
SHORT COMMUNICATION

Laser-Welded Titanium Frameworks for Implant-Supported Fixed Prosthesis: A 5-Year Report

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The 5-year results from a multicenter study of implant-supported, laser-welded titanium frameworks are reported here as a complement to earlier reported 2-year results. Implant survival rates were satisfactory for patients with titanium frameworks and for a control group of patients with gold-alloy frameworks. At the 5-year review, more patients with titanium frameworks had lost implants than the patients with gold-alloy frameworks, but this difference was not statistically significant. More fractures of the titanium frameworks occurred, compared to the gold-alloy frameworks; again, this difference was not statistically significant. No significant differences in marginal bone levels were found between the 2 groups of patients. Slightly more fractures of artificial teeth occurred in patients with titanium frameworks than in patients with gold-alloy frameworks. Overall results for the titanium frameworks after 5 years in function are encouraging.

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Earlier, the 2-year results were reported from a prospective multicenter study of laser-welded titanium frameworks used in fixed implant-supported prostheses.¹ The results were encouraging, even though, with complete maxillary restorations, more patients in the titanium framework group than the control group had lost 1 or more implants. Measurements of height and width of the titanium frameworks showed a high percentage of failure where the lowest values were 3 mm or less in one or both dimensions, indicating a risk for fatigue fractures in the future. The results of the 5-year examination are now presented.

Materials and Methods

Originally, 19 Swedish prosthodontic clinics participated in a prospective multicenter study. After the 2-year examination, 3 clinics were not willing to participate any further. The 5-year report is therefore based only on the patients treated at the other 16 clinics and examined after both 2 and 5 years. However, reported framework fractures are presented for the total material.

The numbers of implant-supported prostheses in the titanium framework group and in the control group (with gold-alloy frameworks) are shown in Table 1.

In the titanium framework group, 18 of the original fixed prostheses were not examined after 5 years for the following reasons: patient deceased (4), new prostheses fabricated (7), drop-out (6), and prosthesis removed in treatment of malignancy (1). In the control group, 15 prostheses were not examined after 5 years for the following reasons: patient deceased (6), new prostheses fabricated (3), and drop-out (6).

Clinical and radiographic examinations were performed at the different centers according to the routines at each center and the original protocol

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Table 1 No. of Implant-Supported Fixed Protheses in the Titanium Framework Group and in the Control Group

Group	Originally	At the 2-year examination	At the 5-year examination
Titanium framework group	85	79	67
Control group (gold-alloy frameworks)	81	79	66

Table 2 No. of Mechanical and Soft Tissue Complications Associated with the Implant-Supported Protheses and Reported During the 5-year Follow-up Period

Complication	Titanium framework group	Control group
Abutment screw fracture	0	1 (1)
Gold screw fracture	1 (1)	0
Fracture of artificial teeth and/or acrylic resin material	17 (11)	7 (4)
Soft tissue complications	8 (8)	2 (2)

Complications that occurred before the 2-year examination are shown within parentheses.

for the study.¹ The radiographs were evaluated at each center and at the Department of Oral Diagnostic Radiology, University of Göteborg, Sweden. Differences between the titanium framework group and the control group were evaluated statistically using the chi-square test and Student's *t* test.

Results

In the titanium framework group, 6 of 415 implants were lost during the observation period, yielding a survival rate of 98.6%. In the control group, 4 of 403 implants were lost, yielding a survival rate of 99%; there were no significant differences between the groups. In the completely edentulous maxillary situations, 5 patients in the titanium framework group were reported to have lost 1 or more implants at the 2-year examination; no further patients with implant loss were found in this group at the 5-year examination. Among those in the control group with completely edentulous maxillae, 1 patient had lost an implant between the 2-year and the 5-year examinations. There was no longer a significant difference between the groups.

No significant difference in marginal bone levels around the implants was found between the patients with titanium frameworks and those in the

control group with gold-alloy frameworks either in the maxilla or in the mandible. This is in accordance with the findings at the 2-year follow-up.¹

Five fractured titanium frameworks were reported during the observation period, compared to 2 fractured gold-alloy frameworks in the control group. These patients were provided with new protheses and were for that reason excluded from further examinations in the study.

Technical and soft tissue complications in patients examined after both 2 years and 5 years are shown in Table 2.

Discussion

The 5-year implant survival rates were satisfactory, both in the titanium framework group and in the control group, and the percentage figures were very similar. There was no significant difference in marginal bone levels between the groups.

At the 2-year examination,¹ a statistically significant difference was noted between the titanium framework group and the control group for patients with complete maxillary fixed protheses. Because of an implant loss in 1 patient in the control group between the years 2 and 5, there was no longer a statistically significant difference between the groups. But there were still more patients in

the titanium framework group than in the corresponding control group with complete maxillary prostheses who had lost an implant.

Generally, more fractures of titanium frameworks were reported, compared to gold-alloy frameworks. However, the difference was not statistically significant. As anticipated in the 2-year report,¹ a number of titanium frameworks had fractured between the 2-year and the 5-year examinations. But only one further fracture of a gold-alloy framework was seen. Framework fractures have been reported to be rare in most patient materials²⁻⁴ with the exception of the Toronto study, in which a silver-palladium alloy was used.⁵ The results for the titanium framework group in the present study are thought to be related to the original design, with rather weak frameworks.^{1,6} This design was modified shortly after the patients in this study had been treated, as mentioned in the publication of the 2-year results.¹

The number of fractures of artificial teeth or acrylic resin material was also higher in the titanium group than the control group after 5 years as well as after 2 years. As with the framework fracture complications, design of the titanium frameworks seems to have been important. Furthermore, the fact that the dental technicians were not familiar with fabricating fixed prostheses on titanium frameworks at the time this study began may have contributed to these complications.

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