The
Metrolina Periodontics
and Dental Implants

PerioDontaLetter

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Summer

From Our Office to Yours....

Dental implants boast high long-term survival rates. with hundreds of of peer-reviewed publications reporting an average of 97 percent success at ten years.

However, failures do occur and can be broadly categorized as follows:

- *Early Failures occurring before functional loading*
- *Late Failures occurring after functional loading*

This current issue of ***The PerioDontaLetter*** *provides a scientific and evidence-based overview of the most important and common causes of dental implant failure.*

As always, we welcome your comments and suggestions.

Preventing Implant Failure

More than 90 percent of all implants function without incident for many years. Failures, when they occur, tend to fail early (within a few months). "Late failures" typically occur beyond five years.

More than 20 factors can cause implant failure. These include autoimmune diseases, diabetes, and osteoporosis. Bisphosphonates have been implicated in necrosis of the jaw. Alcoholism, bruxism and a history of craniofacial radiation therapy can contribute to implant failures. Endotoxins and implant micromovement are also potential risk factors.

Recently, tricyclic antidepressants have been identified as a major contributor to implant failure. This is thought to be related to the suppression of the immune system by this class of drugs.

During site preparation, improper surgical technique can lead to overheating the bone, impairing osseointegration. Careful surgical planning and the use of guided surgery have been shown to improve accuracy and minimize trauma to the bone. Maximum operative sterility is essential to surgical success.

There are two major contributing factors to implant loss. Peri-implant

Figure 1. Among other issues, the absence of keratinized gingiva and labial placement of the implant contributed to a significant cosmetic defect and loss of peri-implant tissue.

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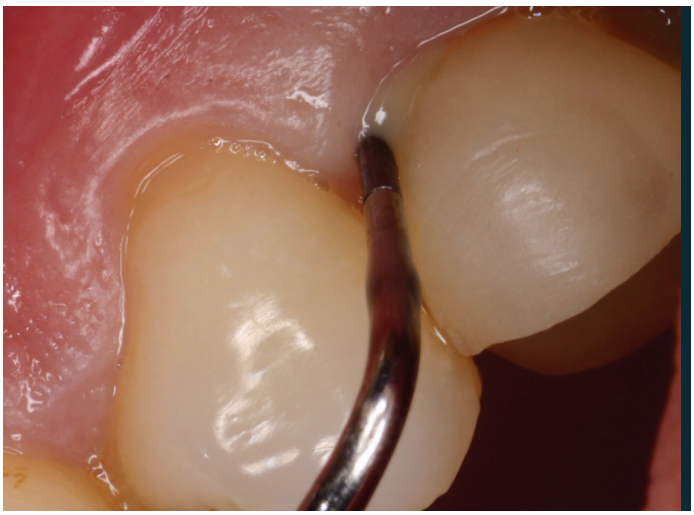

Figures 2 and 3. Retained subgingival cement resulted in a 9mm pocket with suppuration.

disease is by far the most common cause. Peri-implant disease can usually be prevented and controlled by personal oral hygiene and/or local periodontal therapy.

The second most common cause is purely mechanical and the result of factors such as incorrect cementation techniques, poor occlusion, improper implant placement, failure to osseointegrate due to poor bone quality, improper implant design, improper prosthetic design, smoking, and a history of periodontal disease.

Peri-Implant Disease

The leading cause of implant failure is peri-implantitis, an infection which occurs in the tissues surrounding dental implants and is caused by a pathogenic bacteria. It is a "bacterial etiology" much like conventional periodontal disease.

However, because implants do not have a periodontal ligament as natural teeth do, peri-implantitis proceeds MUCH more rapidly around implants than natural teeth.

Peri-implantitis is caused by bacterial colonization associated with the shoulder of the implant. It is characterized by inflammation in the peri-implant mucosa, subsequent gradual bone loss and ultimately failure of the implant. It often goes undiagnosed in its early stages.

Factors which make patients more prone to peri-implantitis and subsequent implant failure include improper implant placement, poorly designed implant/abutment attachments, inadequate bone/tissue thickness, crown margin and cleansability, excess cement retained in the subgingival area, microscopic gaps between implant components, occlusal load and bruxism, insufficient keratinized tissue width at the implant site, generalized periodontal disease, implants splinted to a mobile tooth, host factors such as smoking and diabetes, medications, and poor oral hygiene.

Peri-implantititis can be prevented with proper implant placement at sites with adequate bone volume and density and sufficient keratinized tissue width, well-designed implant/abutment attachments, implant designs with no gaps between implant components, appropriate crown margins with good cleansability, complete removal of excess cement, proper distribution of occlusal load, control of bruxism, control of periodontal infection on other teeth, and a good oral hygiene routine to adequately remove bacteria using a toothbrush, floss, or water irrigator.

A healthy diet, regular dental implant maintenance visits and keeping health conditions under control are also important.

Incorrect Implant Cementation

Screw-retained implant restorations are much better, easier and safer than cement-retained implant restorations.

Cementing implants can lead to cement being left on the implant, beneath the gingiva, contributing to retained sub-gingival plaque and leading to peri-implant disease.

Poor Occlusion

Occlusal overload is one of the most important factors contributing to implant failure. A heavy occlusion often leads to micromovement of the implant, which, in turn can result in bone loss, loss of osseointegration, and ultimately, implant failure.

Implant occlusion is very different from occlusion on natural teeth.

Implants move only a few microns when osseointegrated, whereas natural teeth move significantly due to the presence of the periodontal ligament.

As a result, implant occlusion is critical and needs meticulous adjustment at the time of implant restoration and at follow-up care appointments.

Ensuring a balanced occlusion and using appropriate loading protocols can help reduce mechanical stress on the implant. Use of thin articulating media (Parkell AccuFilm II), occlusal indicator wax (Kerr Dental Occlusal Indicator Wax), and other methods are necessary to place shared occlusal load on implants and natural teeth.

Placing an implant-supported crown adjacent to a natural tooth, without ensuring that the occlusion on the natural tooth is ideal, often creates opening of the mesial contact between the implant and the natural tooth in a few months due to mesial drift of the tooth adjacent to the implant. This results in occlusal changes.

Such situations might be better served with a fixed prosthesis, not an implant.

Attaching implants to natural teeth should be avoided as teeth intrinsically move because of the presence of a periodontal ligament, and implants cannot move because they are "fused" directly to the alveolar bone.

Definitive occlusal equilibration is mandatory at the time of the placement of the implant-supported crown, after a few weeks in the mouth, and subsequently on follow-up care appointments.

Occlusal Guards are useful in mitigating the negative effects of occlusion when natural teeth are opposed by implants.

Improper Implant Placement

The complications of improper implant placement are many.

An implant placed too close to a natural tooth can contribute to loss of supporting bone, reduced papilla height, and may compromise emergence profile making the implant difficult to clean.

Implants placed too close to an adjacent tooth root can damage the adjacent periodontal ligament, cause loss of the tooth, and failure of the implant.

An implant placed too far from a natural tooth can create the need to overcontour the restoration in an attempt to create proper interproximal contact. This can create shear forces and component failure, poor biomechanics with damaging forces leading to bone loss, and food impaction.

The ideal implant-implant distance is approximately 3mm. Multiple implants placed too close to each other will likely result in interproximal bone loss due to lack of blood supply to the implant, thus decreasing the intra-implant papilla, and possibly resulting in unsightly "black triangles."

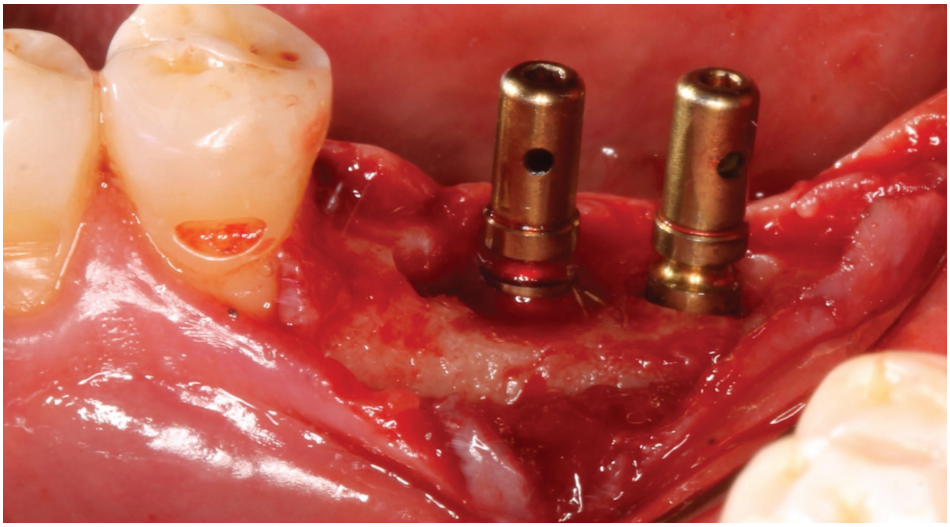

Figure 4. These two implants were placed too close to each other, and too far from the adjacent natural tooth.

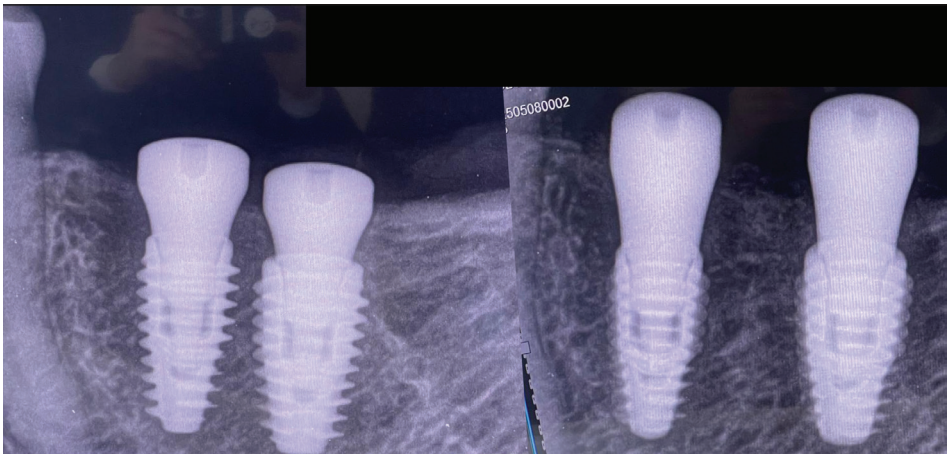

Figure 5. A correction was made, and these radiographs show the before and after corrected, ideal implant placement.

Figure 6. It is unfortunately very obvious that this patient has not taken responsibility for maintaining the health of his restorative treatment.

Additionally, the lack of space makes placement of healing abutments and coping transfers impossible, which, in turn, results in a compromised prothesis.

When implants are too close to each other, the ability to perform adequate plaque control is severely compromised.

A computer-generated guide can be fabricated using cone beam computed tomography (CBCT) scan data to accurately place the implants.

When an implant is to be placed adjacent to a tooth, a tooth-supported guide is the most accurate guide.

Osseointegration Failure Due to Inadequate Bone Density and Volume

Inadequate bone density and/or quality are major contributors to implant failure. Osseointegration of the implant within the jawbone is necessary for successful implantation. If the quality and quantity of alveolar bone is insufficient, osseointegration is likely to fail.

Practitioners can easily assess the quantity and quality of the bone by observing radiographs, especially CBCT scans.

When a patient has compromised bone structure, bone augmentation is necessary to support the implant and encourage osseointegration. Guided bone grafting, guided tissue regeneration (GTR) and guided bone regeneration (GBR) can improve treatment outcomes for these patients.

Improper Implant Design

The improper choice of an implant system and design plays a key role in the failure of implants, primarily due to the implant's failure to osseointegrate and possible damage to the fixture. Short dental implants less than 8mm long may fail because of an unfavorable crown root ratio. Narrow diameter implants are more prone to fracture or failure from occlusal forces in posterior regions.

Defects in implant design and manufacturing processes can contribute to fractures and screw failure. Metal fractures are often associated with microstructural irregularities, particularly failures at interfaces or components.

Platform-switched implants result in less implant failures than those without it.

Regular maintenance appointments with the dentist allow for monitoring of the implant's integrity and detecting any signs of early screw loosening.

Improper Prosthetic Design

Poor prosthetic planning results in a litany of bad outcomes. The design of the implant restoration should be carefully planned to distribute occlusal forces evenly and minimize stress on the implant screws. Avoiding cantilevered designs and ensuring adequate support from neighboring teeth or implants can help reduce the risk of screw loosening.

Smoking

The literature is replete with reports that smoking is a major risk factor for dental implant failure. Smokers experience significantly higher implant failure rates than non-smokers. Based on a significant body of scientific data, smokers are not good candidates for implants.

History of Periodontal Disease

When a patient has had periodontal disease and teeth extracted, the odds of having peri-implantitis later are increased.

Every effort should be exerted to retain natural teeth before removing them and placing implants.

Conclusion

Advancements in dental implant technology, materials, and techniques have contributed to improved success rates over the years, combined with meticulous planning, proper placement, and adherence to post-operative care instructions, which are essential for maximizing the chances of a successful outcome.

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