Combined Tooth-Implant–Supported Telescopic Prostheses in a Midterm Follow-up of > 2 Years

Tim Joda, Dr Med Dent, DMD, MSc[a]

Purpose: The aim of this trial was to evaluate telescopic-retained prostheses on teeth and implants. ***Materials and Methods:*** Ten patients with a mean of 2.8 teeth received strategic implants to achieve triangular/quadrangular support. Survival and complication rates were estimated for telescopic abutments and prostheses. ***Results:*** After a mean observation period of > 2 years, no abutment was lost and all prostheses were in function. Complication rates were low, and maintenance services were limited to minor interventions. ***Conclusions:*** Combined tooth-implant–retained telescopic prostheses improve prosthetic support and offer successful function over a midterm period in patients with a severely reduced dentition. *Int J Prosthodont 2013;26:536–540. doi: 10.11607/ijp.3289*

The prosthetic rehabilitation of partially dentate patients with reduced abutment teeth represents a demanding clinical challenge. Depending on the number of missing teeth and their distribution in the arch, a variety of prosthetic modalities are feasible.

Supplementary implants in strategic positions can ensure a change in critical prosthetic support from a linear or reduced triangular initial situation to stable quadrangular loading forces of removable dental prostheses. However, combined tooth-implant telescopic prostheses deal with different biologic abutment characteristics, such as the periodontal ligament at teeth, in contrast to osseointegrated implants. Furthermore, the soft tissue acts as a third component in the loading scheme. Until now, valid data in the field of removable dental prostheses supported by teeth and implants have rarely been discussed in the dental literature.

[a]*Assistant Professor, Division of Fixed Prosthodontics, University of Bern, Bern, Switzerland, and Clinical Associate Professor, Department of Prosthetic Dentistry, University Hospital Hamburg-Eppendorf, Hamburg, Germany.*

Correspondence to: *Dr Tim Joda, Division of Fixed Prosthodontics, University of Bern, Freiburgstr 7, CH-3010 Bern, Switzerland. Fax: +41 (0)31 632-4931. Email: tim.joda@zmk.unibe.ch*

Therefore, the purpose of this retrospective clinical trial was to evaluate the midterm outcome of maxillary and mandibular telescopic-retained removable dental prostheses on teeth and implants in strategic positions according to survival rate analyses and technical as well as biologic complications in partially dentate patients with a severely reduced dentition.

Materials and Methods

A total of 10 patients (5 women, 5 men) with a mean age of 66.6 years (SD: 8.8 years, range: 52 to 80 years) and a severely reduced dentition were selected to receive supplementary implants with the aim of an extensive triangular/quadrangular prosthetic support in combined tooth-implant telescopic prostheses. Table 1 displays the FDI locations of the natural abutment teeth (n = 28) as well as the strategic implants (n = 28).

More precisely, the indication for additional placement of dental implants in strategic positions can be summarized in accordance with the quantity and topographic location of the remaining teeth: *(1)* two residual teeth in one quadrant with a tangentially linear prosthetic support, *(2)* two residual teeth in two quadrants with a linear cross-arch prosthetic support, *(3)* unilateral free-end situations with a shortened triangular prosthetic loading protocol, and *(4)* extended bilateral free-end situations with inadequate triangular support. For each arch, all natural

Table 1 Prosthetic Concept: Natural Tooth and Strategic Implant Characteristics

Patient no.	Arch	No. and position: Abutment teeth	No. and position: Strategic implants	No.: Telescopic abutments	Prosthetic support	Implant system
1	Maxilla	2 (FDI: 22, 23)	4 (FDI: 15, 13, 11, 24)	6	Quadrangular	Nobel Biocare (Replace Straight)
2	Maxilla	2 (FDI: 17, 27)	4 (FDI: 15, 13, 11, 23)	6	Quadrangular	Nobel Biocare (Replace Straight)
3	Maxilla	2 (FDI: 23, 24)	4 (FDI: 15, 14, 12, 22)	6	Quadrangular	Nobel Biocare (Replace Straight)
4	Mandible	2 (FDI: 33, 43)	4 (FDI: 36, 35, 45, 46)	6	Quadrangular	Nobel Biocare (Replace Straight)
5	Maxilla	3 (FDI: 16, 12, 11)	2 (FDI: 22, 23)	5	Triangular	Straumann (Bone Level Implants)
6	Mandible	2 (FDI: 33, 43)	2 (FDI: 36, 46)	4	Quadrangular	Straumann (Bone Level Implants)
7	Maxilla	2 (FDI: 11, 21)	4 (FDI: 17, 16, 24, 25)	6	Quadrangular	Straumann (Bone Level Implants)
8	Mandible	3 (FDI: 35, 33, 43)	1 (FDI: 46)	4	Quadrangular	Ankylos (C/X)
9	Maxilla	5 (FDI: 15, 14, 13, 23, 24)	1 (FDI: 22)	6	Quadrangular	Straumann (Bone Level Implants)
10	Maxilla	5 (FDI: 14, 13, 12, 11, 22)	2 (FDI: 25, 28)	7	Quadrangular	Nobel Biocare (Replace Straight)
Total	70.0% maxilla, 30.0% mandible	28 teeth (2.8 teeth/patient) (SD: 1.2, range: 2–5)	28 implants (2.8 implants/ patient) (SD: 1.3, range: 1–4)	56 abutments (5.6 abutments/ patient) (SD: 1.0, range: 4–7)	90.0% quadrangular, 10.0% triangular	50.0% Nobel Biocare, 40.0% Straumann, 10.0% Ankylos

teeth in combination with the strategic implants were provided with telescopic crowns to achieve a continual design of the prosthesis. At least four abutments per arch were obtained for the rehabilitation with telescopic-retained removable dental prostheses. Figures 1a to 1e show the clinical situation of patient no. 6 and the prosthetic treatment result in detail.

Moreover, prosthetic maintenance of abutment teeth, strategic implants, and telescopic-retained prostheses were assessed for technical and biologic complications, failures, and the need for prosthodontics-related repair and adjustment.

Results

The study participants were available after a mean follow-up period of 26.3 months (SD: 7.5 months, range: 18 to 40 months). In all patients, the prosthetic loading protocols could be improved to quadrangular (90.0%) or extended triangular (10.0%) prosthetic support either in the maxilla (70.0%) or mandible (30.0%).

After the observation period, all prostheses were still in function and no natural tooth or supplementary implant was lost. Technical and biologic complications related to tooth-implant–supported telescopic abutments occurred rarely in the patient cohort. Prosthetic maintenance services were limited to a low number of minor involvements. Caries, phenomenon of intrusion or periodontal soft tissue inflammation, or fractures of implant prosthetic components were not observed in any patients (Table 2).

Discussion

Telescopic crown–retained dental prostheses make it possible to restore dentition using a few remaining teeth that are located in unfavorable positions for other prosthetic reconstructions.[1–3] In a recent systematic review, the survival rates of tooth-supported double crown–retained prostheses were 90.0% and 95.1% after 4 and 5.3 years, respectively.[4] Despite these high survival rates in general, the

Table 2 Complication Rates

	No. of events
Complications associated with natural teeth (n = 28)	
Loosening or loss of retention	0
Caries	0
Endodontic treatment	1 (3.6%)
Intrusion	0
Periodontal soft tissue inflammation	0
Complications associated with strategic implants (n = 28)	
Loosening or loss of retention	0
Screw loosening	3 (10.8%)
Fractures of implant prosthetic components	0
Peri-implant mucosal adverse reactions	2 (7.2%)
Mechanical problems associated with telescopic prostheses (n = 10)	
Fractures of artificial teeth	1 (10.0%)
Denture base composite resins	0
Total	7

long-term prognosis of conventional double crown–retained removable dental prostheses depends on the total number of the involved abutment teeth. Several clinical investigations agreed that the failure rates of abutment teeth and their corresponding telescopic prostheses in severely reduced dentitions differed significantly from those in patients with more than three remaining natural abutments.[5,6] Moreover, the integration of one to three telescopic abutment teeth was less favorable with regard to the prosthetic loading forces, especially if the distribution of these abutments was arranged in a tangentially or cross-arch linear relation to the arch.[7] Therefore, it can be anticipated that the long-term success of telescopic-retained dental prostheses is highly dependent upon the number and topographic distribution of the remaining abutment teeth. Four or more telescopic abutments can have a positive impact on the survival of the complete restoration.

Dental implants can be inserted to increase the total number of anchoring elements in patients with a strongly reduced dentition and/or unfavorable distribution of remaining teeth. On this occasion, the placement of supplementary implants in strategic positions facilitates a more appropriate abutment situation and, thus, allows an extensive variety of new prosthetic treatment options.[8] Furthermore, supplementary implants in strategic positions may allow the change from a critical prosthetic support of a linear or reduced triangular initial situation to stable quadrangular loading forces of a removable dental prosthesis.[9]

This study revealed results on the therapy of combined tooth-implant–supported telescopic prostheses, with survival rates of 100% for telescopic abutments and prostheses after a mean observation period of more than 2 years. Thus, it may be assumed that the upgrade of the total abutment ratio per patient by placement of supplementary implants improved the midterm prognosis of both the telescopic abutments as well as the complete prosthetic reconstruction.

While the combination of teeth and implants in fixed restorations is well documented in the dental literature, valid data in the field of removable dental prostheses supported by teeth and implants have rarely been discussed and were mainly based on case reports.[10–12] Krennmair et al reported a survival rate of maxillary telescopic prostheses on teeth and implants of 100% after a mean follow-up period of 3.2 years.[13] In a more recent prospective clinical trial with telescopic-retained prostheses on teeth and implants, comparable results were presented.[14]

Presently, the question of different loading schemes on teeth with periodontal ligaments versus osseointegrated implants in the field of removable prostheses, as well as the possible risk for an intrusion phenomenon of the natural telescopic abutment, as described on fixed tooth-implant reconstructions, is still unclear. Moreover, initial costs for the treatment of additional surgical interventions have to be considered and discussed with the patient within the treatment concept of combined tooth-implant–supported telescopic prostheses. A favorable long-term prognosis and less need for maintenance adjustments, however, may justify supplementary implants as telescopic abutments.

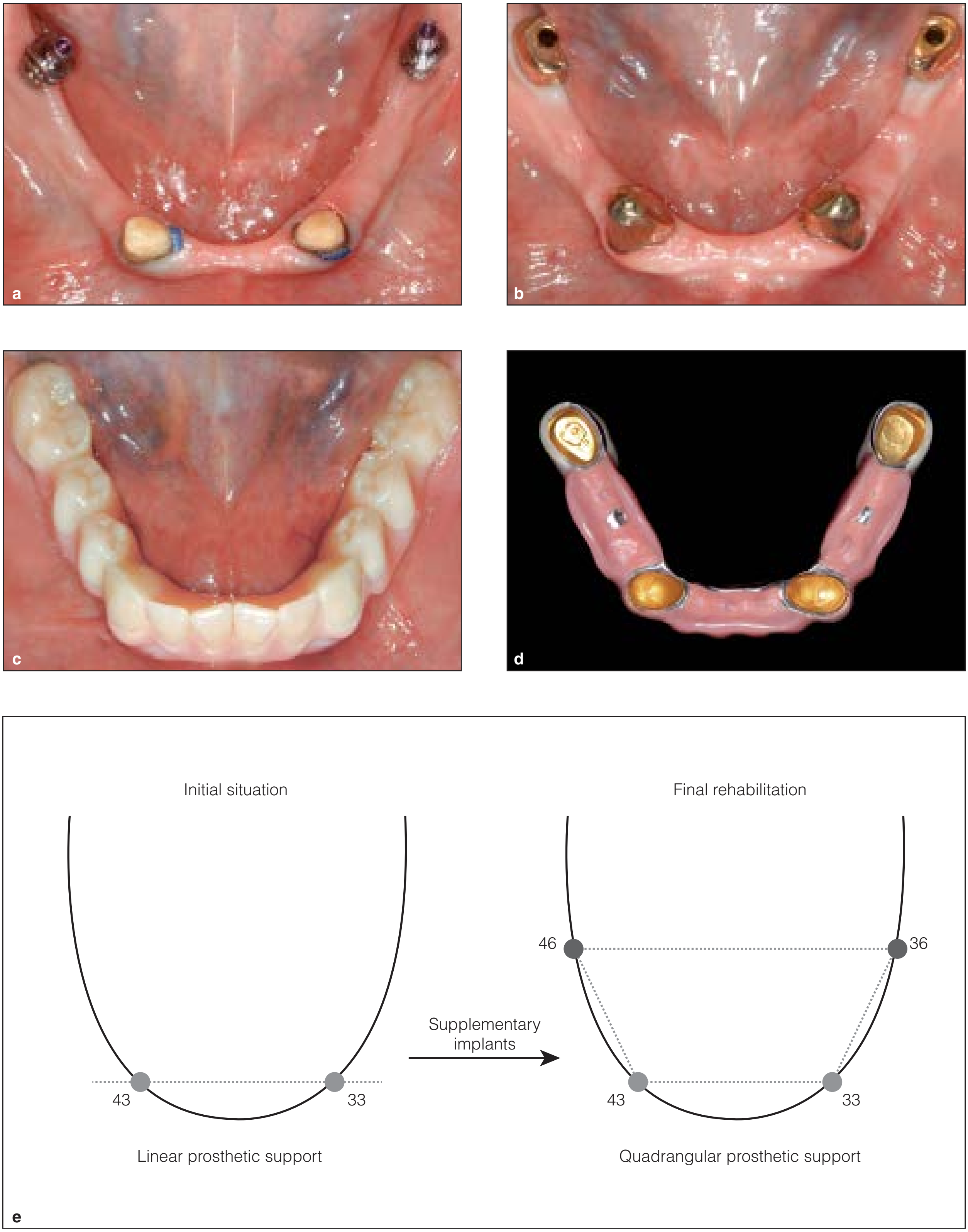

Fig 1 Patient no. 6 with Kennedy Class I arch and implant placement in strategic positions for bilateral supplementary abutment support in the molar region of the mandible. **(a)** Before impression taking, **(b)** inner telescopic crowns on natural teeth and implants for the combined anchoring of the removable dental prosthesis, **(c)** final telescopic-retained restoration in situ, **(d)** intraorally luted gold alloy galvanic mesostructures with the secondary cobalt-chromium-molybdenum alloy framework, and **(e)** integration of all teeth and implants as telescopic abutments to achieve a quadrangular loading protocol.

Conclusions

Strategic placement of implants enhances the prosthetic treatment options for the rehabilitation of patients with a severely reduced dentition. The concept of combined tooth-implant–retained telescopic prostheses improves the loading protocol for stable quadrangular support and appears to ensure successful function over a midterm observation period with only minor technical as well as biologic complications. However, further clinical studies with long-term follow-up periods and a larger patient cohort in comparison with a control group are needed to validate the promising outcomes of telescopic prostheses supported by teeth and implants in one reconstruction.

Acknowledgment

The author reported no conflict of interest related to this study.

References

1. Saito M, Notani K, Miura Y, Kawasaki T. Complications and failures in removable partial dentures: A clinical evaluation. J Oral Rehabil 2002;29:627–633.
2. Wagner B, Kern M. Clinical evaluation of removable partial dentures 10 years after insertion: Success rates, hygienic problems, and technical failures. Clin Oral Investig 2000;4:74–80.
3. Widbom T, Lofquist L, Widbom C, Soderfeldt B, Kronstrom M. Tooth-supported telescopic crown-retained dentures: An up to 9-year retrospective clinical follow-up study. Int J Prosthodont 2004;17:29–34.
4. Koller B, Att W, Strub JR. Survival rates of teeth, implants, and double crown-retained removable dental prostheses: A systematic literature review. Int J Prosthodont 2011;24:109–117.
5. Heners M, Walther W. Prognosis of abutment teeth in severely reduced residual dentitions [in German]. Dtsch Zahnarztl Z 1990;45:579–581.
6. Wostmann B, Balkenhol M, Weber A, Ferger P, Rehmann P. Long-term analysis of telescopic crown retained removable partial dentures: Survival and need for maintenance. J Dent 2007;35:939–945.
7. Hulten J, Tillstrom B, Nilner K. Long term clinical evaluation of conical crown retained dentures. Swed Dent J 1993;17:225–234.
8. Kaufmann R, Friedli M, Hug S, Mericske-Stern R. Removable dentures with implant support in strategic positions followed for up to 8 years. Int J Prosthodont 2009;22:233–241.
9. Hug S, Mantokoudis D, Mericske-Stern R. Clinical evaluation of 3 overdenture concepts with tooth roots and implants: 2-year results. Int J Prosthodont 2006;19:236–243.
10. Keltjens HM, Kayser AF, Hertel R, Battistuzzi PG. Distal extension removable partial dentures supported by implants and residual teeth: Considerations and case reports. Int J Oral Maxillofac Implants 1993;8:208–213.
11. Kuzmanovic DV, Payne AG, Purton DG. Distal implants to modify the Kennedy classification of a removable partial denture: A clinical report. J Prosthet Dent 2004;92:8–11.
12. Mijiritsky E, Ormianer Z, Klinger A, Mardinger O. Use of dental implants to improve unfavorable removable partial denture design. Compend Contin Educ Dent 2005;26:744–750.
13. Krennmair G, Krainhofner M, Waldenberger O, Piehslinger E. Dental implants as strategic supplementary abutments for implant-tooth-supported telescopic crown-retained maxillary dentures: A retrospective follow-up study for up to 9 years. Int J Prosthodont 2007;20:617–622.
14. Moll D, Yildirim M, Spiekermann H, Wolfart S. Telescopic crown-retained removable partial dentures on teeth and implants: An 8- to 9-year prospective randomized clinical trial. Clin Oral Implants Res 2012;23:895.

Literature Abstract

Application of current pain management concepts to the prevention and management of postoperative pain

The author begins by presenting a common clinical situation regarding postsurgery pain and proceeds to explain the pain mechanisms as a precursor to a strategy to manage pain. Nociceptive activity in the peripheral terminal nerve endings of unmyelinated C fibers of the trigeminal nerve as a response to released prostaglandins, bradykinins, and leukotrienes cause the release of substance P sending pain signals to the central nervous system (CNS). There is also a local proinflammatory reaction leading to vasodliation, plasma extravasation, and edema. Postsurgical pain can be managed in three ways: block nociceptive impluses, decrease nociceptive input from the surgical site, and alleviate pain perception in the CNS. To combat the above, the strategy is as follows: use a long lasting anesthetic such as 0.5% bupivacaine 1:200000 epinephrine that has a 5 to 7 hour duration, use nonsteroidal anti-inflammatory drugs (NSAIDs) preoperatively to block some of the actions of cytokines and inflammatory mediators, and use opioids that mimic endogenous opioid peptides to act on the CNS and reduce transmission of nociceptive signals. The author clearly describes the pain mechanisms and outlines an effective pain management strategy. This provides the practitioner with a practical approach to postsurgery pain control based on an understanding of the pain process.

Laskin DM. *J Am Dent Assoc* 2013;144:284–286. **References:** 8. **Reprints:** DM Laskin, Department of Oral and Maxillofacial Surgery, School of Dentistry, Virginia Commonwealth University, PO Box 980566, Richmond, Va. 23298-0566. **Email:** dmlaskin@vcu.edu—*Steven Soo, Singapore*