

Development of Bone Cutter

Bone Decorticator for use in Ankle Arthrodesis



OsteoCentric
TECHNOLOGIES



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Introduction

Osteoarthritis affects 3.4% of the general population and is associated with age, obesity, genetics, and female sex. Different techniques exist to treat osteoarthritis, such as autografting, total joint replacement, and **joint fusion**.

Arthrodesis is the fusion of joints with the use of a bone cutter. While there are devices on the market today that can **decorticate** joints (remove the subchondral bone layer), there is a lack of a device that can also harvest bone for autographs. With OsteoCentric Technologies, we are designing a device that can fit in a small hole, create a larger void, and can harvest bone.



Methods

Our team began by analyzing the current BladeX mechanism to understand how it works and its **essential features**. We decided what features to keep and scaled the rest of the model around them. For example, the height of the bottom knob is the same as the original.

In addition, we **calculated expected torque and stresses** that the device will experience, and adjusted parts so that it will not break in surgery.

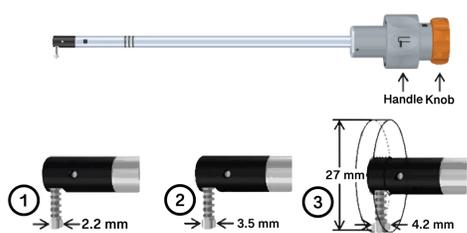
Finally, we worked to create a handle that would provide the most **comfort and control** while **effectively cutting and harvesting bone** in a small area inside the body.

Preliminary Research

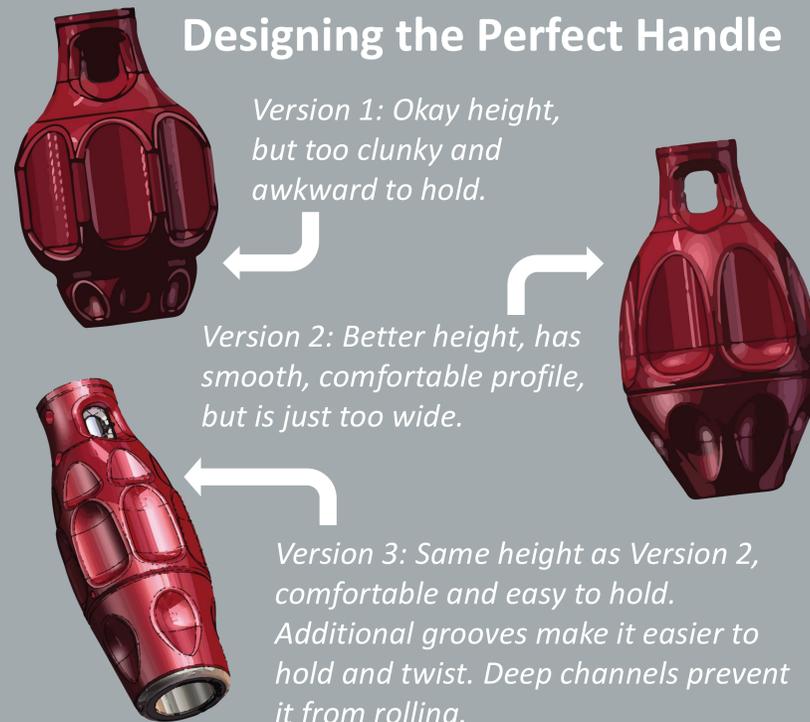
Our design **objectives**: Device withstands **normal surgical loadings**. Device is **sterilizable**. Device enters through a **6 mm hole** and cuts a **15 mm diameter void**.

Benchmarking

- Slimmetry Decorticator incrementally deploys a cutting blade perpendicular to the shaft of the instrument but does not harvest bone.
- Arthroscopy Shaver Blades require more invasion in the body and differs in the blade adjustment method.
- OsteoCentric's precursor device is the BladeX. Our project goal is to shrink the BladeX to fit an ankle osteotomy procedure rather than a hip osteotomy.



Designing the Perfect Handle



Conclusion

Through CAD design, important safety analyses, and several 3D-printed prototype iterations, our team has proven that the **original BladeX can be safely and successfully scaled down** to a size appropriate for decorticating small joints in the body.

Future Work

- Now, with a complete prototype BladeX Mini developed, the team will utilize our **tolerance analysis** to create **mechanical drawings** of each part, which will be fabricated in OsteoCentric's machine shop.
- Then, **testing** will be done to evaluate device performance, and any necessary design adjustments will be made.



Slimmetry Decorticator (top) and Arthroscopy Shaver Blades (bottom).