

## BACK TO ANALOG: OPTIMIZATION OF TREATMENT PLANNING IN HARDLY VISUALIZABLE SITUATIONS

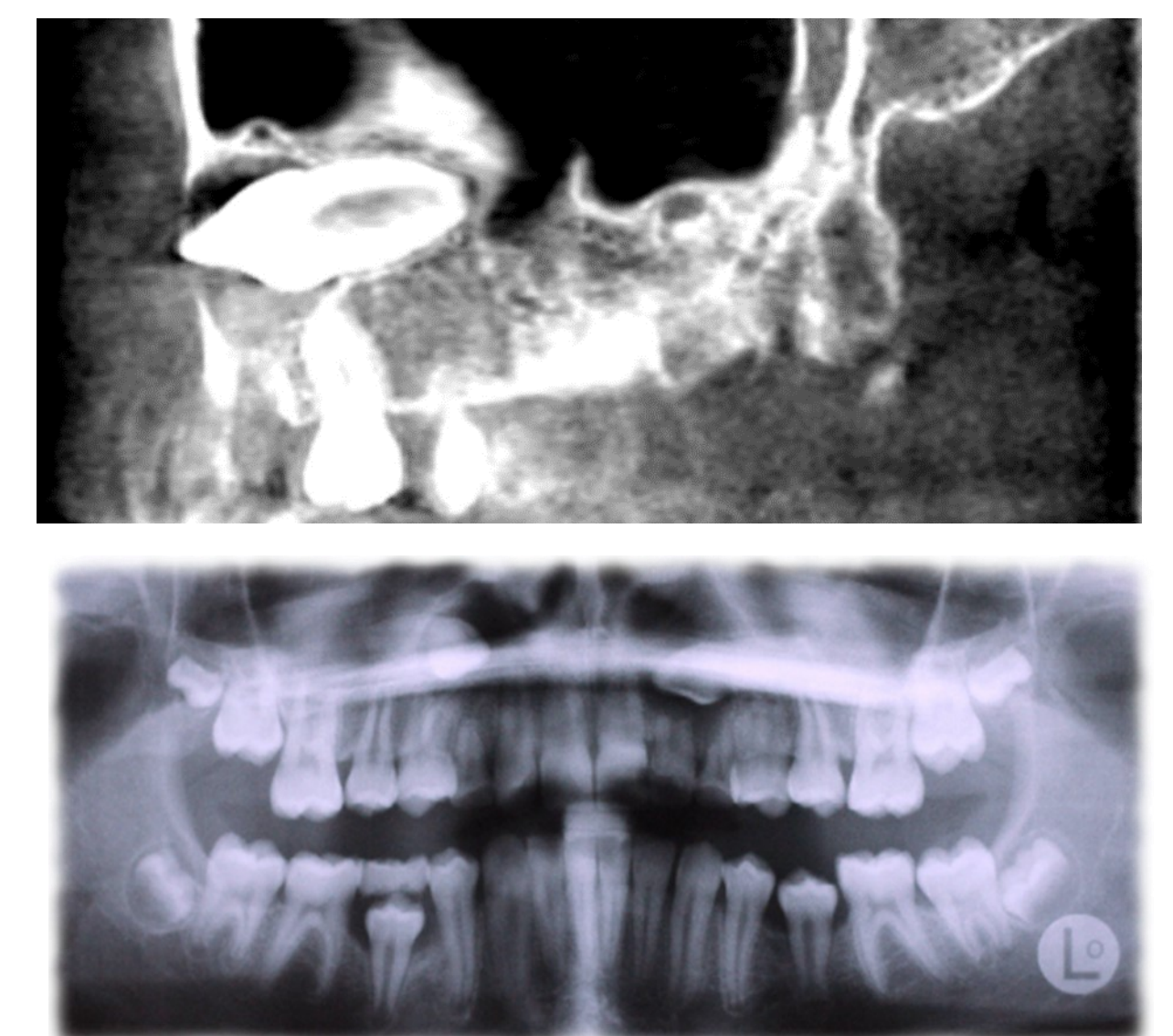
M. Bock, E. De Carli, D. Paddenberg Private office, Paderborn, Germany

97th European Orthodontic Society Congress, Limassol, Cyprus, May/June 2022



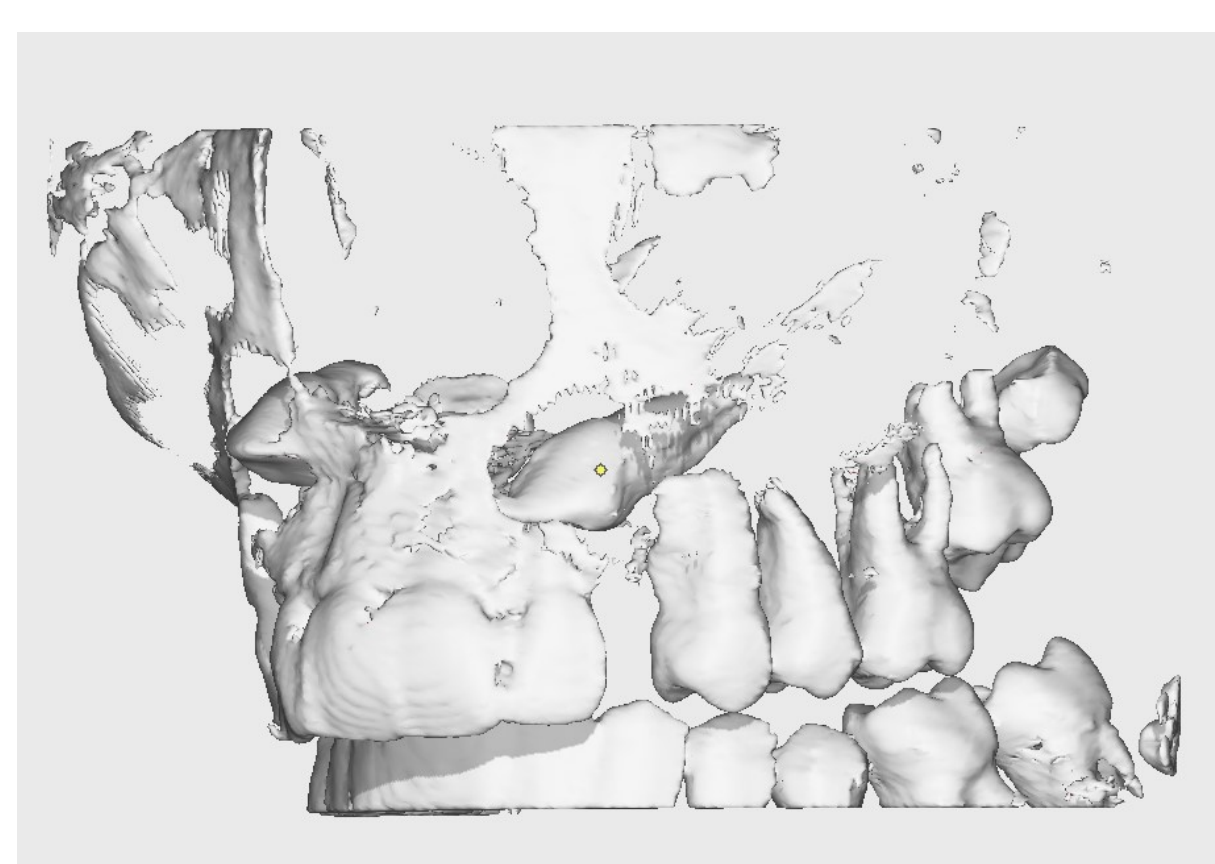
### Objective

Diagnosis and tx planning can be challenging in situations that require knowledge of spatial orientation, e.g. with impacted and displaced teeth. Because visualizing a three-dimensional data on a two-dimensional screen is associated with an inferior sense for dimensions and positional relationships, a physical three-dimensional model of a digital volume tomography image would be the next step.

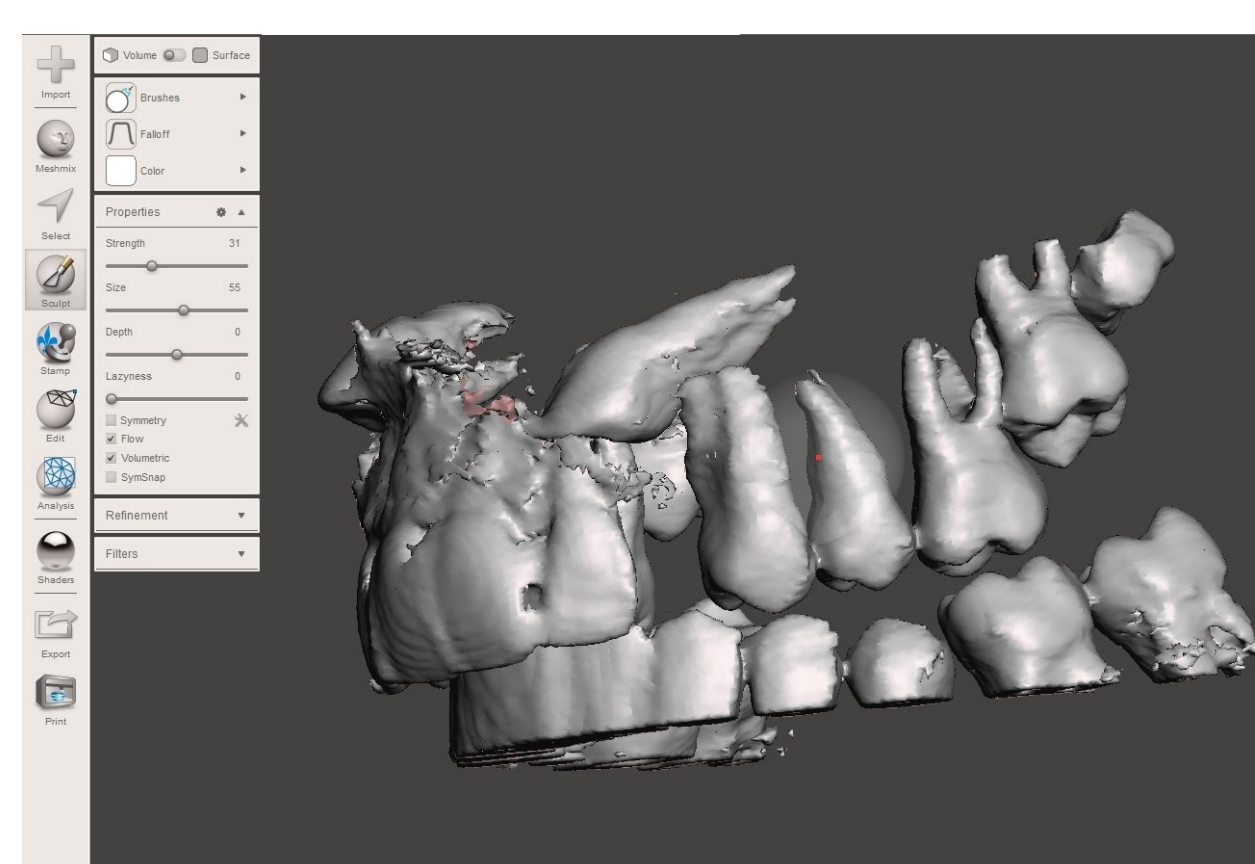


### Material and Methods

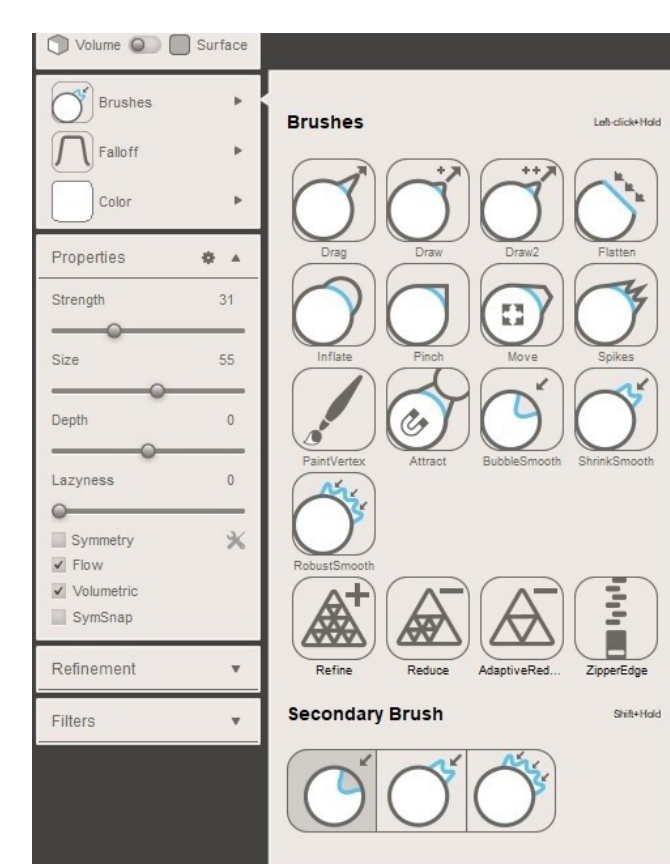
Raw files are typically not suitable for three-dimensional printing. Consequently, processing prior to printing had to be done. Firstly, a conversion of DICOM to STL file was fulfilled using OnyxCeph 3™ (Image Instruments GmbH, Chemnitz, DE) [1]. A suitable density threshold was selected to show the desired structures. The STL file was then edited with Meshmixer (Autodesk Inc., San Rafael, CA, US) to allow for a flawless print [2]. Unwanted parts were deleted from the object and hollow parts were made solid. The surface could be slightly smoothed with the integrated brush tools, where artifacts or irregular structures would pose a risk of a failed print [3]. If necessary, a connection between multiple unconnected parts could be inserted manually, to secure their orientation. Finally, a three-dimensional print of the object was performed using a Formlabs Form 3 printer [4, 5].



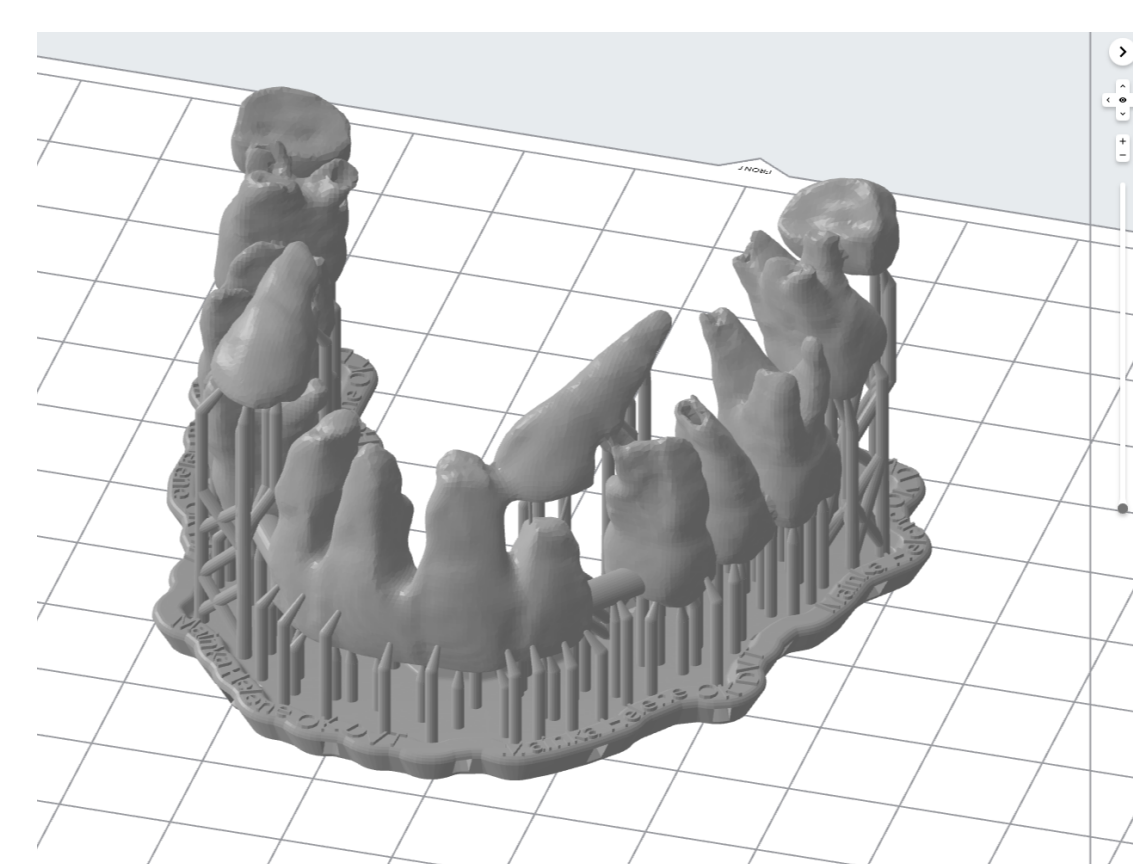
[1]



[2]



[3]



[4]



[5]

### Results

The described workflow was found to be able to create physical three-dimensional models of digital volume tomography images. During workflow, one can exactly control which structures are ultimately converted into the physical model. The models are able to show spatial relations of the elements like impacted and neighboring teeth precisely. Dimensions, distances and orientations are easily perceptible.

### Conclusion

Using widely available software, it is possible to create a three-dimensional printed model of a digital volume tomography image. Such a physical model helps the orthodontist and the surgeon in treatment/operation planning. The patient will be enabled to understand risks and difficulties of the suggested procedures as a precondition for a reliable agreement.