CHAPTER 33

Acute Achilles Tendon Ruptures: Evidence-Based Medicine

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INTRODUCTION

The primary goal when treating acute Achilles ruptures is to regain optimal function for the patient, and return them to their preinjury level. There are many questions on how best to achieve this. Recent studies have shown more comparable results between surgical and nonoperative care, but there are several considerations when deciding the best treatment plan for your patient.

TENDON HEALING AND BENEFITS OF MOTION

Tendons are composed of an extracellular matrix (ECM) that contains tenoblasts and tenocytes (1). Tenoblasts are immature tendon cells that mature into tenocytes, and tenocytes are involved in synthesizing collagen and all components of the ECM. They have a lower metabolic activity, and lower nucleus-to-cytoplasm ratio in comparison to tenoblasts (2). This lower metabolic activity results in slower healing after an injury (3). The ground substance of the ECM surrounding the collagen and tenocytes is composed of proteoglycans, glycosaminoglycans, glycoproteins and other small molecules (2).

The overlapping phases of tendon healing are inflammation (first week), proliferation (weeks 2-8), and remodeling (6 weeks to 12 months) (4). The inflammatory phase consists of an influx of erythrocytes and inflammatory cells entering the site of injury. Phagocytosis of necrotic materials occurs in the first 24 hours when monocytes and macrophages predominate. Type III collagen synthesis is then initiated by angiogenesis and tenocyte proliferation (5). Collagen III synthesis peaks, and water content and glycosaminoglycan concentrations are high during the proliferation stage. The remodeling phase can be divided into a consolidation and maturation stage (6). The consolidation stage (6 to 10 weeks) consists of the tenocytes and collagen fibers becoming aligned in the direction of stress, and a greater proportion of type I collagen is produced during this stage (7, 8). The maturation stage (after 10 weeks) consists of the tendon tissue changing from fibrous tissue to a more scar-like tissue (7), and there is a decline of tenocyte metabolism and tendon vascularity during the final part of this stage (9).

There have been many benefits associated with early tendon loading shown in animal studies including improvement of biomechanical properties of scar tissue, decreased adhesion formation, and enhanced tendon gliding (10, 11). Early mobilization increases collagen and ECM synthesis by tenocytes that can improve tensile strength, elastic stiffness, weight and cross-sectional area of tendons (12). An animal study comparing effects of post rupture mobilization versus immobilization showed histological evidence of increased blood vessel, fibroblast, and new collagen formation with mobilization (13). Immobilization decreases the water and proteoglycan content of tendons, and causes tendon atrophy. However, due to the low metabolic rate and vascularity of tendons this change is slow (14-16).

ACUTE ACHILLES TENDON RUPTURE TREATMENT

A clinical practice guideline for the treatment of acute Achilles tendon ruptures was released in 2010 by the American Academy of Orthopaedic Surgeons (AAOS) (17). A consensus was reached on 2 of their 16 recommendations. They recommended that a detailed history and examination be performed on patients with suspected Achilles tendon rupture, and that operative treatment be approached with caution in patients who are over the age of 65 years or have concomitant medical problems (diabetes mellitus, smoking, sedentary patients, obese patients [body mass index >30], patients with neuropathy, peripheral vascular disease, local/systemic dermatologic disorders, and the immunocompromised). Early postoperative protective weight bearing and using protective devices that allow for postoperative mobilization were moderate-strength recommendations (17).

In a meta-analysis study performed in 2012 (18), the lowest rerupture rates were found in the operatively managed groups whether with cast immobilization (3.4%) or with functional bracing (5.0%). Randomized controlled trials (19-21) comparing cast immobilization with accelerated rehabilitation had a rerupture rate of 3.3% in the accelerated rehabilitation group, and an 11.4% rerupture rate in the cast immobilization group. The authors attempted to assess functional outcomes, but could not due to multiple scoring tools, incomplete data recording, and a variety of definitions of activity.

Open surgical care has been associated with higher risks of wound infection, altered sensation, and adhesions in comparison to nonoperative care (18). Percutaneous surgical tendon repair was noted to have fewer postoperative

infections versus open repair, but did not offer a significant reduction in the rerupture rate. It is also noted that sural nerve injuries were not significantly higher with percutaneous repair; only 1 (1.1%) of 88 participants experienced altered sensation along the sural nerve distribution in the percutaneous repair group (18).

The optimal rehabilitative treatment program has yet to be established. The Swansea Morriston Achilles Rupture Treatment (SMART) Programme was introduced in 2008, and this year an article summarized the outcome of the program (22). Since 2011, operative management was recommended in patients that met the following criteria: were younger than 55 years, had a complete rupture in the body of the tendon, and had greater than a 1 cm gap of the tendon on passive plantarflexion. An ultrasound examination was performed on the day of diagnosis or the following working day. The conservative group was placed in a full weight-bearing equinus cast with a wedge in a position that opposed the tendon ends. Surgical patients were placed in a nonweight-bearing posterior splint for the first 2 weeks following surgery. Starting at 2 weeks, the rehabilitation program was identical in gradually bringing the patient to a neutral position from weeks 2 to 9, and allowing them to fully weight bear as tolerated. Unrestricted motion was allowed at week 9, and patients were able to return to sports as tolerated at approximately 6 to 8 months. The overall rerupture rate was 1.1% (3 of 273); 2 were managed conservatively. There were a total of 15 symptomatic deep vein thrombosis (DVTs) and 5 symptomatic pulmonary embolisms (PEs); the conservative group had 11 DVTs and 4 PEs. The authors noted that success of the protocol required a high level of commitment, manpower, and dedication that would be difficult to provide in a standard clinic (22).

In 2014, a blinded randomized controlled study (23) was performed comparing nonoperative treatments. Inclusion criteria included: treatment had to be initiated within 4 days of injury, and patients had to be between the ages of 18 and 60 years. Patients were excluded if they were not able to follow nonweight-bearing protocol secondary to severe obesity, had a previous Achilles tendon injury, or had received corticosteroid injections within 6 months. Both groups started controlled early motion at the third week following injury, and one group was allowed immediate weightbearing versus the other group being nonweight-bearing until 7 weeks following their injury. Their overall rerupture rate was 9% (5 of 56), with 3 occurring in the immediate weight-bearing group. There were no significant differences in sick leave, return to sport activities, or in their functional assessment. No DVTs were noted.

A prospective, randomized controlled study (24) with 10 or more years of follow up was recently published comparing 2 postoperative regimens after an Achilles tendon rupture repair. Full weightbearing was allowed in both groups after 3 weeks, and one group was allowed to perform early motion in a below-knee dorsal brace that limited dorsiflexion to neutral while the other group was cast at 90 degrees for 6 weeks. Similar clinical outcomes and isokinetic strengths were noted in both groups (24).

In conclusion, there are several considerations when performing treatment for acute Achilles ruptures. Currently, studies have shown comparable results with both surgical and nonoperative care. However, there are still many questions when considering which treatment plan to use. There is no standard protocol that has been established as the gold standard, and further studies are required before definitive treatment recommendations can be made. Ultrasound evaluation should be considered in nonoperative treatment, and a high level of commitment, patient education, and team work is required for nonoperative functional rehabilitation to be effective.

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