Masterclass in Clinical Practice

Dental Implants
with

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Butt-joint versus Morse Taper abutment-implant connections.

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Introduction

The implant-abutment connection is where the abutment meets the implant itself. This interface is extremely important and will determine whether bacteria can infiltrate this junction and thereby settle inside the implant, from where the toxins can leak out with resultant bone loss and soft tissue infection. When bacteria colonise the inside of an implant, it will become anaerobic and a very toxic infection, similar to bacteria in deep periodontal pockets. Figures 1-2 show Morse-taper abutment-implant connections with no measurable space between the abutment and the implant as seen with Micro-focus CT scanning.

If, however, the junction is a passive fit-together, it implies that two surfaces fit together without any friction engagement. The screw holding the abutment to the implant is therefore all that secures the abutment to the implant. This is also known as a butt-joint type abutment attachment (Figure 3). In contrast to this, a friction grip abutment to the implant body implies a cone-in-cone connection, where the screw pulls together the two parts but does not play a large part in holding it together (Figures 1-2). This engineering concept was first described and patented in 1864 by Stephen Morse as a technique for extending rotating drill-bits. It is generally known as a Morse Taper connection and by connecting the male component (the abutment) to the female component (the implant), a cold weld is formed that is so tight, it does not allow for bacterial ingrowth or leakage form this junction and thereby creates a stable connection (Fig 4-5).[1] The original Morse taper was 5 degrees but the "Morse Taper" name is now applied to any cone-in-cone connection in dentistry and orthopaedic surgery.[2]

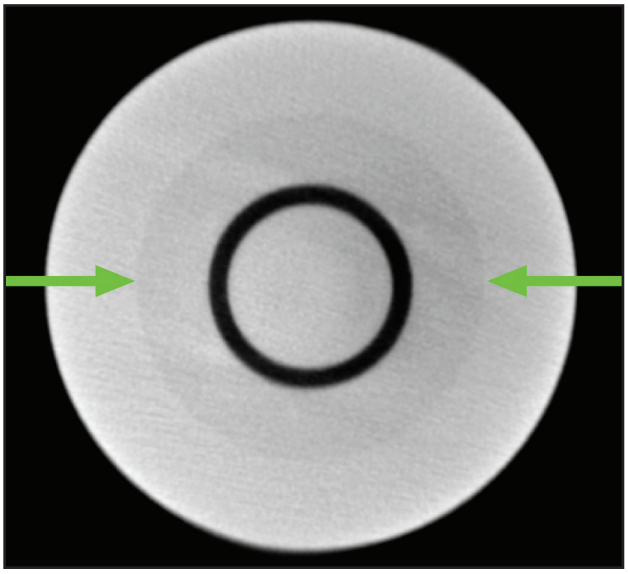

Figure 1: Axial section of a cone-in-cone abutment-implant connection, with arrows pointing at the abutment implant junction (the cold-weld connection) which does not have a visible connection other than the difference in grey-scale as shown by arrows.

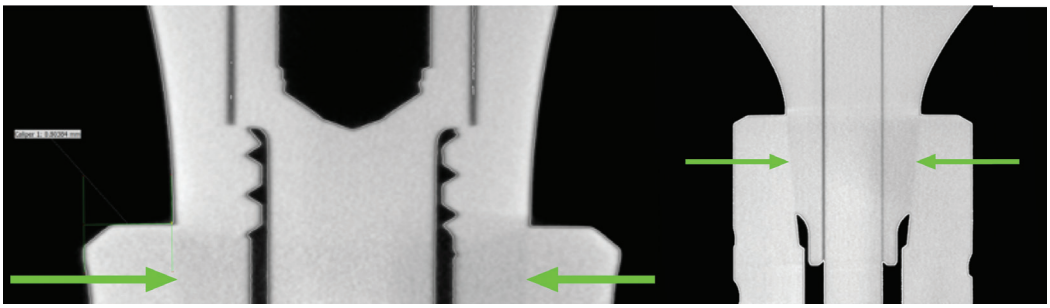

Figure 2: Two Morse taper connection implants in cross section, with no visible abutment-implant connection other than difference in grey scales (shown by arrows), indicating the junction between abutment and implant.. The abutment is of a lesser diameter than the implant and this is known as platform switching, where the word "platform" refers to the diameter of the implant.

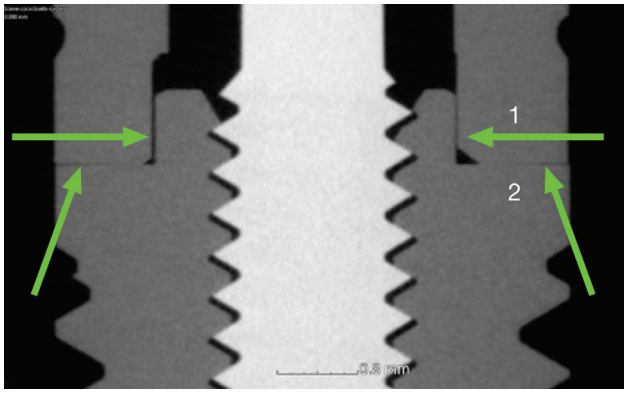

Figure 3: A butt joint connection shown in cross section with clear open spaces (arrows) between the abutment (1) and implant below (2). This allows ingress of bacteria and may cause soft tissue infection and bone loss with puss formation. The abutment is the same diameter as the implant, and this is known as a platform matched connection.

The fact that the abutment fits into the implant, implies that the abutment is of a lesser diameter than the implant and this concept is called a platform switched implant design as compared to a platform matched connection where the abutment and implant are of the same diameter (Fig's 2-3). Platform switched connections have been shown to be beneficial for bone stability, preserving the coronal bone around the implant neck (Fig's 4-5).[3] Long term studies have proven this to create a stable situation regarding bone preservation around the implant neck.[4,5] In contrast to this, some butt-joint implants have shown to harbour bacteria inside the implant body due to the poor seal between the abutment and implant. This will lead to infection in peri-implant tissues and may cause progressive bone loss (peri-implantitis).[6]

Conclusion

The fact is that a butt joint abutment-implant connection will allow anaerobic bacterial ingress into the spaces inside the implant body and cause bone destruction in susceptible patients. Even if it does not cause bone destruction, it will lead to the accumulation of bacteria causing halitosis with patients often complaining of a bad smell/taste coming from the implants (Figs 6-8).

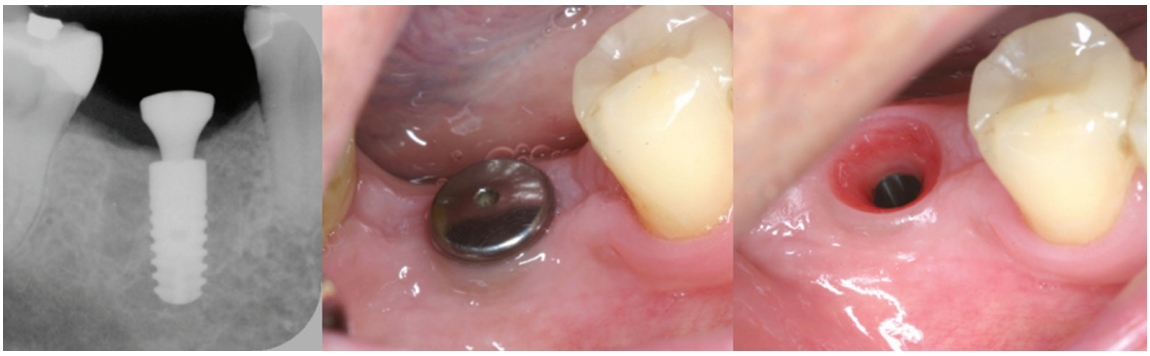

Figure 4: On the left a radiograph of a Morse taper abutment-implant connection, with healing abutment shown and to the right the clinical view of the healthy tissue after removal of the healing abutment on day of placement of crown, with no sign of inflammation/infection.

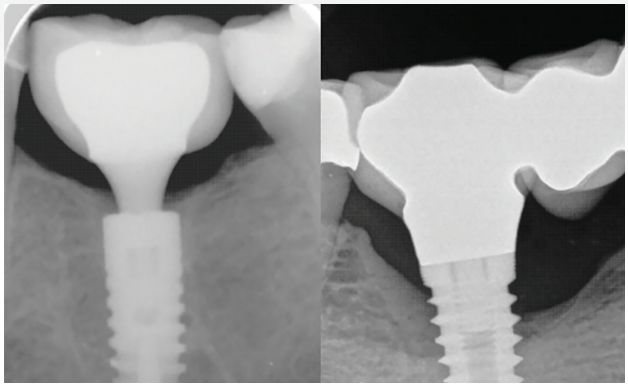

Figure 5: The platform switched implant crown on the left of case in Fig 4 after 4 yrs, showing bone stability and no visible bone loss on radiograph. On the right a butt-joint platform matched implant crown/bridge with bone loss visible due to bacterial action (peri-implantitis).

Figure 6: Even though the soft tissues appear healthy, puss is seen after removal of the crowns in this butt-joint case. This will cause a bad taste and smell for the patient even if there is no bone loss present.

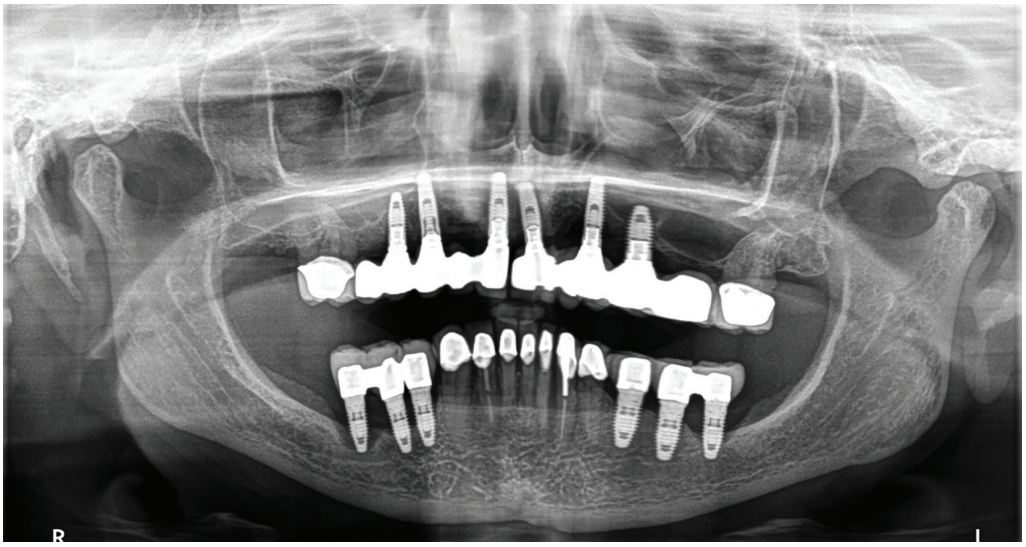

Figure 7: Implant treatment cannot be seen in isolation. In a case like this where a complex fixed rehabilitation was done (in a patient who likely had lost teeth due to periodontitis) on multiple butt-joint implants that are impossible to clean on the inside- there is a high likelihood of peri-implantitis developing. The extensive destruction of alveolar bone seen here due to the peri-implantitis could be due to a combination of genetic susceptibility to periodontitis and accumulation of anaerobic bacteria inside the implants.

The smell when removing such an implant prosthesis is something most patients will never forget and many state that they experience loss of self-esteem knowing this infection is in their mouth, with no chance that they can prevent bacteria from accumulating inside the implant.

When treating the peri-implantitis, there will be an improvement, especially if an anti-bacterial agent is placed inside the implant and the screw access is packed with PTFE (Plumber's tape) instead of cotton pellets. The PTFE should be compacted as much as possible using an amalgam packer, to leave no dead spaces in the prosthesis for bacterial accumulation.

Figure 8: A fixed implant prosthesis such as shown in mandible on the left is for most, if not all patients, extremely difficult if not impossible to clean effectively. This, coupled with a possible susceptibility to periodontitis, butt joint connections with accumulation of anaerobic bacteria on the inside of the implant and even on screw as seen on removal of this prosthesis on the right- is a recipe for failed treatment and further bone loss.

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