

## Review Article

## Survival Rate of Zygomatic Implants: A Systematic Review

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**Abstract:** Zygomatic implants have become a predictable treatment modality for rehabilitation of the severely atrophic maxilla, eliminating the need for extensive bone grafting and sinus augmentation procedures. This systematic review evaluates survival rates and associated clinical outcomes of zygomatic implants reported in studies published between 2015 and 2025. A structured review of human clinical investigations with a minimum follow-up period of one year was undertaken. Data regarding implant survival, surgical approach, loading protocols, and biological or mechanical complications were analyzed qualitatively. The evidence consistently demonstrates high survival rates ranging between 94% and 99% over follow-up periods extending beyond five years. Engagement of dense zygomatic cortical bone contributes to excellent primary stability, supporting immediate loading in appropriately selected cases. Extrasinus and anatomy-guided approaches show reduced sinus morbidity compared to intrasinus techniques. Common complications include sinusitis, mucosal inflammation, soft-tissue recession, and prosthetic component issues; however, most are manageable with timely intervention. Digital planning, CBCT-based evaluation, and guided surgical systems have enhanced placement accuracy and minimized intraoperative risks. Although survival outcomes are favorable, heterogeneity in study designs and reporting standards limits direct comparison among investigations. Long-term monitoring remains essential due to potential sinus changes and prosthetic maintenance requirements. Overall, literature from the past decade confirms zygomatic implants as a durable and efficient solution for full-arch rehabilitation of the atrophic maxilla when performed by experienced clinicians using appropriate planning protocols.

**Keywords:** Zygomatic Implants, Atrophic Maxilla, Implant Survival Rate, Sinus Complications, Immediate Loading, Oral Rehabilitation, Extrasinus Approach, CBCT Planning, Cortical Anchorage.

## INTRODUCTION

Rehabilitation of the severely resorbed maxilla represents a significant clinical challenge due to inadequate bone volume for conventional implant placement. Traditional approaches often involve bone grafting, sinus lift procedures, or staged reconstructive surgeries, which increase treatment duration and morbidity. Zygomatic implants were introduced as an alternative solution by anchoring long implants in the zygomatic bone, bypassing deficient alveolar structures [Brånemark *et al.*]. Over time, their indications expanded to include management of extreme maxillary atrophy, oncologic reconstruction, and revision cases [Aparicio *et al.*].

The growing acceptance of zygomatic implants over the past decade has been driven by improvements in surgical technique and prosthetic protocols. Variations such as intrasinus, extrasinus, and zygoma anatomy-guided techniques have been developed to enhance biomechanical stability while minimizing sinus complications [Davó *et al.*]. Immediate loading protocols allow rapid restoration of function and aesthetics, reducing patient discomfort and treatment time [Bedrossian *et al.*].

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Survival rate is a principal indicator of long-term success. Zygomatic implants differ from conventional implants in their anchorage within cortical bone, which provides enhanced stability and resistance to resorption [Chrcanovic *et al.*]. However, their proximity to the maxillary sinus introduces biological considerations, including risk of sinusitis, mucosal thickening, and oroantral communication [Esposito *et al.*].

Technological advances such as CBCT imaging, computer-guided surgery, and improved implant surface characteristics have further increased predictability [Pellegrino *et al.*]. Despite encouraging clinical results, variability in follow-up periods and outcome reporting complicates evidence synthesis.

This review aims to consolidate data from 2015–2025 regarding survival rates of zygomatic implants and identify factors influencing clinical outcomes.

## Experimental Section

A systematic literature review covering January 2015 to January 2025 was performed. Peer-reviewed human clinical studies evaluating survival of zygomatic implants were screened. Multiple combinations of terms related to “zygoma implants,” “implant survival,” and “atrophic maxilla” were applied.

### Inclusion criteria

- Human clinical studies
- Minimum 12-month follow-up
- Reported survival or failure data
- Clear surgical protocol description

### Exclusion criteria

- Animal or laboratory studies
- Case reports (<5 patients)
- Lack of outcome reporting

Data extracted included patient number, implant count, loading protocol, surgical technique, follow-up duration, and reported complications. Survival was defined as implant presence in function without removal.

Due to heterogeneity, data were synthesized descriptively rather than statistically pooled. Complications were categorized as biological (sinusitis, mucosal inflammation, infection) or mechanical (prosthetic screw loosening, framework fracture). Long-term studies (>5 years) were analyzed separately to assess durability.

## RESULTS

Across reviewed literature, survival rates consistently ranged between 94% and 99% [Chrcanovic *et al.*]. Several longitudinal studies demonstrated stability beyond five years, with minimal late failures. Immediate loading protocols showed comparable outcomes to delayed loading when primary stability exceeded recommended torque values [Bedrossian *et al.*].

Extrasinus techniques were associated with fewer sinus-related complications than traditional intrasinus approaches [Aparicio *et al.*]. Sinusitis was the most commonly reported biological complication but remained relatively infrequent. Mucosal inflammation and soft-tissue recession were occasionally observed, often linked to prosthetic design or hygiene limitations.

Mechanical complications primarily involved screw loosening, prosthetic fracture, or framework misfit. Digital workflows reduced misalignment and improved prosthetic accuracy [Pellegrino *et al.*]. Failures were rare and typically related to infection or inadequate bone engagement.

## DISCUSSION

High survival rates highlight the biomechanical advantage of cortical anchorage in the zygomatic bone [Brånemark *et al.*]. Immediate loading is supported by strong primary stability, reducing treatment time without compromising outcomes. Extrasinus approaches reduce sinus membrane irritation and postoperative sinusitis [Dávó *et al.*].

CBCT-based planning enhances anatomical assessment, particularly sinus morphology and zygomatic bone volume [González-García *et al.*]. Guided surgery improves placement precision, minimizing risks to orbital and sinus structures. Operator experience remains a critical determinant of success.

Despite high survival, prosthetic maintenance remains important. Standardized reporting is needed to enable meta-analysis and stronger evidence synthesis.

## CONCLUSION

Evidence from 2015–2025 confirms zygomatic implants as a predictable, long-term solution for rehabilitation of the severely atrophic maxilla. Survival rates consistently exceed 94%, demonstrating durability even under immediate loading protocols. Advances in surgical technique, digital planning, and implant design have further enhanced clinical outcomes.

Extracranial and guided approaches reduce sinus-related morbidity. Proper case selection, surgical expertise, and prosthetic planning are essential to minimize complications. Long-term monitoring is necessary due to possible sinus and prosthetic issues.

Future research should focus on multicenter longitudinal trials and standardized reporting. Overall, zygomatic implants represent a dependable alternative to graft-based reconstruction.

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