TWO YEAR FREESTANDING VITREOUS CARBON IMPLANTS IN BABOONS

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Objective

The purpose of this project is to determine the long-term efficacy of vitreous carbon tooth-root implants[1] as self-supporting replacements for missing teeth.

Experimental Design

Forty-eight implants were inserted into fresh second premolar extraction sockets in 12 baboons. They were placed in functional occlusion and splinted for a 12-week healing period. At that time one half of the splints were removed and the associated implants left freestanding. The splints on the remaining implants were periodically removed to test mobility and replaced immediately. At two years, these splints were removed and all implants are now freestanding.

Results

In the first 2-year phase of this study half of the implants were splinted. Of the 24 which were freestanding, 6 were exfoliated and 2 were fractured. These losses all occurred within 28 weeks of splint removal: 4 by 4 weeks; 1 at 20 weeks; and 1 at 28 weeks. The fractures occurred at 12 and 20 weeks after splints were taken off. Of the 24 splinted implants all remained in place for 2 years. At 2 years, these splints were removed and left off for the duration of the study. Within 2 months of splint removal at 2 years, 5 of these implants were lost. Of the total 11 implants exfoliated in the study, only 3 were in the mandible. Throughout the study, the large majority of mobile implants were in the splinted group and these exfoliated soon after splints were removed at 2 years.

At this writing, of the 48 implants, 11 were exfoliated and 2 fractured. All remaining implants are in function, freestanding, and range from 2 to 2-1/2 years of age. Twenty-eight are immobile; and 7 have measurable buccolingual mobility (6 0.5 mm and 1 0.5 mm). Bone adaptation or its absence was apparent radiographically after 12 weeks. Radiographs delineated major bone changes and these occurred prior to 36 weeks. The ability of the radiograph to demonstrate minor bone changes taking place after 36 weeks was limited. Minor progressive bone loss was measurable, however, by periodontal probing to bone from a reference point and could be demonstrated in 35 of the 40 implants in place at 2 years. In addition, the reentry of some implant sites demonstrated bone saucerization and deep infraboney defects not evident on x-ray. After 2 years, there was radiographic evidence of change in some immobile implants in the appearance of the lamina dura like entity.

Conclusions

A high proportion of vitreous carbon implants can function without maintenance splinting for prolonged periods in baboons, even those with mobilities up to 0.5 mm. Prolonged splinting holds mobile implants in place that would otherwise be lost. There is gradual bone loss around even the most clinically successful implants which will ultimately limit their useful lifespan. Vitreous carbon implants survive best in the mandibular arch. Pocket probing to bone is the best criteria for assessing long-term bone adaptation and implant prognosis. The ability of vitreous carbon to function as a freestanding implant for 2 years appears to be determinable radiographically according to bone adaptation at 36 weeks. The long-term freestanding function of vitreous carbon implants with minimal bone loss warrants further investigation in humans.

1. Grenoble, D. E., Kim, R. L.: Progress in the evaluation of a vitreous carbon endosteal implant. Arizona State Dental Journal, 19:12-19, January - February 1973.

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