

# SEVERE ASYMMETRICAL ATROPHY OF THE MAXILLA, COMBINED TRANS-ZYGOMATIC IMPLANT PROTOCOL. CLINICAL CASE

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## SUMMARY

Angular and trans-zygomatic implantation is an alternative to most maxillary augmentations with severe deformations and extreme atrophy. The usage of the frontal section of the maxilla for implantation surgery after tooth extraction provides effective stability for implants and prostheses. This is the most frequently used protocol for intraoperative direct replacement with traditional and trans-zygomatic implants after extraction of the frontal teeth. Immediate functional loading with provisional restorations is always guaranteed. This saves a considerable amount of treatment time. Augmentations on the maxilla are not necessary. We present a clinical case of implant prosthetic rehabilitation using conventional and trans-zygomatic implants in extreme atrophy and deformations of the maxillary frontal region.

**KEY WORDS:** implant-prosthetic rehabilitation, intraoperation immediate prosthetics, angular, zygomatic implants, single-stage implantation, maxillary atrophy, immediate loading, deformity of the upper jaw.

## CONFLICT OF INTEREST. The authors declare no conflicts of interest

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## Introduction

In reconstructive osteoplastic surgery of the area of the atrophied maxilla specialists face a lack of bone and soft tissues, and the problem of their discrediting due to previous treatment. The main difficulties for specialists are instability of the obtained result, additional thermal trauma of surrounding soft tissues, resulting from rotating instruments due to the forced enlargement of the operative access. [1–3]. These factors influence tissue healing in the maxillofacial region, especially in persons with major surgical procedures. Severe and extreme atrophy of the upper jaw is an indication for the usage of trans-zygomatic implants. Basic rehabilitation protocols have been developed for patients with maxillofacial atrophy using trans-zygomatic implant techniques. [4–8]. The term «angular implantation» means the placement of implants at a certain angle in relation to the vertical axis (plane) of the alveolar process and the vertical vector of functional load. This eliminates the need for sinus lifts and bone block transplants. The rehabilitation period is accelerated and the cost of treatment is reduced. One-stage implantation and intraoperative direct prosthetics take the major, priority place. [9–13]. This article presents a clinical case with extraction of retained maxillary teeth, cystectomy and subsequent angular and trans-zygomatic implantation in the frontal and lateral areas of the maxilla along with the protocol for a modern immediate intraoperative prosthetic treatment with implant placement. All necessary informed consent for the treatment was obtained from the patient.

**The aim** of the study is to evaluate the effectiveness of implant-prosthetic rehabilitation of a patient with severe asymmetric maxillary atrophy using traditional and trans-zygomatic implants.

## Patient, materials and methods

Patient S., who was born in 1957, came to the clinic in October 2019 to receive help with implants and dentures on the maxilla. The patient's main complaints were difficult eating and speaking. The patient has a strong gag reflex. Treatment attempts with removable dentures on the maxilla had no positive effect. There were roots of teeth 1.7, 1.6, 2.6, 2.7 in the oral cavity. Teeth 1.3, 1.2 were covered with metal-ceramic crowns (Fig. 1).



Fig. 1. Condition before treatment.

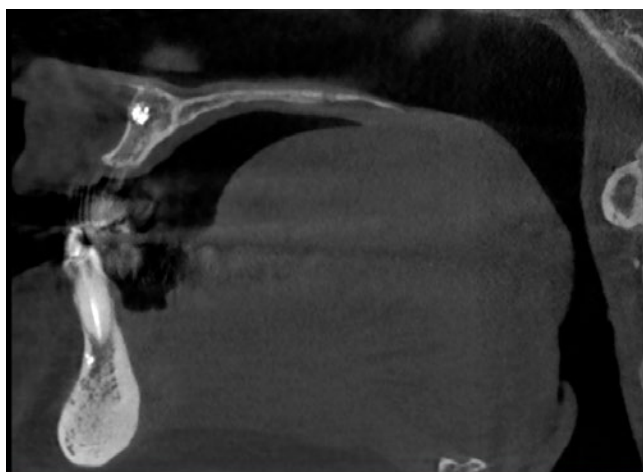


Fig. 2. Foreign material in area of the tooth 1.1.



Fig. 3. Surgical template for the upper jaw and empty-prosthesis (impression module – bite template).

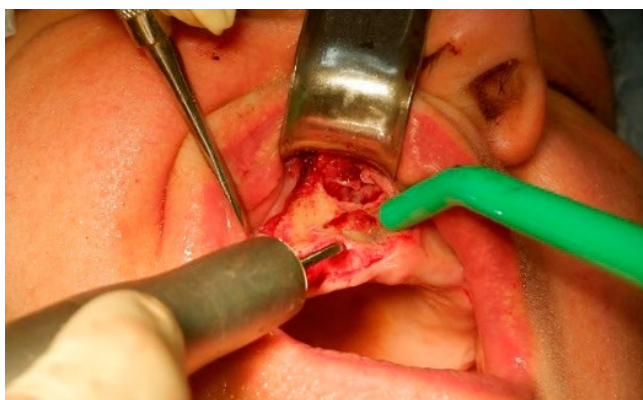


Fig. 4. Bone defect in the area of the teeth 1.1–1.2.

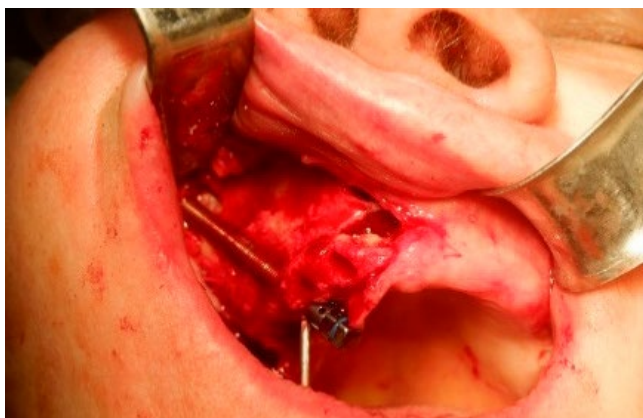


Fig. 5. A S.I.N. trans-zygomatic implant sized IMZ 4152–52 mm was placed in area of the tooth 1.5.

The patient has a partial denture on the upper jaw. CT scan detected a cyst in the area of tooth 1.2. There is a foreign filling material in the apical area of the missing tooth 1.1 (Fig. 2).

The patient has been wearing a removable denture for more than 10 years. The denture is unstable, due to the minimal number of support elements and strong dysocclusion of the denture and mandible's teeth. Patient has the second stage of hypertension, the second type stabilised diabetes mellitus for more than 10 years, BMI is 32. Proposal: extraction of retained teeth and roots, foreign filling material in the area of the tooth 1.1, placement of implants in the area of the teeth 1.2 and 1.3 and trans-zygomatic implants in the area of the teeth 1.5, 2.3 and 2.5.

Current design and prototyping protocols for the final treatment result include a combination in a single design:

- Condition of bone and soft tissues of the maxilla
- Prosthodontic planning data – wax up
- Computerised radiological data
- Most likely locations of implants

The result of successful design and prototyping is the patient's consent to the proposed treatment plan and the receiving of the surgical template.

The dental models have been obtained and the bite relationships have been fixed. The wax up was prepared. An upper jaw oriented surgical template and an empty-prosthesis impression module and bite template were prepared according to traditional dental techniques. The Empty-prosthesis combines the taking of an impression, checking and fixation of the occlusion and checking the aesthetics of the future denture (three in one) (Fig. 3).

We usually use a stereolithographic model for more successful intraoperative navigation. The surgical protocol is agreed; implant sizes, type and size of tapered screw abutments are established. The steps of surgical accesses and techniques are agreed. We apply the fast track surgery concept and protocols and ERAS (Enhanced recovery after surgery), including complex anaesthesia-ambulatory sedation [14]. The Zygomatic Anatomy Guided Approach (ZAGA) technique meets these requirements in this clinical case [15]. Diagnosis revealed a cyst in the region of the tooth 1.2 and a foreign material in the region of the tooth 1.1, bounded by the alveolar process of the upper jaw. The cyst and the material were removed with using piezosurgery and bone grafting was performed in the area of the defect (Fig. 4).

An extensive bone defect forced us to modify the rehabilitation project and the planned position of the implants in the area of the extracted teeth 1.3 and 1.2. S.I.N. implants were placed in the sockets of extracted teeth 1.2 and 1.4, with dimensions of 3.8–13 mm and 4.5–13 mm, respectively. A high level of primary stability of more than 50 N/cm<sup>2</sup> was obtained. An S.I.N. trans-zygomatic implant sized IMZ 4152–52 mm was inserted in the area of the tooth 1.5 (Fig. 5).

Two trans-zygomatic «Zygomatic» S.I.N. implants with dimensions IMZ 4152–52 mm and IMZ 4147–47 mm were placed in parallel in the region of maxilla on the left side. A high primary stability of the implants over 60 N/cm<sup>2</sup> was obtained. Here is a prosthodontic platform area of implants 2.3 and 2.5 (Fig. 6, 7)



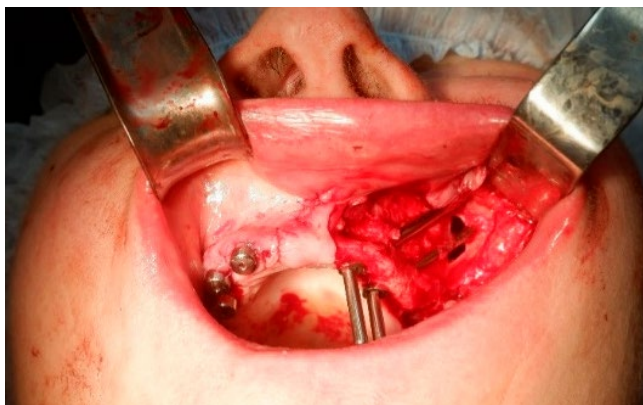


Fig. 6. The Guide «Try-in» has been set.



Fig. 7. Two trans-zygomatic «Zygomatic» S.I.N. implants with dimensions IMZ 4152–52 mm and IMZ 4147–47 mm were placed in parallel in the region of maxilla on the left side.



Fig. 8. The Fitting an empty-prosthesis in the mouth



Fig. 9. View of a temporary screw-retained denture in the mouth. Metal-framed denture.



Fig. 10. Implant-supported permanent denture. The oral cavity's view.

### *Trans-zygomatic implant placement protocol*

With the traditional insertion protocol, a window is formed anterior to the anterior edge of the zygomatic bone for the landmark – the area where the apex of the implant will enter. We used the traditional protocol on the right and a combination of the traditional and ZAGA method in the anterior implant area on the left. Membrane perforation is not a significant problem, but careful delamination of the membrane is essential. The torque was set to more than 60 N/cm. The angled 170 tapered screw abutments were inserted in the conventional implants. On the prosthodontic platforms of the trans-zygomatic implants, 3 mm tapered screw abutments and shaping caps were placed. The different types of sutures were staggered with «Monosin 5.0 Resorba» resorbable monofilament. The tapered screw abutments are fitted with impression modules for the closed tray. An empty-prosthesis was adapted in the oral cavity (Fig. 8).

Empty-prosthesis impressions of the upper jaw were taken and the occlusion and aesthetic parameters of the future restoration were checked. The surgical and prosthodontic protocols were performed under ambulatory sedation, pulse oximetry and intraoperative monitoring of the patient. The duration of the surgical phase was 140 min, the prosthodontic phase – 30 min. Total procedure time was 2 h and 50 min. After 48 hours, the frame of the future prosthesis was cast, which was passively fixed on titanium cylinders using the adhesive fixation method. One day later, the temporary denture with plastic liner was fixed with screws. The screw chambers were sealed with silicone. (Fig. 9).

### **Results**

High (50 N/cm<sup>2</sup>) and great primary stability of the implants in the bone areas of the maxilla frontal region is obtained during the placement phases, due to atraumatic tooth extraction, correct bed preparation, implant shape and thread design. The trans-zygomatic implants are provided with primary stability through a tight fixation in the zygomatic bone. A temporary screw-retained denture with plastic veneer and garnished teeth was fabricated within 72 hours. The patient was monitored on day 7–10 after surgery for correction of the prosthesis, checking the occlusion and borders of the prosthesis, checking the screw fixation force at the stage of suture removal, «repositioning» of the denture, correction of

the cervical areas of the fixed structure 3–4 weeks, without removing the denture. Correction of occlusion was held in 2, 3, 4–6 months after surgery. At the final stage, we managed to restore the patient's chewing and speech function. No loosening of the screws fixing the denture was observed during the monitoring. After half a year a permanent denture was fabricated on the maxilla. (Fig. 10). The patient is satisfied with the treatment results and appreciates the high quality of life with the denture.

## Discussion

The need to minimise surgical implant placement in the area of atrophy and discredited tissue after multiple surgical interventions is realised. [16]. This is justified and consistent with the ideology of «fast track surgery» and applied in dentistry and maxillofacial surgery [14, 15]. In the presented case, there was a high risk of unsatisfactory implant fixation in the area of the teeth 1.2–1.3 due to the extensive defect after removal of the cyst and foreign material in the area of the tooth apices. As a result, an implant was placed in area of the tooth 1.4. It was easier to perform the quad zygomatic protocol. However, a significant bone reduction was required in the area of the teeth 1.1–1.4, which compromised the treatment protocol.

## Conclusion

The most challenging and responsible element of treatment in our case is the precise adherence to the stages and controls of surgical and prosthetic protocols, implant placement and functional load control. This is particularly important in patients with significant defects and deformities. [16, 17]. Dental anesthesiology has made it possible to speed up and optimise complex surgical techniques. [18]. The key success factor in this case was the planning and prototyping of treatment protocols, the use of pattern guides, and the execution of the protocols. In severe asymmetrical maxillary atrophy and total implant-prosthetic rehabilitation, a systematic approach and dental outpatient sedation as a factor of treatment safety and efficacy is a priority.

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