Accuracy Of The “MExPERT® IPM Camlog” For Economical Implant Guides

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Introduction

In the past, there were many approaches to implant with the use of surgical drill guides. In the beginning, dental technicians fabricated a drill template with the help of a gypsum model to individualize. Since then, different methods developed to include the bone supply and surrounded soft tissue by radiological examination. The literature shows a gain of precision comparing surgical guide templates versus the conventional freehand method. The MExPERT IPM is a new patented approach to fully guided surgical drill template. The aim of this experimental study is to evaluate the accuracy of the MExPERT IPM (implant planning model) and the surgical drill guide fabricated from that model.

Material and methods

DICOM data from a CBCT (MESANTIS *line I;* ISI, Hatfield, PA, USA) and STL data from a plaster model scanned with the model scanner D700 (3Shape, Kopenhagen, Denmark) were matched with each other in a specific implant planning software (MESANTIS 3D Studio). Based on the matched data an implant for tooth 36 was planned with the patented new approach.

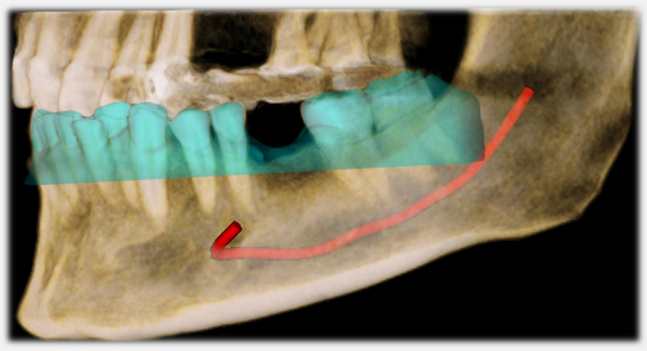


Fig. 1: Matched DICOM & STL data (MESANTIS 3D Studio)

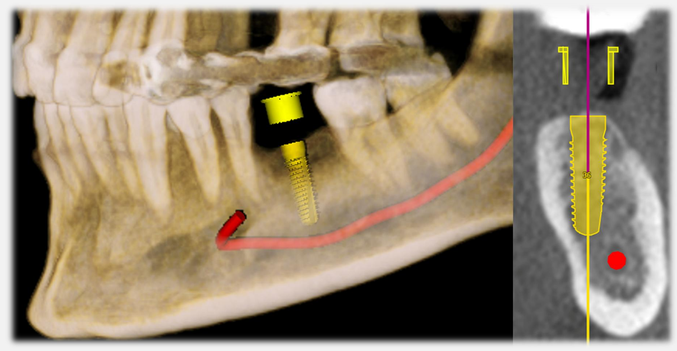


Fig. 2: Implant planning (MESANTIS 3D Studio)

To evaluate the accuracy of the MExPERT IPM in the base of the virtual model four precise holes were placed as reference markers. The distance of the sagittal markers was 30.000 µm and the distance of the transversal markers was 25.000 µm in the virtual model.

Subsequently, acrylic models were printed with Scan LED (MOVINGLight®) technology (D35, Prodways, Les Mureaux, France). All printed IPMs were evaluated with the high-end scanning system CONTURA G2 (Carl Zeiss, Oberkochen, Germany). Altogether four different measurements were done:

1. To assess the basic accuracy of the IPM the sagittal and transverse distances of the reference markers were measured.

2. To assess the vertical accuracy of the Camlog sleeve holder (= IPM marker) in the planned hole of the printed IPM the vertical variation of the IPM marker was measured after repeated placement.

3. To assess the accuracy of the IPM marker angulation in the sagittal and transverse plane repeated measurements were done in relation to the reference markers.

4. The vertical accuracy as well as the sagittal and the transversal angulation of the sleeve in the fabricated implant guide was evaluated.

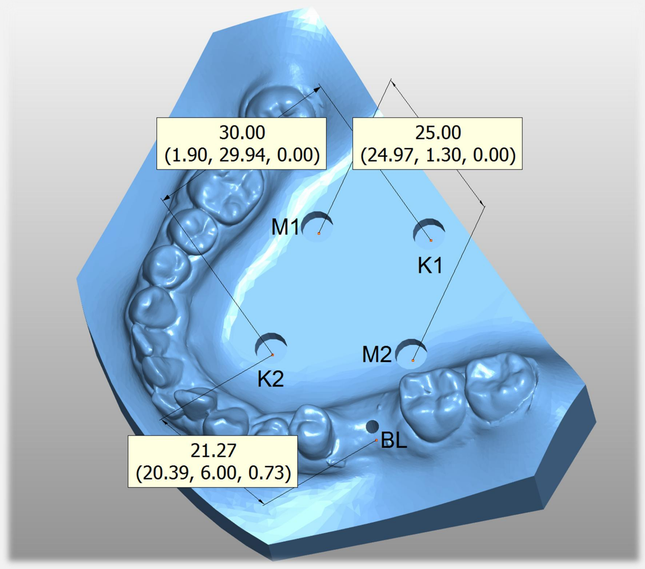


Fig. 3: Digital dataset of the printed MExPERT IPM

Fig. 4: Printed MExPERT IPM with the surgical drill guide and placed IPM marker

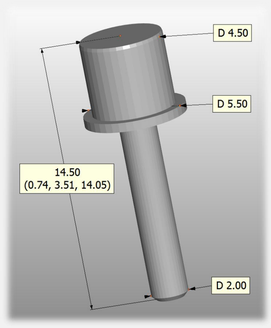


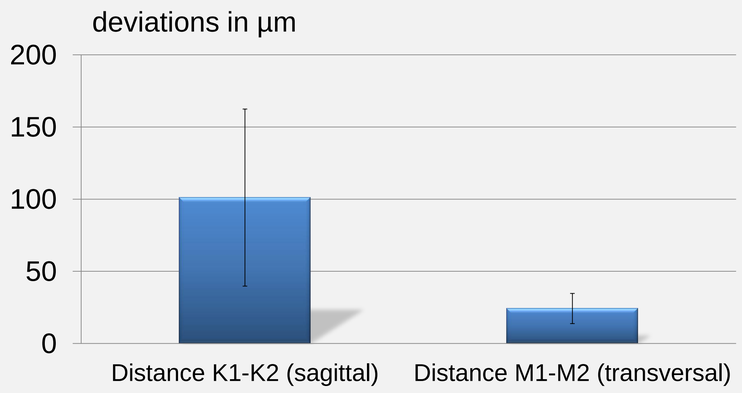
Fig. 5: Digital dataset of the IPM marker

Fig. 6: Prodways D35

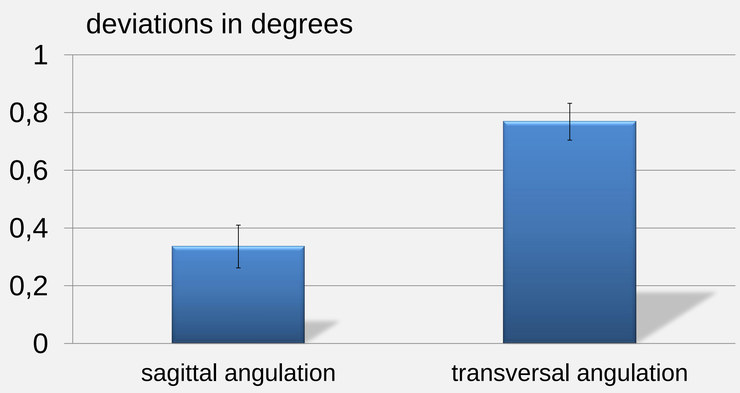
Fig. 7: Carl Zeiss CONTURA G2

Results

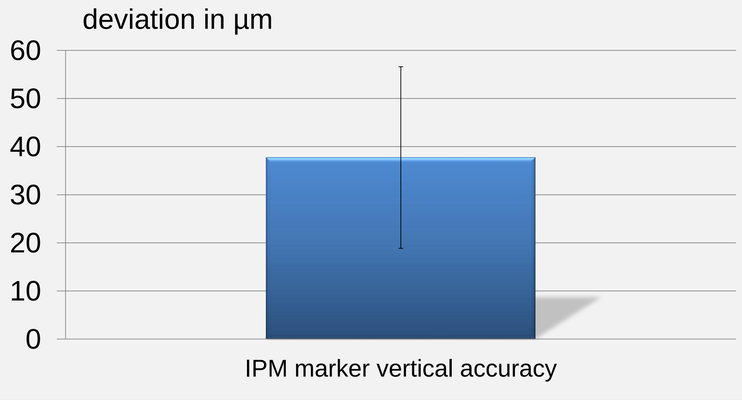
Model accuracy
Repeated fabrication of a MExPERT IPM led to very accurate results. The mean deviation of the MExPERT IPM was 101 µm (0,33%) in the sagittal and 24 µm (=0,096%) µm in the transversal dimension.



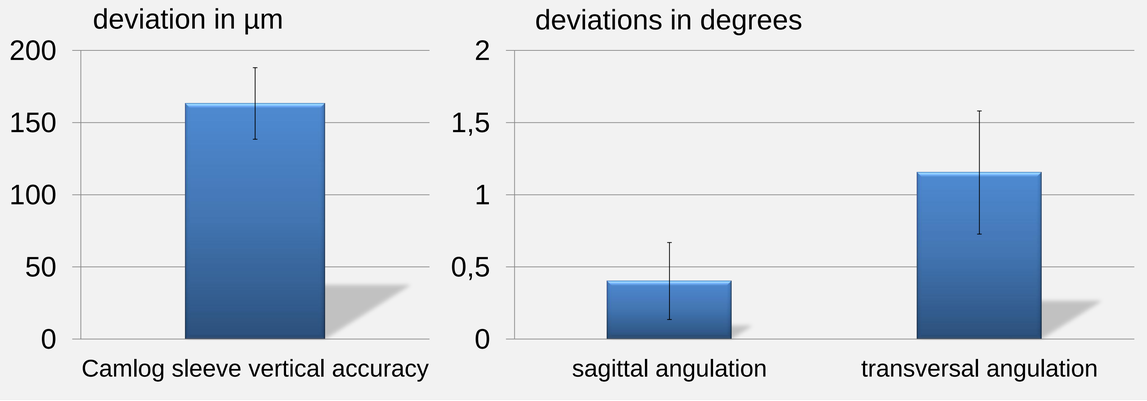
IPM marker angular accuracy
The angular deviation of the IPM marker in the sagittal dimension was 0,33° and in the transverse dimension 0,77°.



IPM marker vertical accuracy
Repeated positioning of the IPM marker on the MExPERT IPM was associated with a vertical variation of 37 µm.



Camlog sleeve accuracy
In the fabricated implant guide the vertical position of the Camlog sleeve varied 163 µm. The mean angular deviation of the sleeve in the implant guide was 0,4° in sagittal plane and 1,15° in transversal plane.



Conclusion

When compared with other scientific studies the MExPERT IPM Camlog seems to be the most accurate and economical implant guide for safe and fast implant placement.

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