



3D Visualization for Young Athlete Education on Potential Risk of Injury

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Introduction

3D visualization software is a useful tool in patient education because it allows patients to put an image to what a physician is describing to them. With an emphasis on education of young athletes on the potential injuries, 3D images can create a more complete understanding of their risks. The software used in this study provides young athletes with insight on joint structure, joint movement, mechanism of injury, inherent risks of sport, and tips to help prevent injury in a way that is easier to visualize. This gives these patients the ability to make an informed decision on their participation in sports.

Methods

The study was performed in the Marian University College of Osteopathic Medicine 3D Visualization Laboratory. It used MRI data from Indiana Orthopedic Hospital and other various sources to reconstruct the knee, hip and shoulder joint. The anatomical structures were discerned and extracted through various slices of images using FEI Amira software.



Figure 1: MRI of Knee

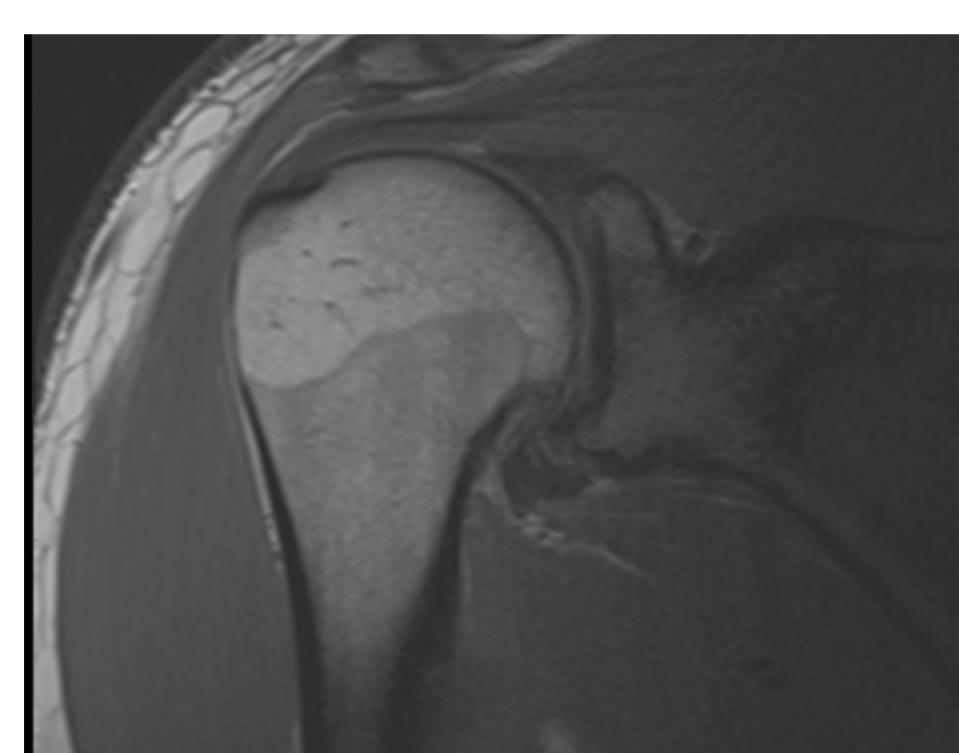


Figure 2: MRI of shoulder

The resulting extracted structures were manipulated in Amira and MeshMixer to assemble a 3D image or movie that can easily convey the intended educational message. The images and movies were compiled and edited in Camtasia to create a visual presentation to be viewed by juvenile athletes.

Results

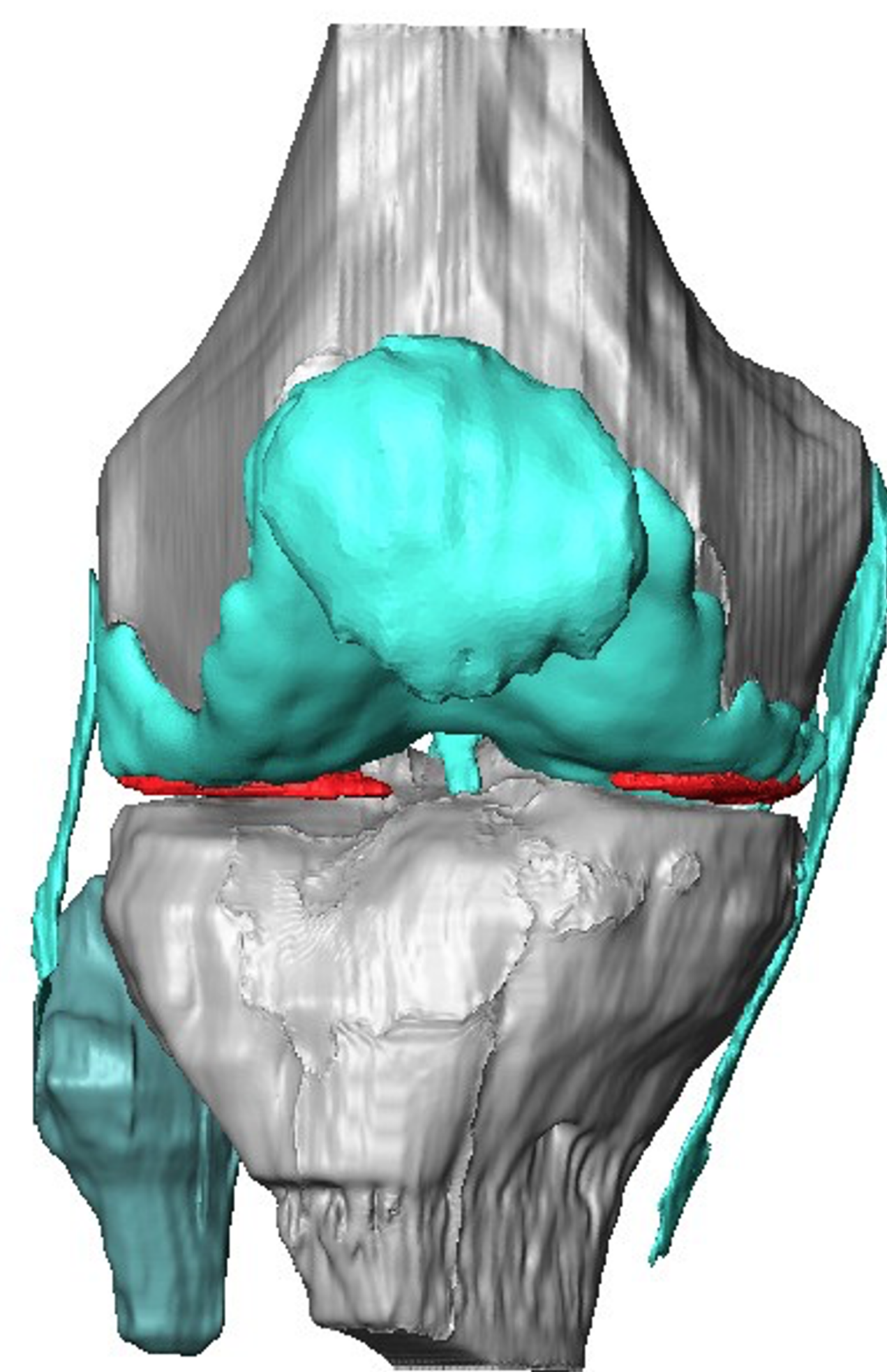


Figure 3: Anterior view of the knee joint created with 3D visualization software

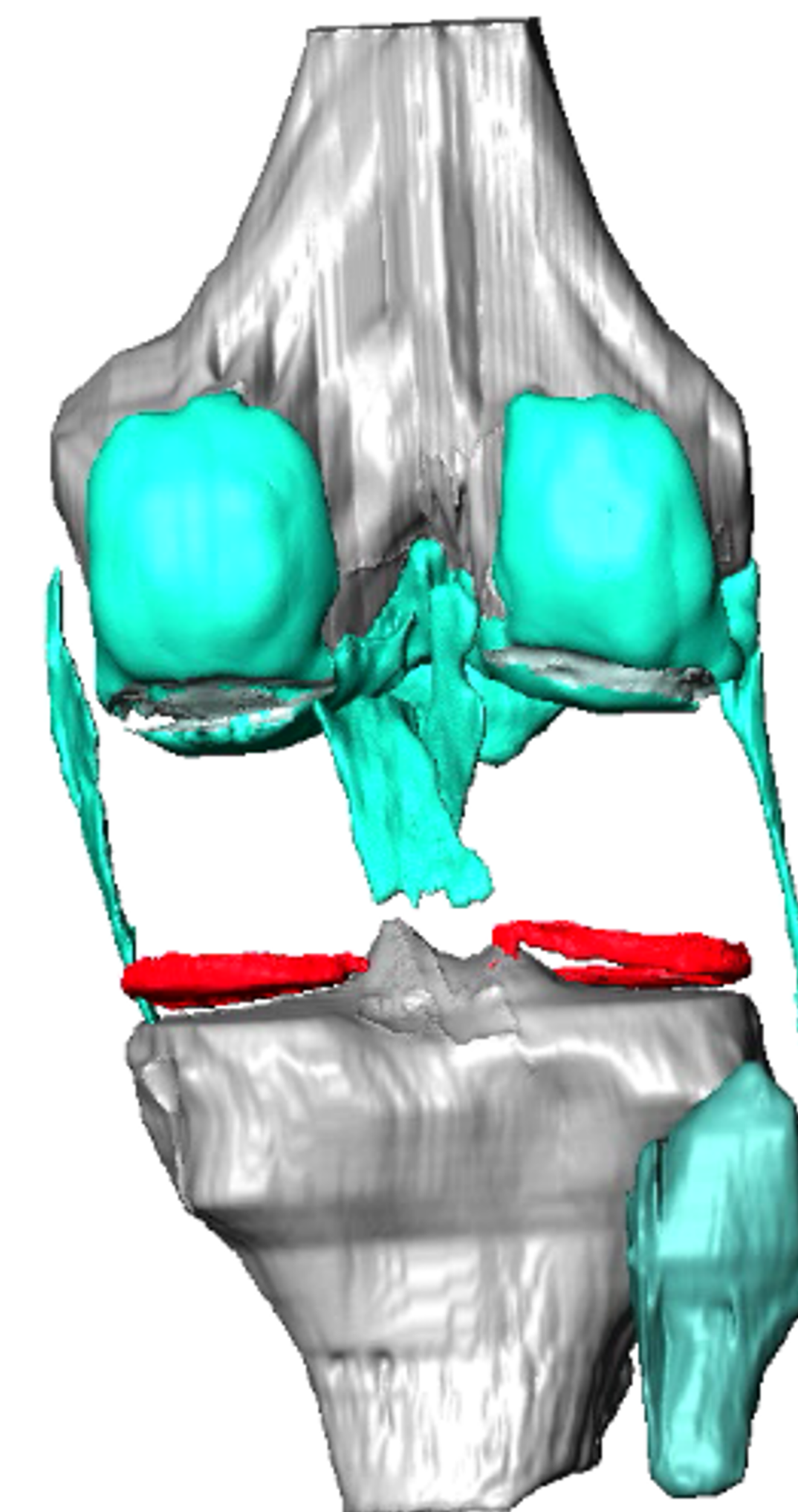


Figure 4: Posterior view of knee joint with femur and tibia theoretically pulled apart using 3D visualization software

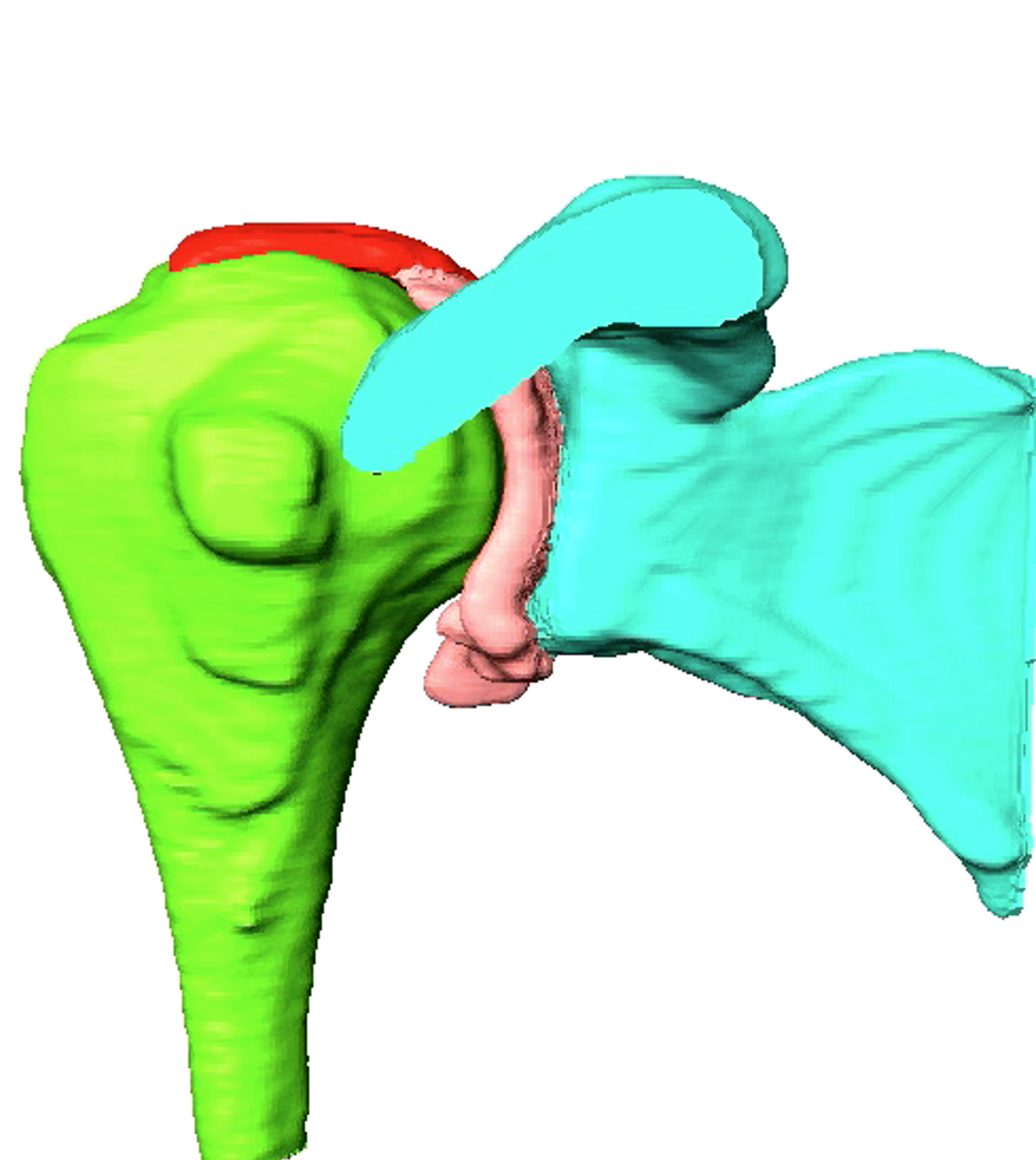


Figure 5: Anterior view of right glenohumeral joint created with 3D visualization software

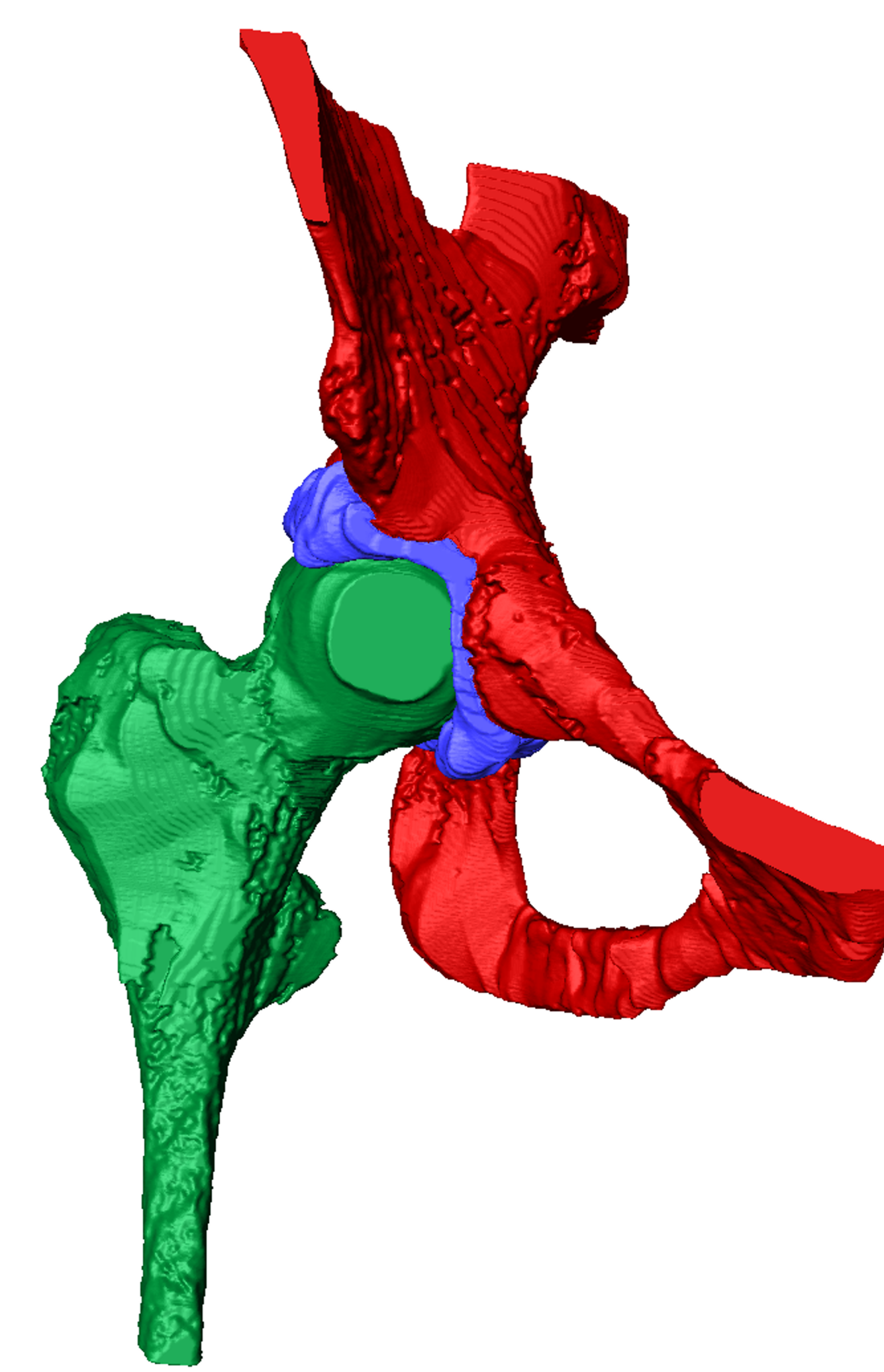


Figure 6: Anterior view of right hip joint created with 3D visualization software

Results

SLAP tears occur when the humerus is abducted and externally rotated. This usually occurs during sports involving overhead throwing or swinging motions.

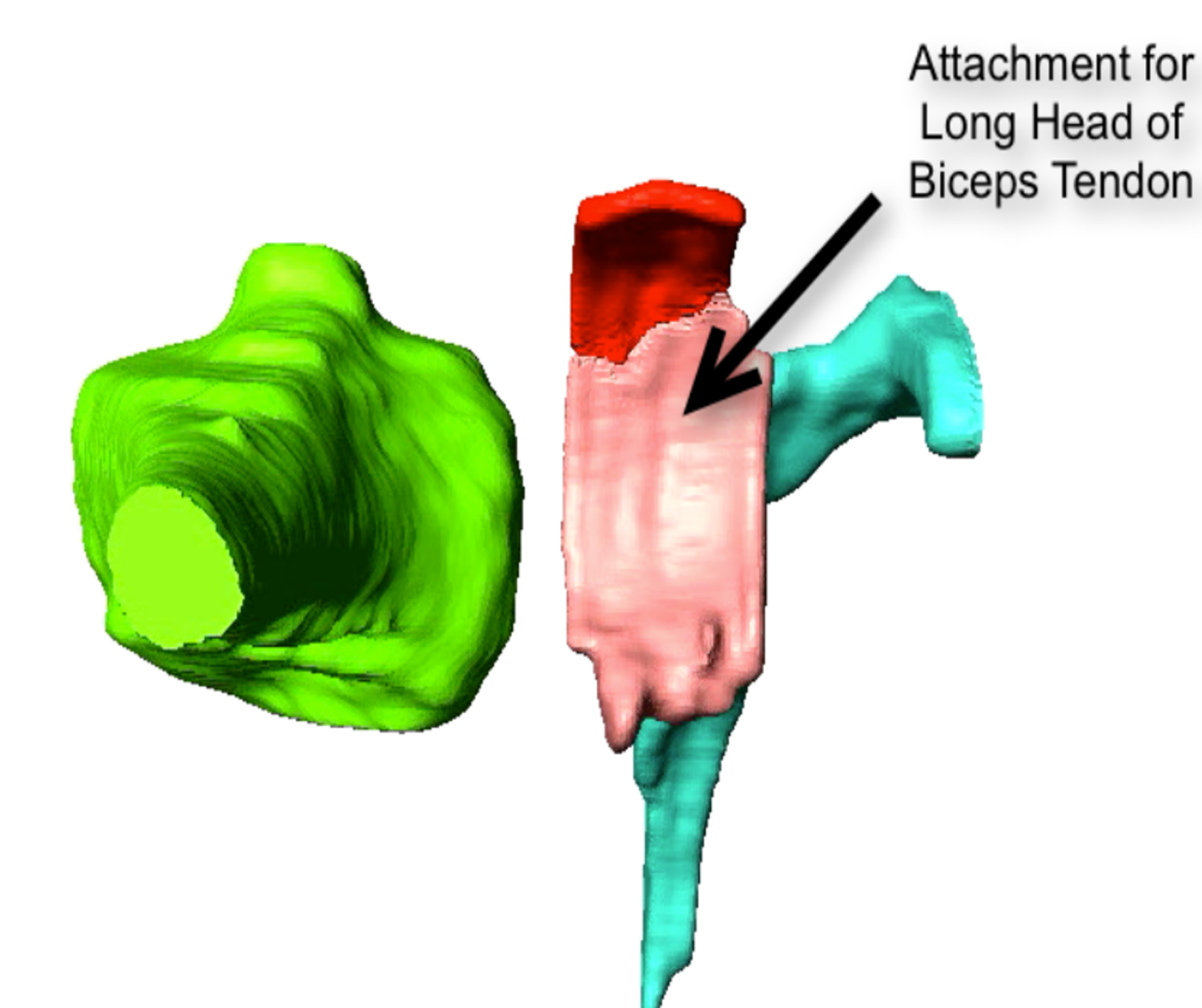


Figure 7: 3D model of SLAP tear

Terrible Triad

A Sad Triad is a tear to the ACL, MCL and the medial meniscus. This occurs when a large lateral contact force applied to the outside of the knee with a planted leg.

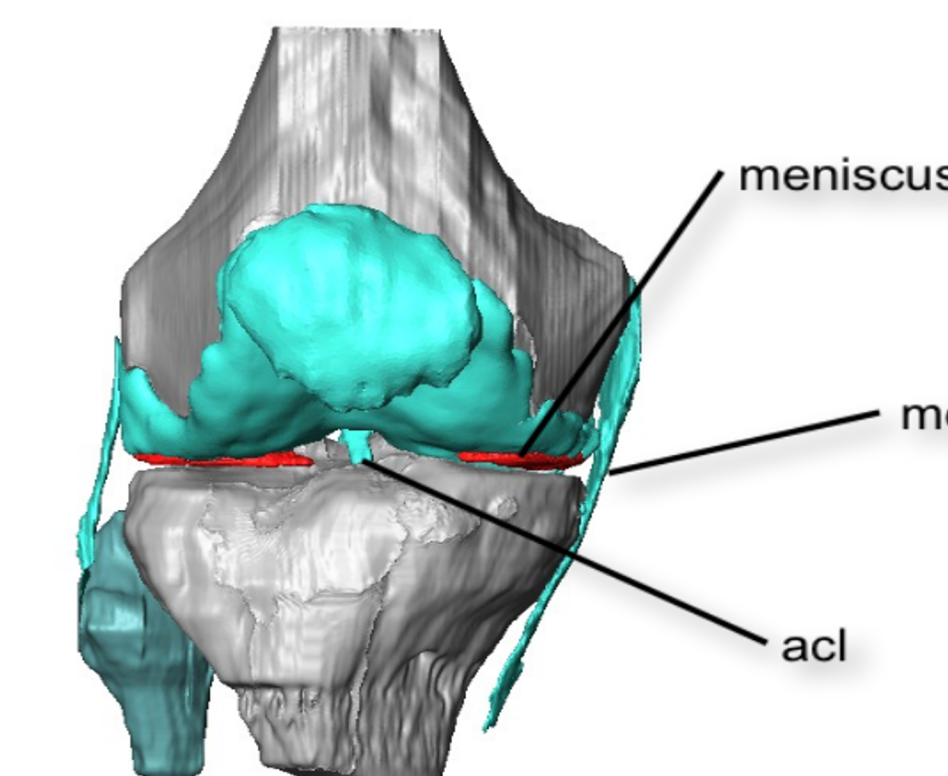


Figure 8: 3D model of terrible triad

Conclusion

The intention of this study was to demonstrate the usefulness of 3D visualization and how it can be used in patient education. Specifically, the final video products use this technology to help educate young athletes on the risks of sports, anatomy, and prevention of injury.

Future Direction

Ultimately, the team would like every juvenile athlete to watch an educational video, similar to that of the final product made in this study, that outlines their risks before making an informed decision on whether to participate in their sport. 3D printing these models could allow patients to get their hands on these structures to better conceptualize their functions.