Extra-Short 4-mm Implants Splinted to 10-mm Implants in the Posterior Maxilla: 3-year Results

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Purpose: To evaluate the 3-year success and survival rates of fixed prostheses supported by 4-mm extra-short implants splinted to 10-mm implants in patients with shortened maxillary arches and low maxillary sinus floors. ***Methods:*** A total of 11 patients with reduced alveolar bone heights due to low maxillary sinus floors received two or three titanium-zirconium tissue-level implants: one or two extra-short (4 mm) implants, and one implant 10 mm in length. After 6 months, prosthetic rehabilitation with splinted crowns connecting the 4- and 10-mm implants was performed. Follow-up visits and maintenance protocols were implemented every 4 to 6 months. ***Results:*** The 11 patients were treated with 11 10-mm implants and 17 4-mm implants. One extra-short implant failed and was removed before loading, and its planned design was modified from three splinted crowns to a bridge between the 10- and 4-mm implants. After 36 months, all (11/11) prosthetic rehabilitations connecting the 10-mm (11/11) and 4-mm (16/16) implants were functional. At the 10-mm implant sites, the median (interquartile range [IQR]) probing depth and marginal bone loss measured 2.9 mm (2.3 to 3.2) and 1.3 mm (1.0 to 1.5), respectively. At the 4-mm implant sites, the median (IQR) probing depth and marginal bone loss measured 2.9 mm (2.4 to 3.1) and 0.3 mm (0.1 to 0.5), respectively. ***Conclusion:*** Prosthetic rehabilitation with splinted crowns connecting 4-mm and 10-mm implants showed promising outcomes in shortened maxillary dental arches after 3 years. Additional studies are needed to further validate these findings. *Int J Oral Maxillofacial Implants 2023;38:907–914. doi: 10.11607/jomi.10179*

Keywords: alveolar bone loss, dental implants, short dental implants, maxilla, survival rate

The restoration of partially edentulous posterior maxillae using standard-sized implants in patients whose bone quantity is reduced and whose alveolar ridge dimensions are compromised[1] is often performed after a transcrestal[2,3] or lateral sinus floor elevation.[4,5] The use of shorter implants, including extra-short 4-mm implants, has been examined over the past decade as an alternative option to avoid the need for bone augmentation.[6] Extra-short implants have also been associated with lower costs, shorter recovery times, and decreased patient morbidity.[7]

Several meta-analyses have disclosed favorable short-term survival rates of functionally loaded extra-short implants measuring ≤ 6 mm.[8–11] However, based on the actual duration of time in function, Vazouras et al[8] reported a failure rate of up to 2% for such implants after 1 year and found that the rate increased to 10% after 3 years. Moreover, Ng et al[12] showed that the survival rate of single-tooth 6-mm implants in the posterior maxilla heavily depends on bicortical stabilization; in their retrospective study, only 51% of implants without bicortical stabilization survived a 5-year follow-up period compared to 100% of those that did achieve bicortical stabilization.

Fernández-Bodereau et al[13] utilized finite element analysis to predict the success rate of splinted extra-short implants and found that they could be used reliably in the porous bone of the maxilla. Similarly, several clinical studies confirmed favorable 1-year survival rates of splinted extra-short 4-mm implants in the posterior maxillary region.[14,15] Torassa et al[16] also reported a high 2-year success rate of posterior maxillary rehabilitations when using 4-mm implants splinted to 10-mm implants, with a tooth distal to the edentulous gap serving as additional protection against occlusal overload. Similarly, Slotte et al[17] showed a promising 5-year

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Submitted July 17, 2022; accepted September 7, 2022.
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survival rate of splinted 4-mm implants in resorbed posterior mandibles.

Rehabilitation with extra-short implants imposes several challenges because their performance is generally assessed at sites with reduced vertical bone height. This results in very long clinical crowns and unfavorable crown-to-implant ratios, making the predictability of such rehabilitations indeterminable.[6,9,10,17] In addition, bone remodeling related to flap elevation, implant neck configuration, topographic profiles, and platform dimensions may jeopardize implant stability.[18] The most frequent complications of dental implants, including technical failures such as screw loosening, material wear, chipping, and implant fractures, may also be regarded as risk factors when considering short implant survival and success rates.[19]

Complications related to peri-implantitis are roughly equivalent in short and standard-length implants. Nevertheless, complete healing of inflamed peri-implant tissues and progressive loss of supporting bone is not an easily achievable goal, especially in patients with a history of periodontitis.[20] Peri-implantitis has been reported to be the primary cause of short dental implant failure[21] and is generally attributed to poor oral hygiene, irregular maintenance protocols, restricted access, and anatomical variations.[22] However, Naenni et al[2] observed no signs of peri-implant infection or marginal bone loss prior to loss of osseointegration in failed single-tooth 6-mm implants placed into posterior segments of the maxilla or mandible.

We have previously reported promising 12-month postloading results after rehabilitating 11 patients with shortened maxillary dental arches using extra-short 4-mm implants splinted to 10-mm implants.[15] This report describes the 3-year follow-up data of the same cohort.

MATERIALS AND METHODS

Patients and Study Criteria

In this case series, 11 patients with shortened dental arches on one side of the maxilla were included. Patients with minimal vertical ridge resorption, sufficient alveolar ridge width, and expanded maxillary sinuses were selected and treated with one or two 4-mm–long dental implants. In addition, sufficient vertical bone dimension next to the site of short implant placement was required for the positioning of a 10-mm–long implant.

This study adhered to the CARE guidelines for the collection of systematic data, analysis, and reporting (Fig 1). All patients were given a detailed explanation of the conditions and procedures concerning the trial before signing an informed consent form. The study protocol was authorized by the Republic of Slovenia's National Ethics Committee (No. 30/10/2015). All guidelines and standards of the Declaration of Helsinki were followed.

Patient characteristics included:

- Age above 18 years
- Good systemic health
- Shortened maxillary dental arch on one or both sides
- No carious lesions, active periodontitis, or endodontic pathology in the teeth, alveolar bone, or soft tissues adjacent to the planned implant site
- Denture or natural dentition in the mandible
- Adequate bone volume for the placement of a 10-mm–long (4.1-mm diameter) implant
- One or more adjacent implant sites with reduced vertical dimensions measuring < 8 mm and alveolar ridge width measuring ≥ 7 mm

Patients were excluded if they had previously already received implant or graft placement at the potential operative site. Patients who smoked and patients with well-treated periodontitis were not excluded.

Clinical Procedure

The surgical approach for implant placement with a single-stage surgery[23] and the 1-year postloading results have been described previously.[15] The standard implant bed preparation sequence was followed as recommended by the manufacturer (Institut Straumann). One 10 x 4.1-mm diameter and one or two 4 x 4.1-mm diameter tissue-level (Standard Plus, titanium-zirconium [Ti-Zr] alloy, SLActive) implants were manually placed. Of the 17 placed 4-mm implants, 10 penetrated the bone of the sinus floor and were considered to be bicortically stabilized. The rest (n = 7) did not penetrate the sinus floor bone and were considered non–bicortically stabilized. The primary stability (mean ± SD) was evaluated using Ostell equipment (Integration Diagnostics) and was similar for both the bicortically stabilized (ISQ: 56 ± 18) and non–bicortically stabilized (ISQ: 60 ± 5) 4-mm implants. One non–bicortically stabilized 4-mm implant was lost before loading.

After 6 months, osseointegation was confirmed by radiographs and ISQ values. All implants were thereafter restored with metal-ceramic fixed dental prostheses (FDPs). The metal frameworks were milled from a cobalt-chromium alloy (Coron, Institute Straumann). Three FDPs were fixed on cementable synOcta abutments (Institut Straumann), and eight FDP frameworks were screwed directly onto the implants without abutments. Seven 3-unit FDPs were manufactured, six to be attached to two extra-short (4-mm) implants and one 10-mm implant, and one to be attached to one 4-mm and one 10-mm implant. Four 2-unit FDPs were supported by one 4-mm implant and one 10-mm implant. Access holes of the screw-retained crowns were closed

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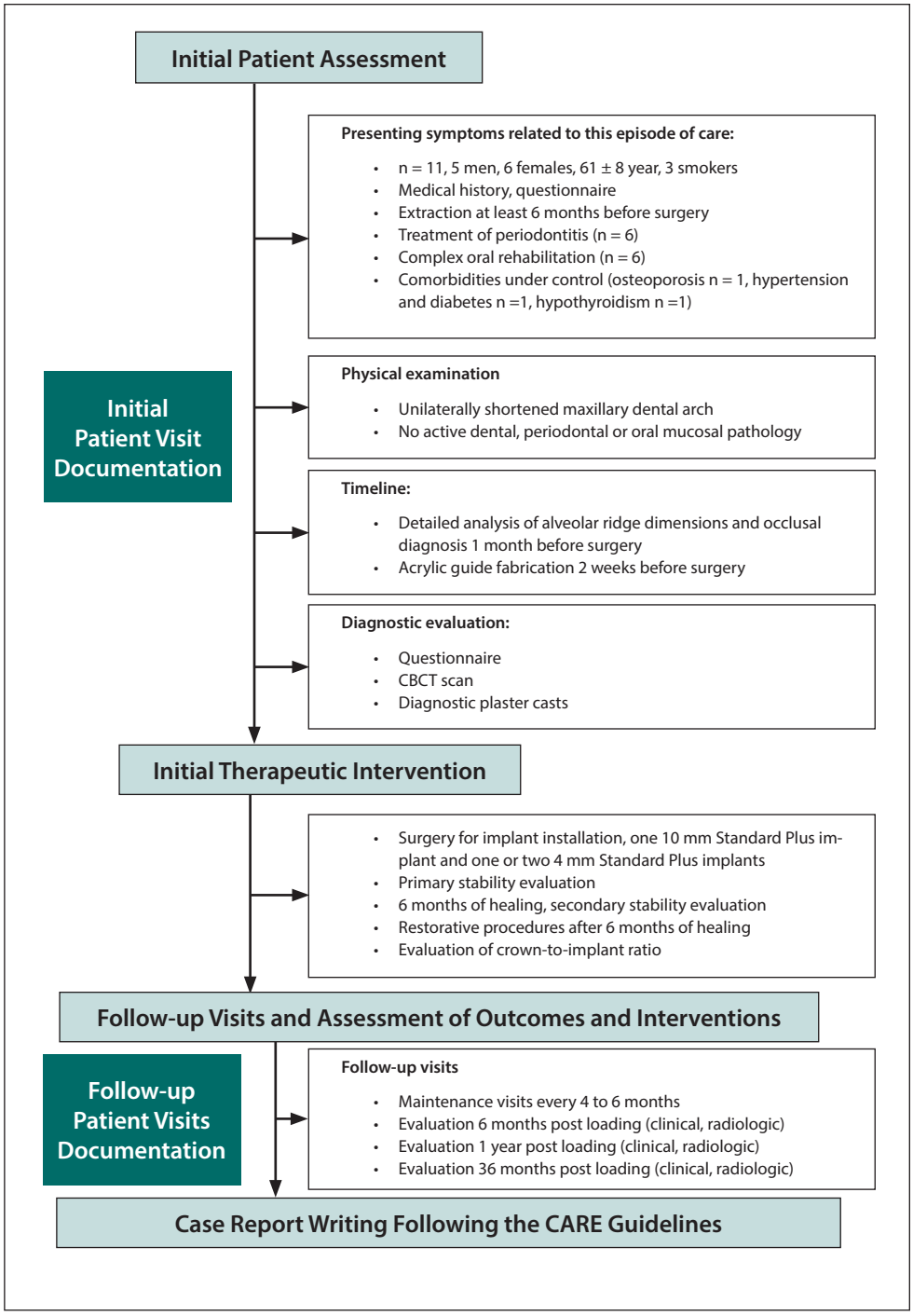

Fig 1 Flowchart showing patient treatment protocols.

using plugs made of a high-viscosity laboratory composite (SR Nexco, Ivoclar Vivadent).

Postloading Maintenance

Patients were recalled every 4 months. Oral hygiene instructions were reinforced during each follow-up visit to sustain adequate levels of oral hygiene throughout the study period. All patients underwent a full periodontal examination at each visit using a periodontal probe (POW6, Hu-Friedy). At each follow-up, all teeth showing clinical signs of inflammation, bleeding on probing (BOP), suppuration, increased probing depths (PD; ≥ 5 mm), recession (REC) of the mucosal margin, and/or radiographic bone loss (> 2 mm) received supra- and subgingival debridement.[24] Persisting tooth sites with PD ≥ 5 mm and BOP were treated surgically.

At each visit, plaque levels were evaluated, and the implant-supported FPDs were meticulously cleaned of

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Table 1 Clinical Characteristics of Patients at Baseline

Teeth (n)	20 (18.0–23.5)
Sites with PD ≥ 5 mm (n)	0 (0.0–1.8)
BOP (%)	0 (0.0–1.0)
PPD (mm)	2.8 (2.3–3.0)
REC (mm)	0.5 (0.2–1.0)

All data are reported as median (IQR).

any tooth deposits with a polishing brush and prophylaxis paste (Proxyt, Ivoclar Vivadent). Every 12 months, a detailed periodontal examination was performed in addition to a radiographic examination of the implants.

Postloading Measurements and Radiographic Evaluation

Final check-ups were performed between 2019 and 2021, 36 months after loading. An experienced periodontist (R.G.) first completed a calibration exercise in 10 periodontitis patients. Calibration measurements were repeated after 1 week, yielding intraclass correlation coefficients for REC, PD, and full-mouth plaque score (FMPS) above 0.9 and kappa values for BOP above 0.95. A clinical evaluation of each subject followed, whereby six sites per tooth and implant were assessed using a manual probe. FMPS, PD, BOP, and REC were recorded. The implant-crown junction for implants and cementoenamel junction for teeth were used as reference points while measuring PD and REC. Radiographic examinations were also performed using normal periapical radiographs taken without bite blocks.

The location of the most coronal radiopaque contact between the bone and the implant, the highest cusp of the metal framework, and the level of the implant platform were assessed by an experienced periodontist (R.G.) in ImageJ software (version 1.48u4, US National Institutes of Health), whereby each radiograph was calibrated using the length of the implant as a baseline measurement (5.8 mm at the extra-short and 11.8 mm at the standard implants, also taking the 1.8-mm machined collar of the tissue-level implants into account). The dimensions of the most coronal radiopaque contacts between the implant surface and the bone crest were measured and averaged on both the mesial and distal sides of each implant. The marginal bone loss observed between periapical radiographs taken right after implant placement and 36 months after loading was estimated as the difference in distance between the implant platform and the most coronal radiopaque contact between the bone crest and implant surface.

Statistical Analysis

A descriptive analysis was employed to present the results of this study. Survival and success rates are presented as absolute numbers. Numeric data are presented as median and interquartile range (IQR), as these data were not normally distributed. Mann-Whitney and Fisher exact tests were used to evaluate differences in clinical and radiographic parameters between the 4-mm and 10-mm implants.

RESULTS

General and Oral Health

The average age of the 11 patients was 61 ± 9 years at baseline. Five of the patients were male (45%), and 3 were smokers (27%). Clinical characteristics at baseline, postloading status, and oral and general health issues are presented in Table 1 and Appendix Table 1 (appendix information can be seen in the online version of this article).

During the follow-up period, one patient developed severe peri-implantitis of a nontested implant on the same side of the maxilla; the implant was therefore explanted. Another patient reported chronic orofacial pain almost every day at noon on the right side of the head (the side with the extra-short implants); the pain subsided after medication with a combination of a narcotic analgesic and paracetamol. The cause of this orofacial pain remains to be determined.

One patient underwent cataract surgery of both eyes at the beginning of 2021. Soon after the surgery, the same patient also suffered an injury of the right arm. These two events hindered the patient's ability to maintain adequate oral hygiene. Consequently, this patient had two additional surgical periodontal interventions in the region of both the mandibular and maxillary incisors.

Postloading Results

At the 36-month follow-up examination, all (11/11) implant-supported prostheses were functional, including the one that needed modification of the planned splinted crowns into a bridge due to the loss of one extra-short implant. On March 1, 2022, the patients had carried functional suprastructures for more than 36 months (mean ± SD = 49 ± 7 months, maximum: 60 months) without any indication of peri-implant tissue pathology or critical technical complications. Few minor technical complications were observed during the follow-up period. In one patient, retightening of a loose abutment screw was needed. In two patients, composite plugs adhesively cemented over the screw access hole openings fell out, and direct composite had to be used instead. In another two patients, the

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margins of the plugs needed to be polished due to discoloration. No ceramic chipping occurred during the follow-up period. All patients had stable, canine-guided occlusions with no premature propulsion or lateropulsion contacts, and all patients (11/11) were satisfied with the esthetics and function of their suprastructures.

Overall, postloading survival was 16/17 for the extra-short (4-mm) and 11/11 for the standard-sized (10-mm) implants. The postloading success of the 10-mm implants was reduced to 10/11 due to an area of tissue recession at one implant site. A thorough examination of the peri-implant soft tissues and marginal bone revealed satisfactory results (Table 2). Typical radiographs showing two cases at implant placement, immediately after loading, and at 1, 2, and 3 years postloading are presented in Figs 2 and 3.

Table 2 Peri-implant Soft Tissue and Marginal Bone Parameters 36 Months After Loading

	10 mm (n = 11)	4 mm (n = 16)	*P* value
Sites with PD ≥ 5 mm, n/total (%)	4/66 (6)	1/96 (1)	.18
Sites with BOP, n/total (%)	9/66 (14)	15/96 (15)	.84
PD, median (IQR) mm	2.9 (2.3–3.2)	2.9 (2.4–3.1)	.22
Tissue recession, median (IQR) mm	0.5 (0–0.6)	0 (0–0.3)	.24
Marginal bone loss, median (IQR) mm	1.3 (1.0–1.5)	0.3 (0.1–0.5)	< .01
Cumulative survival	11/11	16/17	1
Postloading success	10/11	16/16	1

DISCUSSION

Splinted crowns supported by one or two extra-short 4-mm implants with hydrophilic surfaces and one conventional 10-mm implant showed good survival and success rates 3 years after placement in posterior reduced maxillary dental arches. Furthermore, all restorations were still free of severe technical and biologic complications after 36 months, including the prosthetic restoration that needed to be modified due to the loss of one 4-mm implant. Based on these findings, using extra-short 4-mm implants connected to standard-sized implants could be a faster and less expensive treatment option than sinus floor elevation, which is required for the placement of longer implants in posterior maxillae with expanded sinuses. To the best of the authors' knowledge, this is the first 3-year report showing effective rehabilitation of shortened maxillary dental arches with 4-mm extra-short implants connected to standard-sized implants. The obtained results match several similar case-control series and case studies that have shown promising outcomes for short implants supporting single crowns in the posterior maxilla[25–27] or splinted crowns in partially edentulous maxillae with gaps between the premolar and distal molar.[16]

The titanium-zirconium implants with hydrophilic surfaces used in this study have been found to enhance osseointegration compared to pure titanium implants with hydrophobic surfaces.[28] In addition to improved mechanical strength,[29] titanium alloys containing 13% to 15% zirconium may also aid osseointegration in osteoporotic bone.[30] When compared to 10-mm implants with a thread pitch of 1.25 mm, 4-mm implants bear a thread pitch of 0.8 mm and consequently increase the implant-to-bone contact ratio.[31] However, contrary to our splinted 4-mm titanium-zirconium implants, occasional losses of single-tooth extra-short 6-mm implants manufactured from pure titanium have been reported. Rossi et al[26,32,33] published two studies on the survival of 6-mm moderately rough, pure titanium implants with hydrophilic surfaces supporting single-crown rehabilitations in the posterior maxilla. In the first study, 6-mm implants were placed in the bone of posterior maxillae with sufficient bone height for 10-mm implants; 3 of the 12 implants were lost after 5 years, yielding a survival rate of 75%.[32] In the second study, only 1 of the 15 implants was lost after 10 years.[26,33] Naenni et al[2] compared the 5-year survival rates of 6-mm and 10-mm pure titanium implants placed in single-tooth gaps in the posterior segments in both arches. They reported a 91% success rate of the 6-mm implants and a 100% success rate of the 10-mm implants after 10 years, and none of the lost implants showed any signs of marginal bone loss or peri-implant infection prior to the loss of osseointegration. Sahrmann et al[34] speculated that an increased degree of mineralization and additional corticalization of the peri-implant bone hampers the bone's biologic response and precedes sudden loss of osseointegration in 6-mm pure titanium implants. Unfavorable crown-to-implant ratios in short/extra-short implants may also be associated with the sudden loss of osseointegration. Studies on this subject have, however, failed to prove a negative effect of a high crown-to-implant ratio on crestal bone loss and implant survival.[35] In this respect, it should be noted that the impact of crown-to-implant ratios is less critical for splinted than for non-splinted extra-short implants.

The results of this study are congruent with a recent review by Rameh et al,[36] which concluded that short and standard implants placed in the maxilla or mandible exhibit comparable survival rates, showing no difference in marginal bone levels even after 5 to 10 years of observation. Hence, short and extra-short dental implants offer several advantages for both the patient and practitioner in many clinical scenarios[32,37–40] and

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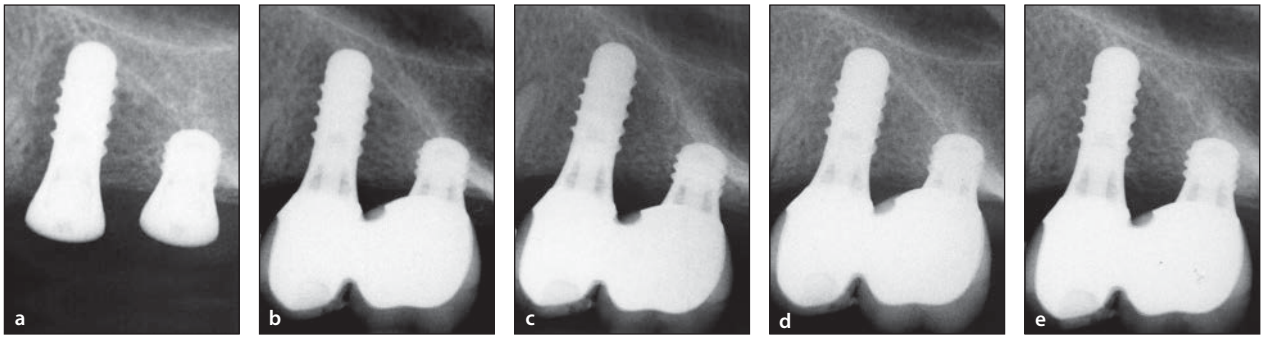

Fig 2 An extra-short implant splinted to a standard implant in a 67-year-old female patient at *(a)* placement, *(b)* immediately after loading (baseline), and *(c)* 12 months, *(d)* 24 months, and *(e)* 36 months postloading.

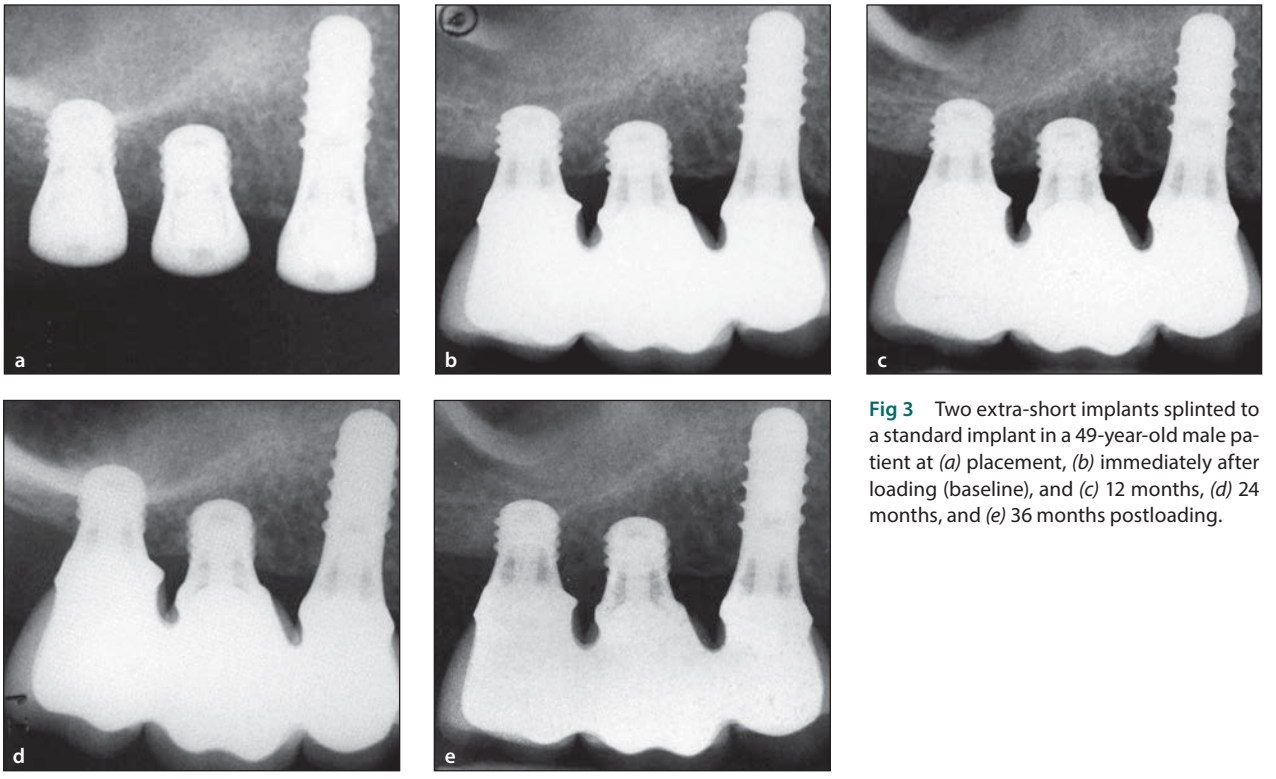

Fig 3 Two extra-short implants splinted to a standard implant in a 49-year-old male patient at *(a)* placement, *(b)* immediately after loading (baseline), and *(c)* 12 months, *(d)* 24 months, and *(e)* 36 months postloading.

provide a straightforward, reliable solution for individuals with objections to more aggressive regenerative procedures.

Compared to standard-sized tissue-level implants, marginal bone remodeling at 4-mm tissue-level implants can either be smaller[15] or larger.[41] At our 3-year follow-up visits, greater bone loss was noticed around the 10-mm implants (median value of 1.3 mm) than around the 4-mm implants (median value of 0.3 mm). This may be attributed to the establishment of an adequate biologic width. Ravidà et al[42] made a similar observation in their systematic review, noting that marginal bone loss associated with standard-sized implants is greater compared to that of short/extra-short implants. Remodeling and loss of marginal bone around tissue-level implants may occur due to their deeper positioning, characterized by a shift of the biologic width toward a more apical direction, especially in patients with thick gingival biotypes.[22] In addition, an inferior horizontal dimension of the alveolar ridge in the premolar region, where all the 10-mm implants were placed, could explain the higher marginal bone loss in comparison to the 4-mm implants, which were mostly placed in molar areas. In contrast, animal experiments and clinical trials utilizing 4-mm implants with concave-shaped transmucosal necks (imitating a platform-switch design[14,43]) demonstrated that bone can even grow over the implant shoulder.[14,43,44] At

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present, only tissue-level extra-short implants measuring 4 mm are available on the market, possibly due to the space requirements of the implant components,[13–16,43,45] which seem to hamper the fabrication of a bone-level implant design. Short implants also feature more technical complications than standard implants, presumably diminished by splinting.[46]

Besides the small sample size and short follow-up period, our study has several limitations associated with the case series study design, preventing the possibility of analytical or statistical approaches. As previously stated,[15] rehabilitation with extra-short implants was tested in order to reflect real-world clinical scenarios, which contributes to the external validity of our findings. Despite several general health issues pertaining to more than half of the included patients that could have potentially jeopardized implant survival (ie, osteoporosis, denosumab therapy, smoking, and periodontitis history), this study showed promising survival and success rates. Additionally, even though numerous patients developed new oral and systemic health concerns between the 12-month and 36-month check-ups, this did not affect the survival rate of the tested implants. The influence of the COVID-19 pandemic on health care services in Slovenia, on the other hand, had an impact on patients' supportive care,[47] whereby one follow-up visit per patient (between March and June 2020) had to be cancelled. Nevertheless, no signs of peri-implantitis were observed at any point around the tested implants.

CONCLUSIONS

Rehabilitation with splinted crowns connecting 4- and 10-mm implants in posteriorly reduced maxillary arches showed favorable 3-year outcomes. However, future clinical trials will be required to evaluate the long-term effectiveness of such an alternative.

ACKNOWLEDGMENTS

This study was supported by the Ministry of Science and Technology of the Republic of Slovenia, grant no. P3-0293. Implants were donated by Institut Straumann AG, Basel, Switzerland, and suprastructures by Dentalia, Ljubljana, Slovenia (a local Straumann distributor). Drs Susy Linder and Michel Dard are employees of Institut Straumann AG. The authors thank Mr Jure Garbajs, dental technician, for skillful technical work. The authors report no conflicts of interest.

Author contributions: R.G., C.O.: study conceptualization, formal analysis, investigation, methodology, project administration, drafting and revision of manuscript; M.D.: study conceptualization; methodology, drafting and revision of manuscript; S.G., K.P.: investigation, drafting of manuscript; S.L.: methodology, revision of manuscript.

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APPENDIX

Appendix Table 1 Patient Characteristics, Including General and Oral Health Issues, at 12 and 36 Months Postloading

Sex	Age, y	Site and dimension of implants	Time period from restoration placement (mo)	Baseline conditions
M	67	Reg. 14 = SS Reg. 15 = E Reg. 16 = E_2	60	• Unilaterally shortened maxillary arch • Smoker • Active periodontal therapy before recruitment • Needed complex rehabilitation of severely worn or/and damaged dentition
F	67	Reg. 14 = SS Reg. 15 = E Reg. 16 = E_2	60	• Unilaterally shortened maxillary arch • Osteoporosis and received denosumab (30 mg/6 months, Prolia, Amgen)
F	62	Reg. 15 = SS Reg. 16 = E	46	• Unilaterally shortened maxillary arch • Smoker • Hypothyroidism and receives supplemental hormone therapy • Active periodontal therapy before recruitment • Needed complex rehabilitation of severely worn or/and damaged dentition
M	73	Reg. 14 = SS Reg. 15 = E	57	• Unilaterally shortened maxillary arch • No chronic systemic diseases or pharmacologic therapy
F	65	Reg. 26 = SS Reg. 27 = E	46	• Unilaterally shortened maxillary arch • Smoker • No chronic systemic diseases or pharmacologic therapy • Active periodontal therapy before recruitment • Fixed orthodontic appliance therapy • Needed complex rehabilitation of severely worn or/and damaged dentition
M	63	Reg. 24 = SS Reg. 26 = E Reg. 27 = E_2	48	• Unilaterally shortened maxillary arch • Smoker • Borderline hypertension and hypoglycaemia without medical therapy
F	49	Reg. 16 = SS Reg. 17 = E	49	• Unilaterally shortened maxillary arch • No chronic systemic diseases or pharmacologic therapy • Active periodontal therapy before recruitment • Needed complex rehabilitation of severely worn or/and damaged dentition
M	55	Reg. 24 = SS Reg. 25 = E Reg. 26 = E_2	45	• Unilaterally shortened maxillary arch • No chronic systemic diseases or pharmacologic therapy • Active periodontal therapy before recruitment • Needed complex rehabilitation of severely worn or/and damaged dentition
F	51	Reg. 14 = SS Reg. 15 = E Reg. 16 = E_2	41	• Unilaterally shortened maxillary arch • No chronic systemic diseases or pharmacologic therapy

Legend: M = male F = female, Age = age of patients, when the implants were inserted;
Reg. = region; SS = standard sized implant E = extra short implant, E_2 = second extra short implant;
UI = unrelated to implant therapy, RI = related to implant therapy

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Conditions during the first 12 months (already reported15)	New conditions
• Former smoker • After 2 weeks of healing he reported pain in the short-implant area; one of the 4-mm long implants became mobile and was easily removed; after removal, the pain vanished within 1 day (RI); • In the 1st year after the loading of the implants: *Streptococcus pneumonie* – caused pneumonia, requiring systemic antibiotic treatment and ending with diagnosis of chronic obstructive pulmonary disease (UI).	• Due to fracture of the tooth 22, received composite filling (UI) • Prostatic hyperplasia (UI)
• Mucosal pain and outbreak of intraoral herpetic vesicles 3 days after surgical procedure; she was treated with Valacyclovir (500 mg twice per day, Valtrex, GlaxoSmithKline) for 2 weeks (RI); • Had several scaling and root planning procedures due to increased PPD on teeth 13, 11, 21 (UI).	
• After 2 weeks of healing one of the closure screws became loosened and was immediately retightened (RI) • After 2 months of healing she reported pulpitic pain of the neighbouring premolar (tooth 14); the tooth was later extracted due to unsuccessful endodontic treatment (UI) • After 3 months of healing she was diagnosed with breast cancer, which was surgically treated (UI) • Six months after breast cancer surgery, the extracted premolar was replaced with a new implant (UI) • The patient experienced severe periimplantitis of this non-tested implant (site 14) which neighboured a tested 10-mm implant; the implant at site 14 was consequently explanted (UI)	• Cataract surgery on both eyes (March/April 2021) (UI) • Injury of the right arm causing difficulty in maintaining the satisfying oral hygiene level (UI) • Progression of periodontitis that required periodontal therapy; flap surgery around teeth 32, 31, 13, 12, 11, 21, 22, 23; maintenance every 3 months (UI)
• He reported pain of the endodontically treated neighbouring canine, which was extracted and replaced with a pontic between the new implant on the position of the second premolar and first premolar (UI) • New implant on the position of the maxillary right lateral incisor (reg. 12) after the extraction of an endodontically treated maxillary right canine, neighbouring the testing 10 – mm implant (UI)	Presence of chronic orofacial pain on the right side of the head (UI)
• Received one more implant in reg. 15 (UI)	Due to fracture on central incisor, received composite filling(UI)
• New implants on sites 16 and 17, trans-crestal sinus lift for placement of 16; (UI)	Explantation of the implant in region 16 in the beginning of the year 2021 (UI)
	Progression of periodontitis that required periodontal therapy (UI)
• Received two more implants in the contralateral side of the mandible (UI)	
• Two mucogingival procedures due to gingival recession around teeth 11 and 33 (UI)	

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