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Maintenance and Monitoring of Dental Implants in General Dental Practice

Abstract: A lot of effort has been directed towards developing dental implant surfaces which in turn have seen the increased success rate of osseointegration. Peri-implantitis and peri-implant mucositis are inflammatory conditions of implants that can lead to implant failure. Monitoring and maintaining implant restorations is aimed at preventing these complications.

CPD/Clinical Relevance: As the number of patients opting for dental implants after tooth loss is increasing, general dental practitioners will be treating patients who have already had dental implants and need to know how to maintain and treat complications associated with them.

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One of the most important factors for long-term success of dental implants is the maintenance of healthy peri-implant tissues. It is important, therefore, that all underlying dental disease is diagnosed, treated or stabilized before implant therapy starts.

This article will look at the long-term maintenance and monitoring of patients who may have had implants carried out within specialist practice, but return to their general practitioner for their ongoing care; a literature search was carried out.

Even though dental implants have been documented to have a high survival rate, it is becoming increasingly evident that successfully integrated implants are susceptible to disease which may lead to implant loss.[1] Implant failure can be due to a number of causes that include unstable prosthesis, implant mobility, occlusal trauma, fractured components, pain, inflammation, infection and neuropathy.[2]

According to the Consensus Statement of the 6th European Workshop of Periodontology, failure has been described as early or late.[3] Early failure occurs not long after placement without osseointegration being achieved. Late failure occurs in a successfully integrated implant some time after placement and subsequent restoration. The causes of late failure could be from disease of the marginal tissues of the implant or biomechanical overload.[4] However, clinical trials of the ITI system reveals that only a small proportion of failures seem to be associated with occlusal overload.[5] This implies that the major cause of late implant failures could be attributed to infection of the peri-implant tissues. It was noted that patients with good oral hygiene tended to keep implants longer.

To ensure good, long-term prognosis of osseointegrated implants, it is necessary to monitor and maintain good oral hygiene and treat disease as soon as possible.

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Monitoring and maintenance

Generally, it is recommended that patients treated with implant-supported restorations are seen at least on an annual basis but, in some cases, they will all require routine hygienist treatment at 3-, 4-, or 6-monthly intervals, according to individual requirements.[6] This is also in line with the NICE guidelines.[7]

The following assessments should be made at review appointments:

- Peri-implant soft tissue health and oral hygiene;
- Marginal bone levels (radiographs at appropriate intervals);
- Conditions of prosthetic replacement and occlusion;
- Hygiene maintenance requirements.

Peri-implant soft tissue evaluation

Infections of peri-implant tissues were classified as peri-implant mucositis and peri-implantitis.[8] Peri-

implant mucositis is a reversible inflammation of the peri-implant mucosa without bone loss and peri-implantitis is defined as an inflammatory reaction characterized by loss of supporting bone in the tissues surrounding a functioning implant. Use should be made of the many clinical parameters to evaluate the status of peri-implant mucosa and to help in early diagnosis and treatment of peri-implant tissue inflammation. Probing depth, bleeding on probing, the accumulation of plaque and radiography are useful tools.

A methodical approach to monitoring the peri-implant tissues at review appointments is essential to spot the early signs of peri-implantitis.[9] The clinical manifestations that are assessed for the presence and severity of inflammation around implants are:

- Plaque and calculus accumulation;
- Inflammation of the peri-implant tissues;
- Increase in peri-implant probing depths;
- Bleeding on probing;
- Suppuration from the peri-implant pocket;
- Implant mobility;
- Radiographic changes.

To avoid trauma to the peri-implant tissues, it is essential to probe with a light force (0.25N cm). There is no present evidence to indicate that this light force of 0.25 Ncm will cause injury or damage to the junctional epithelium or the surface of the implant.[10] Histologically, there is no junctional epithelium surrounding the implant surface and, as such, there is less resistance to probing. It is important to record the initial base line probing depth at the time of fitting the final restoration. With subsequent routine monitoring, comparisons can be made to the baseline and changes noted.

It will also be important to take baseline radiographs when the final restoration is fitted to record the bone levels. Recommendations have been suggested for repeating radiographs annually for the first three years of function. Further radiographs can be taken following clinical assessments and with clinical justification. Data provided by most implant systems show that there is marginal bone loss within the first year of function.[11] Following clinical examination, probing depths and radiography, if progressive bone loss is observed, then it is vital to establish the cause. This is usually due to occlusal overload, biofilm-induced inflammation, inflammation secondary to excess cement material in the crevicular sulcus, or a combination of the above. When the restoration is fitted, great care should be taken to make sure excess cement material is removed.

Occlusal assessment

It is important to replicate or approximate the patient's natural occlusal architecture for proper functioning of the prosthesis. This should also distribute the occlusal load evenly onto the implants, thereby minimizing crestal bone loss. Owing to lack of the periodontal ligament, osseointegrated implants, unlike natural teeth, react biomechanically in a different fashion from occlusal force. It is therefore believed that dental implants may be more prone to occlusal overloading, which is often regarded as one of the potential causes for peri-implant bone loss and failure of the implant/implant prosthesis. Overloading factors that may have a negative influence on implant longevity include:

- Large cantilevers;
- Para-functions;
- Improper occlusal designs; and
- Premature contacts.

Hence, it is important to control implant occlusion within physiological limits and thus provide optimal implant load to ensure long-term implant success. It must be emphasized that currently there is no evidence-based, implant-specific concept of occlusion. Future studies in this area are needed to clarify the relationship between occlusion and implant success.[12]

Masticatory forces developed by a patient restored with implant-supported restorations are equivalent to those of a natural dentition.[13]

The mean values of axial displacement of teeth in the socket vary between 25–100 microns.[14] The range of motion of osseointegrated implants has been reported to be approximately 3–5 microns.[15] Displacement of a tooth begins with an initial phase of periodontal compliance that is non-linear and complex, followed by a secondary movement phase occurring with the engagement of the alveolar bone.[13] In contrast, an implant deflects in a linear and elastic pattern and movement of the implant under load is dependent on elastic deformation of the bone. There are studies supporting the finding that implants are more susceptible to occlusal overloading than natural teeth.[16]

Techniques should be used to minimize excessive loading on implant-supported restorations. The occlusion should be evaluated and organized so that there is anterior guidance and disclusion of posterior teeth on lateral excursion. There should be no contact of posterior teeth on both working and non-working sides. If the canine is compromised, group function is acceptable. Initial occlusal contact should occur on the natural dentition. The centric contact is adjusted with light occlusal contact on the implants.[17]

Any evidence of occlusal overload should be corrected.

Treatment

Biofilm-induced inflammation of the peri-implant tissues can be treated surgically and by non-surgical means.

Non-surgical

Non-surgical management involves the removal of plaque from the implant surface using curettes, scaling and polishing and by locally delivered antiseptics – chlorhexidine, detergents and antibiotics therapy. Antibiotics can be delivered both locally and systemically.

Plaque control can be carried out with the use of manual and powered devices for the debridement of implant neck and prosthetic surfaces. It has been recommended that use be made of manual teflon curettes for calculus removal from implant necks, while powered brushes are used for plaque removal on prosthetic surfaces. Interdental floss can remove plaque and calculus on mesial and distal surfaces of tilted implant necks.[18]

Maintaining good oral hygiene

is vital for the health of peri-implant tissues. It then follows that the correct use of manual or powered toothbrushes can help reduce the amount of plaque biofilm. To access and clean interdentally and under pontics, floss, super floss, single tufted and inter-dental brushes can be used.

When removing calculus using scalers, it is contra-indicated to use stainless steel scalers as these will damage the titanium surface. It is recommended to use a material which is softer than titanium, such as gold-plated or reinforced plastic instruments. Hasturk *et al* carried out a comparative study of the impact of different scaler material composition on polished titanium implant abutment surfaces.[19] Unfilled resin was found consistently to be the least damaging to abutment surfaces, although all scalers of all compositions caused detectable surface changes to polished surfaces of implant abutments and there were no statistically significant differences found between scalers and abutments with regards to plaque control. However, there is little evidence to suggest that plaque formation is increased on this roughened surface.

The use of ultrasonic is controversial. Insufficient cooling could lead to the implant overheating and damage to the bone-implant interface.

Laser use in the non-surgical treatment of peri-implantitis has been reported in the literature, however, there is no consensus on its appropriate use. Al-Falaki *et al* carried out a pilot study in which the use of an Er,Cr:YSGG laser was used as a non-surgical aid to the management of peri-implantitis and found that it seems to be effective in the majority of cases, coming to the conclusion that, in view of the positive findings of their study, more well-designed randomized controlled trials of the use of Er,Cr:YSGG lasers in the non-surgical management of peri-implantitis are required to validate their clinical findings.[20]

Surgical

When peri-implant inflammation leads to bone loss, then the lesion can be treated surgically in much the same way as a lesion of periodontitis affecting teeth. Disinfecting the implant surface poses great difficulty. Different therapeutic strategies have been put forward, but there is inadequate evidence to recommend one over the other.

Some have tried to decontaminate the infected implant surface by applying topical antiseptics like chlorhexidine, detergents and topical antibiotics, smoothing the implant threads and employing regenerative techniques such as guided tissue regeneration and bone grafting. However, the results of these proposed treatments have not been consistent with re-osseointegration. The results have been unpredictable.

Summary

At every check-up appointment, the dental clinician should look out for the following:

- Soft tissue assessment;
- Assessment of plaque and calculus;
- Probing – bleeding, depth, suppuration;
- Occlusal assessment;
- Mobility;
- Radiographic assessment;
- Integrity of restoration: for overdentures – check bars, balls, locator attachments and the respective inserts which are housed in the dentures.

Once pocketing exists and has been noted, the Cumulative Interceptive Supportive Therapy (CIST) protocol suggested by Salvi and Lang can be used to treat the majority of peri-implant disease.[21]

Cumulative Interceptive Supportive Therapy:

- Pocketing <3 mm – mechanical debridement, scaling and polishing;
- Pocketing 4–5 mm – antiseptic chlorhexidine gel twice a day for 3–4 weeks;
- Pocketing >5 mm:
  - i. Bleeding on probing, no bone loss: antiseptic chlorhexidine gel twice a day for 3–4 weeks;
  - ii. Bleeding on probing <2 mm: systemic or local antibiotics with possible resective or regenerative surgery;
  - iii. Bleeding on probing with bone loss >2 mm: resective or regenerative surgery.

Conclusion

In order to control the incidence of peri-implant mucositis, plaque accummulation and clinical attachment loss, it is necessary to adopt a systemic hygiene protocol. Since the requirements of different patients differ, each patient should have a tailored protocol.

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