



# Baseball *Research*

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## Computer Simulation of Tommy John Surgery offers Improved Surgical Technique

Several modifications to the original Tommy John Surgery have been introduced. An important aspect of the surgery requires creation of bone tunnels to place the graft. Poor bone tunnel placement can result in catastrophic complications such as a fracture of the bone or poor healing and functioning of the reconstructed ligament. To improve the understanding of

Tommy John Surgery Dr. Christopher Ahmad utilized sophisticated research methodology developed at Columbia Orthopedics Biomechanics Laboratory that allows surgical simulation. Tommy John Surgery was simulated using imaging information from actual baseball players requiring surgery.

Three different modifications of Tommy John Surgery were analyzed. The findings concluded that humeral and ulnar tunnel angles, starting points, and diameters affect tunnel length, distance from the articular surface, and bone bridge size in Tommy John Surgery. Maximal humeral tunnel length is achieved by starting central or lateral to the midpoint of the epicondyle,



### Christopher S. Ahmad, MD

Dr. Christopher Ahmad studied mechanical engineering at Columbia University setting a foundation to become an expert in ligament injuries. He trained with Dr. Frank W. Jobe, the inventor of Tommy John Surgery and now practices sports medicine at Columbia University. He is the Chief of the Sports Medicine Service and the Head Team Physician for the New York Yankees. He has been researching and performing elbow surgery in baseball players for over twenty years and has published over 100 articles related to Tommy John Surgery

# Applying Research to Improve Patient Outcomes

“Tommy John Surgery was simulated using computer techniques using information from real Tommy John Surgery was simulated using computer techniques on the information from real baseball players requiring surgery | baseball players requiring surgery.”

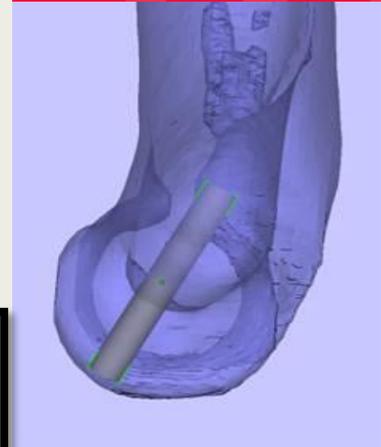


angulated 30 degrees to the humeral axis in the sagittal plane and 15 degrees in the coronal plane. A reasonable goal tunnel depth should range from 15 to 20 mm. This research used for

the first time computer models to guide Tommy John Surgery technique by indicating tunnel placement for maximizing the bone bridge and tunnel length.

Byram IR, Khanna K, Gardner TR, **Ahmad CS**. Characterizing Bone Tunnel Placement in Medial Ulnar Collateral Ligament Reconstruction Using Patient-Specific 3-Dimensional Computed Tomography Modeling. *American Journal of Sports Medicine*, 2013

## COMPUTER SIMULATION



Computer surgical simulation testing used in this research was performed with a customized software that allowed analysis of different Tommy John Surgical techniques.



Figure 1: Tommy John Surgery with docking technique.

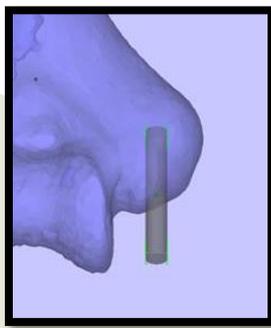


Figure 2: Computer simulation of tunnel creation on an actual patient.

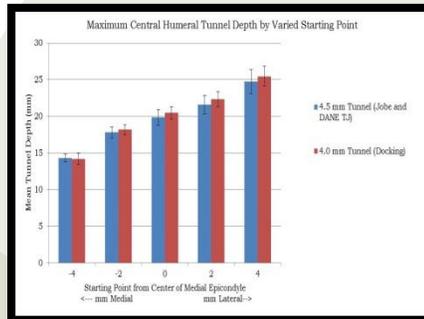


Figure 3: Tunnel length can be optimized with ideal starting point.

To see more research or watch a video of Tommy John Surgery being performed by Dr. Christopher Ahmad, please go to [www.ChrisAhmadMD.com](http://www.ChrisAhmadMD.com)

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