Implant-supported rehabilitations show higher patient satisfaction when compared with conventional prostheses. Systemic conditions, however, can affect treatment planning of dental implant supported rehabilitations. The oral structures that are commonly affected in patients with Down syndrome include the tongue (macroglossia), teeth (number and shape), and poor quality alveolar and jaw bones (osteoporotic-like). This clinical case presents an interdisciplinary team approach aimed at achieving functional, phonetic, and esthetic outcomes in a patient with Down syndrome.

Key Words: dental implants, function, prosthesis, Down syndrome, rehabilitation, esthetics

INTRODUCTION

The incidence of the population afflicted with Down syndrome is estimated at 1 per 800 to 1 per 1000 births.1 Down syndrome (chromosome 21 anomalies), syndromic cleft lip/palate, Sjögren syndrome, oral lichen planus, hereditary ectodermic dysplasia,2 and other conditions can present relative or absolute contraindications to implant therapy, depending on the individual’s systemic health. Down syndrome carriers show some of the following physical characteristics: shortened and high palate, microgenia, macroglossia,3 microdontia of permanent dentition, altered crown morphology and shape, enamel hypoplasia and hypocalcification, thinner enamel and dentin in the permanent dentition, taurodontism, and hypodontia.4 These individuals show increased prevalence of periodontal disease compared with healthy aged-matched controls and other developmentally disabled people.5,6 A pattern of periodontal destruction similar to localized juvenile periodontitis has been described in this group.7

Patients presenting with these conditions are in need of special management, and clear benefits may be obtained from placement of dental implants to replace lost teeth.
and avoid the need for removable prostheses. Implant-supported prosthetic rehabilitations show higher patient satisfaction in terms of comfort, stability, and esthetics when compared with conventional prostheses. Most studies show that implant therapy has a satisfactory effect on patient’s oral health and quality of life.

The aim of this paper is to describe the various phases of the rehabilitation of a patient with Down syndrome.

**Case Report**

In 2004, a 36-year-old woman (Figure 1) was referred to the Department of Implantology at the Federal University of Santa Catarina, in Brazil. The patient had moderate mental retardation but was able to speak and perform simple everyday tasks without difficulties. An oral examination showed that the patient had poor oral hygiene, periodontal disease, dental plaque, and calculus. Additional medical history was noncontributory. Blood tests (complete hemogram and coagulogram) showed results within normal limits.

Following careful preoperative radiographic and intraoral examinations, treatment planning was conducted, and the treatment options were discussed with the patient’s parents. Two full arch dental fixed implant supported prostheses were planned: 7 implants for the maxilla and 5 implants for the mandible. Panoramic X-ray revealed absence of many teeth, moderate to severe bone loss in the maxilla, and severe bone loss in the mandible (Figure 2).

**Mandible**

The dental implant surgical protocol was according to the manufacturer’s recommendations. The patient was treated under local anesthesia; approximately 10 mL (2%) of lidocaine with epinephrine (1:80 000) (Xylocaine-Adrenaline; AstraZeneca, Södertälje, Sweden) was used. Prophylactic (2 g of amoxicillin 1 hour before surgery) and therapeutic (500 mg every 8 hours for 7 days) antibiotics were administered.

A crestal incision was made to raise the full-thickness mucoperiosteal flap, and 5 Master Screw implants (3.75/13 mm, external hex, Conexão, Sistemas de Prótese, São Paulo, Brazil) with acid-etched surface were placed in the mandible for site numbers 22, 23, 26, and 28. The patient was instructed to avoid brushing the surgical site postoperatively and to rinse with 0.12% chlorhexidine twice a day. Fixtures were intentionally located in the anterior mandible between the mental foramen with an attempt to place the longest fixture possible.

Six months later, multi-unit abutments (Figure 3) were positioned and torqued according to the manufacture’s guidelines at 20 Ncm. The appropriate impression copings were connected to the abutments. Polyether (Impregum Penta Soft, 3M ESPE AG, Seefeld, Germany) was injected around the transfer copings and placed inside the custom tray using the dispenser. Abutment analogs were connected to the impression copings and repositioned in the impression tray.

**Maxilla**

The same implant surgical protocol for the mandible was followed for the maxillary implant placement, including the same preoperative and postoperative medications. After local anesthesia, a mucoperiosteal flap was raised with bilateral releasing incisions on the buccal aspect. Minimally traumatic extractions were performed for the remaining teeth by means of periotomes and minimum forceps rotation. Any remaining granulous tissues were removed carefully from the socket walls with a Molt (Quinelato, São Paulo, Brazil). The patient received 8 rough-surface acid-etched self-tap screw type implants that were 3.75 mm in diameter.
and 13 mm in length (Conexão). Cover screws were attached to the implants (Figure 4), and nonabsorbable sutures were used to allow for submerged healing.

Postoperatively, the patient was instructed to rinse twice a day with 0.12% chlorhexidine digluconate for 2 weeks. The provisional denture was relined with COE-SOFT (GC America Inc, Alsip, Ill).

Six months later, the implants were surgically uncovered and healing abutments were secured to the implants. Radiographic assessment showed peri-implant bone loss around dental implant number 22. Clinical analysis showed absence of mobility. The patient stated pain around the implant number 22, which was not used for the final rehabilitation. The remaining implants were fully osseointegrated. Osseointegration was confirmed by verifying absence of implant mobility, percussion test with high pitch, and lack of vertical or peri-implant radiolucency.

The micro-unit abutments were tightened to 20 Ncm, and the micro-unit pick-up impression copings were secured to the abutments (Figure 5). Pick-up impression was conducted. A base plate with an occlusal rim was placed in the maxilla and mandible, and the patient was placed in centric relation. The following facial dimensions

**Figures 1–6.** Figure 1. Frontal view showing smile line of a 36-year-old female patient. Figure 2. Panoramic radiograph. Figure 3. Intra-oral view of 5 multi-unit abutments placed in the mandible. Figure 4. Intraoral occlusal view of the 7 cover screws attached to the dental implants. Figure 5. Multi-unit impression copings secured to the dental implants. Figure 6. Maxillary and mandibular full arch wax try-ins.
were registered: vertical dimension of rest position, vertical dimension of occlusion, lip lines in rest and high smile positions, vertical dimension of speech, and midline.

Maxillary and mandibular full arch wax try-ins were conducted 1 week later (Figures 6 and 7). Next, the metal bars were fabricated and adjusted. The acrylic teeth were embedded, adjusted, and the final prostheses were delivered 1 month after impression taking. The removal of the lateral incisors was advised in order to maintain the original esthetics from the natural dentition (Figure 1). The patient was rehabilitated with a screw-retained prosthesis fabricated with metal framework on an acrylic resin base material, which enables retrievability by the dentist. The occlusal contacts were evenly distributed over the arch with anterior guidance. Lateral excursion movements were done with light contacts on the cantilevers. Both implant-supported hybrid prostheses were constructed to allow the patient to maintain adequate oral hygiene. Oral hygiene instructions (brushing and flossing techniques) and instructions in the use of interdental brushes were given.

Follow-up

After the surgical and prosthetic treatments were completed, the patient was placed on a regular follow-up for peri-implant maintenance. The oral hygiene regimen implemented for this patient was a 6-month recall. However, heavy calculus formation was present due to difficulty in oral hygiene home care (Figure 8). Therefore, the follow-up period was reduced to a 3-month recall for prophylaxis. The last follow-up, 28 months after prosthetic delivery, showed minimum bone loss (Figures 9 and 10) compared with the X rays taken immediately after prosthetic delivery (Figure 11). The patient was satisfied with the treatment.

Discussion

The maxillary and mandibular full arch implant-supported prostheses were fabricated at the same moment, after the osseointegrated period of the maxillary and mandibular implants. The predictability of dental implants has introduced a significant modification of the treatment of fully and partially edentulous patients over the past decade. Moreover, the range of indications for dental implants has broadened tremendously, which is another important factor for the increasing popularity of implant dentistry among clinicians and patients. It enhances patient satisfaction in terms of chewing ability, stability, comfort, esthetics, and speech.12,13

The most significant dental anomaly in Down syndrome carriers is congenitally missing teeth. Case reports on treatment planning and results of invasive treatment with dental implants in Down syndrome
Figures 9-11. Figure 9. Periapical X rays of the mandibular arch taken 28 months after the implants were loaded. Notice presence of maladaptation between the dental implant for number 22 and the microunit abutment. Figure 10. Maxillary periapical X rays taken 28 months after loading. Figure 11. Radiographic analysis of the prostheses delivery 7 months after surgery. Notice presence of peri-implant bone loss around implant number 22. Radiographs taken immediately after loading the lower arch prosthesis.
carriers are scarce. This case report suggests that dental implants may be an effective restorative method for rehabilitating patients with Down syndrome. A problem that may arise is the tendency of increased interproximal bone loss that has been reported in adults with Down syndrome. Ekfeldt stated that Down syndrome carriers present reduced resistance to infection and delayed healing process. The white blood cells are shown in decreased amount in response to infection, and consequently, there is reduced ability to kill microorganisms.

One out of 8 installed fixtures in the maxilla was lost within 6 months. An early implant failure can be caused by several factors such as trauma to the implant bed, bacterial infection acquired during implant installation, or technical failures. Van de Velde et al related 2 implant failures in a Down syndrome patient which were associated to overload. As it is difficult to communicate with the patient, one cannot verify whether the postoperative instructions in general are followed up appropriately.

Following a meticulous oral hygiene regimen is suggested. Patient awareness of his or her role in the overall dental rehabilitation is imperative in order to achieve ideal long-term results. The risk of soft tissue complications is probably higher among patients with physical or mental impairments who cannot maintain ideal oral hygiene. The eligibility of Down syndrome carriers for implant placement has been questioned because of macroglossia, osteoporotic alveolar bone, and a tendency towards poor compliance. However, another study that compared a group of patients unable to maintain ideal oral hygiene with a group that was able to provide their own oral care found no differences between groups in the degree of soft tissue inflammation, though more plaque on abutments was noted in the group unable to complete ideal oral hygiene. The patient’s most frequent presented condition was peri-implant mucositis due to insufficient home care. More frequent maintenance recalls were done in order to address this issue.

Wearing complete dentures, in the mandible and maxilla, is difficult for patients with reduced oral motor skills. Fixed implant-supported prosthesis could provide the desired stability for the patient evaluated in this study. Oral health is an integral part of systemic health. Improving the oral health of individuals with disabilities is imperative for a successful treatment outcome. When a good relationship was established between the clinician and the patient, she became highly motivated and began participating regularly in the maintenance recalls.

CONCLUSION

According to this clinical case, Down syndrome carriers may be considered candidates for dental implant rehabilitations. However, close collaboration with the patient’s primary care provider is necessary. Further follow-ups are necessary for maintenance care and overall function analysis to be made.

REFERENCES

7. Sreedevi H, Munshi AK. Neutrophil chemotaxis in Down’s syndrome and normal children to Actinobacillus actino-