Background
Peri-implant diseases are classified into two categories: Peri-implant mucositis, which is defined as inflammation confined to the surrounding peri-implant soft tissue, and peri-implantitis, which extends to the supporting alveolar bone around an implant. Initial estimates from The Consensus Report of the Sixth European Workshop on Periodontology determined that peri-implant mucositis was found in as high as 80% of implant patients (50% of sites) and peri-implantitis was found in 28-56% of implant patients (12-40% of sites). More recently, a systematic review estimated that the mean prevalence of peri-implant mucositis and peri-implantitis is 43% and 22% of sites respectively. With over 3 million people in the US already having an implant placed and the number growing by over 500,000 people annually, peri-implant disease will present a significant challenge that clinicians should be prepared to diagnose and treat. There is a common misconception that probing around dental implants may be detrimental to the implant abutment or the fixture itself and is therefore routinely omitted from dental examinations. The purpose of this update is to discuss the rationale and the suggested risks associated with probing around dental implants, explain the differences in probing healthy versus diseased peri-implant tissue, and provide basic recommendations for probing peri-implant tissue.

Rational for Probing Around Dental Implants
Reports in the literature have discussed difficulties with accurate probing around natural teeth to include tooth malposition, inflammation of the soft tissue, calculus, differences in probe diameters, and probing force. Although the tissue surrounding natural teeth and implants differs in terms of composition, these same factors can also impact probing around the peri-implant tissues. Similar to probing around teeth, consistency in reproducibility in probing can be achieved with dental implants. Christensen et al. found that using three different devices that probing around implants has adequate reproducibility with a 0.25 N force, which is considered a light probing force. Even with this light force, providers should be aware that pain or discomfort during peri-implant probing may be experienced by the patient. In a recently published study, Stammer et al. found that a standard probing force of 0.23 N caused significantly more pain and discomfort around dental implants compared to natural dentition. Similar to diagnosing periodontal disease, peri-implant diseases are diagnosed through collection of the following parameters: Bleeding on probing (BoP), suppurative, probing depth (PD), radiographic bone loss, and implant mobility, with three out of the five parameters requiring the use of a periodontal probe for assessment. These factors are significant as they provide the clinician with possible predictors of development of peri-implantitis. In evaluating PD, mucosal recession (MR), and BoP, Monje found that sites exhibiting PD ≥4.5 mm, BoP, and MR were significantly more likely to be diagnosed with peri-implantitis, with PD being the most reliable prognostic indicator of disease progression followed by MR and BoP. Finally, Fromm and colleagues noted that probing around an implant, as in natural dentition, is useful to detect the presence of disease on the buccal and lingual aspect of implants that would be otherwise difficult to discern on a standard radiograph.

Risks for Probing Around Dental Implants
There are several concerns that have been cited with probing around implants which have resulted in the misconception that probing should be omitted or perhaps should only be completed with a plastic probe. Those concerns include the risk of peri-implant tissue damage, damage to the implant surface by the metallic probe, and risk of bacterial inoculation. There are some important differences between the soft tissues surrounding natural teeth and dental implants. The soft tissue surrounding an implant may or may not have keratinized epithelium similar to natural teeth; however, implants lack gingival, transeptal, and periodontal ligament fibers that provide anchoring support. The lack of these fibers presents concerns for potential damage to the peri-implant soft tissue while probing. However, Etter et al. evaluated the soft-tissue healing in dogs following a standardized probing force of 0.25N and found that, although probing resulted in a separation of the junctional epithelium from the implant surface, epithelial re-adaptation occurred within five days. The authors concluded that probing dental implants does not seem to significantly alter the peri-implant tissue. With respect to surface damage by the probe, it has been hypothesized that probing a dental implant or abutment surface, especially with a metal probe, can roughen the surface which can increase bacterial accumulation and cause an infection or even lead to implant failure. However, in an in vitro study evaluating surface effects of plastic and metal periodontal probes on machined titanium abutments, researchers found increased surface roughness and residues after probing with a plastic probe when compared against a metal probe. The authors noted that the rounded point of a metal periodontal probe burnished the grooves on the implant-machined abutment, while the plastic probe left a significant amount of attached plastic particles and debris on the surface of the same abutment. It was also emphasized in the study that to date, there are no reports linking either development of peri-implantitis or implant failure to these surface alterations produced by plastic probes. Regarding possible bacterial inoculation from using the periodontal probe between multiple sites, Greenstein and Lamster found the transfer of microorganisms from periodontal probing does not result in colonization of bacteria or lead to an infection of the site. They concluded that the concerns of spreading bacteria and initiating periodontal disease or infection are unwarranted. Providers must keep in mind that this study looked at the transfer and colonization of bacteria around teeth and there has been no study to date that has evaluated the possible impact of inoculation of those bacteria around dental implants.
Probing Around an Implant in Health versus Disease
It has been established histologically that depth of probe penetration is greater in diseased versus healthy sites in the natural dentition by over 1 mm. Lang et al. using a dog model, found similar results around implants, with the depth of probe penetration being directly proportional to the degree of inflammation. Additionally, in the experimentally induced peri-implantitis sites, they noted that the probe tip penetrated past the connective tissue attachment by a mean of approximately 0.5 mm when probing around an inflamed implant site. In another comparison study evaluating probe penetration in healthy and diseased sites in both natural teeth and implants, Shou et al. found that both slight and severe marginal inflammation surrounding implants were associated with probe penetration closer to the bone than was seen in teeth. With the results of these studies in mind, it is vital for the clinician to evaluate the integrity of the surrounding soft tissue around implants and consider how probing depths may be affected by the inflammatory conditions of the peri-implant tissue.

Basic Recommendations for Probing Around Dental Implants
When assessing the health of dental implants based on Froum et al. the following protocol is recommended:
(1) Use a smooth un-indentated probe with a round tip diameter of approximately 0.4mm to 0.5mm. Since probing does not necessitate the use of a plastic probe, a UNC-15 or WHO (PSR) metal probe can be used.
(2) Use a gentle probing force of ≤0.25 N
(3) Clean the probe in chlorhexidine after it is used around infected sites such as periodontal abscesses or sites with suppuration before using the instrument to probe other sites
(4) Finally, in cases that are difficult to access with a probe such as splinted, or hybrid-designed restorations, remove the restorative structure before probing if possible.

Conclusion
As implants are commonly being used to replace missing teeth, the value of appropriately examining peri-implant tissues clinically cannot be underestimated. Similar to the benefit of probing around natural teeth, probing around dental implants is the most effective non-invasive technique for assessing peri-implant tissue health. Probing peri-implant tissue does not necessitate the use of a plastic probe as has been previously thought. While some studies have discussed peri-implant tissue damage and implant/abutment surface alterations from probing, the tissue damage is reversible and the risk of those surface changes having an undesirable clinical outcome on the dental implant has not been noted in the literature.

References

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