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Why Implant Screws Loosen Part 1

Carl Misch's take on why implant screws loosen

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Single Tooth Implant

According to Misch, a single tooth implant success rate is above 98% and unlike a bridge, the adjacent teeth are no more at risk than if no tooth was missing. Accordingly, the only option dentists should give to patients for single tooth replacement is an implant. For the maintenance of bone, the health of adjacent teeth, the longevity of the restoration, a single tooth implant is the treatment of choice.

Some general rules of implant placement will serve to illustrate that implant surgery is not rocket science:

1. For a bicuspid space of 6-7mm, a 4mm wide implant is used

2. If the mandibular canal is ≥9mm from the crest of the bone, the tissue does not even need to be flapped to place the implant.

3. Most smokers are acceptable candidates for implants as they experience only a slightly higher failure rate.

4. If patient is a bruxer, and missing both 1st and 2nd molars, use 3 implants to replace 2 molars.

5. If there are two adjacent implants, splint the restorations together. There is no reason to have independent tooth implants as hygiene is not a problem.

6. If the implant is placed too close to the root of an adjacent tooth, simply remove the implant, let it heal and redo it, no big deal.

Implant Considerations and Complications

There are some special considerations regarding implants which must be factored in their use to avoid problems. They include:

- Patients put a HIGHER bite force on implants than regular teeth, therefore some implant problems are a result of this increased stress.
- Impact forces are GREATER on implants due to the patient's lack of proprioception. Therefore overload conditions on implants may go unnoticed.
- Because a natural tooth can be depressed 28µ and can deflect away from a downward force, the bone and natural tooth can accommodate to chewing forces very well. On the contrary, an implant cannot accommodate to excessive stress like natural teeth and may become loose and remain loose. Bone loss around an implant is almost always due to excess stress. Bacteria infiltration may occur SECONDARILY to the bone loss caused by stress.
- Those in academia maintain that bone loss around an implant has nothing to do with stress, however this concept is FALSE.

- Bone loss around an implant IS directly related to excess stress which may be a result of any of the following three factors: 1. Occlusal stress; 2. Insufficient implant size; 3. An inadequate number of implants used for a given space.

- Because the implant abutments are generally smaller than natural tooth abutments, the lab may make a standard thickness COPING which will then require an overly thick (>2mm) layer of porcelain. Fired porcelain which is more than 2mm thick is weak and will fracture easily. Therefore, inform the lab to design the coping so that the resulting porcelain will be ≤2mm thick in all areas.

Implant Screw Loosening Problems

For me and any dentist who has restored implants, screw loosening represents one of the most frustrating problems encountered. Some have claimed that the "internal hex" design and proper torque will minimize the problem. The tips below may provide additional insights to all but eliminate this problem.

In a study of 70 implants, 57% of abutment screws become loose during the first year. After three years, only 35% of the implants in the study remained tight without incident. In another study of 107 implants, 26% suffered screw loosening the first year. This frustrating problem may be part of the reason why GPs are not embracing implant technology with more enthusiasm. As Misch points out however, screw loosening is not related to implant design but rather bruxism and several other controllable factors:

1. If the occlusal table of the implant tooth is NARROWED, there is less screw loosening.

2. Stress on the screw can be decreased by decreasing the crown height, increasing the hex height (though most companies hex is 0.7mm high) and perhaps the best solution for decreasing stress on the screw is to INCREASE the DIAMETER of the implant.

3. When using a torque wrench to tighten the screw, the ABUTMENT should be held securely with a small hemostat so the implant will not turn when the screw is torqued.

4. Torque wrenches LOSE CALIBRATION with use and autoclaving and should be returned to the manufacturer for re-calibration periodically.

5. An implant outside the ESTHETIC ZONE (i.e. in the posterior) should NOT have normal anatomical cuspal inclines as these will greatly increase the LATERAL FORCES on the implant and contribute to screw loosening, bone loss and failure rate. A wide central fossa area centered over the implant is desirable. These two photos of implants posterior to tooth #20 illustrate how

"molar" implants should be fabricated. They are no larger than the 2nd bicuspid natural tooth and have flat plane occlusion.

6. Therefore, if the implant tooth is not in the esthetic zone, it should be NARROWER and have basically FLAT PLANE occlusion to avoid unnecessary forces (see also Adjusting the Occlusion of Implants). As Misch often says, "If the implant tooth is out of the esthetic zone and I have made it LOOK like a tooth, I have made it INCORRECTLY."

Implant Design and Treatment Considerations

- The DIAMETER of the implant and the DESIGN of the implant (more surface area is better) are key factors and are paramount for implant success. The wider the diameter of the implant, the better the distribution of stresses will be.

- LENGTH of the implant is NOT the most important factor in stress distribution as the stress is only at the top 5-8mm of the implant and is concentrated at the crest of the ridge, so a longer implant will not be better. The ultimate dynamic strength of natural teeth, vis à vis crown-to-root ratios, have no basis in fact when it comes to implant design. The implants at left come in lengths of 9, 12, and 15 mm and widths of 3.5, 4.0 and 5.0mm.

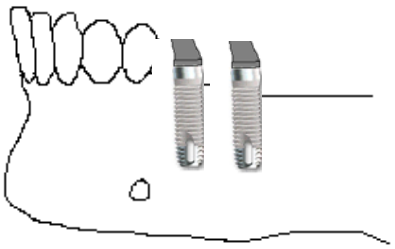
- In planning a case, the implant size (diameter most critical) should be selected by what is needed to support the case. Perform bone grafts if necessary to support this selection, rather than fitting the size of the implants to the existing anatomic conditions, as is often the case.

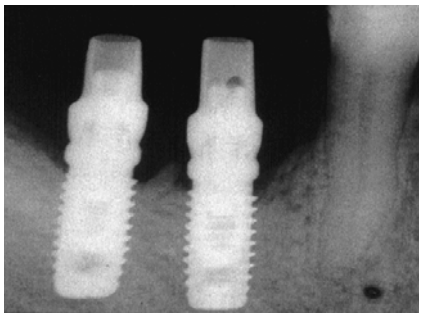
- The NUMBER of implants to be placed should be dictated by what is needed for success (i.e. four teeth to be replaced = 3-4 implants used) and NOT by how many implants the existing bone can support. This decision unfortunately is often made by a specialist who **does not have to restore and be responsible for the ultimate success or failure of the case!** If the bone is not present to support the number of implants needed then it should be "grown" first via grafting procedures.

- PLAIN CYLINDER implants (left) have less surface area than THREADED ones (right) and are prone to a higher failure rate. The higher the number of threads, the greater the surface area and the greater the chance for long term success. TAPERED implants have less surface area than NON-TAPERED.

- Use WIDER implants and MORE of them in molar areas.

- Implants placed at angles other than absolutely VERTICAL (perpendicular to the biting force) because of placement imprecision are thought to be irrelevant because the implant companies have conveniently made angled abutments to compensate for this. Unfortunately, it is NOT IRRELEVANT as now the forces of occlusion will be dissipated on the SIDE of the implant rather than impacting parallel to its long axis. Off-angled implants with compensating abutments will have increased screw stress, increased screw loosening and increased chances for crestal bone loss on the side of the implant absorbing the force. The implants at left are all off-vertical (exaggerated) and while the angled abutments have corrected it, the complications mentioned above may be the sequelae.





- Because of anatomic considerations in the anterior, one cannot help but have implants placed at angles well off from the occlusal force axis. Fortunately, the force of occlusion is the lowest in the anterior region (35 lbs. vs 200 lbs.) so the effect is minimized. Nevertheless, bone loss is typically seen in anterior implants on the buccal as that is the side of the implant which absorbs the force. The xray at left shows two well placed implants in the posterior region and are correctly parallel to the occlusive forces.

Occlusal Adjustments of Implants

Adjusting the occlusion of implanted prosthetics requires special consideration. As mentioned before, since proprioception of occlusive force in implants is nonexistent, the implant must be protected from the excess forces described earlier.

Natural teeth compress 27µ downward and 50-100µ laterally during function. Implants, of course, do not move at all. Visual acuity allows one to only "see" movement > 80µ. If the occlusion on a newly restored implant is adjusted to light tapping in the usual manner, the implant will be in HYPEROCCLUSION and subjected to excessive stress during normal function.

Occlusal adjustment and marking of implants therefore needs to be done under HEAVY biting pressure in order to fully compress the natural teeth. A very thin articulating paper (Accu-Film; Parkell) should be used to accurately record prematurities. Under full biting pressure, any heavy occlusive marks need to be relieved, otherwise bone loss around the implant may occur as early as one month. Again, the patient will not be able to "tell" that the implant is too high as there is no proprioception.

The only occlusal contact for an implant crown should be in its central fossa, directly over the implant. Occlusal contact on the marginal ridges will increase chances for screw loosening, bone loss and porcelain fracture. The occlusal table of an implant should NEVER mimic natural dentition.

The best occlusion for posterior implants is posterior disclusion. This will decrease the lateral forces on the implant during function.