

LIFE THREATENING CONSEQUENCES DUE TO IMPLANT PLACEMENT IN THE MANDIBLE

EDWIN SCHER

Risk management when placing an osseointegrated implant in the mandible has been discussed previously (Scher, 2002). The protocol developed from that article was mainly intended to avoid possible nerve damage, but it also covered the possibility of lingual perforation and the risk of haemorrhage in the floor of the mouth.

If the literature is reviewed, there are literally dozens of articles describing the consequences of lingual perforation when creating an osteotomy site. When treatment planning a particular case, it is of paramount importance that one knows the dimensions of the bone into which an implant is placed. Failure to take care at this stage can result in extremely dangerous haemorrhaging in the floor of the mouth.

Anatomy

The course of the inferior dental (ID) nerve is obviously the most important obstacle to safe surgery in this region; but it is also important to observe the curvature of the bone (especially on its lingual aspect) and to understand the course of the lingual nerve and artery.

There is much variation between individual mandibles, including the actual course of the nerve (Anderson et al, 1991) and the shape of the jawbone. It is therefore essential to diagnose and treatment plan accurately. Moreover, the treatment plan must be followed when operating in this region.

Diagnosis and treatment planning

In order to obtain these parameters, special tests are performed on the patient. A panoramic x-ray is usually the first test performed when investigating this area. Many of the modern machines will give an accurate 1.25% magnification for all regions. The panoramic view is also valuable in that it will show the superior cortical border of the nerve better than a periapical x-ray. A periapical x-ray should also be taken, as the measurements can then be accurately checked using a long cone x-ray system and an x-ray holder (Larheim, 1979).

If there is a good height of bone above the ID canal, you will

now need to know if the width of the ridge and the shape of the body of the mandible are favourable before proceeding. The width of bone can be measured using a ridge mapper first described by Wilson (Wilson, 1989). Direct measurements may also be taken if pre-implant surgery is necessary, for instance at the time of extracting a root or performing a socket preservation procedure.

The shape of the bone, particularly on its lingual aspect, can be observed using a tomogram program on a modern panoramic machine. This view is for estimation only as measurements are often inaccurate. Palpation of this area can reassure the surgeon that the lingual anatomy is favourable.



Figure 1: CT scan showing the inferior dental nerve painted in red. See the nerve showing up on the cross-sections and emerging from the mental foramen

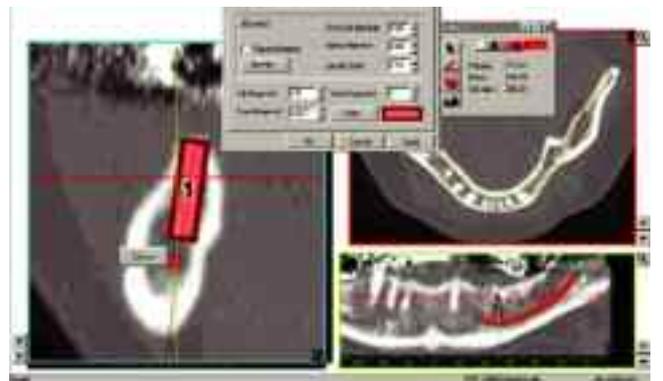


Figure 2: With the nerve painted in, the software allows you to enlarge the cross section and drag the implant into the exact position you would like to place it. Obviously you need a 2mm safety margin above the nerve. The panoramic picture shows the implant in place, and the chart allows adjustment of the size of all aspects of the implant

Edwin Scher BDS, LDS RCS, MFGDP, specialist in oral surgery and prosthodontics, UK and Visiting Professor of Implantology, Temple University, Philadelphia, USA

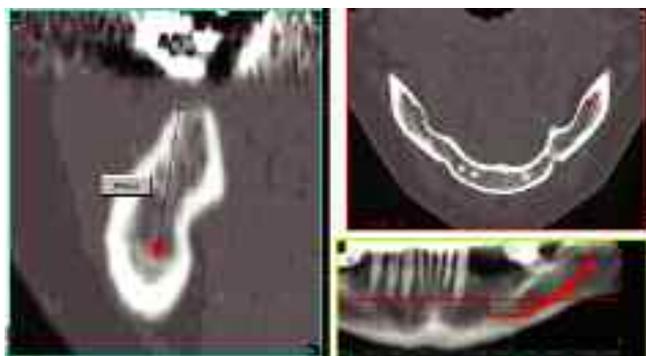


Figure 3: The position for implant placement looks perfect on the panoramic picture. However, note the shape on the lingual aspect of the enlarged cross-section.

Figures 3 and 4, discussed below, describe possible life-threatening problems if the surgeon fails to realise there is an unfavourable curvature of the mandible.

If these tests suggest a risk to operating safely, a CT scan must be taken before continuing with the treatment planning. The later versions of SIM/Plant (Stockham, 1996) that allow coloured marking of the ID canal and the placement of implants simulated on computer give an ideal assessment of possible treatments. The CT scan allows for measurements to be accurate to the nearest millimetre, as well as conveying a 3-D image. It is also possible to colour in the nerve so that the operator can see it in panoramic and cross-sectional view (Figure 1). The operator can then plan the surgery accurately by actually simulating the placement of the implants (Figure 2). It can be seen in Figure 2 that the implant is well within the bony architecture, by looking at the cross-section of that area.

The software will give a printout of the implants required, including bone density using the Hounsfield scale, and full 3D images. One must always discuss with the patient the possible risks of nerve damage and remember that the implant placed must be capable of bearing the considerable load placed on an implant in this area, especially because the quality of the bone may be poor.

Avoiding a haemorrhage in the floor of the mouth

The CT scan can be beneficial in revealing where the shape of the mandible changes on its lingual aspect. Figure 3 shows a similar cross-section to that in Figure 2, but this time, note the shape of the lingual aspect of this cross-section of the bone. If one places an implant in this region, the implant may look satisfactory on the panoramic x-ray, but the cross-section shows the implant encroaching the floor of the mouth (Figure 4). One can see how easy it would be for the osteotomy to perforate lingually, possibly damaging the lingual artery. The literature reports many cases of life-threatening haemorrhage in this region (Ten Bruggenkate et al, 1993, Mason et al, 1990). The consequences of haemorrhage in the floor of the mouth



Figure 4: The implant appears to be in an ideal position on the panoramic picture, but you can see the danger of placing an implant without understanding the lingual anatomy.

are very serious, as it is very difficult to control bleeding, due to the absence of direct access to tie off the artery, and the great difficulty in placing a pressure point on the artery. This must be treated as an acute emergency, and the patient must be transferred to an Accident and Emergency Unit, preferably with a maxillo-facial surgeon on call.

In order to avoid such a tragedy, it is essential that treatment planning must be very thorough, and if there is any doubt regarding the position of the nerve or the shape of the mandible, then a CT scan is essential.

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