Semi-automated presurgical planning of maxillofacial reconstruction with the use of the fibula free flap: software development and evaluation

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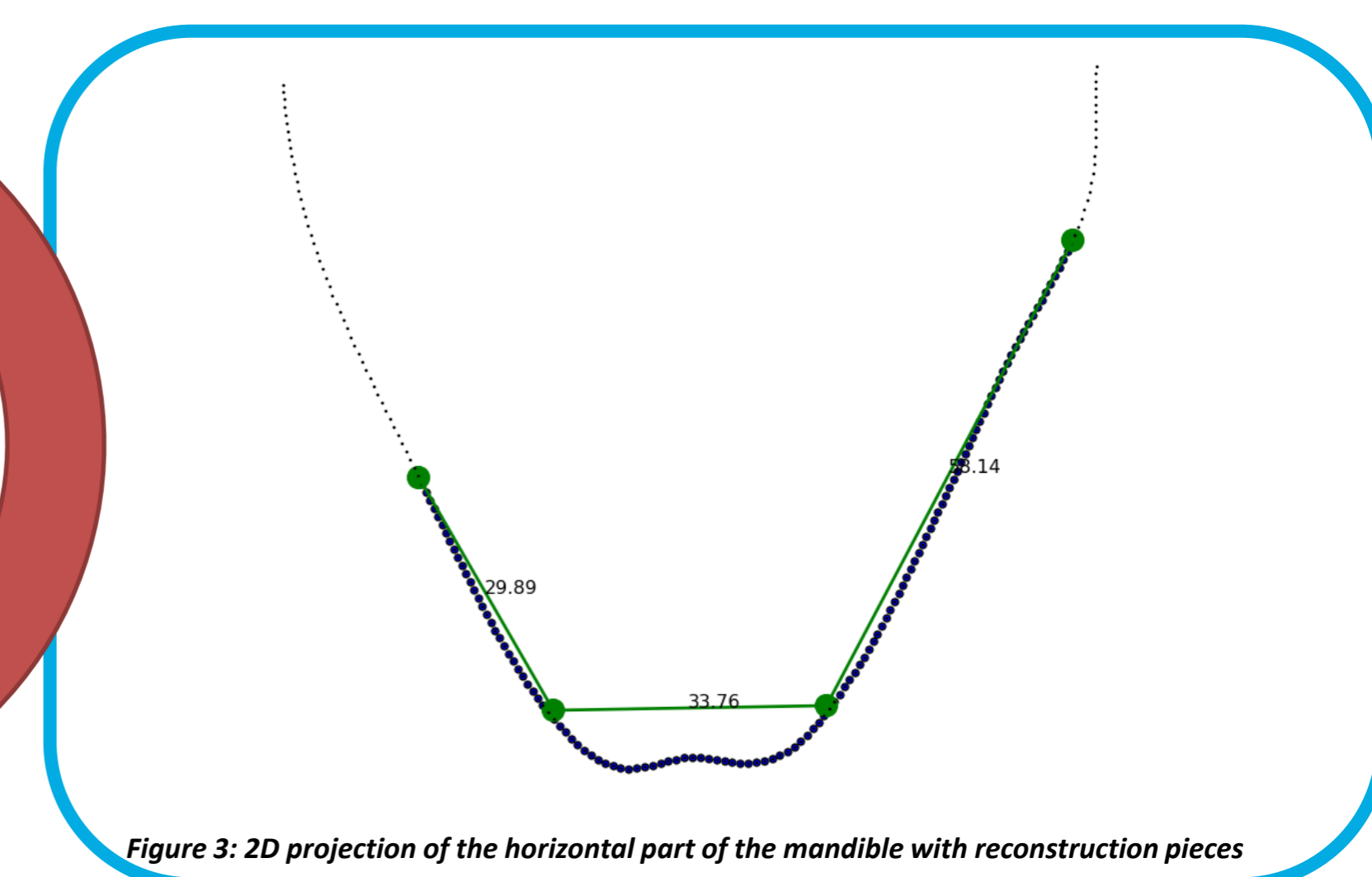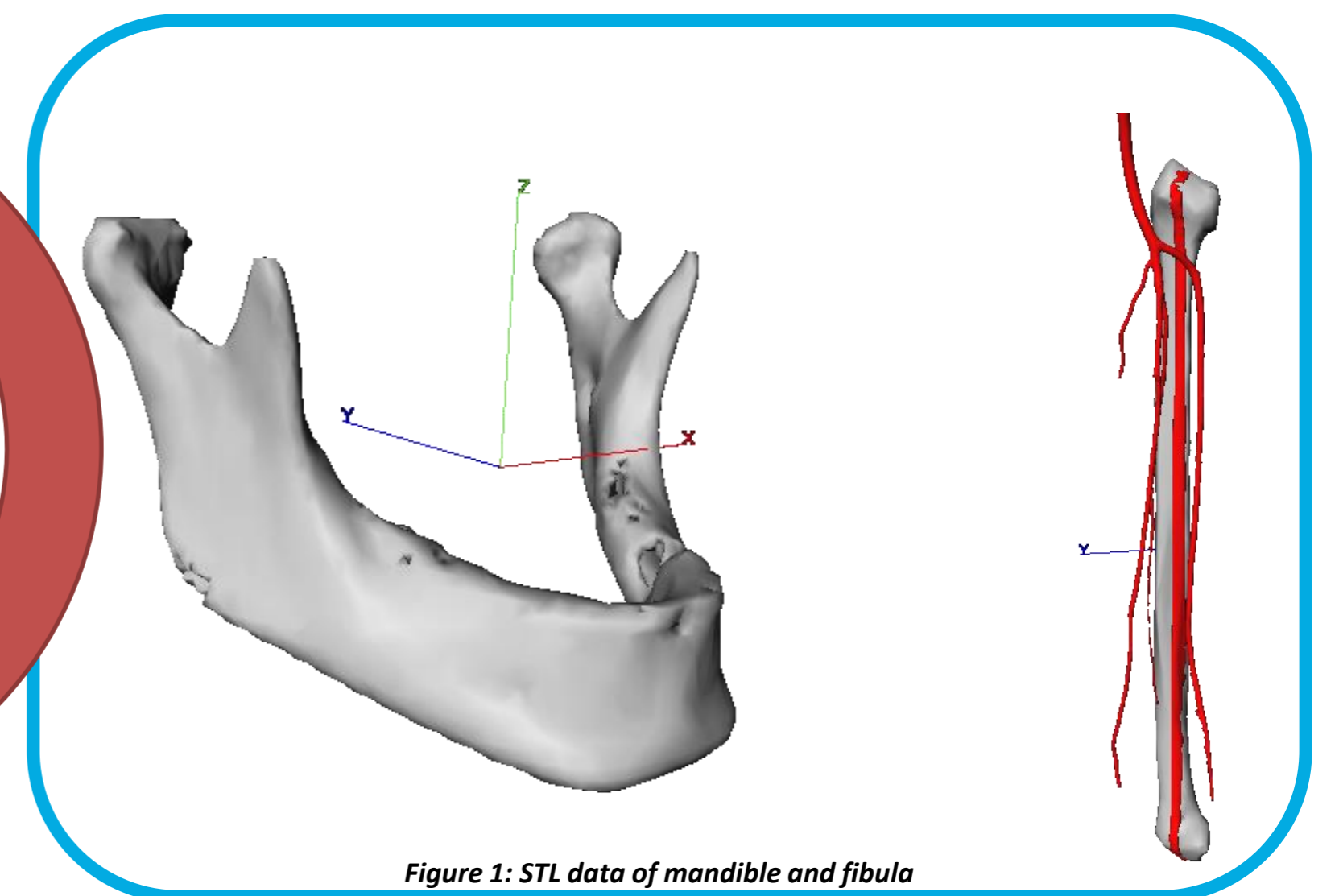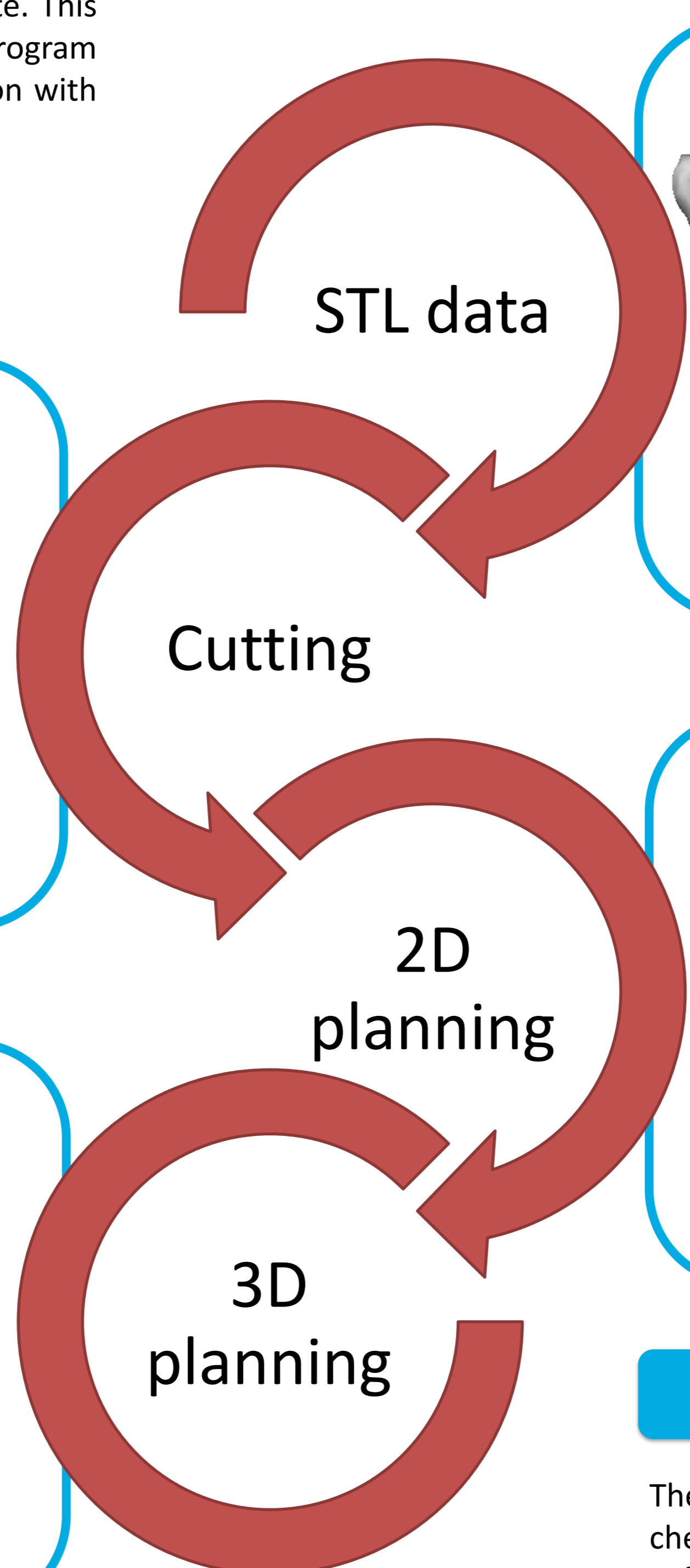
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Introduction

The mandible plays a crucial role in speaking and eating. Physical trauma can interfere with the functionality of the mandible. The best method to restore the functionality of the mandible is to reconstruct it using the patient's fibula bone. This bone is not vital for normal activities and has a good shape to reconstruct the mandible. Because the fibula must fit perfectly in the mandible, a presurgical plan is made. Each planning is unique and conducted by a medical expert. This planning can take more than one half hour to complete. This Brings forward the central question: can we create a program to reduce the planning time of mandible reconstruction with the fibula free flap?
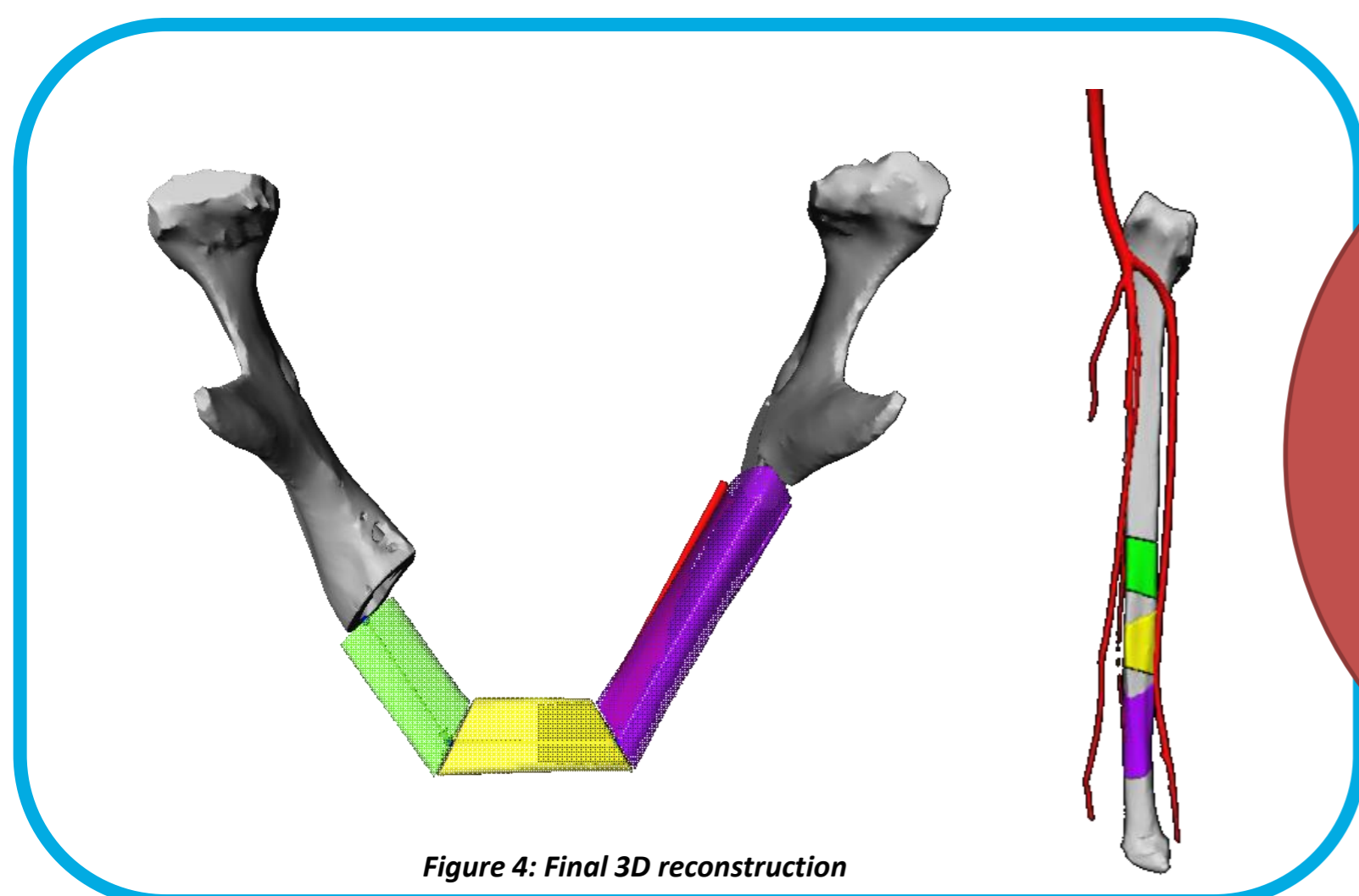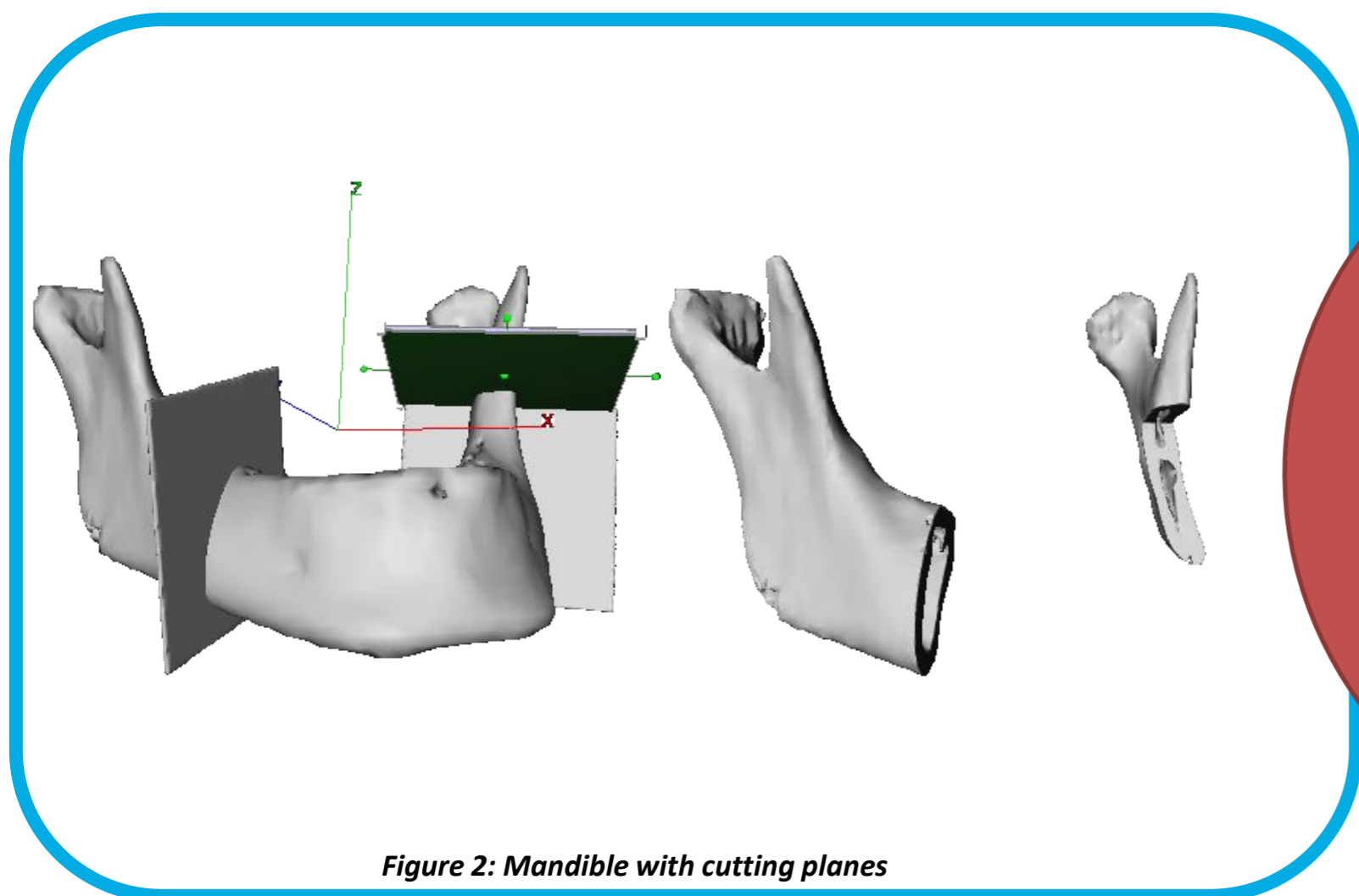
Objectives

- Provide an easy and fast workflow for each reconstruction.
- Give suggestions for multiple steps in the workflow.
- Provide the user with all the tools to easily change or fine tune the suggestions given by the software.
- Provide the same level of quality as the currently used software in a shorter planning time.

STL data

Figure 1: STL data of mandible and fibula

Cutting

Figure 2: Mandible with cutting planes

2D planning

Figure 3: 2D projection of the horizontal part of the mandible with reconstruction pieces

3D planning

Figure 4: Final 3D reconstruction

Conclusion

The quality of the reconstruction and ease of use has been checked at UZ Leuven. The reconstruction produced by the software is of a high enough quality so it can be used in presurgical planning. The user interface is however not ideal and can be confusing. The software is a good base for future work and improvements.

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