Vertical alveolar distraction in the presence of a double mental foramen. Diagnostic and therapeutic utility of 3D virtual prototyping.

Case presented by:
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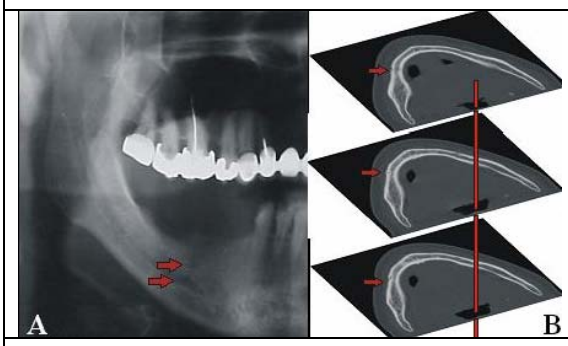

Figure 1:
A female patient, 37 y.o., was presented for placing dental implants at the right premolar-molar area of the mandible. However, extensive alveolar resorption (**1A**) and the suspicion of presence of a double mental foramen (MF) was confirmed in CT scans (arrows) (**1B**).

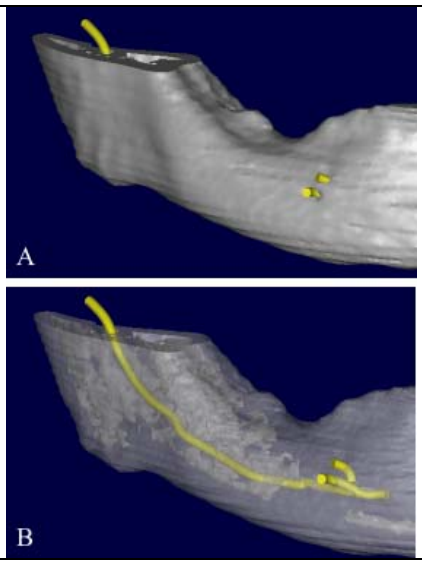

Figure 2:
Using Simplant software a 3-D vitrual model was generated. The double emergence of the mental nerve (MN) through two separate foramina (**2A**) was the result of its branching at the level of the lower MF(**2B**). A bony canal of 0.8 mm width and 1.4 mm height was leading to the upper MF that was directed upwards. The max. height, width and depth of the lower MF were also measured 2.1 mm, 3.2 mm and 2.3 mm respectively and the pattern of emergence of MN was of a downwards and backwards direction. Finally, the max. width and depth of the upper MF were calculated 2.6 mm and 1.8 mm respectively.

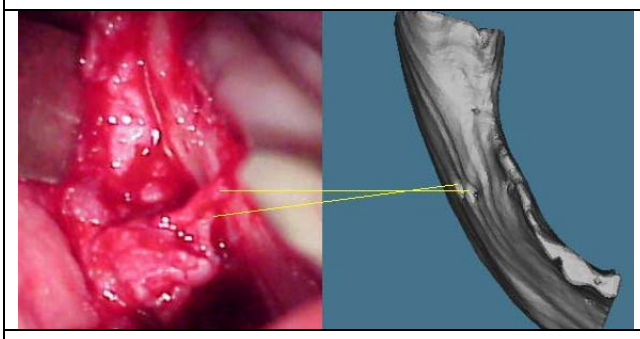

Figure 3:
A vertical alveolar distraction was planned as the treatment choice to manage bone augmentation before the dental implants placement. From the comparison of some virtually calculated linear measurements, such as the distance between the upper and lower MF, no differences were found in the surgical field.

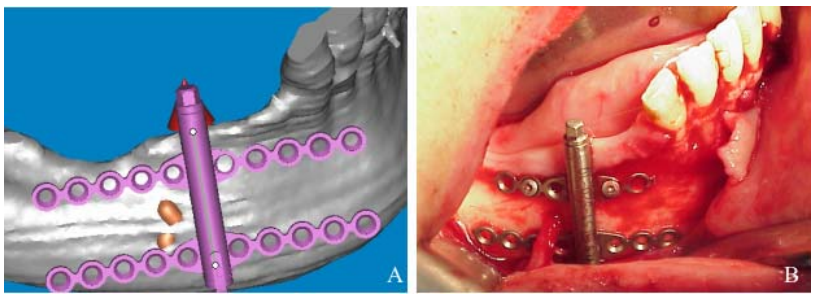

Figure 4:
During the simulation procedure an upwards movement of the upper plate of the alveolar Distractor device (KLS Martin, 10 mm) by 4 mm was considered to be necessary so that the involvement with the area of the double MF could be avoided and osteotomy level safely secured (**4A**). The above virtual data has been examined in the surgical field (**4B**).

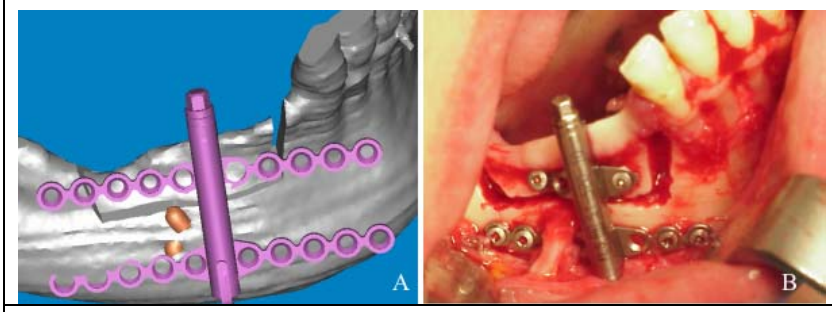

Figure 5:
Apart of the upwards reposition of the segmented bone, an outwards (buccally) translation (in order to align with the vector of distraction) was also simulated using Simplant software (**5A**). The calculated values were intra-operatively tested (**5B**).

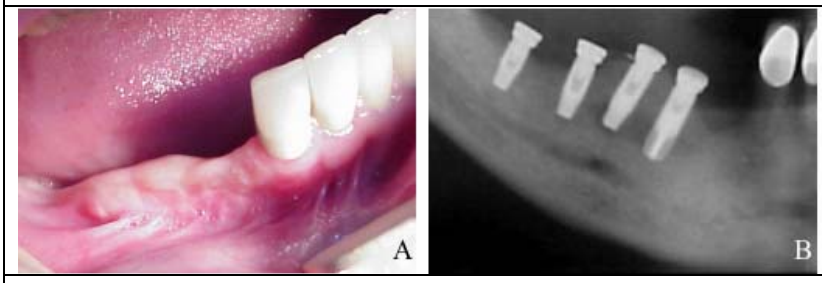

Figure 6:
Following a consolidation period of three months the placement of dental implants took place (**6A** & **6B**).

CONCLUSION: The procedure of distraction osteogenesis in this patient, it was necessary to be precisely and safely planned due to the co-existing anatomical variation of a multiple mental foramen. For that purpose the utility of 3-D virtual prototyping by means of Simplant software was examined.
From a diagnostic point of view the anatomical variation and its elements were effectively studied and understood. The virtual data that could be intra-operatively tested showed high accuracy. The proper placement and functioning of the Distractor device could be predicted, resulting in better control of the osteotomy plan with simultaneous protection of the MN. As a result, reduced surgical time and tissue stress were also achieved.
It appears that virtual biomedical modelling, even without physical modelling, is a sufficient tool to carry out an effective and safe pre-operative surgical plan.