Anterior Collateral Ligament Treatment: BEAR Surgery

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BME 281 First Presentation, November 2, 2016 <john_kearns@my.uri.edu>

This paper will provide a look into recent developments in treatment for ACL tears that could drastically improve post-injury well-being for the patient that sustains a tear. The treatment is called BEAR surgery and would provide an alternative to ACL reconstruction.

I. INTRODUCTION

The ACL (anterior cruciate ligament, pictured below) is one of four ligaments responsible for attaching and providing stability to the tibia and femur. When the ACL is torn, a common injury which occurs to 1 of every 3,000 Americans annually (Davarinos et al.), the knee becomes unstable and weakened. Untreated ACL tears can result in further damage to the ACL-deficient knee; such as, tearing of the meniscus, damage to the other 3 ligaments, and arthritis of the knee. For this reason repair of the knee is necessary, as the ACL does not heal on its own, largely due to poor blood supply to the ACL. The current standard of ACL treatment; however, has a few significant disadvantages. For one it involves shaving off a segment of either the patella tendon or the hamstring, which necessitates the post-surgery rehab of both the ACL and the shaved tendon. Secondly, post-surgery development of tendinitis and osteoarthritis are not uncommon. In fact, 80 percent of ACL reconstruction patients experience osteoarthritis 15 years removed from surgery (Boston Children’s Hospital).

II. METHODS

Pictured below is the current method by which an ACL is reconstructed, using the patella tendon. By this method, the torn ligament is entirely removed. After removing the torn ligament, drill holes are created through the tibia and femur. One-third of the patella tendon is then shaved off along with grafts taken from the bone on each end. (Davarinos et al). The patella tendon along with the bone grafts are then threaded through the drill holes where the bone grafts are screwed into place to ensure stability. The patella tendon now essentially acts as the ACL. In response to the disadvantageous outcomes from ACL reconstruction that I discussed in the introduction, Dr. Martha Murray hypothesized a potential alternative called Bridge Enhanced ACL Repair surgery, BEAR™ for short. Pictured below is an illustration of BEAR™ surgery. The torn ends of the ACL are salvaged by the surgery. A sponge made of special proteins is placed in between the ends of the torn ligament. The sponge is then injected with the patient’s own blood and the ends are then sutured to the sponge (Murray et al.). Through the clotting process the patient’s blood stimulates the healing of the ligament. Eventually, the healing ligament tissue replaces the sponge and a healthy ACL has been grown. (Boston Children’s Hospital).

III. RESULTS

The use of BEAR™ surgery has gone through two trials, one animal and one human. In the animal trial, 64 pig’s knees were operated on. At the 3, 6, and 12 month marks post-surgery it was found in all instances the pigs receiving the BEAR™ surgery had similar strength as the ACL reconstruction specimens, as well as a lack of the arthritis and cartilage damage found in those who underwent ACL reconstruction (Murray PhD et al.). Furthermore, in a 10 patient human safety trial using patients between the ages of 18-35, it was found that after 10 months each patient had a functional and healthy ACL. Patients were cleared for activity at the 13 month mark (The Boston Globe).

IV. DISCUSSION

Following the successful 10 patient trial, BEAR™ surgery will now undergo a larger phase 2 100 person trial where 2/3 of the patients undergo BEAR™ surgery while the other third undergo traditional ACL reconstruction surgery (The Boston Globe). After the trial is complete, each group will be monitored and compared in terms of rehabilitation speed, post-procedure pain, and signs of postsurgical knee complications such as osteoarthritis, tendinitis, and limitations in flexion and extension. If the BEAR™ surgery compares favorably or is just as satisfactory as traditional ACL reconstruction, it will likely undergo more extensive trials as it makes its way towards FDA approval.

References


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