The placement of implants in patients who are medically or intellectually compromised. A review of the literature and case reports

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Abstract

Recent legislative changes now insist on equal access to care for all patients. Those with medical or intellectual conditions are entitled to high quality dental treatment and this case series aims to show how this can be achieved. Important aspects for successful provision of this care include the use of adjuncts to deliver treatment, the inclusion of carers/family and a team approach for all those involved in these cases.

Key words: Implants, disability

Introduction

The past 20 years have seen significant advances in use of titanium implants in dentistry. Placement of implants has now proven to be a reliable, useful and successful procedure (Lazzara et al., 1996). As a result, public awareness of this treatment option has grown quickly and many patients now enquire about implants when investigating their restorative options. In addition, general dental practitioners commonly refer patients for implant placement and provide follow-up when the implant procedure is complete. With implants now becoming the treatment of choice in many situations (Zarb and Schmitt, 1996; Heydecke et al., 2003) should the use of implants be available to more people?

Traditionally limitations have been set as to which patients are suitable for implant placement. Although not an exhaustive list there are some conditions that may be viewed by some surgeons as contraindications to implant therapy:

- Diabetic patients – due to delayed wound healing and increased inflammatory tissue destruction
- Older patients – due to problems with adapting to new prostheses and possible complicating systemic conditions
- Patients who have received radiotherapy to the implant site
- Patients with a physical/intellectual disability or neurological/psychological disorder which may impact on the maintenance of oral hygiene
- Patients who are immunocompromised or taking immunosuppressant medication e.g. HIV or transplant patients
- Patients with reduced bone density e.g. osteoporosis, osteogenesis imperfecta.

Recently however, many of these exclusion criteria have been challenged. A literature review reveals many
case reports describing circumstances where implants have been placed successfully in patients who once would have been denied this treatment option (Bergendal, 2001; Addy et al., 2006). In addition, two recent articles now consider there to be two main types of contraindications to implant therapy. Firstly, absolute contraindications to implant placement, for example, intravenous bisphosphonate use. Secondly, relative contraindications, where the mere presence of a disease does not necessarily preclude implant placement but when controlled implant survival rates can match those in health for example in diabetes. (Hwang and Wang, 2006; 2007)

Tooth loss has been found to occur more frequently in patients with disabilities. This is often due to poor levels of oral hygiene, a higher prevalence of periodontal disease, extraction of teeth as a treatment option and poor attendance at dental services. The conclusions of a study of 1,156 adults with physical disability living in New England, USA revealed that there was a “direct association between physical disability...current caries and edentulism” (Jette et al., 1993). Furthermore, a study of intellectually and physically disabled patients living in Galway, Ireland showed that, traditionally, extraction of teeth was more likely to be the outcome of dental disease than restoration (Costello, 1990) There are likely therefore, to be significant numbers of disabled patients who are partially or completely edentulous and who would prefer a fixed restoration.

In 2005 the Disability Act entered the statute books in Ireland and relates to all disabled people with respect to education, social welfare, housing and health. This Act encourages the integration of disabled people into society and requires that they have equivalent access to health care as do those without a disability. Disabled people now have the potential to be more integrated in society and thus there needs to be equity in provision of care, including dental care. It is important that dentists consider all treatment options, as they would for all patients and see any impairment as a challenge to be overcome rather than a reason for exclusion.

The aim of this paper is to present cases where there were clinical indications for the use of implants but the patients presented with a range impairments that were potentially a barrier to the provision of such treatment.

Case 1

This 45-year-old lady was diagnosed at the age of 18 years with insulin-dependent diabetes and as a consequence received a double kidney and pancreas transplant in 2000. Her medications included prednisolone 7.5mg daily, tacrolimus 5mg daily, aspirin 75mg daily, co-trimoxazole 480mg alternate days, bicarbonate of soda 600mg three times daily and mycophenolate mofetil 500mg twice daily.

The patient had been a regular attender at her general dental practitioner for periodontal maintenance until 2001, when she was transferred to the care of the Department of Restorative Dentistry and Periodontology at the Dublin Dental School and Hospital. The patient continued to receive periodontal treatment but her oral condition failed to stabilise and teeth were extracted as a result. Removable acrylic and chrome-cobalt partial dentures were constructed for the patient but she found these difficult to wear and was unhappy at wearing dentures at her age.

A decision was made to restore anterior edentulous spaces with implants to avoid the need for the patient to wear removable partial dentures. Over two visits, four implants were placed. On both occasions the treatment was performed with the aid of local anaesthesia alone and with antibiotic and steroid prophylaxis. The implants were all manufactured by 3i®, two of which had the dimensions 3.75x13mm and were placed in the lower right canine (43) and upper right central incisor (11) area. A micro-miniplant measuring 3.25x13 mm was placed in the upper right lateral incisor (12) area and the fourth implant, placed in the upper left first premolar (24) area, measured 3.75x11.5mm.

The implants were placed as a two-stage technique and were uncovered three months later when healing abutments were inserted (Figure 1). Following clinical and radiographic assessment, the implants were deemed to have osseointegrated. The patient continued to wear her removable partial dentures throughout treatment until a prosthodontist restored the implant abutments with ceramic restorations. At a follow-up appointment 36 months after the initial implant insertion, the patient continued to make good progress and was pleased with the treatment outcome. All implants remained osseointegrated, with no radiographic evidence of attachment loss.

Figure 1
Panoramic radiograph of Case 1 using a two-stage technique
Case 2

The patient is a 21-year-old male with Cerebral Palsy and epilepsy. Athetosis has resulted in poor eye-hand co-ordination and he also has difficulty swallowing. He uses a wheelchair and attends a day-care centre five days per week. He lived at home with his mother who is blind. Medications include sodium valporate, biperiden and lactulose. His only previous dental treatment was as a child for extractions under general anaesthesia.

In October 2004, following a fall from his wheelchair, the patient avulsed his upper right central and lateral incisors (11, 12) and his upper left central incisor (21). The upper left lateral incisor (22) was also luxated during the fall and although repositioned, had lost significant bone on the mesial aspect of this tooth as a consequence of the avulsion of the other teeth and an associated alveolar fracture.

Following referral from the Public Dental Service to the Dublin Dental School and Hospital the patient was assessed with his mother in attendance. The patient had received no dental treatment to restore the aesthetics and function of the missing teeth. The patient’s ability to incise food had become worse in the few months since the accident and his mother believed the absence of teeth were contributing to this. After a full history, clinical and radiographic examination, it was decided that the upper left lateral incisor (22) had a very poor prognosis and that this tooth required extraction. Treatment options were discussed with the patient and his mother and a removable partial denture suggested as the best alternative. A letter was then received from the patient’s mother who, following consultation with the patient, decided a denture was not in his best interests due to his poor hand-eye co-ordination, difficulty swallowing and history of epilepsy. She was also concerned that a removable denture could be misplaced and her own lack of sight could lead to problems in locating the denture. She concluded that a fixed prosthesis would be preferable.

In June 2005 the patient attended for extraction of the upper left lateral incisor (22), hard tissue augmentation of the anterior maxilla with Bioss and implant placement, under local anaesthetic (LA) and intravenous (IV) sedation. Three dental implants manufactured by 3i® were placed, two measuring 3.75×13mm in the upper left lateral and upper right lateral incisor (12, 22) areas and a micro-miniplant with dimensions 3.25×11.5mm in the upper right central incisor (11) area (Figure 2).

After four months the implants were uncovered and healing abutments placed, again under LA and IV sedation. Impressions were recorded and a ceramic bridge was constructed and fitted at a third visit (Figure 3). The patient has attended a dental hygienist over the past 24 months for cleaning of the implants. Following instruction and education his oral hygiene is excellent and both he and his mother are very happy with the outcome. The implants are well integrated and no radiographic or clinical signs of attachment loss evident. Oral hygiene visits have now been arranged at a venue more local to the family.
Case 3

This 27-year-old lady suffers from Morquio’s Syndrome, one of the group of mucopolysaccharidoses disorders with features including short stature, short neck with atlantoaxial instability, scoliosis and often gradual loss of walking ability, joint laxity, corneal clouding and hepatosplenomegaly. Oral features include mid-face hypoplasia, mandibular protrusion and reduced thickness of enamel. Patients are usually of normal intelligence and survive well into adulthood. In this patient an additional challenge was her severe needle phobia. This patient originally presented to the Periodontology Department in the Dublin Dental School and Hospital in 1998 aged 19 and was diagnosed with generalised advanced juvenile periodontitis. As the periodontal condition was so poor the treatment of choice was a maxillary clearance and extraction of the lower left and right second and third molars (37, 38, 47 and 48). This was performed under general anaesthesia in 1999. An upper complete acrylic denture was fabricated for the patient in 2000. She slowly acclimatised to wearing the denture but has never found this to be an acceptable replacement for her natural teeth.

In 2004 it was proposed that implant placement may provide a better alternative for this young patient and the possibility was investigated. Again, general anaesthesia was deemed necessary as an adjunct for invasive dental treatment due to the patient’s extreme needle phobia. To arrange this required extensive communication with medical colleagues as to the suitability of the patient for anaesthesia having had both respiratory and cervical spine complications following previous surgery.

In March 2006, three implants were placed in the anterior maxilla. It was possible only to restore the maxilla because of limited mouth opening. The implants were manufactured by Brånemark Systems and all had the dimensions 3.75x7mm (Figure 4). Ten months after the original surgery the restorative phase of treatment began. The patient was treated by a prosthodontist who fabricated an implant retained, cobalt-chrome denture to replace teeth from maxillary right second premolar to maxillary left second premolar. The patient has been wearing this very successfully for the past 18 months and is much more confident in her masticatory ability (Figure 5).

Case 4

This 48-year-old lady is a long standing patient of the Dublin Dental School and Hospital and has received extensive periodontal treatment for many years. She had a moderate learning disability, a congenital heart defect and hypothyroidism. The patient initially lived at home until her mother’s death after which she moved into residential care. The patient works in her local day centre one day a week.

Many years previously the patient had had a fixed partial denture placed from the upper right canine to upper left canine (13 to 23) to replace missing lateral incisors, using the upper canines and central incisors as abutments. Subsequently the abutment teeth developed extensive caries resulting in mobility of the bridge. In time this led to the upper right maxillary central incisor (11) becoming non-vital and developing a periapical radiolucency and the root was sectioned Surgically, leaving the crown integral to the bridge. Attempts to restore the teeth and save the fixed partial denture were unsuccessful (Figures 6 and 7). All treatment options were discussed with other dental colleagues and the patient, with her family. As a result, a decision was made to remove the upper central incisors and canines (13, 11, 21 and 23) and to provide an
implant retained prosthesis.
In November 2006 the patient had six implants placed from the upper right first premolar (14) to the upper left second premolar area (25) under general anaesthesia and antibiotic prophylaxis. These implants were of the Ankylos® system. The patient made an uneventful recovery and returned for follow up, suture removal and impressions in the following weeks. She was wearing a removable partial denture until the implants were uncovered. In the restorative phase of treatment the patient was initially provided with an implant-retained maxillary partial denture. However, over the past 18 months the patient has found it difficult to adapt to wearing this appliance. The manual dexterity required to place and remove the denture has been a challenge. As a result an additional implant has been placed in the upper left sextant to support an implant-retained fixed partial denture.

**Case 5**
This 45-year-old male had been a patient of the Dublin Dental School and Hospital for many years. He has a moderate intellectual disability, epilepsy that is well controlled with medication and a very severe gag reflex. He lives in his own house on a complex managed by support staff, close to his siblings who are his joint guardians.

The patient lost his upper central incisors (11, 21) following dental trauma experienced as a result of a seizure many years previously. The patient had been provided with an upper partial acrylic denture but had great difficulty wearing this due to his gag reflex. Over many years several attempts were made to improve the retention of the denture. Fabrication of a cobalt-chrome version was commenced but not completed due to difficulty taking accurate impressions. In later years the patient developed carious lesions on the mesial surfaces of the upper lateral incisors (12, 22). A plan was made to endodontically treat these teeth and use them as abutments, again to aid denture retention. Treatment was difficult with the taking of radiographs especially troublesome. While this treatment plan was progressing the patient suffered an episode of choking on a spoon denture he was wearing. This was a serious and frightening experience which encouraged all those involved in his care to look for an alternative treatment option.

Following consultation with a periodontist and the patient’s guardians, it was agreed to restore the upper anterior edentulous space with an implant-supported bridge. Over the years of treatment in the Dublin Dental Hospital both inhalation sedation with nitrous oxide and intravenous sedation with midazolam had been used in an endeavour to control the patient’s gag reflex. However, both were unsuccessful and so the only way to effectively place the implants was under general anaesthesia.

Three implants were placed in the upper incisor area. These were all manufactured by 3i®, one of which had the dimensions 3.75x15mm and the other two measured 3.25x15mm (Figure 8). Following a six month period of osseointegration the implants were uncovered under local anaesthesia only and the prosthetic phase of treatment began. This was completed two months later. The patient has now had the fixed partial denture in place for two years and attends regularly for review. No problems have been experienced to date and both the patient and his siblings are very pleased with the outcome.
Case 6

This gentleman, who is 47 years old, has factor VIII deficiency Haemophilia. As a consequence of contaminated blood product administration he is also both Hepatitis C and HIV positive. An accident many years previously led to the loss of his upper central incisors (11, 21). A conventional fixed partial denture was initially used to restore the edentulous space and was successful for several years. The restoration then required replacement but this was no longer feasible as the adjacent teeth were of insufficient quality to support the prosthesis.

A decision was made to restore the space with implant-supported single tooth restorations. Following both dental and medical consultation, two implants were placed in the central incisor area (Figure 9). These were manufactured by 3i® with the dimensions 3.75x13mm. The treatment was provided under local anaesthesia only, with the patient comfortable throughout. On the morning prior to implant placement the patient received factor VIII concentrate. In addition, a dose of 3g Amoxicillin was given to the patient immediately before surgery with a follow-up of 500mg Amoxicillin three times daily for five days prescribed for the post-surgical period.

The patient was closely monitored to check for osseointegration of the implants. During this time a temporary Rochette-style adhesive fixed partial denture was provided to maintain his appearance. Despite his complex medical history no problems were encountered in the healing stage. After four months the implants were uncovered and healing abutments placed. The prosthetic treatment was completed soon after and two cemented porcelain fused to metal crowns on custom abutments, provided (Figure 10). The patient is now six years post-initial implant insertion with no complications.

Discussion

In this case series, twenty one implants were placed and there have been no implant failures. One patient has had successful implant placement but requires an additional implant to provide a fixed restoration. The five remaining patients have had implants placed and restored successfully and as a result have improved masticatory function and dental aesthetics.

Tooth loss can have several impacts on an individual. Firstly, there is the emotional impact. In two studies performed at Guy’s, King’s and St Thomas’ Dental Institute in London, of 94 people who were questioned about the loss of their teeth 45% (42 people) expressed “difficulties in accepting the loss of their teeth” (Davis et al., 2000). In addition, it was confirmed that tooth loss led to feelings of lowered self confidence, dislike of appearance, concerns about keeping tooth loss private as well as restoration of the edentulous space (Fiske et al., 1998). Secondly, tooth loss can impact on masticatory ability and nutrient intake. Studies in older patients show that the presence of natural teeth relates to the ability to eat certain foodstuffs which improve nutrient intake (Sheiham and Steele, 2001). Thirdly, there is the impact on appearance. Missing anterior teeth can add to a feeling of re-
duced attractiveness not only in the opinion of the patient but also in the opinion of society in general (York and Holtzman, 1999). Therefore, with these widespread feelings of negativity towards tooth loss it is not surprising that many people wish to undergo treatment to restore dental status (Trulsson et al., 2002).

With several options to restore edentulous areas available, it is also important to determine whether implants are the most desirable option from a dental and patient viewpoint. Several randomised controlled clinical trials have compared mandibular implant overdentures and conventional dentures in terms of patient satisfaction, overall health status, function and quality of life. The results of these trials indicate that mandibular implant overdentures provide better function, better oral health-related quality of life and better patient satisfaction than conventional dentures (Awad et al., 2003a; Awad et al., 2003b; Thomason et al., 2003). As a consequence, where possible, a mandibular implant overdenture is now the treatment of choice in the edentulous mandible. One of the main reasons why patients rank implant restorations higher than dentures is the improved retention. In addition, the fixed nature of the prosthesis enables a patient to hide their tooth loss and the patients feel this is the closest semblance to their natural dentition.

In order to place implants in patients who are medically and/or intellectually compromised, conscious sedation or general anaesthesia may be required. This may be because of patient anxiety or because an aspect of a medical condition may make treatment difficult or even unsafe. An example of this is Parkinson’s disease. A physical impairment can give rise to safety concerns because of unpredictable movement. Ethical questions may be raised when general anaesthesia is required for such procedures. Therefore, each case needs to be discussed by professionals, the patient and their family/carers, to ensure that the outcome will improve quality of life and the benefits outweigh the risks.

Treatment must be managed safely and consideration must be given to all behaviour management techniques and not just the use of general anaesthesia, in this group of patients. Inhalation sedation with nitrous oxide and oxygen is a useful adjunct in patients with mild anxiety, some involuntary movements and other conditions, for example, a gag reflex (Yoshida et al., 2003; Packer et al., 2005). Single-drug conscious sedation, with intravenous midazolam, is advocated for patients with moderate anxiety and involuntary movements. Finally, general anaesthesia, on a day-case basis is indicated, for those patients with severe anxiety or where a complicating condition makes dental treatment difficult, for example, severe learning disability. Post-operative morbidity, although always a concern has been shown to be low following dental treatment under general anaesthesia irrespective of underlying disability (Enever et al., 2000). In addition, with general anaesthesia, it is important that it is provided in the correct location with adequately trained personnel. In 1999, the Royal College of Anaesthetists in the UK published ‘Standards and Guidelines for General Anaesthesia for Dentistry’. Adherence to these guidelines should ensure that dental treatment using this adjunct is provided safely.

As with any complex treatment plan, careful case selection achieved by a thorough assessment is essential. When contemplating the provision of implant retained restorations in those with medical or intellectual complications, certain factors should be considered before a case is approved. The degree of disease-control may be far more important that the nature of the disorder itself, and individualised assessment, including the medical condition, quality of life and life expectancy is indicated (Scully et al., 2007). Obviously the opinion of the patient and their relatives/carers is extremely important and alternative treatments should be considered. The patient has to understand, where possible, the risks and complications of the procedure and the likely success rate. Where understanding may be limited the relatives need to have the full facts as the procedure cannot proceed without their assent. The backing of the relatives/carers may also be important to achieve the levels of oral hygiene necessary for long-term success of the treatment (Oczakir et al., 2005). Before commencing treatment, high levels of oral hygiene should be demonstrable. This could be achieved with a period of instruction from a dental hygienist with information and techniques shown which are individual to each situation. This type of caregiver training approach has been shown to improve patient oral hygiene on a training scheme studied in New York (Glassman et al., 2006). It is also important to plan the final restoration. For edentulous adults with intellectual disability it has been suggested that it is best to design prostheses which are anteriorly placed and removable as this aids both hygiene and repair (Durham et al., 2006).

The provision of implant-retained restorations can be challenging and the addition of patients with complicating medical conditions can make these cases even more complex. These patients are best treated in a hospital environment which allows a team approach. A special care dentist, periodontist, oral surgeon and hygienist are all essential members of the team. In several of the cases outlined above medical colleagues were also required to aid in the preparation for, or the provision of, surgery. Only with all members working together has it been possible to complete these treatment plans.

It could also be suggested that the treatment provided for these patients has only been so successful because the initial goals were reasonable. It is important to set achievable treatment aims to restore function and aesthetics but avoid complex, lengthy plans where patient co-operation would be compromised. The ultimate aim is to improve
the patient’s quality of life (Heydecke et al., 2003).

**Conclusion**

It is now possible to provide high quality dental treatment to individuals with both medical and intellectual conditions by working with a motivated team and managing the patients with the most appropriate adjunct to treatment.

**References**


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