



SIGN Drilling Techniques to Reduce Bone Temperature and

Prolong Drill Bit Life

Principles to remember:

1. Excess heat during drilling is not your friend. **Temperatures above 47°C for over 1 minute** can cause osteonecrosis
2. Over heating a drill bit softens the metal resulting in a dull bit
3. Heat is always generated during drilling because of the FRICTION between the spinning drill bit and the bone.
FRICTION + TIME = HEAT

Practical Techniques:

1. **Water cools**
 - Irrigation when drilling is the single most effective way to reduce the temperature of the bone and bit. The more the better (1000 mili-Liters/minute), but ANY irrigation is better than NONE.
2. **More feed less speed:**
 - Push more on the drill (8 kg, 17 lbs) at a lower speed (400 rpm). It's better to push harder on the drill and spin slow (400 rpm) than to spin fast (1100 rpm) and push lightly. Practice pushing on a scale with a drill in hand to learn what 8 kg, 17 lbs feels like
3. **Pulsing works better**
 - Bone debris accumulates in the channels of the drill. A clogged drill bit generates heat and won't drill. Use a pulsing technique: drill for 2 sec and then remove the bit from the bone while spinning, repeat.
4. **Use a pilot**
 - Drill a smaller hole first then finish the hole with the larger size. Drilling a small hole generates less heat and the larger drill bit will cut faster and last longer. For example first drill with a 2 mm bit followed by a 3.5 mm bit. In this case 2 steps are better than one.
5. **A keen edge**
 - No drill bit will last forever. A dull bit that does not cut needs to be sharpened or replaced. Drill bits can be sharpened with a grinding stone. Find your local carpenter, metal worker, farmer, mechanic who can put a sharp edge back on the tip.

Final Thought:

- All tools need to be used properly, with care, and maintained regularly to lead a productive and dependable life.

References:

1. Matthews LS and Hirsch C. Temperatures measured in human cortical bone when drilling. J Bone Joint Surg Am. 1972; 54:297-308
2. Natali C, Ingle P, Dowell J. Orthopaedic bone drills – can they be improved? J Bone Joint Surg Br. 1996; 78-B:357-62
3. Goran Augustin et al. Thermal osteonecrosis and bone drilling parameters revisited. Arch Orthop Trauma Surg 2008; 128:71-77

