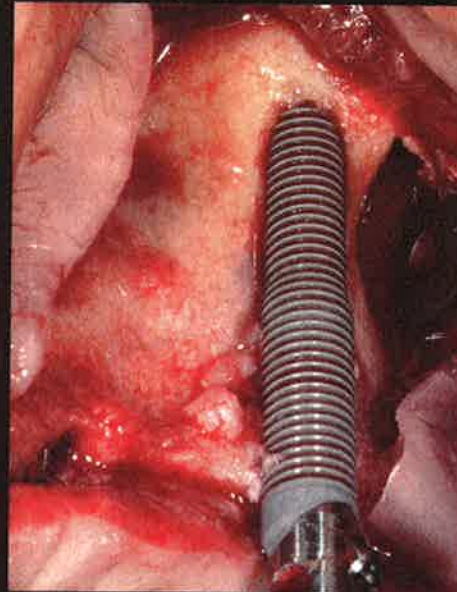
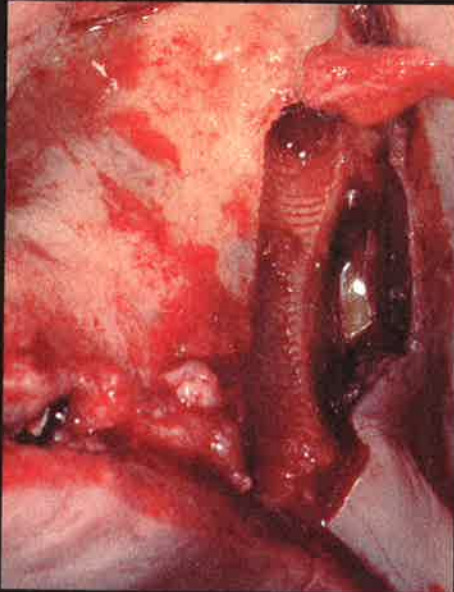


Edited by Carlos Aparicio

ZYGOMATIC IMPLANTS

The Anatomy-Guided Approach



Contributions by

Javier Alandez, Tomas Albrektsson, Arnau Aparicio, Thomas J. Balshi, John B. Brunski, James Chow, Lesley A. David, Rubén Davó, Oscar González, Hans-Göran Gröndahl, Kenji W. Higuchi, Ole T. Jensen, Chantal Malevez, Carolina Manresa, David Nisand, Wafaa Ouazzani, Josep M. Potau, Frank Renouard, Marco Rodriguez, Lambert J. Stumpel

Modifications of the original Brånemark prosthetic protocol for immediate function and esthetics

Thomas J. Balshi, Glen J. Wolfinger,
Stephen F. Balshi, James R. Bowers,
Julia N. Della Croce, and Carlos Aparicio

Immediate loading on regular implants

Brånemark's original protocol determined that an initial period in which implants remained submerged and out of function was critical in order to eliminate implant micromovement and for the prospective success of the implant.¹ This protocol remains valid and continues to be utilized by many clinicians. However, the viability of immediately loading endosseous implants has been an area of considerable interest to dental researchers for many years. In 2002, a consensus meeting was organized in Barcelona, Spain, during the Sociedad Española de Implantes World Congress, to present and discuss the experiences from immediate/early loading protocols in dental implant treatment. The consensus meeting agenda included presentations from the following independent participants: Carlos Aparicio (Spain), Lars Sennerby (Sweden), Bo Rangert (Sweden) (chairmen and moderators), Thomas Balshi (USA), William Becker (USA), Winston Chee (USA), Matteo Chiapasco (Italy), Lino Esteve Coromina (Spain), Lyndon Cooper (USA), Luis Fujimoto (USA), Ronald Glauser (Switzerland), Paulo Malo de Carvalho (Portugal), Carl Misch (USA), Peter Moy (USA), Dennis Tarnow (USA), Dietmar Weng (Germany), and Peter Whorle (USA) (invited experts and presenters). The lectures were followed by a consensus discussion, which resulted in a report published in 2003. One of the most important conclusions reached in this consensus was the need to reconsider the objectives of current implantology; immediate loading is the first objective to consider in implant treatment with the attainment of osseointegration no longer being the prime objective. Clinical protocol should be centered on the maintenance of primary stability and obtaining this stability earlier in placement surgery. As primary stability is determined by bone properties, the implant design, and the surgical technique, it is possible that the success rate may be more susceptible to factors such as clinician ability and training than the use of two-stage surgery.²

A review of the scientific literature makes it clear that dentistry should acknowledge the work of Balshi and co-workers in providing clinical guidelines for converting a removable denture into a fixed immediate prosthesis.^{3,4} This group published a 5-year follow-up study in 2003, with the following conclusions. First, undisturbed splinting of immediately loaded implants with an all-acrylic resin conversion prosthesis is critical during the initial 3 months of healing following implant placement to prevent unwanted implant micromotion at the bone-to-implant interface. Second, *in vitro* comparison of force distribution to the implants from acrylic resin or metal-reinforced prostheses showed no differences, suggesting that there was no reason to convert to metal-reinforced material during the critical early healing.⁵ Central to their findings was the importance of undisturbed splinting of immediately loaded implants with an all-acrylic resin conversion prosthesis for the initial three month healing period following implant placement. The rigid splinting of the implants, with concomitant distribution of the occlusal loads bilaterally, allows undisturbed bone-to-implant regeneration to occur during the initial stages of osseointegration. Although the provisional prosthesis does provide rigidity for the implants during the initial healing period, adherence to a soft diet is critically important to avoid unwanted occlusal force overload, which could interfere with successful osseointegration. Therefore, strict compliance with a soft diet during this time must be understood and agreed upon by the patient. At the end of the initial 3 months, with the interim prosthesis perfected and with a satisfied and symptom-free patient, final impressions and necessary laboratory work can proceed toward completion of a permanent, highly functional and esthetic implant-supported restoration.

Immediate loading on zygoma implants

According to the literature, zygoma implants, when used in conjunction with premaxillary implants,

can serve as viable alternatives to posterior maxillary bone grafting. In 2006, Chow and co-workers reported the results of immediate occlusal loading of zygoma implants with full-arch implant-supported interim prostheses.⁶ In the time frame of this study, all of the zygoma implants were stable with no signs of failure. According to the authors, "immediate occlusal loading of the zygoma implants has a very good potential for success, as much as immediate occlusal loading of normal dental implants." In the same year, Bedrossian and co-workers reported the results of 14 consecutive patients treated with immediately loaded zygoma implants.⁷ Inclusion criteria mandated between 1 and 3 mm of posterior maxillary subsinus bone height, indicative of severe residual bone atrophy. Traditional premaxillary implants were placed bilaterally in canine and central incisor regions. Zygoma implants, ranging from 35 to 52.5 mm, were placed into the right and left second and first premolar regions. In each patient, all six implants were rigidly splinted and placed into immediate function with an all-acrylic resin implant-supported provisional restoration.

At a minimum of a 1-year follow-up, none of the traditional or zygoma implants exhibited any signs of failure either clinically or radiographically. According to Bedrossian and co-workers,⁷ "A possible explanation for the favorable outcome is the high initial stability of the zygoma implants and the splinted cross-arch support of the four well-anchored standard premaxillary implants." Aparicio and co-workers published a follow-up study of a total of 47 zygoma and 129 regular implants placed in 25 consecutive patients.^{8,9} Impressions and bite registrations were made, and 19 patients received a fixed partial denture within 24 hours and six patients were rehabilitated within 5 days. Screw-retained full-arch restorations were used in 23 patients and cemented in 2 patients. The patients were instructed to follow a soft diet for 4 months. Follow-up controls were performed at 1, 4, and 12 months and annually thereafter. All patients were followed for at least 2 years and up to 5 years in function. All zygoma implants were stable during

the follow-up (cumulative survival rate, 100%). One regular implant placed in the pterygoid plate failed after 52 months of loading (cumulative survival rate, 99.2%). Apart from fracture of one abutment screw and of anterior teeth in five patients, no other complications were noted. In a recent study, Davó and co-workers followed 42 consecutive patients treated with implants for at least 12 months (mean, 20.5 months; range, 12–42 months).¹⁰ Thirty-seven patients were totally edentulous and five were partially edentulous. In total, 81 zygoma and 140 conventional implants were inserted. After 1 year, there was no patient dropout. None of the zygoma implants were lost over the observation period (100% success rate). Four conventional implants were lost, resulting in a success rate of 97%. All of the prostheses were stable. In a multicenter study, Testori and co-workers reported the outcome of immediately loaded tilted implants placed in 41 patients with edentulous maxillae.¹¹ Each patient received a full-arch fixed partial denture supported by four axial implants and two distal tilted implants. Loading was applied within 48 hours of surgery. Patients were scheduled for follow-up at 6 months, 1 year and, annually up to 5 years. Their conclusions were that immediate loading associated with tilted implants could be considered a viable treatment modality for the atrophic maxilla and that there did not appear to be any different clinical outcome between tilted and axial implants. Balshi and co-workers have examined the results from 110 consecutively placed zygoma implants in 56 patients from May 2000 to October 2006.¹² Five machine-surfaced implants failed, four within the first 3 to 6 months and one within 9 to 12 months of insertion, yielding a 95.5% cumulative survival rate with follow-up data no less than 1 year and upwards of 5 years. To date, no reports of failure occurred with any oxidized titanium surface implant. All implants in this study were immediately loaded following the "Teeth In A Day" protocol (Figs 16-1 to 16-9). According to Balshi and colleagues, the "zygoma implants used in this immediate loading protocol have proven in this study to have a higher clinical survival than implants in grafted maxilla."¹²

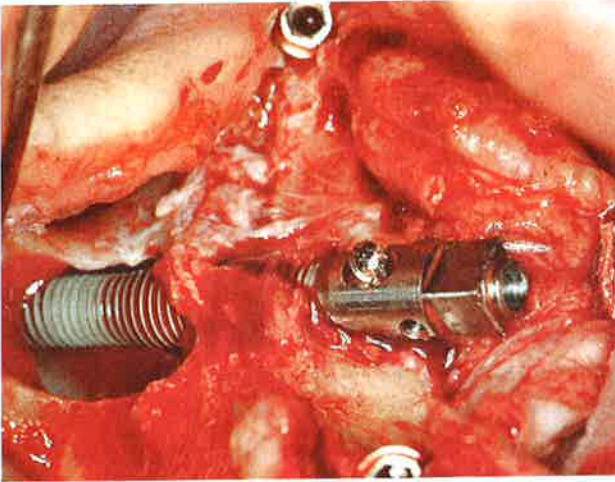


Fig 16-1 The mixture mount screw of the zygoma implant should be positioned in the most favorable prosthetic position.

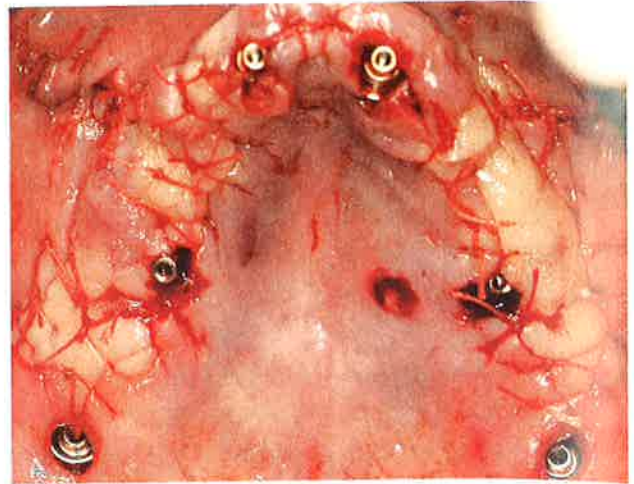


Fig 16-2 Interrupted Vicryl sutures are used to close the soft tissue.

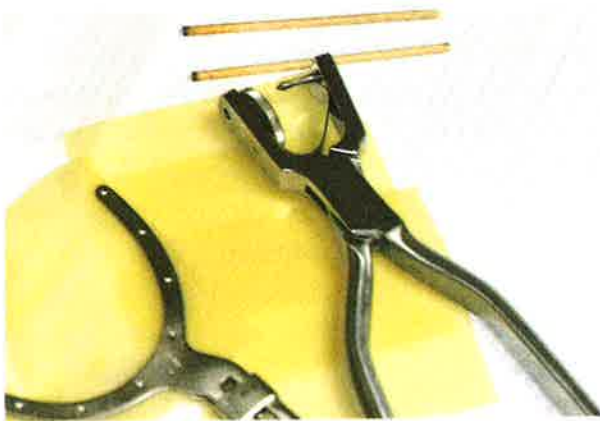


Fig 16-3 Rubber dam is installed into a full-arch articulation paper holder. Ink sticks are used to mark the guide pins from the impression copings; the hole punch allows for a clean punch of rubber dam in the areas marked by the guide pins.



Fig 16-4 The temporary prosthesis is relieved in the area where the temporary titanium cylinder will be connected.

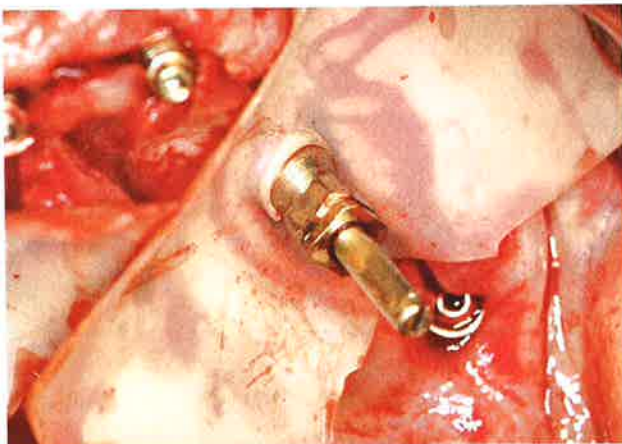


Fig 16-5 Rubber dam is positioned over the temporary cylinder but not below the junction of the cylinder to the abutment.



Fig 16-6 Sufficient room should be available around the cylinder for the application of the acrylic resin.

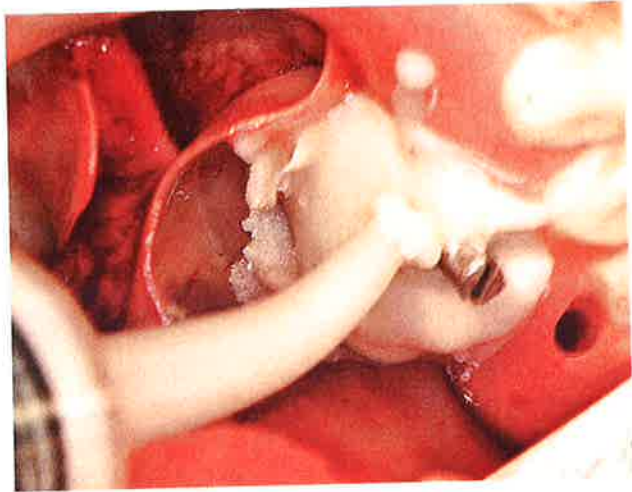


Fig 16-7 Using a monoject syringe, autopolymerizing acrylic resin is applied to secure the titanium cylinders to the provisional prosthesis.



Fig 16-8 The all-acrylic resin provisional prosthesis in intaglio (a) and occlusal (b) views.



Fig 16-9 The delivered frontal prosthesis in frontal (a) and mirrored occlusal (b) view.

In conclusion, these preliminary data suggest that, as with regular implants, the immediate loading protocol may be the first option for treatment based on zygoma implants.

References

1. Brånemark PI, Zarb GA, Albrektsson T. *Tissue-integrated Protheses Osseointegration in Clinical Dentistry*. Chicago, IL: Quintessence Publishing, 1985.
2. Aparicio C, Rangert B, Sennerby L. Immediate/early loading of dental implants: a report from the Sociedad Española de Implantes World Congress Consensus Meeting in Barcelona, Spain, 2002. *Clin Implant Dent Relat Res* 2003;5:57–60.
3. Balshi TJ, Wolfinger GJ. Immediate loading of Brånemark implants in edentulous mandibles. *Implant Dent* 1997;6:83–88.
4. Balshi TJ. The Biotec conversion prosthesis: a provisional fixed prosthesis supported by osseointegrated titanium fixtures for restoration of the edentulous jaw. *Quintessence Int* 1985;16:667–677.
5. Wolfinger GJ, Balshi TJ, Rangert B. Immediate functional loading of Brånemark system implants in edentulous mandibles: clinical report of the results of developmental and simplified protocols. *Int J Oral Maxillofac Implants* 2003;18:250–257.
6. Chow J, Hui E, Lee P, Li W. Zygomatic implants: protocol for immediate occlusal loading – a preliminary report. *J Oral Maxillofac Surg* 2006;64:804–811.
7. Bedrossian E, Rangert B, Stumpel L, Indresano T. Immediate function with the zygomatic implant: a graftless solution for the patient with mild to advanced atrophy of the maxilla. *Int J Oral Maxillofac Implants* 2006;21:937–942.
8. Aparicio C, Ouazzani W, Garcia R, Arevalo X, Muela R, Fortes V. A prospective clinical study on titanium implants in the zygomatic arch for prosthetic rehabilitation of the atrophic edentulous maxilla with a follow-up of 6 months to 5 years. *Clin Implant Dent Relat Res* 2006;8:112–122.
9. Aparicio C, Ouazzani W, Aparicio A, Fortes V, Muela R, Pascual A, et al. Extrasinus zygomatic implants: three year experience from a new surgical approach for patients with pronounced buccal concavities in the edentulous maxilla. *Clin Implant Dent Relat Res* 2010;12:55–61. [Epub 2008 Dec 3]
10. Davó R, Malevez C, Rojas J, Rodríguez J, Regolf J. Clinical outcome of 42 patients treated with 81 immediately loaded zygomatic implants: a 12- to 42-month retrospective study. *Eur J Oral Implantol* 2008;1:141–150.
11. Testori T, Del Fabbro M, Capelli M, Zuffetti F, Francetti L, Weinstein RL. Immediate occlusal loading and tilted implants for the rehabilitation of the atrophic edentulous maxilla: 1-year interim results of a multi-center prospective study. *Clin Oral Implants Res* 2008;19:227–232.
12. Balshi SF, Wolfinger GJ, Balshi TJ. A retrospective analysis of 110 zygomatic implants in a single-stage immediate loading protocol. *Int J Oral Maxillofac Implants* 2009;24:335–341.