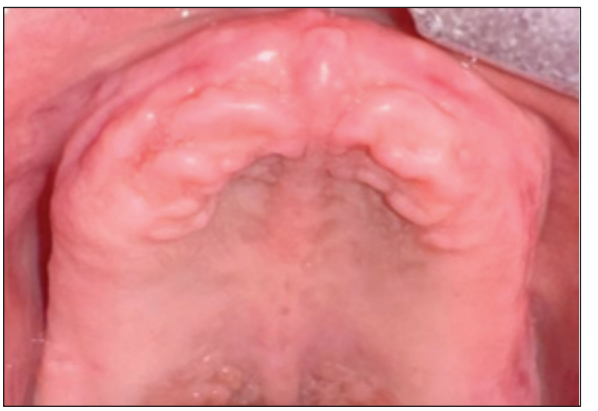

Fig. 4. Intraoral view of the maxillary arch.

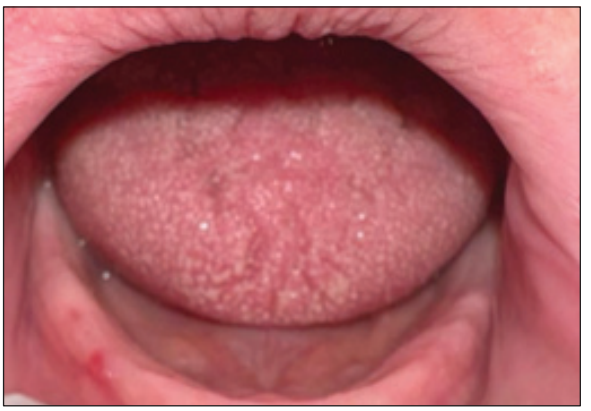

Fig. 5. Intraoral view of the mandibular arch.

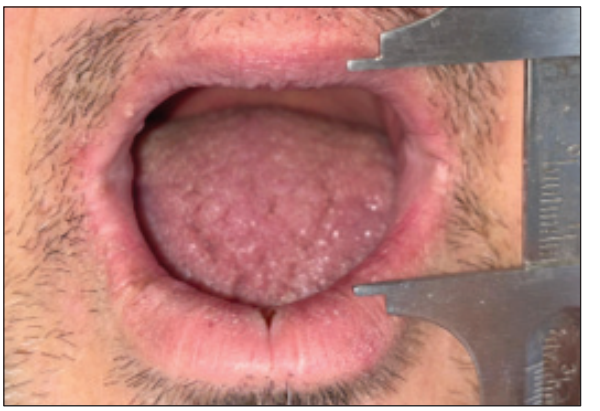

Fig. 6. Limited mouth opening.

Primary impressions were obtained using stock trays and an irreversible hydrocolloid impression material (extra-fast setting alginate with a pleasant aroma). The impressions were poured in dental stone, and custom trays were fabricated using autopolymerizing acrylic resin (Fig. 7.A,B).

Initially, the patient refused tray insertion due to anxiety related to the unfamiliar clinical procedure. After careful explanation of the treatment steps and gradual familiarization with the tray and impression material, the patient became cooperative and the procedure was continued.

Following intraoral adjustment of the custom trays, border molding was performed using a thermoplastic modeling compound (greenstick compound) (Fig. 7.C). Final impressions were subsequently made using a light-body elastomeric impression material to ensure accurate recording of the supporting tissues (Fig. 7.D).

Piezography was not used in the present case, prosthetic stabilization was instead achieved through conventional functional impression and border molding procedures.

After recording the maxillomandibular relationship (Fig. 8.A,B), clinical analysis

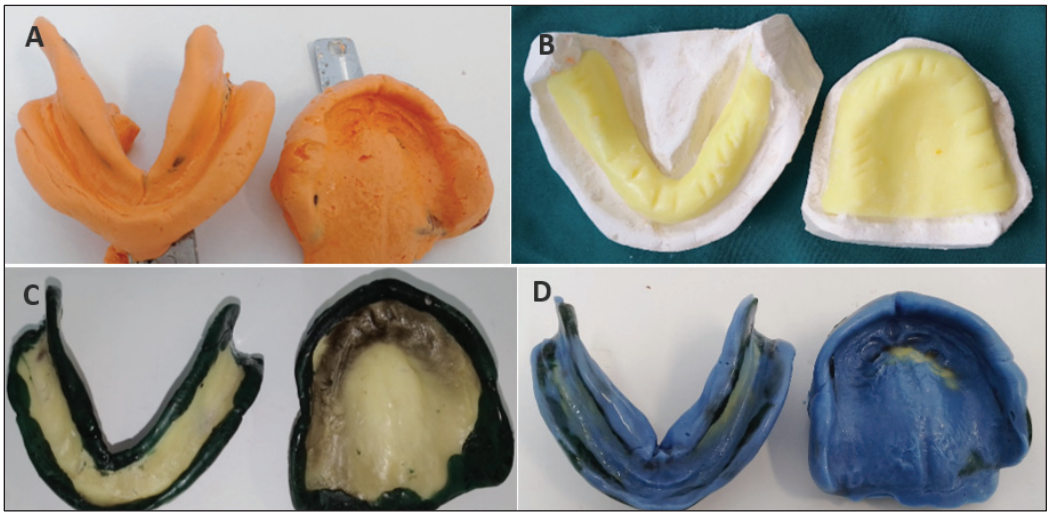

Fig. 7. Prosthetic impressions. A. Primary impressions obtained with irreversible hydrocolloid material (alginate), B. Primary casts with corresponding autopolymerizing resin custom trays, C. Border molding made with a thermoplastic modeling compound, D. secondary impressions made with a light-body elastomeric impression material.

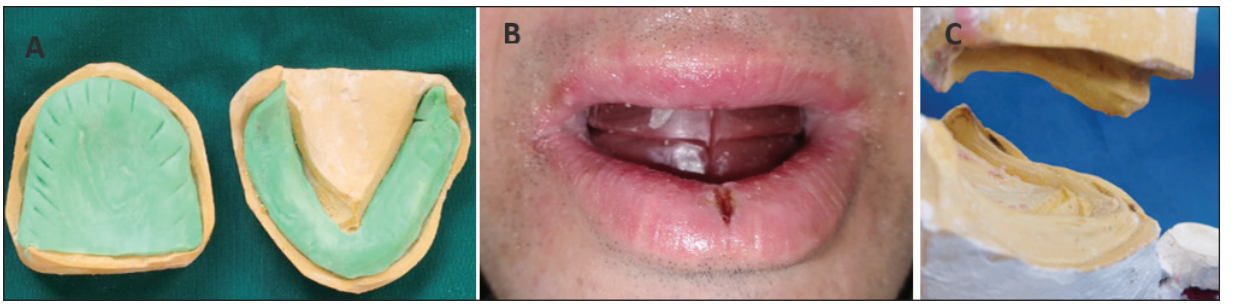

Fig. 8. Maxillomandibular relationship recording. A. Secondary casts with corresponding record bases, B. Jaw relation recording, C. Definitive casts mounted on the articulator revealing an inverted sagittal inter-arch relationship.

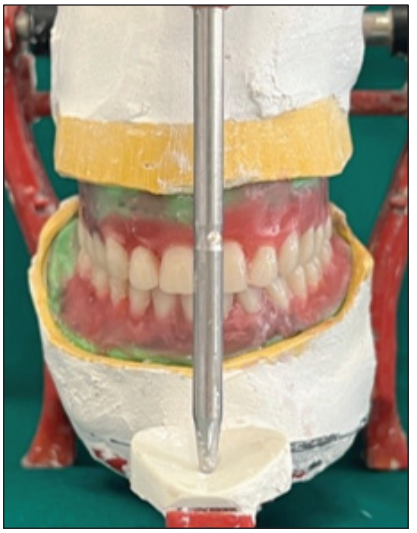

Fig. 9. Arrangement of prosthetic teeth according to the bilateral balanced occlusion concept.

revealed that the maxillary arch was reduced transversely, and an inversion of the frontal and sagittal inter-arch relationship was noted.

Jaw relation records were then completed, and the artificial teeth were arranged in a Class III relationship. To achieve functional stability and harmonize the prosthetic design with the patient's anatomical and physiological context, the dental formula was reduced and the occlusal surface dimensions were carefully adapted. These modifications helped control the prosthetic length and reduce both sagittal and frontal occlusal curvatures. A more vertical orientation of the mandibular posterior teeth, combined with a slightly exaggerated ad-vestibulum inclination of the maxillary molars, was adopted to resolve the problem of frontal arch offset (Fig. 9).

A trial insertion was then done to ensure that the appropriate vertical dimension and centric occlusion positions had been established, prior to denture processing (Fig. 10).

The facial appearance with the trial teeth arrangement in place was evaluated and approved by the patient and his mother, who expressed satisfaction with both the tooth selection and arrangement.

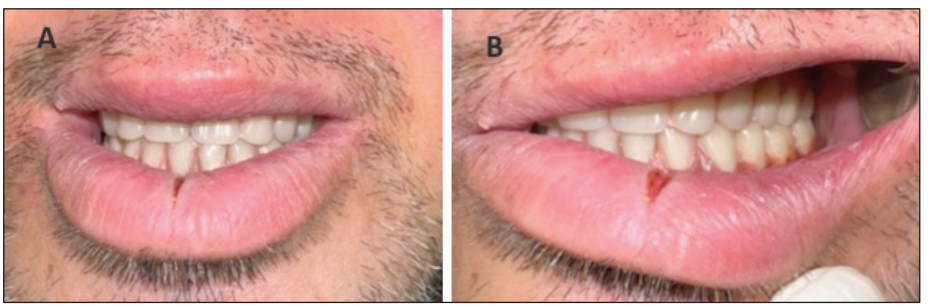

Fig. 10. Try-in: A. frontal view, B. lateral view.

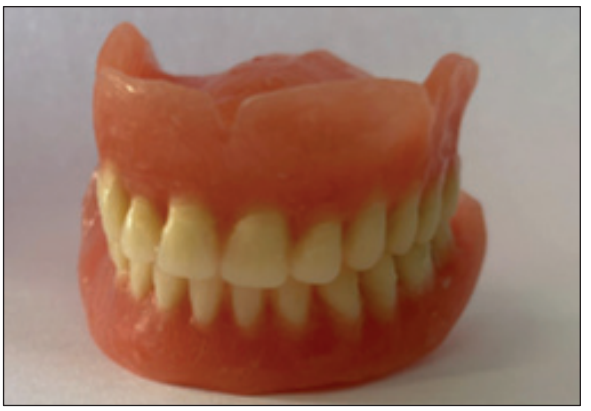

Fig. 11. Finished complete maxillary and mandibular prosthesis.

Individuals with Down syndrome also present a high prevalence of periodontal disease and often demonstrate compromised oral hygiene practices. Consequently, they are at increased risk of early tooth loss and edentulism, making prosthetic rehabilitation an important component of their oral health management.

In this context, the dental management of these individuals requires particular attention. They are considered patients with special needs, requiring a tailored clinical approach, particularly for prosthetic rehabilitation in

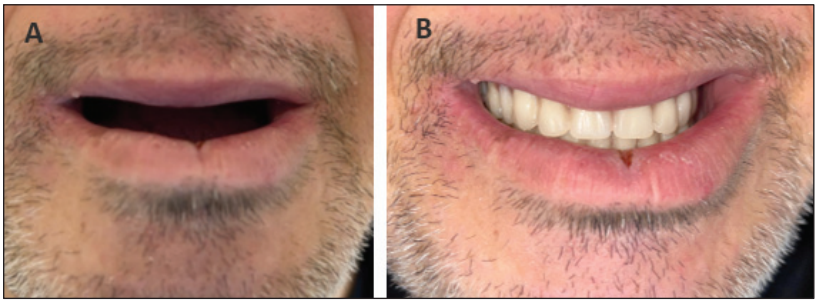

Fig. 12. Final result: A. Preoperative view, B. Postoperative view: aesthetic outcome of the conventional complete denture.

The definitive prostheses were delivered after performing the necessary occlusal adjustments (Fig. 11). Detailed instructions were given to the patient and his mother regarding denture use and oral hygiene maintenance. The presence of a companion was recommended during the denture insertion appointment and throughout the initial adaptation period. Follow-up visits were scheduled regularly, and the patient reported a high level of satisfaction with both the aesthetic and functional outcomes (Fig. 12).

Discussion

Down syndrome, the most common genetic cause of intellectual disability, is characterized by a wide range of physical abnormalities as well as delays in language acquisition, motor planning, and cognitive development.[9-11] cases of complete edentulism.[3,6,7] Behavioral challenges such as anxiety, dental phobia, limited cooperation and low treatment motivation may further complicate management. Additionally, mild to moderate intellectual disability can influence patient behavior during dental procedures.[3,12,13] Poor compliance may manifest as missed appointments and the loss, misuse or damage of previously delivered prostheses, while unexpected events may also occur during the course of treatment.[4]

To ensure effective prosthetic rehabilitation, the treatment plan should remain simple and realistic to achieve prompt and satisfactory therapeutic outcomes.[4] The clinician must assess the patient's intellectual and functional abilities and provide a calm environment with minimal distractions. Standard behavioral management techniques are recommended to promote

cooperation, including positive reinforcement, clear verbal and nonverbal communication, the Tell–Show–Do approach, and repeated, simplified instructions adapted to the patient's level of understanding. Short appointments and additional time for explanation may further facilitate successful treatment.[12,14]

Individuals with Down syndrome frequently present craniofacial and oral anomalies related to altered jaw growth. Common findings include microstomia, maxillary hypoplasia associated with midface deficiency and oral breathing, a narrow and short palate, maxillary retrognathism, a relatively protrusive mandible with reduced effective jaw length, a small chin, and Class III malocclusion according to Angle's classification.[5,9,12] Sagittal skeletal discrepancies and transverse alterations may result in intermaxillary inversion, potentially affecting prosthetic tooth arrangement and denture seating in complete edentulism.[5,9,12]

Macroglossia is also frequently reported in individuals with Down syndrome. Due to muscular hypotonia and reduced oral cavity volume, the tongue may appear relatively enlarged and protruded, often assuming a low position between the dental arches, and contributing to an open-mouth posture, protruding tongue and lip incompetence.[5,12,15]

Furthermore, altered salivary composition, macroglossia, and a protrusive tongue position may compromise mandibular denture stability.[16] Therefore, prosthetic teeth and denture contours should be positioned within the neutral zone between buccolabial and lingual muscular pressures. Piezography can be used to record the functional prosthetic space through muscular activity, facilitating appropriate tooth arrangement. In cases of macroglossia, mandibular dentures should also incorporate anterior-posterior and mesiodistal concavities in the sublingual region, forming a "lingual cradle" to accommodate tongue dynamics.[17]

Conclusion

Prosthodontic rehabilitation of completely edentulous patients with Down syndrome remains challenging due to their intellectual disability and altered neuromuscular coordination. An interdisciplinary, scientifically grounded, and technically competent approach is required to provide optimal care and promote the inclusion of individuals with special needs. The involvement of caregivers is essential to support treatment adherence and long-term prosthesis maintenance, thereby improving oral health and social integration.

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