Insertion Torque: Beyond the « Biologists » versus « Carpenters » Controversy

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An interesting debate was recently organized by the Academy of Osseointegration and The Dental Guys, Drs. **Wesley S. Mullins** and **Jonathan M. Rogers** (AO Spotlight, episode #5). Their guests, two world renowned clinicians and researchers, Profs. **Michael R. Norton**, AO past President, and **Tiziano T. Testori**, were asked to debate on the torque/ISQ issue.

Dr. Mullins opened the discussion relating the advice of Prof. **Lyndon F. Cooper** on implant placement: "As long as you can't spin it in the bone with your hand, then trust it." Asked to comment, our respected 31st president said with a smile, "We absolutely don't stop at spinners, spinners are our friends!" He added, "We're not carpenters. We're not engineers. We are biologists. We are surgeons, treating living, vital tissue. We are not working on wood!"

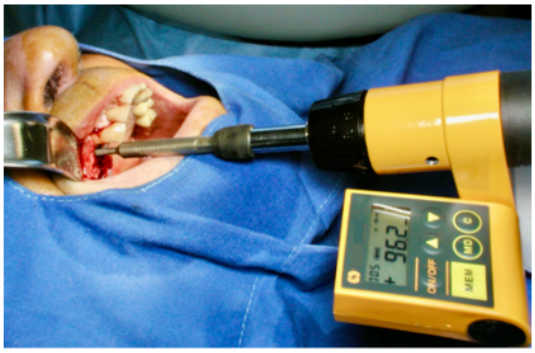

Fig. 1. Tohnichi torque measuring instrument. In our study,[4] high insertion torques (here: 96.2 Ncm) were associated with the use of wide tapered implants featuring a deep internal hex allowing a strong connection to the insertion and measuring tools. Although no adverse effect was observed during healing, such high levels of torque are not needed, and stability is obtained with much lower values.

Many of us feel uncomfortable if the implant is not perfectly stable after insertion. We do not like to see the implant rotate when removing the fixture mount, connecting the healing abutment, or tightening that immediate single provisional crown. Even though osteointegration may still occur, this is a stressful situation. To avoid it, we tend to underprepare the implant site and make sure both lateral and rotational stability are obtained. This "tight" fit of the implant is often associated with an increased insertion torque. I guess we are the "carpenters!"

Of course, carpentry is a noble craft. Jesus himself was a carpenter. But in this opposition between "biologists" and "carpenters," who wants to be called a "carpenter?"

Let us approach this low versus high torque controversy pragmatically, convinced that a dispute among talented friends and colleagues can only make us more intelligent.

From a purely scientific point of view, it seems the "carpenters" aren't doing so bad. Three independent meta-analysis in 2015[1], in 2016[2], and in 2020[3] have shown that high insertion torques do not induce increased marginal bone loss nor prevent osseointegration.

In my study[4], very high torque values were reached. Up to 176 Ncm! This is due to the inclusion of wide tapered implants with a deep internal hex allowing a strong connection to the insertion and measuring tools (Fig. 1). For the low torque group, the mean was 37 Ncm, and, for the high torque group, it was 110 Ncm. All implants osseointegrated and marginal bone levels in the control and experimental groups were similar both at the time of loading and one year later.

Despite this favorable outcome, such high levels of torque are not needed. Stability is obtained with much lower values. It was interesting, however, to show that inserting the last millimeters of a wide tapered implant can lead to important torque elevation and, still, no adverse effect was observed during healing.

Furthermore, most studies[5-11] comparing bone-to-implant contact (BIC) for implants placed with high and low torques show that there is no difference after healing. The statement that osseointegration after high insertion torques is not as good as osseointegration after low torques, setting the stage for future peri-implantitis, is not substantiated.

On the biologists side, it has been shown that very low torques can be associated with clinical success. In his 2011 publication[12], Prof. Norton selected implants that had been immediately placed with a very low insertion torque (mean 22.5 Ncm) and immediately restored. He observed a 95.5% success rate and concluded that 25 Ncm is more than enough to obtain clinical success. Implants with a manually detectable lack of axial stability were excluded from immediate restoration and, thus, from the study.

What do we do with such conflicting information? Here are a few reasonable guidelines:

From a practical standpoint, very low insertion torques (below 25 Ncm) should be avoided. Even if they can lead to clinical success, they are too close to the values reached when hand tightening a provisional restoration screw. Having a provisional tooth or an angulated abutment rotate during this final phase is very unpleasant.

Continues on page 22

The final insertion torque cannot be set in advance. It is the result of many factors including drilling technique, bone density, implant diameter and shape. If our target is a low torque, we may end up with a very low torque and enter a vulnerability zone.

At the other end of the spectrum, high torques should also be avoided. Even if they are associated with clinical success, they can be very dangerous for the implant system itself because the insertion tool or the connection can be damaged during implant placement. A recent study[13] showed that deformation starts at 80 Ncm for the weaker connections and that all connections show some form of damage at 120 Ncm. Sometimes the fixture mount features a pre-determined breaking point to protect a weak inner connection, but the best strategy is to stay well below these limits and shoot for a torque range that keeps us far away from this danger zone.

With all this information in mind, one might question the relevance of the "biologists" versus "carpenters" debate. A pragmatic approach should prevail: bone adapts to a wide range of torque values, it is uncomfortable to work on spinners, and we do not want to damage the implant connection. For these reasons, the 30 to 70 Ncm torque range appears to be a safe and reasonable objective.

References for this article are available via scanning this QR code.