Surgical and Orthopedic Rehabilitation Following Maxillary Hemi-Resection Using SGS Dental Implants

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Abstract: In the combined treatment of patients diagnosed with maxillary adenocarcinoma, the comprehensive execution of the surgical stage creates the possibility of restoring the dentition and occlusion through the proper application of dental implants. This serves as the necessary foundation for the improvement of masticatory, swallowing, and speech functions, as well as the normalization of aesthetic and cosmetic parameters. Achieving this objective is possible only through the individual modeling of each clinical case, integrated into both the surgical and orthopedic rehabilitation processes.

Keywords: Maxillary adenocarcinoma, post-operative defect, complex prosthetics, SGS dental implant, soft tissue defect, orthopedic rehabilitation, surgical rehabilitation, individual modeling.

Article

In the combined treatment of patients diagnosed with maxillary adenocarcinoma, the proper execution of the surgical stage—maxillary hemi-resection—creates the opportunity for the subsequent stage of restoring the dental row and occlusion. This is achieved by incorporating modern technologies such as the placement of dental implants and digital scanning. The secondary components of combined treatment, namely radiation therapy and chemotherapy, create significant complications for the use of dental implants. This necessitates a detailed, sequential, and meticulous examination, taking into strict account the post-treatment intervals following radiation and chemotherapy, as well as every nuance of the clinical outcomes.

The chain of difficulties does not conclude with surgical rehabilitation and osseointegration; it persists throughout the orthopedic rehabilitation process. Beyond the complex anatomical location of the post-operative defect, challenges arise regarding the boundaries of the alveolar ridge defect, deficiency in masticatory muscle mass, and insufficient mucosal coverage. Consequently, these lead to functional limitations that complicate the implementation of proper clinical manipulations during the rehabilitation process, requiring extreme precision and professional execution.

In this regard, it is sufficient to mention the restriction of mouth opening (trismus) without further detailing other relatively manageable difficulties, such as elemental issues with swallowing, respiration, communication, and the basic placement of clinical instruments within the oral cavity.

Furthermore, the presence of heterogeneous scar tissue within the prosthetic field, soft tissue deficiency in the upper lip, cheek, zygomatic, or orbital

regions, and the impairment of basic functions exacerbate the clinical problem. The growth of the tumor within a closed bony space, a prolonged asymptomatic progression, and the invasion of the tumor into the superior, inferior, and middle nasal meatuses create a uniquely characteristic clinical picture. This necessitates highly individual modeling in every clinical case.

Figure N1: Soft tissue deficiency in the region of the upper lip

- *Figure N2: Post-operative defect 6 months later.*

Our study, conducted at the K. Mardaleishvili Scientific Research Center between 2014 and 2026, involved 81 patients diagnosed with maxillary adenoid cystic carcinoma. Of these, 58 (71.6%) were male and 23 (28.3%) were female. Regarding age distribution, 9 (11.1%) patients were under 40 years of age, while 72 (88.9%) were over 40. Within the younger cohort, 2 (4.7%) cases were detected in patients under 20 years of age.

Malignant tumors of the right maxilla were identified in 28 (34.5%) cases, and the left maxilla in 45 (55.9%) cases. Bilateral involvement of the central incisor region occurred in 8 (1.9%) cases. Regarding the duration of the disease, 32 (39.2%) patients noted symptoms up to 6 months, while a duration of 1.5 years or more was observed in 46 (56.8%) patients. Three (3.7%) patients

reported a duration of two or more years.

In terms of etiology, 5 (6.1%) patients associated the development of the disease with a pre-existing cystic formation; 12 (14.8%) noted a history of chronic sinusitis with periodic exacerbations; 9 (11.3%) associated it with a prior tooth extraction; and 16 (19.7%) with the use of a complete removable denture. The remaining 39 (48.1%) patients could not identify a specific cause.

For the diagnosis of malignant maxillary tumors, all patients underwent sequential clinical-morphological examinations, beginning with visual inspection of the face, assessment of the transitional fold condition, and determination of the quality of nasal breathing on the affected side. Fibroscopy was performed in 67 (82.7%) of patients, and fibroscopy with targeted biopsy was performed in 51 (62.9%). Squamous cell carcinoma was identified in 62 (76.5%) of cases. Material for cytological study was obtained via endoscopy as well as sinus puncture.

All patients underwent morphological examination of the post-operative specimens. These findings included: Squamous cell carcinoma – 49 (60.4%); Osteogenic sarcoma – 4 (4.9%); Cylindroma – 24 (29.6%); and other tumors of various genesis – 4 (4.8%). Radioisotope diagnostics were conducted in 20 (24.6%) patients.

Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) were utilized for all patients. According to these findings, the spread of the neoplastic process into the orbit was noted in 14 (17.2%) cases; the pterygopalatine fossa in 8 (9.8%); the infratemporal and temporal fossae in 5 (6.17%); the hard and soft palate in 24 (59.2%); and the lacrimal canal in 14 (14.8%). Extension into the alveolar ridge was present in all cases.

Based on these findings, staging according to the TNM classification was as follows:

- Stage I: 19 (23.4%)
- Stage II: 32 (39.5%)
- Stage III: 24 (29.6%)
- Stage IV: 6 (7.4%)

To detect regional metastases, all patients underwent ultrasound examination of the cervical lymph nodes, while CT of the lungs was used to identify hematogenous metastasis. Regional metastasis was noted in 26 (32.1%) patients, and hematogenous metastasis in 4 (4.9%). No regional metastasis was found in 51 (62.9%) cases.

Combined treatment methods were planned for 63 (77.7%) patients based on clinical and radiological data, as well as cytological analysis. Radiation therapy as monotherapy was planned for 18 (22.3%) patients. Recurrence after radiation occurred in 4 (4.9%) patients, and after surgery in 7 (8.6%).

Surgical Treatment Overview:

- Right maxillary hemi-resection: 28 (34.7%) cases.
- Left maxillary hemi-resection: 45 (55.6%) cases.
- Maxillary resection with orbitotomy: 14 (17.6%) cases.
- Maxillary resection with exenteration: 5 (6.17%) cases.
- Total bilateral maxillary resection: 2 (2.4%) cases.
- Maxillary resection with lymphadenectomy: 24 (29.6%) cases.

Stomatological care in these patients involves several phases: pre-operative and post-operative stages. The pre-operative stage focuses on oral sanitation, as the preservation of every viable tooth is directly proportional to the success of post-operative rehabilitation tactics. This includes evaluation of tooth health, conservative treatments, removal of metallic crowns, and the fabrication of an individual splint and a separating plate. Immediately after surgery, while the patient is still on the operating table, the fitting of the individual splint protects the tamponaded resection area and partially isolates the oral cavity from the upper respiratory tract.

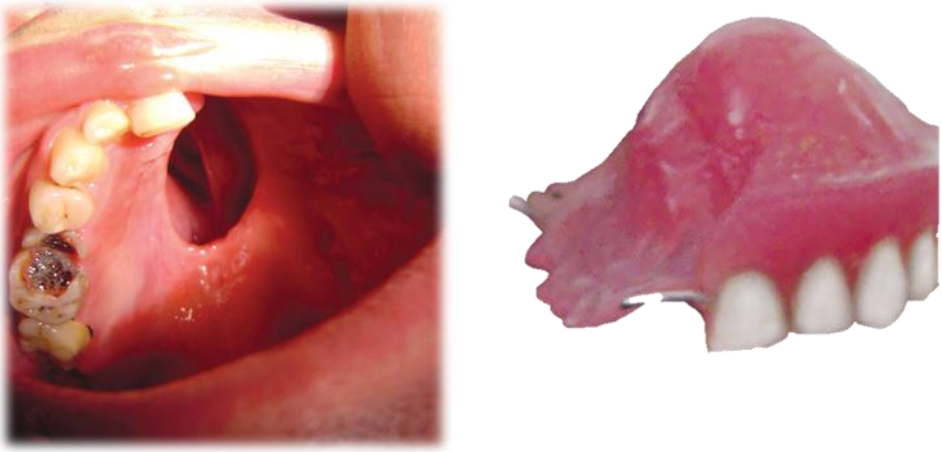
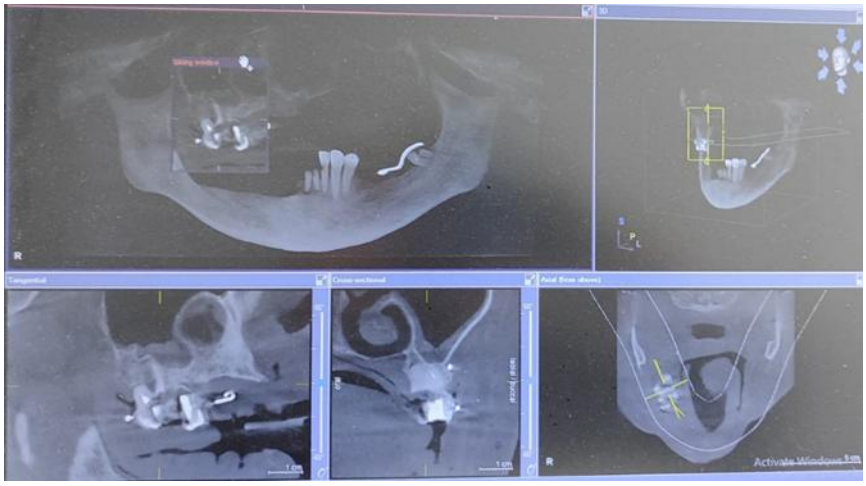


Figure N3-4: Post-operative defect and separating plate

Case Study

The following clinical case presents the stages of surgical and orthopedic rehabilitation for a patient with adenoid cystic carcinoma of the maxilla.

- Patient: T.Ts, 67 years old.
- Diagnosis: Adenocarcinoma of the left maxilla.



- Figure N5: 3D CT scan after left maxillary resection prior to dental implant fixation.

Combined treatment was performed: radiation therapy in the first stage, followed by electric resection of the left maxilla. During the first six months, the patient used a separating plate. After six months, a complete removable denture incorporating an obturator for the post-operative defect was provided.

Three years after the initial treatment, the patient underwent a 3D CT scan, which deemed the fixation of SGS dental implants in the remaining maxillary bone feasible for dentition restoration. For occlusion restoration, it was decided to replace the mandibular edentulous denture with a partially removable prosthesis fixed on SGS implants.

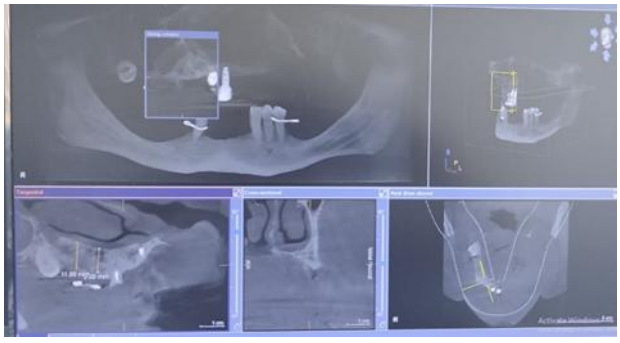
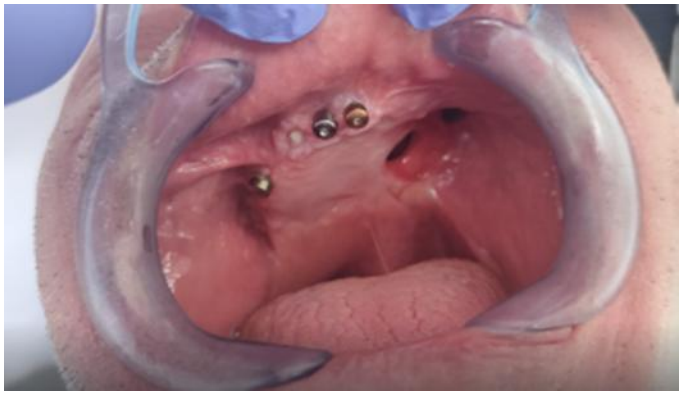


Figure N6: Orthopantomogram after implant fixation



- Figure N8: Gingival formers on the maxilla.

- Figure N9: Gingival formers on both upper and lower jaws.

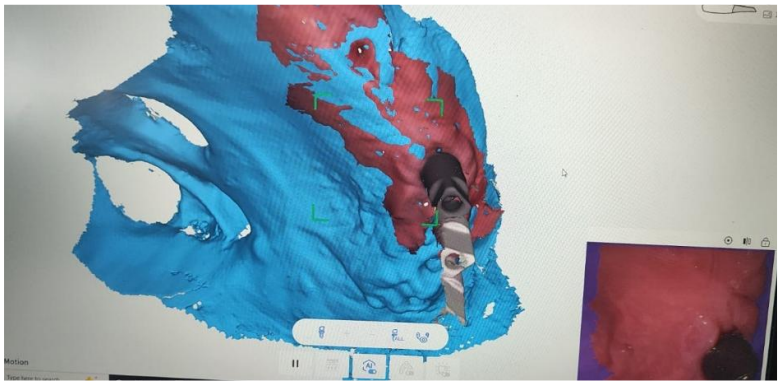


Image N10

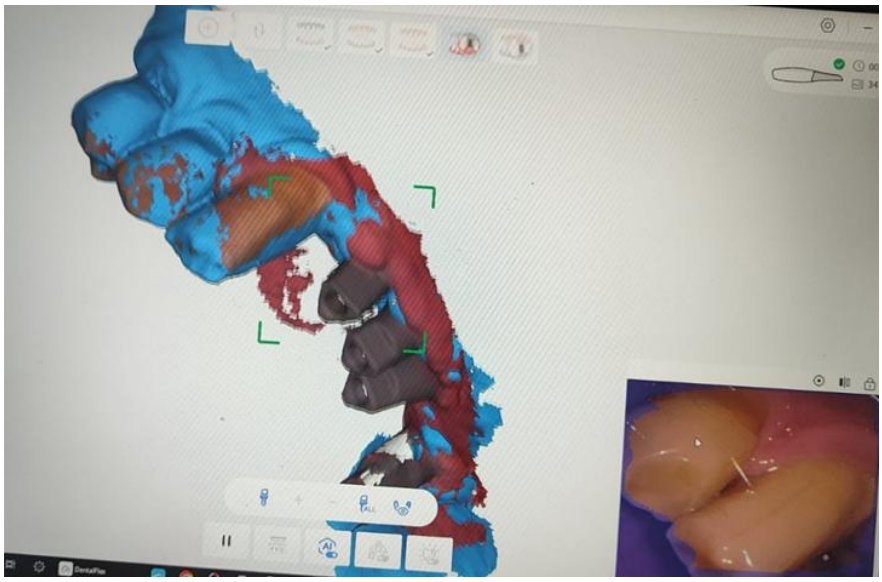
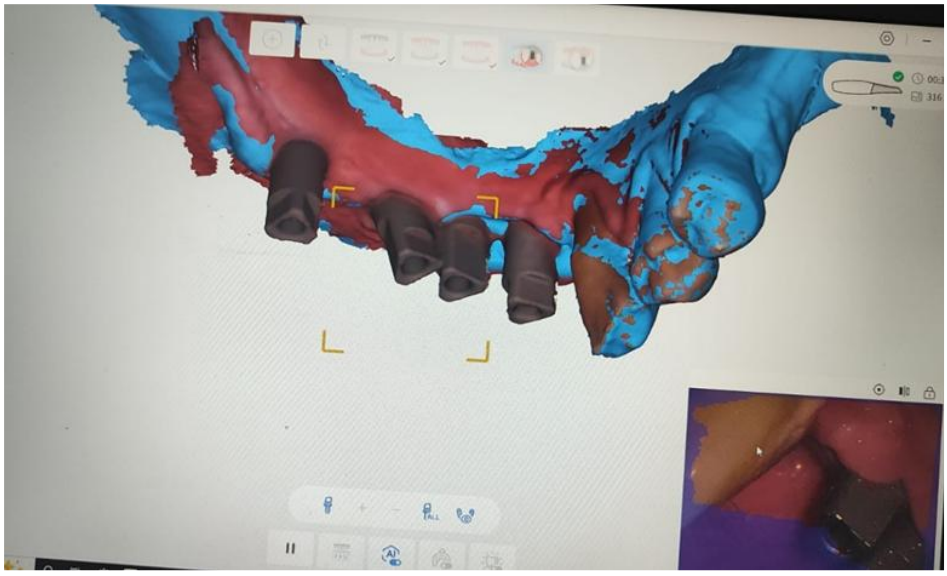
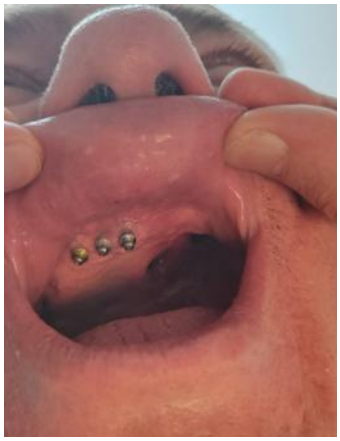


Image N11



- Images N10, N11, N12: Digital scanning process.



- Figure 16: Final attachments on the maxilla utilizing a complex orthopedic model including a post-resection defect obturator.

- Figure 15: Abutments on the maxilla and mandible.

- Image N13: Final stages and outcome of orthopedic work.

- Image N14: Mandibular abutments.

- Figure 17: Maxillary wax model with defect-filling obturator, modeled with incremental layer-by-layer wax application.

- Figure 18: Maxillary prosthesis with fixation slots for the abutments.

Dentition and occlusion have been successfully restored. Consequently, chewing, swallowing, and speech functions are normalized.

Figure 19

Figure 20

Figure 21

Figures 19, 20, and 21 demonstrate normalized occlusion and aesthetic/cosmetic improvement. The patient reported significant relief from severe, chronic hypersalivation that had persisted for four years. Notably, there was a stark, clear improvement in the patient's speech post-rehabilitation.

Conclusions

1. Individual dental implant-based rehabilitation for maxillary adenocarcinoma patients can be planned three years after the successful completion of combined treatment.
2. Evaluation of specific oncological treatment outcomes is vital, specifically assessing the quality of the jaw bone post-radiation and post-surgery.
3. The surgical phase of dental implantation must be meticulously planned based on the assessed condition of the jaw bone.
4. It is of paramount importance to evaluate the structural integrity and condition of the mandibular (lower jaw) bone.
5. When feasible, dental implants should be utilized in the mandible to ensure it provides a proportional and stable base for restoring the occlusal plane.

6. The osseointegration process must be assessed at strictly predetermined intervals following the placement of implants in the maxilla and mandible.
7. Post-osseointegration orthopedic rehabilitation should be planned specifically to address the unique boundaries of the dental row and restored occlusion.
8. Every patient successfully rehabilitated via this complex pathway provides hope for subsequent patients facing the same diagnosis at the start of their treatment journey.