Study Suggests Changes In Rotator Cuff Surgery Rehabilitation Needed

A new Hospital for Special Surgery study suggests that the current rehabilitation used for patients undergoing tendon-bone repairs such as rotator cuff repair may be partially to blame for the high rates of failed healing after surgery. Experiments in a rat model of this injury suggest that immobilizing the limb for four to six weeks after surgery, rather than quickly starting physical therapy, improves healing.

"Before we did this study, we thought that delaying motion for a short period of time, seven to ten days, and then starting physical therapy would be the most beneficial to tendon healing. However, from the data in this study, it appears we should be immobilizing our patients for longer periods of time," said Scott Rodeo, M.D., principal investigator of the study and co-chief of the Sports Medicine and Shoulder Service at Hospital for Special Surgery (HSS) in New York City.

Carolyn Hettrich, M.D., MPH, who was an HSS resident when she conducted the study, will present the study July 14 at the annual meeting of the American Orthopaedic Society for Sports Medicine (AOSSM), held in Baltimore.

The rotator cuff is a set of a four small muscles in the shoulder that allow the upper arm to rotate. When a rotator cuff is torn, the tendon part of the muscle tears away from the bone of the upper arm. During a repair surgery, a surgeon reattaches the tendon to the bone and a surgery's success is dependent on how well the interface between the tendon and bone heals. Studies have shown that 20%-40% of patients undergoing rotator cuff surgery have failed healing. These patients have poorer outcomes, including decreased strength and decreased range of motion.

Rehabilitation after rotator cuff surgery usually consists of immobilizing the shoulder in a sling for seven to ten days, physical therapy with passive and assisted motion for six weeks, followed by physical therapy with active motion for six weeks. However, there is little data on the optimum rehabilitation program, and clinicians recognize there is a delicate balance between minimizing movement after surgery to protect the repair and allowing movement to prevent joint stiffness.

To explore the timing of post-operative rehabilitation, investigators at HSS conducted experiments using a rat model of patellar tendon injury and repair. The investigators used a small metal frame to hold the joint in place and then used a specially designed motorized device to precisely apply loads of strain. One group of rats received a low load 50 times per day (analogous to a leg extension with no weight), another group received a moderate load 50 times per day and a third group had their joint immobilized for the entire study period. The animals were studied at 4, 10, 21, and 28 days.

The researchers found that rats that had their joint immobilized had the best healing with significantly less fibrocartilage or scar tissue than rats in the other two groups. Scar tissue is weaker than original tissue, and oftentimes scar tissue forms at the interface between bone and tendon during tendon repair surgery. The rats that were immobilized also had better connective tissue organization, higher load to failure, better bone mineral density, and fewer dead cells in the area that was operated on. During the healing and inflammatory process, there is a regeneration and remodeling of tissues, which sometimes involves cell death that can lead to inflammation.

"Very surprisingly, all of the data supported immobilization. The biomechanics, the histology, everything," said Dr. Hettrich. "The rats that were immobilized and didn't have any load through that period of healing did the best. This study suggests that we might want to consider immobilizing human patients for a little bit longer to let some of the post operative inflammation calm down, because excess inflammation might be having a harmful effect."

The investigators suggest that the best path to recovery for patients undergoing rotator cuff surgery might be to keep individuals in slings for six weeks and then start with passive motion therapy. However, studies are needed in humans to test this hypothesis and make firm clinical recommendations.

Dr. Hettrich is now an assistant professor of orthopedics in sports medicine at the University of Iowa. Dr. Rodeo's laboratory will be presented with the Cabaud award for the study at the annual AOSSM meeting. The award is given to the best basic science/laboratory research paper at the meeting.

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