



Prosthetic Rehabilitation with Implants for a Patient Using an Obturator Prosthesis after Hemimaxillectomy for Squamous Cell Carcinoma

Skuamöz Hücreli Karsinom Tanisiyla Hemimaksillektomi Sonrası Obturator Protez Kullanan Bir Hastanın İmplantlarla Protetik Rehabilitasyonu

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ABSTRACT

Hemimaxillectomy involves the removal of part of the maxilla, which can lead to complications such as speech difficulties and asymmetry in facial appearance. The inclusion of implants in rehabilitation significantly improves the stability and retention of prosthetic devices, facilitating improved functionality. This article discusses important aspects of rehabilitation with an implant-supported obturator prosthesis in a patient who had previously undergone hemimaxillectomy for squamous cell carcinoma (SCC).

Keywords: Squamous cell carcinoma, dental implants, obturator prosthesis rehabilitation, multidisciplinary approach, quality of life

INTRODUCTION

Cancers of the oral cavity account for 30% of head and neck malignancies, posing significant challenges for healthcare providers. Oral squamous cell carcinomas (SCC) represent about 90% of these oral cancers. Major risk factors for SCC include tobacco, alcohol, betel quid, HPV, bacteria, immune status, environmental pollutants, occupational exposures, genetic conditions, and hereditary factors (1).

Hemimaxillectomy entails the surgical removal of half of the maxilla, often necessitated by severe conditions

ÖZ

Hemimaksillektomi, konuşma güçlükleri ve yüz görünümünde asimetri gibi komplikasyonlara yol açabilen maksillanın bir kısmının çıkarılmasını içeren cerrahi prosedürdür. İmplantların rehabilitasyona dahil edilmesi, protetik apanelerin stabilitesini ve tutuculuğunu önemli ölçüde artırır ve daha iyi fonksiyonellik sağlar. Bu makalede, daha önce skuamöz hücreli karsinom (SCC) nedeniyle hemimaksillektomi geçirmiş bir hastada implant destekli obturator protez ile rehabilitasyonun önemli yönleri tartışılmaktadır.

Anahtar Kelimeler: Skuamöz hücreli karsinom, dental implantlar, obturator protez rehabilitasyonu, multidisipliner yaklaşım, yaşam kalitesi

like SCC. While this procedure can be lifesaving, it leads to significant structural and functional impairments, which necessitate complex rehabilitation strategies to restore oral function and aesthetic appearance. Patients may experience challenges in speech (hypernasality), eating (fluid leakage into the nasal cavity and swallowing difficulties), and alterations in facial shape, all of which can adversely affect their quality of life. Additionally, the removal of a substantial portion of the maxilla results in orofacial complications that complicate the use of prosthetics. Effective rehabilitation typically involves the use of obturator prostheses or implants to restore oral

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functionality. The choice of appropriate techniques and materials is crucial in promoting healing and aesthetic outcomes, as indicated by recent studies on the influence of surgical methods on bone structure and recovery (2,3). The primary objective of surgical resection is the complete removal of tumor tissue. Incomplete tumor resection can elevate the risk of local and regional recurrence and diminish long-term survival rates. However, broadening resection margins in oral SCC may lead to increased aesthetic and functional complications. Therefore, collaboration among specialists is essential to address the various challenges associated with hemimaxillectomy. The deployment of implants can enhance the stability of the obturator prostheses used to address surgical defects, thereby improving the quality of life for patients undergoing such significant changes (4,5).

Prosthetic rehabilitation is vital for oral cancer patients who have undergone major surgeries like hemimaxillectomy. It primarily serves to separate the oral and nasal cavities for proper deglutition and articulation, support the orbital and surrounding tissues to maintain facial contour, and achieve desirable aesthetic outcomes (6). However, due to the diminished supporting tissues, fabricating an obturator prosthesis becomes especially challenging in meeting both the aesthetic and functional expectations of patients. A study involving 25 patients fitted with obturator prostheses revealed that 72% prioritized stability and retention over aesthetics, indicating a preference for functionality (7). Retention is crucial for the functionality of removable prostheses in edentulous patients. The challenge becomes even more significant when fabricating a prosthesis for edentulous patients who have undergone a maxillectomy. For edentulous obturator prostheses, retention is derived from the residual alveolar ridge, remaining soft and hard palates, anterior nasal aperture, lateral scar band, and the height of the lateral wall. Despite these support structures, many patients report dissatisfaction with their obturator prosthesis due to its inadequate functionality (8). To address this challenge,

the use of implant-supported prosthetics represents a significant advancement for obturator patients (9).

Various attachment systems, such as ball systems, bars, and magnets, are commonly used for implant-supported obturator prostheses.

CASE REPORT

A 71-year-old male patient, who had previously received a hemimaxillectomy following a diagnosis of SCC and was using an obturator prosthesis, sought consultation at Istanbul University's Department of Oral and Maxillofacial Surgery due to concerns about prosthesis stabilization. The patient's medical history indicated type 2 diabetes mellitus and hypertension, both of which were well-managed. The primary issue reported was the reduced retention of the obturator prosthesis following hemimaxillectomy, coupled with functional and phonation challenges attributed to the use of the obturator prosthesis and age-related bone resorption (**Figure 1**).

Radiographic assessments confirmed the presence of hemimaxillectomy and inferior conchal resection on the right maxilla. Due to insufficient bone volume in the left maxilla, which lacked adequate tissue for effective retention, a plan for implant-assisted retention was established to address the current complexities (**Figure 2**).

Two dental implants (Bioart Implant, Türkiye) measuring $\varnothing 3.3 \times 8\text{mm}$ were placed in the left maxilla. The incision was primarily closed with a 3.0 PGLA suture (**Figure 3**). After 10 days, the sutures were removed, and the patient was scheduled for a follow-up at the one-month postoperative mark, during which radiographic evaluations were conducted (**Figure 4**). The patient continued to receive monthly follow-ups, with an appointment scheduled for six months later. At the six-month mark, the gingival shaping components of the implants were fitted, followed by a one-month follow-up (**Figures 5, 6**). By the end of the seventh month, the patient was reassessed and referred to the appropriate department for prosthetic rehabilitation.

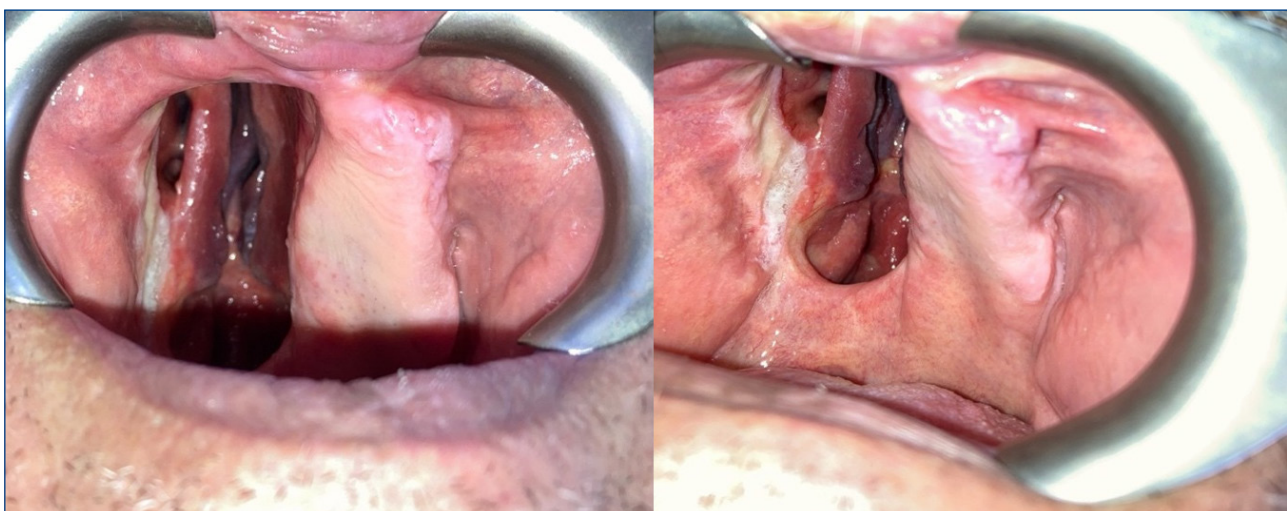


Figure 1. Preoperative intraoral view of the patient

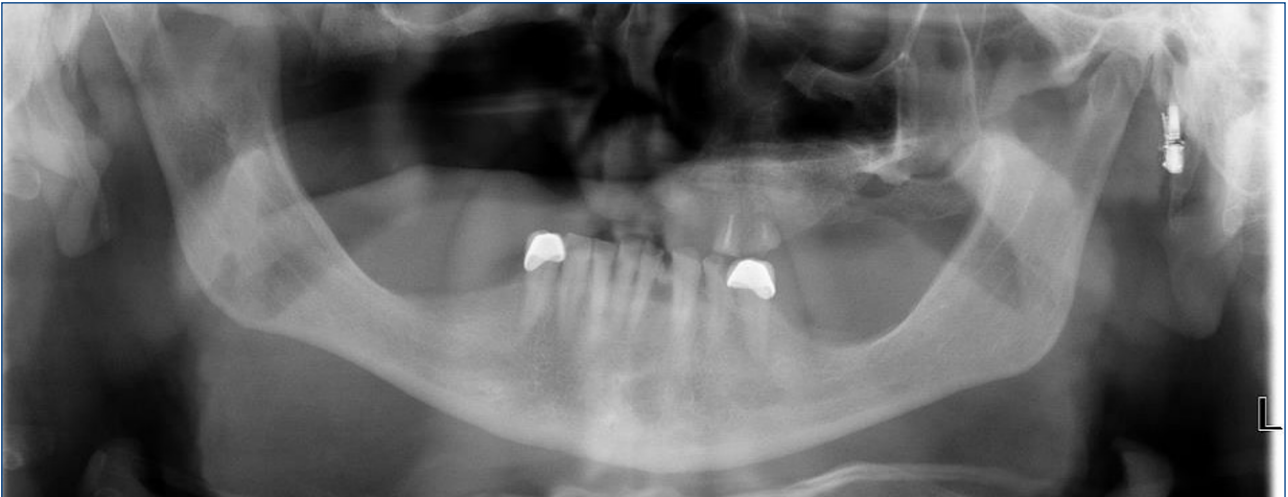


Figure 2. Preoperative panoramic radiograph of the patient (2023)

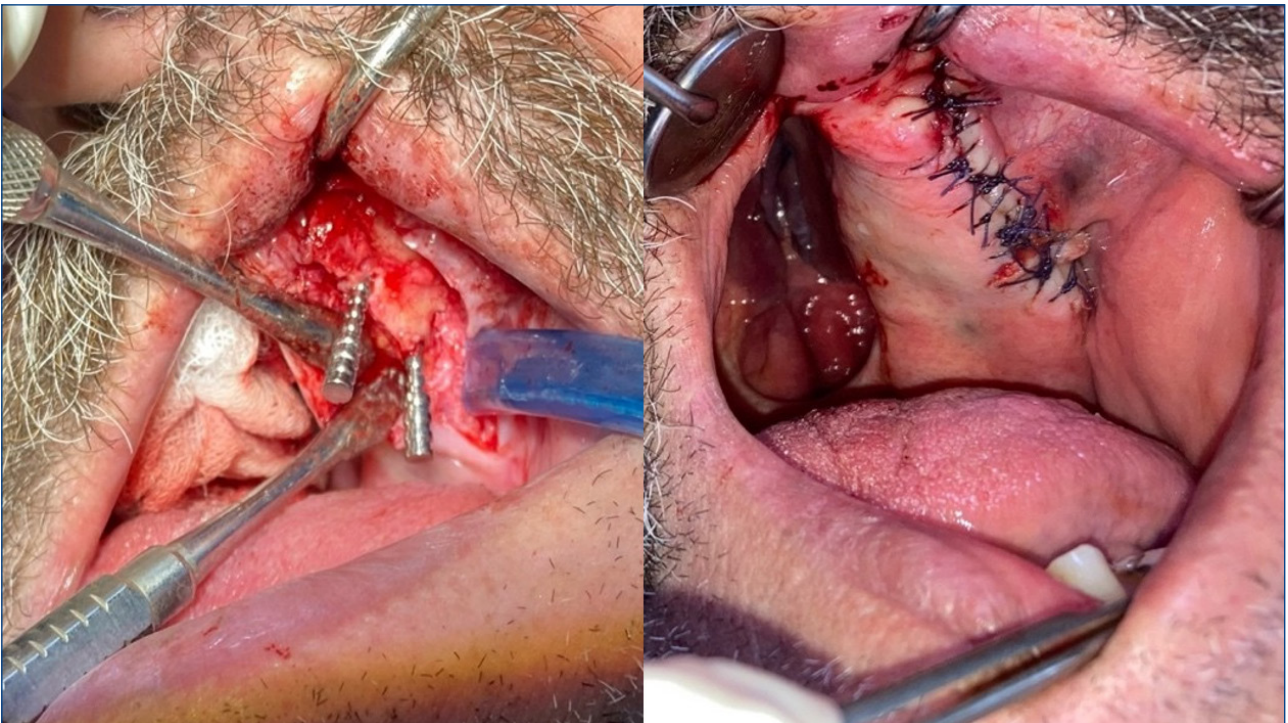


Figure 3. Intraoperative views

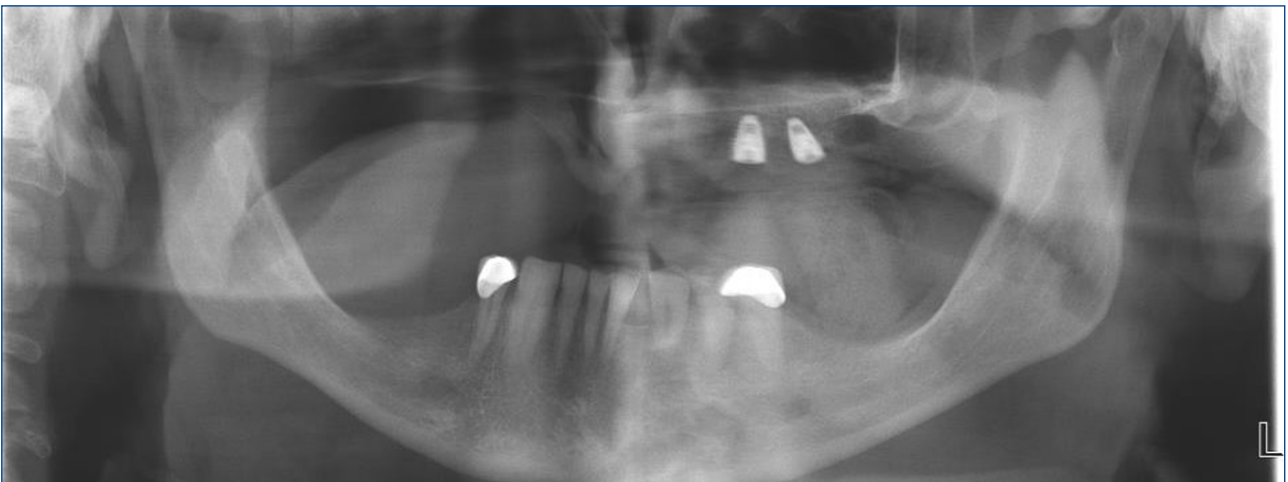


Figure 4. Postoperative 1-month panoramic radiograph of the patient

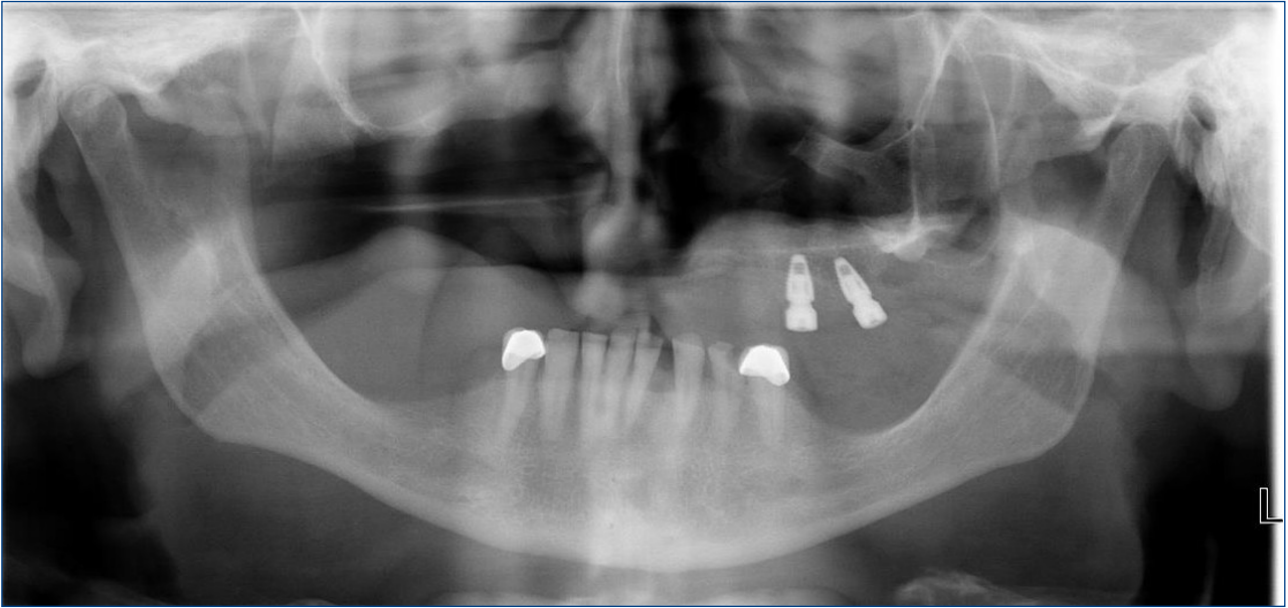


Figure 5. Postoperative 6-month panoramic radiograph of the patient



Figure 6. Postoperative 6-month intraoral view of the patient (abutment placement)

For the obturator prosthesis, a preliminary impression was made using the silicone putty/wash technique. After the custom impression tray was fabricated, the impression transfer copings were placed. An impression was then made with additive silicone, transferring the positions of the implants and

abutments to the master cast. A master cast with analogs was obtained. Due to the position of the implants, locator attachments were selected instead of ball attachments. Since the patient retained his natural lower anterior teeth, an acrylic resin prosthesis with a cobalt-chromium alloy metal framework was

fabricated. The metal framework in the master cast was blocked out with wax, and an acrylic resin baseplate was constructed. A wax rim was prepared to record the maxillomandibular relationship and establish the appropriate vertical dimension. Artificial anatomic teeth were arranged to establish bilateral balanced occlusion. The trial denture was seated intraorally, and the tooth arrangement and occlusal relationships were assessed to align with the patient's aesthetic preferences. A final silicone impression was made to border-mold the defect's boundaries and create a posterior palatal seal for an optimal peripheral seal. The locator attachments were selected intraorally based on the appropriate gingival heights. The attachments were then placed, with a torque of 30 Ncm. The housings were inserted, and the fit of the definitive denture was checked. Any interferences were removed to ensure complete seating of the obturator prosthesis. Prior to bonding the attachments to the prosthesis, the attachment undercuts were blocked out using Teflon tape. The openings for the

locator attachments and housing in the obturator prosthesis were coated with autopolymerizing acrylic resin. The obturator prosthesis was placed intraorally in the proper position with firm finger pressure, and polymerization was completed while the patient maintained an occlusal bite. After removing the prosthesis, excess acrylic resin was carefully removed from the intaglio surface. After delivery of the prosthesis, function and phonation were evaluated by having the patient drink water and eat. Prosthetic care instructions were provided regarding insertion, removal, intraoral hygiene, and maintenance of the obturator prosthesis.

At the six-month follow-up, the patient reported issues with retention. After replacing the locator cap, retention was restored. Follow-up sessions continue.

The patient was successfully rehabilitated with an implant-supported obturator prosthesis and subsequently discharged. Routine annual follow-ups are ongoing (**Figure 7, 8**).



Figure 7. Postoperative 2-years panoramic radiograph of the patient (2025)



Figure 8. Postoperative 2-year intraoral views of the patient (2025)

DISCUSSION

There is a scarcity of literature regarding the long-term outcomes of patients with maxillary defects who have been rehabilitated prosthetically with an implant-supported obturator prosthesis. Hemimaxillectomy, commonly performed for the excision of cancerous lesions such as squamous cell carcinoma, alters facial structure and can considerably diminish a patient's quality of life (QoL). Many patients require prosthetics to restore functionality and improve their oral health-related QoL. Zygomatic implants present a viable option for patients struggling to maintain their dental function post-surgery, enhancing bite strength and overall stability of dental prosthetics (10). Furthermore, tools like hollow bulb obturator prostheses can greatly assist patients in daily activities post-surgery, addressing challenges such as speech resonance and prosthetic fit. Recognizing these components of hemimaxillectomy is essential for enhancing outcomes in prosthetic rehabilitation (9).

The postoperative defect and remaining tissues are effective in determining the reconstruction method. Maxillary defects can be reconstructed using either a prosthetic obturator or free flap transfer. Research indicates that there is no significant difference in oral function between patients with implant-supported obturator prostheses and those with implant-supported fixed prostheses following a free vascularized flap after maxillectomy. However, patients receiving obturator prosthesis treatment exhibited poorer mental health compared to those with fixed prostheses (11).

Obturator prostheses are crucial in addressing defects and preventing issues such as oro-nasal communication, a common complication following maxillary resections. These problems can significantly impact nutrition and overall health, emphasizing the necessity for timely prosthetic interventions. Additionally, studies show that the majority of patients prioritize stability and retention over aesthetics when evaluating the functionality of their obturator prosthesis (7,8).

In this case report, it was aimed to rehabilitate the patient with an implant-supported obturator prosthesis to provide better stabilization considering both the patient's current condition and the postoperative defect and residual tissues.

Supporting obturator prostheses with implants, as presented in this case report, offers numerous advantages, especially for patients undergoing hemimaxillectomy for squamous cell carcinoma. The primary benefit is improved stability, resulting in better outcomes in

speech and ability to feed. Unlike traditional obturator prostheses that rely heavily on the shape of soft tissues for support, implant-supported obturator prostheses offer a more effective alternative to overcome the challenges posed by large maxillary defects (9).

Peri-implant bone loss and implant failure are among the most significant complications associated with osseointegrated implants. Excessive loading on the implants can contribute to these issues, making it crucial to carefully consider prostheses that place increased stress on supporting tissues and attachments, such as obturator prostheses. The stress around implants is influenced by the type of attachment used, as well as the direction and location of the applied load. Studies have shown that bar-and-clip attachments generate greater stress, while ball-and-socket attachments produce lower stress levels. However, in terms of retention, the ranking is reversed (12).

The number of the implants is one of the factors considered when selecting appropriate implant system. Trakas et al., stated in their literature review that factors such as bone quality and quantity, arch shape, and implant length are more effective on implant survival than the type of attachment system used (13). In this case, it was thought that the additional retention could not be obtained with a bar attachment, given the close placement of the implants. Also due to the angulation of the implants, it was decided to use locator attachments instead of ball attachment. It was aimed to minimize horizontal forces on the implants as much as possible to enhance implant survival.

In the present case, the patient's speech, chewing, swallowing and hypernasality disorders were almost completely corrected after placement of the obturator prosthesis. The patient was provided with a pleasant aesthetic appearance.

Moreover, a systematic review indicates that implant survival rates among head and neck cancer patients can vary from 54% to 100%, with complications related to autogenous bone grafts potentially leading to additional issues (14). Therefore, meticulous surgical planning and custom-designed prosthetics are vital for enhancing functional outcomes and patient satisfaction (11).

The field of prosthetic support for patients utilizing obturators post-hemimaxillectomy is advancing, with future research and practices likely to yield improved patient outcomes. A key area of focus is the application of advanced imaging techniques such as 3D printing and computer-aided design to create obturator prostheses that accommodate individual anatomical differences. Additionally, exploring new biomaterials and surface modifications for implants may enhance integration and longevity, addressing challenges associated with traditional prosthetics. Furthermore, incorporating patient feedback regarding their outcomes will provide a comprehensive understanding of how these prosthetics influence quality of life. Collaboration among surgeons, prosthodontists, and speech therapists is essential in developing treatment plans that consider not only functionality and aesthetics but also psychological well-being, aiming to achieve optimal rehabilitation results for patients (15).



CONCLUSION

Rehabilitation of maxillary defects using an implant-supported obturator prosthesis appears to be a favorable approach for patient rehabilitation. Significant improvements in patients' bite force and critical functions such as swallowing, mastication, and speech highlight the effectiveness of this treatment strategy in enhancing patient satisfaction and overall quality of life (QoL). These advancements underscore the necessity for tailored treatment plans that address the complex needs of patients, thereby improving functional outcomes and facilitating their return to regular daily activities.

ETHICAL DECLARATIONS

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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