Single tooth replacement

Gabriela Steier
Liviu Steier
Giovanni Dicran Meghignian
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Liviu Steier, Giovanni Dicran Meghighian and Gabriela Steier explain the clinical possibilities

Introduction
This article describes the variety of clinical possibilities for the patient and clinical challenges for the dentist in a classical presentation: a missing mandibular right first molar. The solution chosen in this clinical case is a single tooth implant restoration with flapless surgery. Here we explain why.

Single tooth replacement epidemiological data
Missing molars is a frequent occurrence in patients aged over 30 in developed countries (Palmqvist et al 2000, 2001). In a 10-year follow-up study of the population of Turku in Finland (Hiidenkari et al 1996) the mean number of lost teeth was 1.5 and the median one tooth. Among the 30-39 year age group, there has been a considerable improvement in retention of natural teeth during the 10-year interval. However, amongst the middle-aged and elderly population, reduced dentition was common. Mack et al (2006) analysed the prevalence of single tooth gaps in a German population of 3989 subjects aged 20-74.

Dr Steier is currently Visiting Professor at Florence Dental School, Tufts School of Dental Medicine - Boston and Honorary Clinical Associate Professor at Warwick Medical School. He has been in private practice since 1985, and has been working at MSdentistry since 2006. He is currently the President of the British Academy of Oral Bone Grafting and is can be reached via www.msdentistry.co.uk

The tooth missing most in all age groups was the first molar. The maxilla showed more single-tooth gaps than the mandible, with no significant differences in gender. The highest frequency of single-tooth gaps was present in medium education subjects and the lowest frequency was found in high education subjects. One single-tooth gap was found in 25% of the sample, 16% of all subjects had two single-tooth gaps. The prevalence of one single-tooth gap was between 3.8 and 13.1%.

Single-tooth replacement: Fixed partial denture (FPD)
The traditional treatment for a single empty space between teeth is a fixed partial denture (FPD) (Shillingburg et al 1981). The need of extensive tooth reduction and the need of RCT of adjacent abutments (pillars of the bridge) makes this choice less desirable by patients who fear the early loss of abutments. This might be justified in the past. Schwartz et al (1970) estimated a longevity of 8.3 years, and Walton (1986) estimated a longevity of 10.3 years. The improvement of techniques, materials and trainings can explain the increased longevity of three units FPD. In 20 years, a retrospective study at Ghent University, Belgium (De Backer et al 2006), the overall survival rate of three units FPD produced by undergraduate students, as part of their curricula was 73.1% after 20 years. A statistically significant difference (P = .036) between the survival rates in the mandible for the vital group (96.3%) versus the root canal-treated group (69.3%) was found. Comparing the survival rate in the vital group for the restorations in the maxilla (70.2%) versus the mandible (96.3%), there is a statistically significant difference (P = .045). The survival rate after 20 years for the three-unit FPDs (73.1%) was significantly different.
from that of the FPDs with more than three units (61.5%) \((P = .026)\). The main reason for failure was caries (38.1%).

The single-tooth replacement was a resin-bonded fixed partial denture (RBFPD). Rochette introduced resin-bonded bridges concepts in 1973 as a periodontal splint improvement. Different techniques and materials are available. Metal, metal ceramic, metal composite, all ceramic, fibres reinforced composite are viable options available today.

Whatever the material used, the design of the retainers remains the key to avoid fractures or de-bonding. For those interested the scientific literature is filled with data and facts.

The advantages of RBFPD are basically its minimal invasive nature; the retainers can substitute existing restorations in the adjacent teeth, avoiding at all the destruction of remaining tooth tissues. If the adjacent teeth are sound, the more conservative approach is an alternative to conventional FPD. Secondly it is a very fast technique in the hands of an experienced dentist. A bridge can be delivered in two appointments. If the patient needs to fill the gap but cannot wait, this might be the right option. In regard to the survival rate, many studies are available.

Hussey et al (1991) reports a de-bonding rate of 25% over a period of 2.7 years. Ketabi et al (2004) reports a mean functional survival rate of 83% in 13 years. Audenino et al in (2006) suggest an estimated survival probability for the first de-bonding or failure of 85% after five years and 71% after 10 years.

**Single-tooth replacement: Implant-supported restoration**

The use of single implants restorations is well established since the first data were published (Scheller 1998, Laney et al 1994).

Levine et al (2006a) report a 92.5% survival rate in areas with bone augmentation, and 93.1% in the non-augmented areas. Longer implants showed similar survival rates as shorter implants. Implant width showed no differences. A significant difference in implant longevity is related to the anatomic zone of placement and the maxillary premolar area showed the highest survival rate (96.2%). Implants have always involved a long treatment plan.

Levine et al (2006b) report a survival rate of 92.6% in single molar restoration with single implants. New surgical techniques and implant design have been developed to shorten the clinical time required and to create a better comfort for the patient.

Flapless implant surgery is a minimally invasive technique, where the bone is not exposed before drilling the socket to receive the implant. It reduces the healing time and is associated to immediate loading of the implant, or with shorter time span before loading.
Clinical

As Campelo and Camara (2002) assert that, since flapless implant surgery is a ‘blind’ technique, care must be taken in selecting the patients and the appropriate width of bone assessed. The risk of perforating the cortical bone associated with such procedure is virtually eliminated by adopting a surgical stent to guide the drilling.

Because the technique requires a smaller amount of time than conventional flap surgery the advantages for both the patient and the dentist are minimal bleeding, fast implant placement, and no need for sutures.

Clinical case

The patient, a 46-year-old Caucasian female, expressed her concern about the missing lower right first molar, which was missing since she was 25 (Figure 1). Because of her previous dental experience with missing premolars in the maxilla and the RCT in the adjacent premolars to the missing 3.6 and the aesthetic consequences involved, she expressed the demand for a long lasting restoration which would not involve the premolars on the right side.

The patient’s medical history was checked focusing on oral (mucosal) diseases, blood dyscrasias, non-controlled diabetes, drugs and medications, irradiation of maxillae, psychoses, substance abuse (tobacco, alcohol, drugs). Indication for antibiotic cover was negative. An OPG x-ray examination was done to assess the dental status.

The possible alternatives have been discussed with the patient. A conventional FPD was excluded as too invasive. A RBFDP was an option, especially because both the abutments 4.7 and 4.5 had fillings that would have been replaced by the retainers. Nonetheless a better stability would have required the preparation of 4.4, which the patient did not agree with. A conventional implant option, with flap surgery appeared too invasive to the patient, and the time of recovery before receiving the final crown too long.

A flapless surgery with a groovy implant to speed up the integration process was proposed. The patient asked to know more about the procedure, and she was informed of any complications. She discussed the treatment plan and an informed consent was signed.

Accepted treatment plan

Implant retained full ceramic crown.

Step by step treatment

At the first appointment impressions were taken for a lab made surgical stent. At the following appointment implant placement was performed using local anesthesia, raising a full flap and the correct drilling protocol. The wound was suited using GoreTex suture material. Fourteen days later the sutures were removed. The healing process occurred without any problems. The second stage was performed three months later. The implant was exposed using locator and punch and an acrylic temporary was performed for two weeks. After 14 days an impression was taken and sent to the laboratory. Seven days later the coronal rehabilitation could be seated in local anesthesia. Further details regarding the seating are described in the pictures attached. Two recall sessions were organised to check the occlusal fitting as well as the gum. Two years after the performed treatment the patient was happy with the results.

Implant selection

Selected implant = Nobel Speedy Replace. Beautiful Teeth Now™ is delivered by flapless surgery. The NobelSpeedy™ implant enables dentists to achieve primary stability at time of implant placement, and is specially designed to circumvent compromised bone conditions. Its TiUnite® surface provides accelerated osseointegration over machined surface implants and natural gum contours, while its narrow tip makes it perfect for flapless surgery – shortening treatment time and speeding recovery as a result. NobelSpeedy™ features - Parallel walled implant - Slightly tapered design - Internal/External abutment connections.

The implant for flapless surgery

Immediate Function™
Increased initial stability in soft bone
Optimal Emergence Profile and Esthetics
TiUnite® ‘all the way up’
Healing time = 12 weeks

References