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Implant Overdenture Using Konus Telescope on One-piece Implant: A Case Report

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Abstract - *An implant-retained Konus (tapered double crown) telescopic complete overdenture was fabricated for a mandibular edentulous patient. The Konus telescopic overdenture coping crowns and framework assembly were cast with commercially pure (CP) titanium, joined using laser welding and placed on four one-piece implants. Sufficient retention and stability were obtained using this method.*

KEY WORDS: one-piece implant, telescopic denture, retention, stability, laser welding

INTRODUCTION

A one-piece tapered implant (Nobel Direct; Nobel Biocare AB) was recently developed for immediate loading[1, 2]. Since these implants allow flapless surgery, the surgical time is shortened, and this minimally invasive surgery mitigates postoperative swelling and pain[1]. Furthermore, the tapered body and rough surface promote osseointegration, thus offering the possibility of immediate loading and soft tissue integration[2]. The implant supported superstructures for one-piece implants are usually cemented to the abutment head. However, there are no suggested manufacturer's instructions for these specific one-piece implants used to retain overdentures[3-5].

Since the abutment head of the one-piece implant has a conical shape with 6 degrees of taper, it may be used as an inner crown in the Konus telescopic system[6,7]. This system has been designed as a tapered (6±2 degrees) double crown; the retention is produced by the friction of the outer crown fitting on the conical inner crown.

The advantages of this technique compared with conventional bar, magnet or ball attachment overdentures are the following:

1. Stiff connections between the implant and overdenture are obtained for greater denture stability;
2. Impression copings and implant replicas are not needed to make the impression and a definitive cast;
3. If retention decreases, the retentive force can be easily recovered by creating nods on the inner surface of the outer crown using laser irradiation; and
4. The cost is lower because commercial abutments and attachments are not used.

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By contrast, the disadvantage of this method is that accurate laboratory techniques are necessary. The prosthodontic indications are similar to those for conventional root telescopic overdentures; thus, there is less resilience of the soft tissue. Appropriate pressure must be distributed between the tissue and the implant.

This clinical report describes a Konus telescopic system applied on a one-piece implant. The outer crown of the Konus telescope and the framework of the implant-retained complete denture were fabricated with CP titanium and joined using laser welding.

CLINICAL REPORT

The patient was a 71-year-old mandibular edentulous Asian woman with a partially edentulous maxilla. She had worn an acrylic resin mandibular complete denture and a maxillary removable partial denture for 3 years. At the time of the consultation appointment, her chief complaint was instability and lack of retention of the mandibular denture. There were no systemic contraindications to implant surgery, and sufficient bone (approximately 20 mm long) was present between the mental foramina. The patient was informed about treatment options, which included a new complete mandibular denture, an implant-retained complete denture, or a fixed complete denture. The option for an implant-retained complete denture using the telescope system was selected for this mandibular rehabilitation because of the patient's expectations, cost considerations, and the diagnostic findings indicating that there was only a little bone in the bilateral posterior regions.

Implant placement

Using the Piezographic technique[8], correct tooth position was recorded. A radiographic guide was fabricated within the Piezographic zone, and a computed tomography (CT) examination was performed using the guide. The planned position of the implant placement and direction were confirmed and determined based on the CT results with the guide. Because the patient required prompt treatment

and minimally invasive surgery, four one-piece implants (NobelDirect 4.3mm RP, 13 mm, 16 mm; Nobel Biocare AB) were placed so that each implant was strictly parallel using a surgical guide modified from the radiographic guide (Fig. 1). The manufacturer's instructions did not specify a particular technique, so all the implants were placed with insertion torques of more than 35 N/cm. Firm initial stability was obtained.

Modification of existing denture

The existing mandibular complete denture was immediately modified into an implant-retained complete denture. The intaglio surface of the complete denture was adjusted with autopolymerized PMMA (Unifast II; GC Dental Corp., Tokyo, Japan) resin to fit the abutment head of the implants. After a period of 2 weeks, rubber O-rings (3.0 mm diameter, Sanei) were fitted on the implant heads to obtain sufficient retentive force for the implant-retained transitional denture, which became the implant-retained complete denture (Fig. 2)[3-5]. After a period of 1 month, fabrication of the new mandibular implant-retained complete denture began.

Fabrication of Konus telescopic denture

A preliminary impression was made with hydrocolloid impression material (Aroma Fine III, GC Dental Corp.), and a conventional individual custom tray was fabricated. After border molding with modeling plastic impression compound (Modeling compound, GC Dental Corp.), a definitive impression of both abutment heads and soft tissue was made with regular-bodied silicone impression material (Exaflex; GC Dental Corp.). A definitive cast was poured with type IV gypsum stone (Vel-mix; KerrHawe SA). The maxillomandibular relationship was registered using an occlusal rim, and the casts were mounted on an average value articulator (Gysi Simplex; Onuki Iki Corp.).

As shown in Figure 3, the plastic patterns of the four Konus telescopic crowns were fabricated extraorally using a one-piece implant abutment (Nobel Direct 4.3mm RP; Nobel Biocare AB) with auto-polymerized PMMA resin (Pattern resin; GC Dental Corp.). The bar connector pattern of the implant superstructure was also fabricated. All the patterns were vacuum invested with phosphate-bonded investment material (T-invest; GC Dental Corp.) and cast using a gas pressure casting system (Autocast system; GC

Figure 1. *Four one-piece implants were placed parallel to one another and between the mental foramina.*

Figure 3. *Pattern of coping for Konus telescopic prosthesis was fabricated on 1-piece abutment head.*

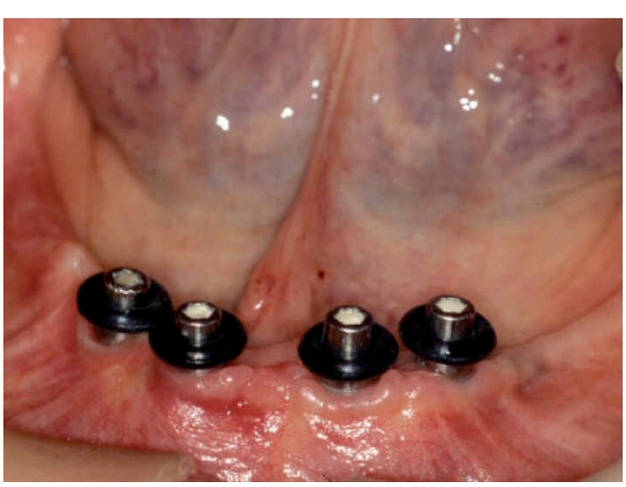

Figure 2. *Existing denture was modified to 1-piece implant-retained complete denture using rubber O-rings.*

Figure 4. *Coping was cast with grade 3 CP titanium.*

Dental Corp.) according to the manufacturer's instructions. Because greater wear can occur when the same grade of titanium is used for two frictional bodies[9,10], the one-piece implant and abutment were manufactured with CP titanium grade 1, while CP titanium grade 3 (T-alloy H, GC Dental Corp.) was used to cast the outer copings. Each casting was airborne-particle abraded with 125 µm Al_2O_3 particles (5.9 bars, Sandblaster USB-751B; Unique Co.) and chemically treated for 5 minutes with a HNO_3/HF solution (Chemi-polish, Shofu) to remove the oxidation reaction layer.

After the nodules and burs were carefully removed with silicon carbide points, each casting was fitted to the extraoral abutment head and adjusted so that appropriate retentive force was obtained (Fig. 4). After extraoral adjustment, the castings were fitted to each appropriate abutment head intraorally; and they were provisionally joined using autopolymerized PMMA resin (Pattern resin, GC Dental Corp.) using the brush-on technique. The connected copings were carefully removed from the abutment heads after appropriate retention was confirmed. The four titanium copings and bar were welded together using a Nd:YAG laser (Neo laser L-ALC30; Girrbach) with laser titanium solder (Laser wire Ti; Selec Corp.) under the following irradiation conditions: 180 v (voltage); 3 ms (pulse); 1.0-1.2 mm (focus) with argon shielding (Fig. 5)[11,12].

The interior of the welded coping/bar assembly framework was evaluated, and the appropriate fit and retention were confirmed (Fig. 6). The artificial teeth (Endura M28, Shofu) were conventionally arranged, and the wax trial denture was finalized. Auto-polymerized PMMA resin (Palapress Vario; Kulzer) was packed and polymerized according to the manufacturer's recommendations. After finishing and polishing, the implant-retained telescopic denture was delivered (Figs. 7 and 8). At the post-insertion treatment, the impression surface and occlusal surface of the mandibular overdenture were adjusted two weeks following placement.

The patient has been wearing the implant telescopic overdenture for two years and two months. The mandibular implant Konus telescopic denture with four Nobel Directs was well stabilized and provided more posterior tooth units for mastication. The patient expressed satisfaction with this simple implant surgery and the removable prosthetic rehabilitation was implemented without any postoperative inconvenience.

Figure 5. *Each coping of Konus telescopic system was fabricated extraorally on new 1-piece implant instead of gypsum die. All copings were joined using laser welding.*

Figure 7. *Intaglio surface of completed 1-piece implant-supported Konus telescopic complete denture.*

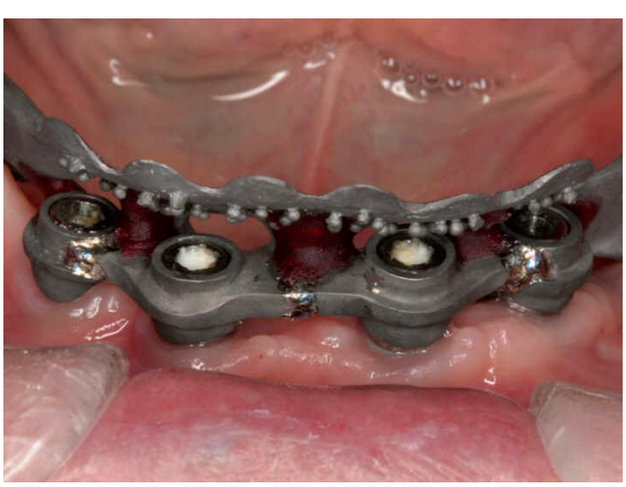

Figure 6. *Assembled titanium copings and titanium bar/metal reinforced framework were provisionally joined with autopolymerized resin intraorally and then laser-welded.*

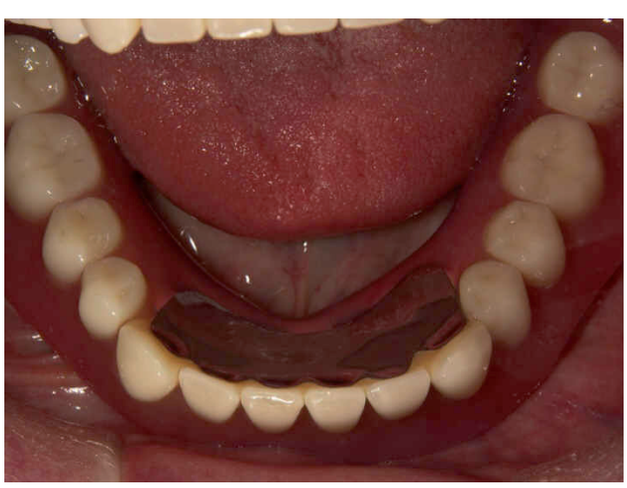

Figure 8. *One-piece implant-supported Konus telescopic complete denture was inserted in mouth.*

SUMMARY

After implant surgery, proper retention was promptly obtained using an O-ring on the existing denture. Since the implant head was manufactured to a 6 degree taper and 6 mm height, four implants were used as the abutments for the telescopic copings. Using CP titanium grade 3 for the outer telescope copings, the implant-retained Konus telescopic complete denture provided appropriate retention and stability.

MANUFACTURERS' DETAILS

- Nobel Biocare AB, Goteborg, Sweden
- GC Dental Corp., Tokyo, Japan
- Sanei, Tokyo, Japan
- KerrHawe SA, Bioggio, Switzerland
- Onuki Iki Corp., Tokyo, Japan
- Unique Co., Kawaguchi, Japan
- Shofu, Kyoto, Japan
- Girrbach, Pforzheim, Germany
- Selec Corp., Osaka, Japan
- Kulzer, Wehrheim, Germany

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