Dental Implant Versus Natural Tooth : A Short Communication

Dr. Mukhatar Ahmed Javali
Professor
Department of Periodontics

Dr. Humera Ayesha
Tutor
Department of Prosthodontics

Al-Badar Dental College & Hospital, Gulbarga 585 104.Karnataka, India.

Introduction

Dental implants are a major tool in restorative and prosthetic dentistry and are used to support various configurations of tooth replacements. Dental implants are metal posts that are surgically implanted in alveolar bone and differ from natural tooth in both health and disease.

Comparisons of Teeth and Implants

Although dental implant functions as prosthetic replacements for teeth but implants are not teeth. Their arrival into the oral cavity, their connection to supporting alveolar bone, and the connective tissues involved differ markedly from natural teeth[1].Tooth usually erupts into the gingivally healthy environment of childhood and adolescence. In contrast, implants are generally placed in the totally different environment of adult gingival or periodontal tissue and microbiota.

Unlike natural teeth, the dental implant and its abutment are composed of metal and cannot attach to gingival fibers. Gingivodental fibers and transseptal fibers do not exist in the gingival tissue surrounding the implant abutment (Figure 1a,b). Although it is believed that a hemidesmosomal attachment (junctional epithelial attachment) exists at the base of the implant sulcus[1].

The dental implant unlike a natural tooth is integrated directly to bone with no intervening periodontal ligament. This integration was termed osseointegration by Dr. Per-Ingvar Branemark. The term osseointegration can be defined as "a direct structural and functional connection between ordered, living bone and the surface of a load-carrying implant".

Without a periodontal ligament the dental implant lacks the sensory advantages of a natural tooth. The dental implant is unable to adapt to occlusal trauma. Trauma can result in microfractures of the crestal bone and bone resorption.

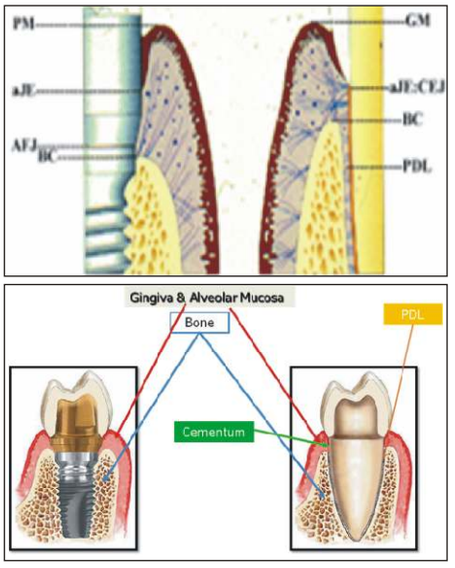

Fig 1a,b. Natural tooth versus Dental Implant.

- PM=peri-implant soft tissue margin
- AJE=apical termination of junctional epithelium
- AFJ=abutment-fixture junction
- BC=marginal bone crest
- GM=gingival margin
- CEJ=cementoenamel junction
- PDL=periodontal ligament

The soft tissue that surrounds the transmucosal part of the implant is termed as peri-implant mucosa.The peri-implant mucosal seal may be a less effective barrier to bacterial plaque than the periodontal attachment around a natural tooth[3]. There is less vasculature in the gingival tissue surrounding dental implants compared to natural teeth. This reduced vascularity, concomitant with parallel orientation of the collagen fibers adjacent to the body of the implant, makes dental implants more vulnerable to bacterial insult[4]. (Please see the Table 1).

To probe or not to probe

The Probing of dental implants is often debated in implant literature. The controversy is over the possibility of disrupting the perimucosal seal between the soft tissue and the implant[5]. Plastic probes are better used then metal probes. Use a nylon or plastic probe, dipped in chlorhexidine, and reserved for implant only, to reduce cross contamination from other pockets. All implant probing should be done with care. A gentle probing force is used so that the tip of the probe penetrates the junctional epithelium but not the connective tissue. In the presence of inflammation, the probe tip may penetrate the connective tissue and come close to the bone. It is important to understand that probing depths differ around dental implants depending on the length of the abutment used. Deeper probe readings only indicate the presence of periodontal pathology if there is bleeding on probing, exudate and changes in probing depths over time. After 1 year of stable probing only buccal & lingual and interproximal can be assessed from radiographs.

Radiographic Assessment

When inflammation is present, a radiograph is recommended to evaluate for any bone loss. Radiographic assessment is one of the most useful means of evaluating the status of an endosseous dental implant.For most situations, a periapical

and a panoramic radiograph will be more diagnostic in assessing implant health than probe measurements alone. Invasion of biologic width, predictable remodeling, or so-called saucerisation, is an average marginal bone loss of 1.5 during the first year following prosthetic rehabilitation followed by an average of 0.2mm of vertical bone loss every subsequent year[6,7]. Thus, progressive bone loss around a dental implant that exceeds these averages may be indicative of an ailing or failing implant.

A periapical radiograph should be taken after placement of the permanent prosthesis to:

1. Verify full seating of prosthesis and establish baseline bone level
2. First year implant evaluation.
3. Evaluate the implant for bone level changes annually from years 2-5; biannually thereafter.

Lastly, during radiographic evaluation, no evidence of peri-implant radiolucency should be found, because such a rarefaction usually indicates infection or failure to osseointegration[8].

Implant Instrumentation, Debridement and Polishing

Removal of deposits on the implant should be accomplished with instruments that are implant-safe. Instruments made of metal, such as stainless steel, should be limited to natural teeth and not to be used to probe or scale dental implants. The rationale for this well-documented and spoken conclusion is that this metal is so hard it can scratch, contaminate, or cause a galvanic reaction at the implant abutment interface[9].A variety of implant scalers are available which are similar to curettes. Plastic, resin, graphite and gold-tipped scalers are acceptable for implant debridement. A soft-tip plastic sleeve placed on the tip of a sonic or ultrasonic scaler (use low power and extra water) does not damage the implant surface and is clinically effective in debriding the area.

Air powder polishing units may also damage the implant surface and should be avoided during maintenance. Even the use of baking soda powder in these units may strip off any surface coating on the implant. Additionally, the air pressure may detach the soft tissue connection with the coronal of the implant leading to emphysema. A rubber cup can be used to polish the implant surface with a nonabrasive toothpaste, fine polishing paste or tin oxide.

Thus, as with dentated patients, an implant patient's home care requirements should be individually tailored according to each patient's needs. Individual needs are based on the location and angulation of the dental implants, the position and length of transmucosal abutments, the type of prosthesis, and the dexterity of each patient. Another popular category of cleansing device is the oral irrigator, used with or without an antimicrobial solution.

Periodontal Disease versus Peri-implant Disease[10,11].

In accordance with the classification of periodontal disease around teeth, peri-implant disease includes two entities: peri-implant mucositis, which corresponds to gingivitis and peri-implantitis, which corresponds to periodontitis.

Peri-implant mucositis - reversible as gingivitis ie inflammation of peri-implant soft tissue.

Peri-implantitis - irreversible as Periodontitis ie inflammation involving the tissue surrounding implants causing both soft and hard tissue destruction around the implants. Peri-implantitis lesions are poorly encapsulated and extend into the marginal bone tissue.

- Peri-implantitis has the same etiological, clinical,radiographic and histologic characteristics as Periodontitis; however inflammation spreads more rapidly and deeply into the bone.
- The bacterial composition which causes Periodontitis and Peri-implantitis is identical.
- The bacterial composition related to the healthy state of periodontal and a peri-implant tissue is identical.
- Periopathogenic bacteria migrate from residual periodontal pockets to peri-implant tissues and can cause peri-implantitis and even implant failure.
- Thus, it is imperative to achieve periodontal health prior to implant placement in patients with Periodontitis and to maintain regular preventive maintenance subsequent to implant placement.
- Patients with a history of Periodontitis must be informed that they are more at risk for peri-implant disease.
- It is imperative that periodontal disease is treated before implant placement and that the patient receives proper periodontal maintenance care.
- Smokers should be informed that they are more at risk for peri-implant disease.
- The clinician should inform the diabetic patient that she/he may have an increased risk for peri-implantitis.
- The peri-implantitis is difficult to treat and the outcomes may not be predictable.

Recommendation for periodontal patients who are going for implant placement.

1. Enhancement of patient awareness of periodontal disease and its relation to implants.
2. Instruction same as natural teeth for oral hygiene.
3. Treatment of existing periodontal disease prior to implant placement.
4. Regular preventive maintenance as natural teeth.

Summary and Conclusion

Implant dentistry is growing and gaining wide acceptance as a treatment for patients who have missing teeth. The reduced vascularity, concomitant with parallel orientation of the collagen fibers adjacent to the body of the implant compared to natural teeth, makes dental implants more

vulnerable to bacterial insult. Hence, it is imperative to eliminate any existing periodontal disease prior to implant placement and maintain a regular maintenance program subsequent to implant placement for overall success and longevity of the implant supported prosthesis.

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Table 1: Deference between Natural Teeth and Dental implant [1,2].

Natural Tooth	Dental Implant.
• Cementum and periodontal Ligament present	• No cementum and periodontal ligament.
• Soft tissue attachment:	• Soft tissue attachment;
• Junctional Epithelium and hemidesmosomes.	• Same as tooth.
• Connective tissue: Perpendicular fibres, periodontal ligament, alveolar bne.	• Connective tissue: Parallel fibres, Adaptation v/s Attachment. Circular fibres.
• Less collagen, more fibroblasts and blood vessels.	• More collagen fibres,less fibroblasts and less blood vessels
• Same biologic width	• Same biologic width
• Sulcus Depth 3mm when healthy	• Determined by length of abutment and margin location
• Periodontal Ligament allows for adaption from Occlusal forces	• No adaptive capability ankylosed
• Proprioception Receptors in ligament	• No Proprioception Receptors