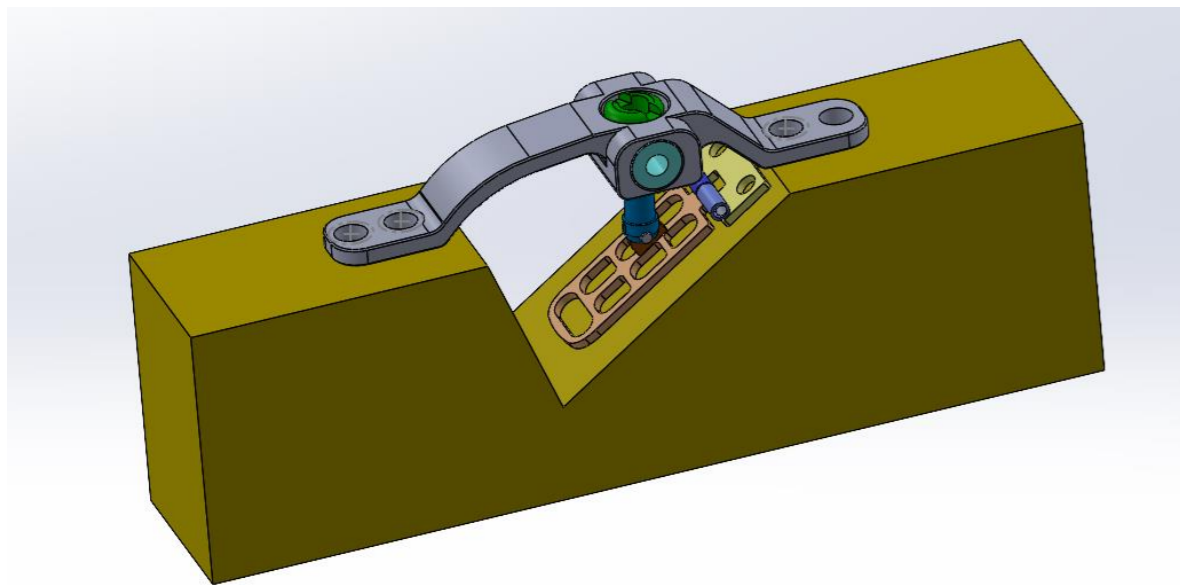
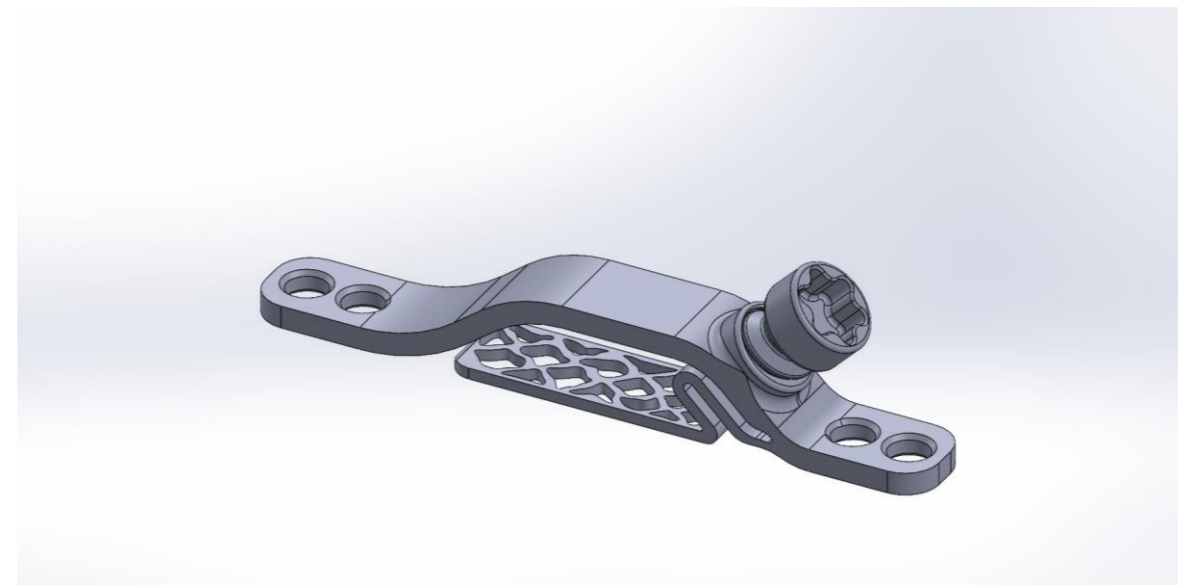


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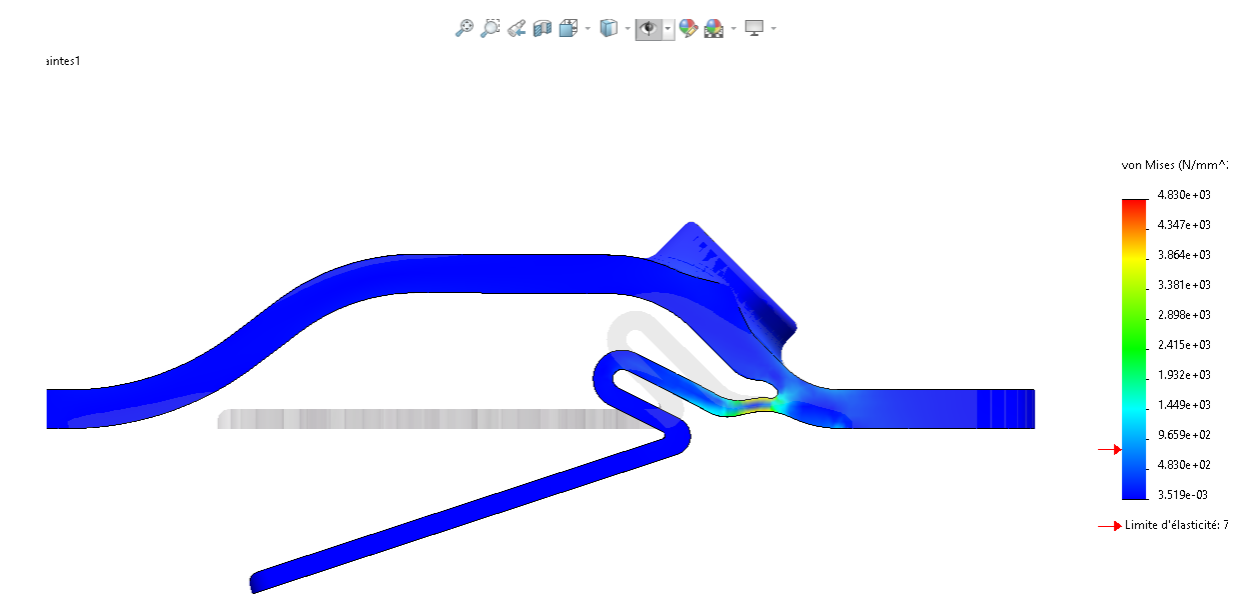
Development of an additive manufactured distractor for intraoral periosteal distraction osteogenesis



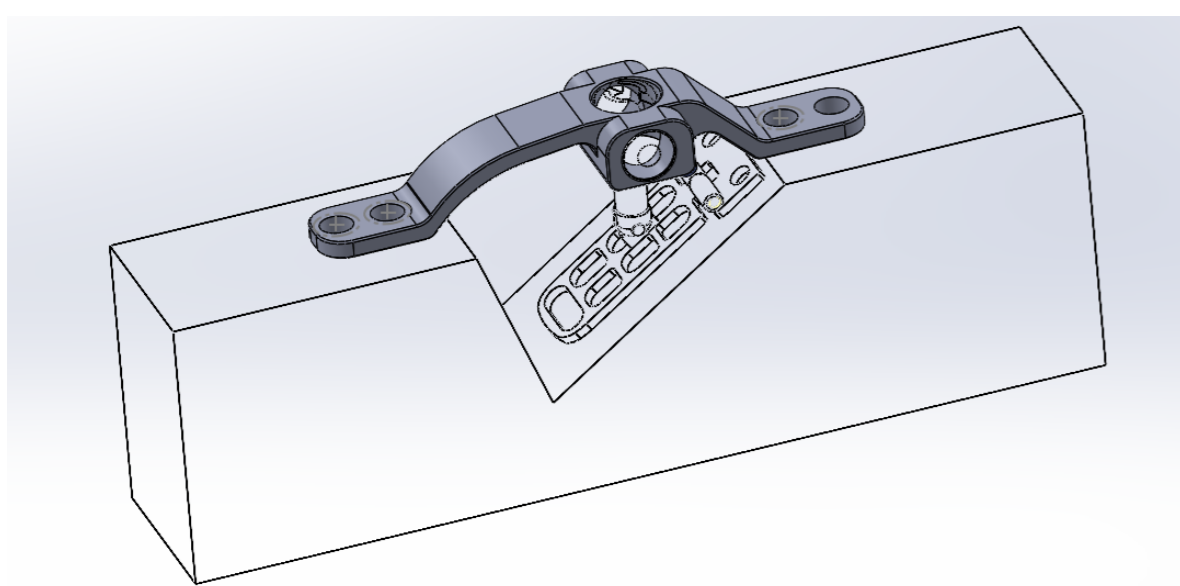
Prototype Zero complete



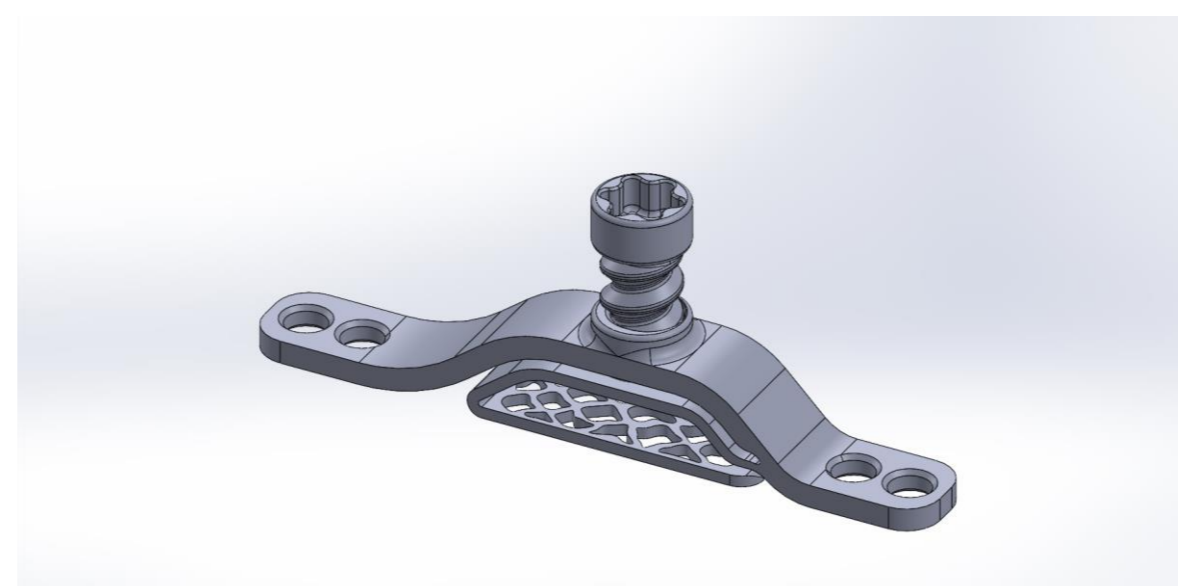
Prototype 2 - Version 1



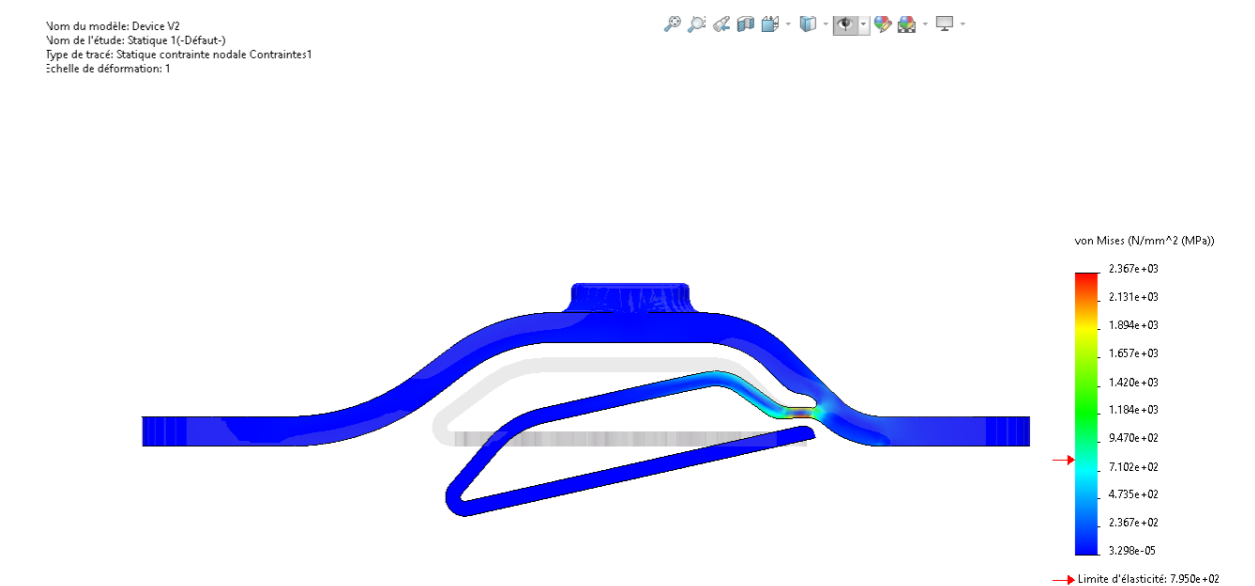
Prototype 2 - Version 1 - Yield Strength Simulation



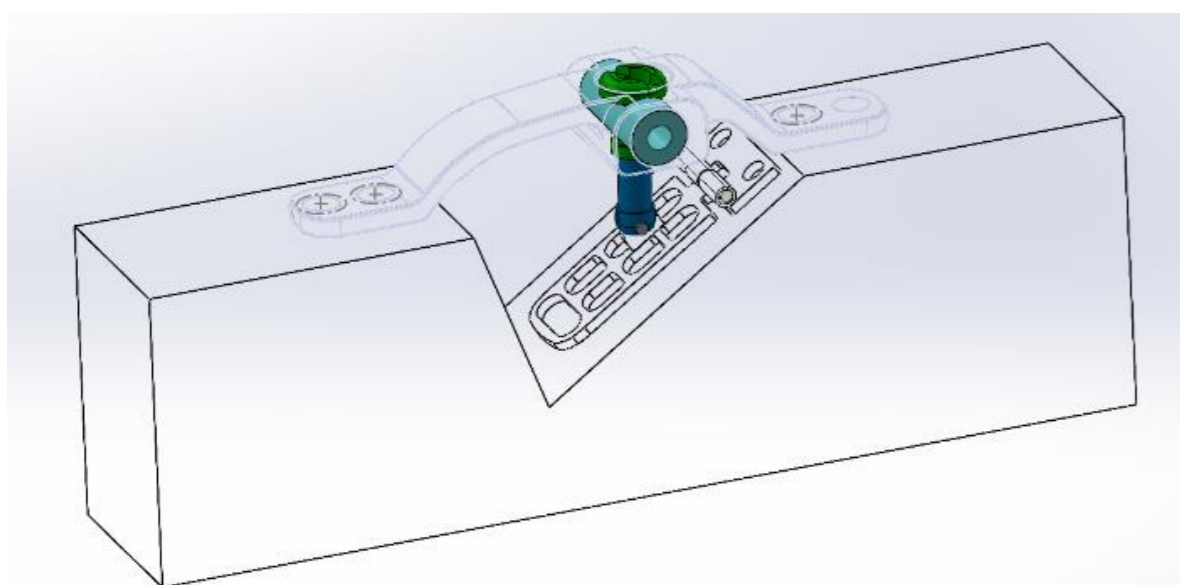
Prototype Zero lifting bridge isolated



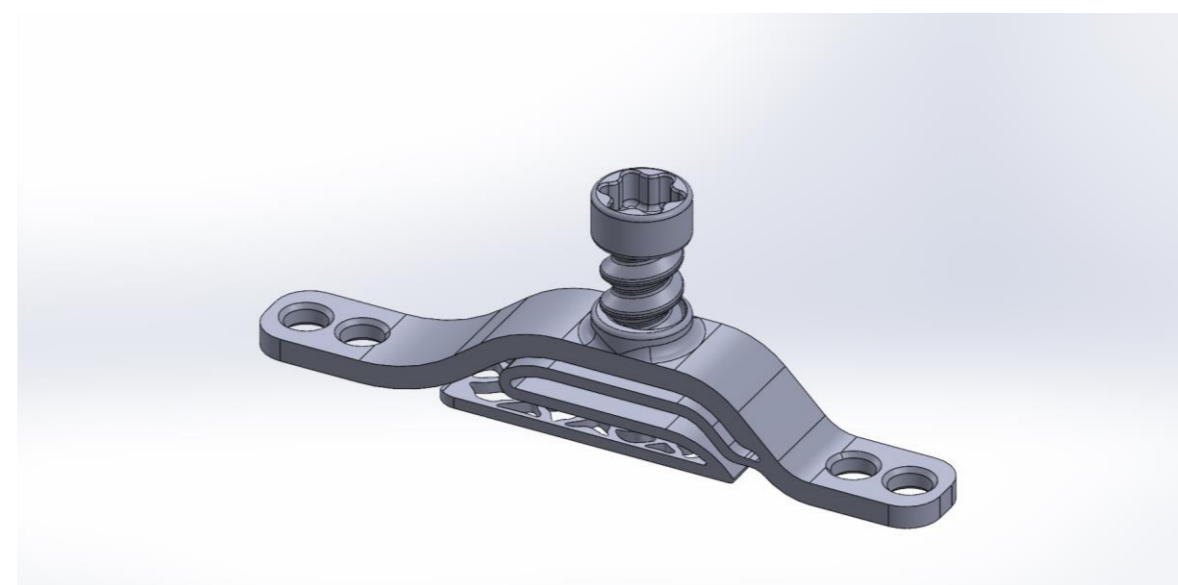
Prototype 2 - Version 2



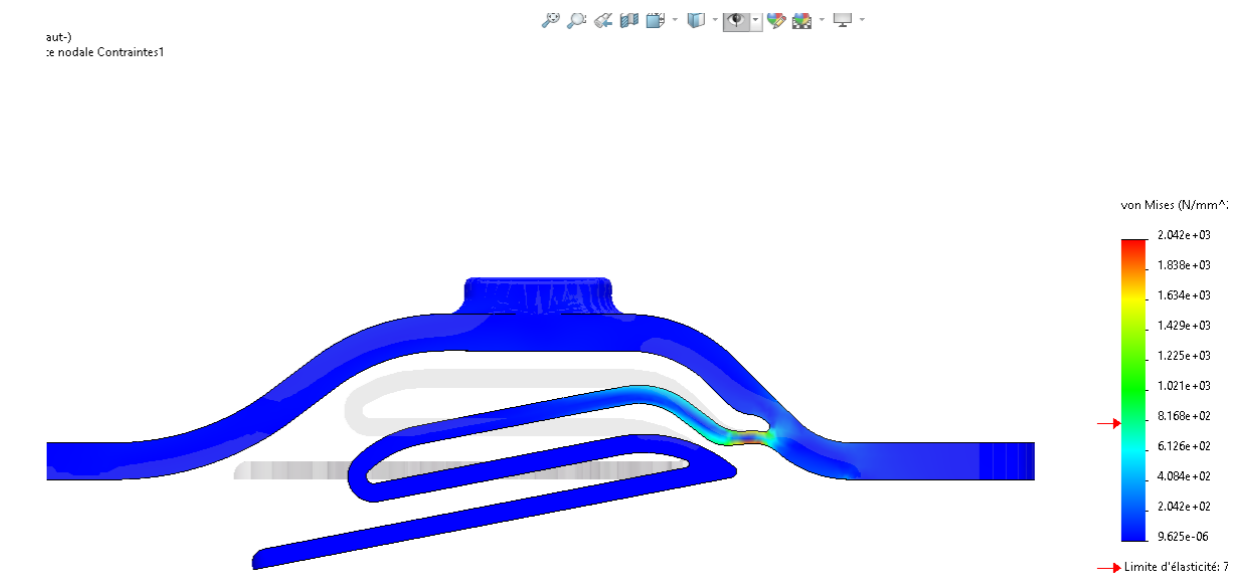
Prototype 2 - Version 2 - Yield Strength Simulation



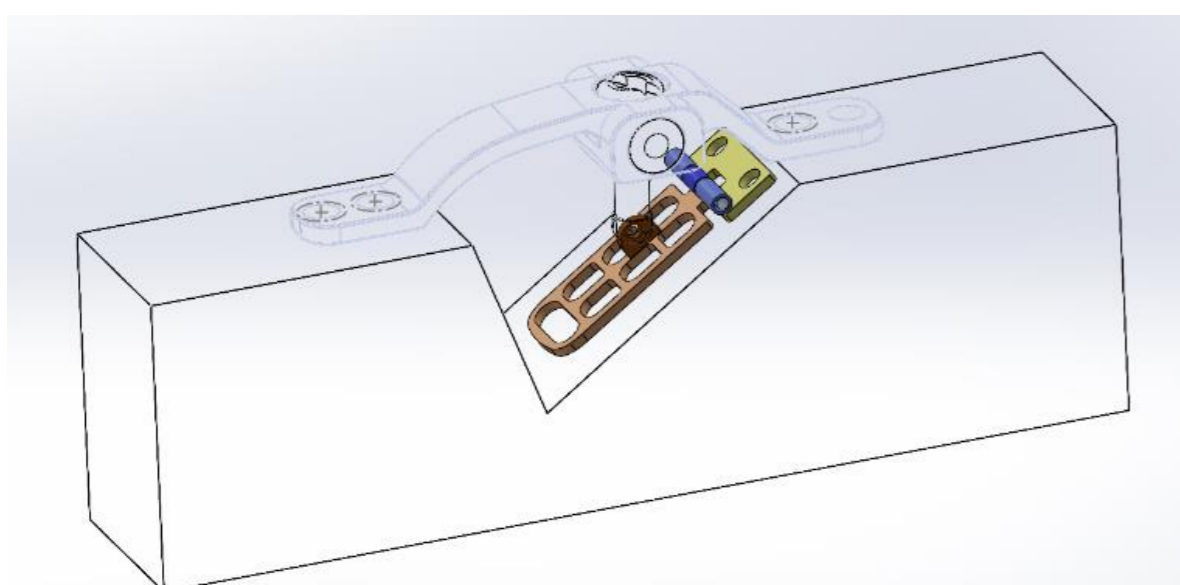
Prototype Zero adjustment mechanism isolated



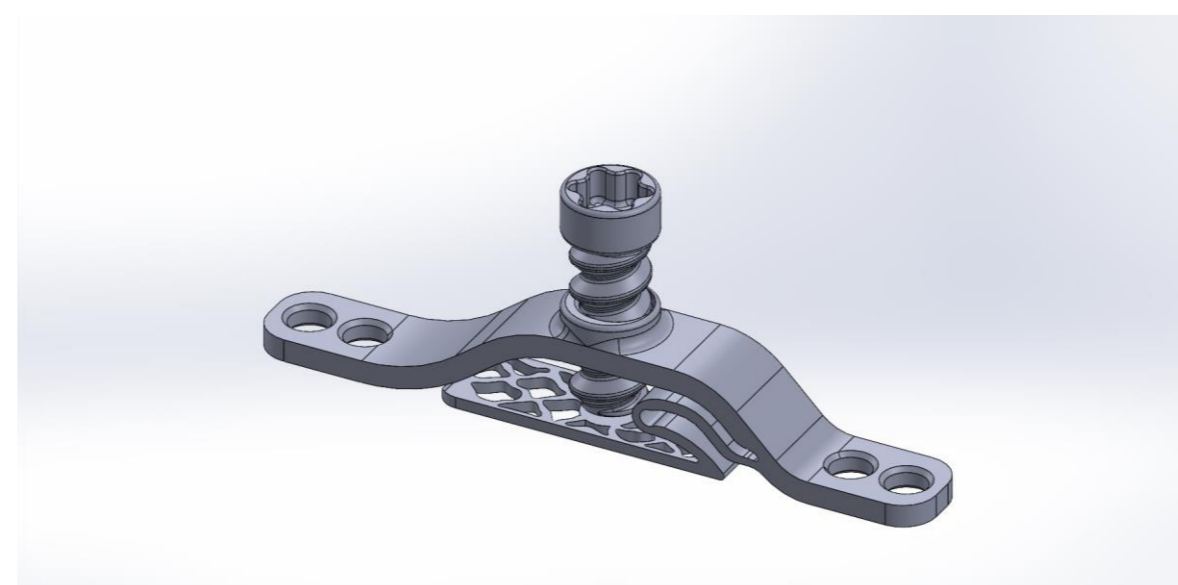
Prototype 2 - Version 3



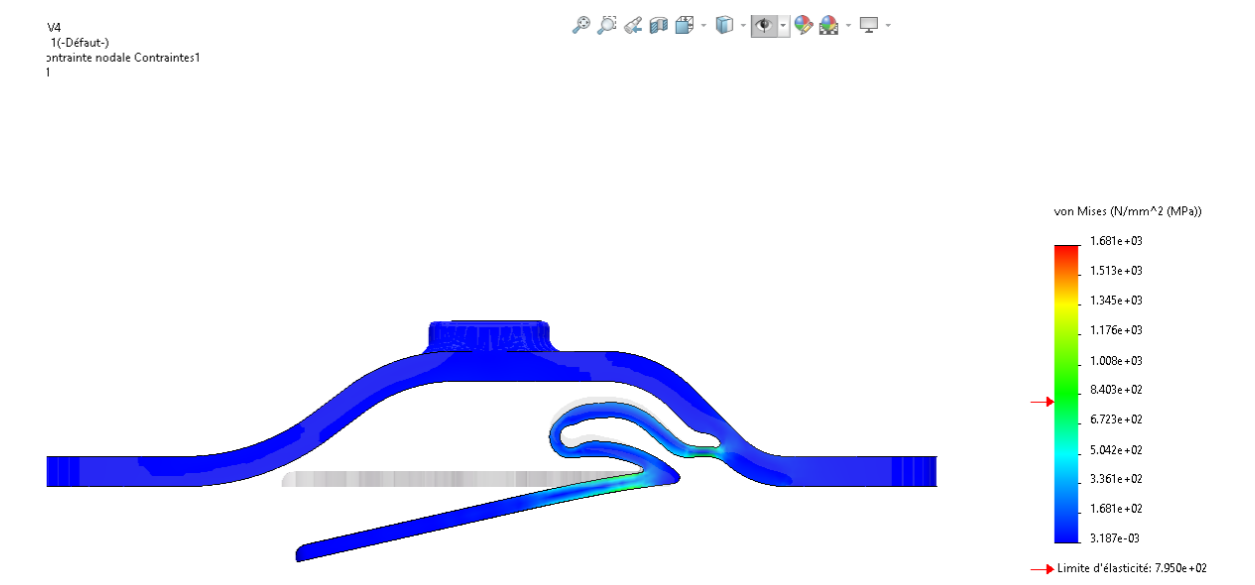
Prototype 2 - Version 3 - Yield Strength Simulation



Prototype Zero distraction plate isolated



Prototype 2 - Version 4



Prototype 2 - Version 4 - Yield Strength Simulation

Project Description

For 15 years, the Department of Cranio-Maxillo-facial Surgery of the Inselspital, University of Bern, has been researching the method of autogenous bone formation by performing periosteal distraction osteogenesis. Several animal studies have been successfully conducted and provided breakthrough insights into the behavior of new autogenous bone formation, when the gingival is minimally lifted from the mandibula.

During this project, the latest generation of the periosteal distraction device (Prototype Zero, Column 1), which was used in an animal study, has been further developed by introducing additive manufacturing of titanium as the leading manufacturing method.

In addition, the method of intraoral periosteal distraction osteogenesis has been compared with established bone augmentation methods in terms of its dental implant protocol and its economic viability.

Design and Development Process

The initial design of the latest generation of the distractor used in an animal study for periosteal distraction osteogenesis has been investigated in terms of its deficiencies. These weak points have been identified, justified and improved by conducting two design and development iterations.

By creating a stand-alone technical documentation consisting of a design and development plan, the definition of the user requirements and the translation of the user requirements into the product requirements specifications, two versions of a new generation of a periosteal distraction device have been developed. The prototype 1 was manufactured by means of additive manufacturing of plastics for fast prototype iteration at low cost. The final version of the periosteal distraction device, the prototype 2, can be seen in column 2.

The user requirements as well as the product requirements specifications have been verified by conducting a design verification test plan.

Results

The final result of this project is the prototype 2 which can be seen in column 2. Four different versions of the final prototype design have been produced by means of additive manufacturing of titanium. The results of the design verification by means of simulation of the maximal yield strength can be seen in column 3.

Sandro Lamia

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Expert: Berhard von Allmen

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