

# Promotion of Tibial Tendon-Tunnel Healing Following ACL Reconstruction

## *Simple, Low Profile Fixation Technique*

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A variety of methods have been utilized to reconstruct a torn anterior cruciate ligament (ACL). Several have promoted the use of a patellar tendon bone-tendon-bone graft, but this technique requires removal of bone from the kneecap, often resulting in anterior knee pain. In contrast, the use of a soft tissue graft has become a reproducible option because of improvements in fixation techniques.

The use of a soft tissue graft may prove more challenging, however, due to slower tendon-tunnel healing and earlier stress at the fixation sight, resulting in potential slippage of the graft construct and loss of stability. However, a simple, low profile fixation technique is currently available that provides the following advantages in soft tissue ACL graft reconstruction:

- Promotion of Early Tendon-Tunnel Healing
- Resists Graft Slippage
- Prevents Tunnel Widening

### Early Tendon-Tunnel Healing

Healing of the tendon to the tunnel wall is more of a concern with a soft tissue graft because it heals slower than a bone plug during the first several weeks of implantation.<sup>1</sup> Also, healing is more challenging in the tibia when compared to the femur due to softer bone and increased fat found within the bone marrow. This requires the use of an improved fixation technique that resists graft slippage. Several strategies can be utilized to promote early tibial tendon-tunnel healing.

**Long, Snug Tunnel** The healing of a tendon graft is stronger and stiffer when the tunnel is lengthened and the fit is snug.<sup>2</sup> This requires fixation of the graft at the end of the tibial tunnel, not inside, to increase tunnel length. The use of a bone dowel further increases the snugness of fit.

**Circumferential Healing** Circumferential healing between the tendon and tunnel wall allows the entire surface area of the tunnel to heal to the graft (Figure 1), resulting in a stronger construct. In contrast, intratunnel fixation, such as the interference screw, results in one-sided healing of the tendon to the tunnel wall<sup>3</sup> (Figure 2).

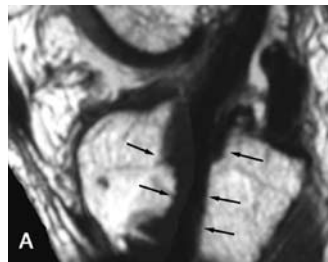


Figure 1

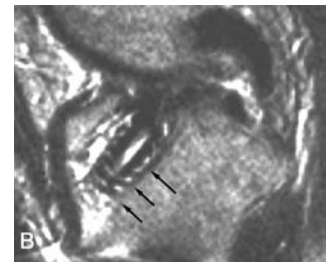


Figure 2

**Biologically Active Substance** Finally, it is important to surround the tendon graft with a biologically active substance to promote accelerated healing. Wrapping periosteum around the graft and adding bone morphogenetic protein accelerates the healing process.<sup>4,5</sup>

### Slippage Resistance

It is important to utilize ACL graft fixation devices that engage cortical bone at the distal end of the tibial tunnel in order to provide high stiffness and resist future slippage of the graft. It is equally important to maintain the length of the graft construct after initial fixation, further requiring the use of fixation devices that resist slippage during cyclical loading. Those fixation devices which engage cortical bone, versus intratunnel devices that purchase cancellous bone, are more effective in preventing graft slippage.

### Limiting Tunnel Widening

Concern over expansion of the tibial tunnel, which may complicate revision surgery, following ACL reconstruction requires the use of a fixation technique that limits tunnel widening. The use of a bone dowel has been shown to substantially reduce tunnel expansion to that of the cross-sectional area of the reamer<sup>6</sup> (Figure 3). Ninety percent of patients who underwent ACL graft construction with this technique had little to no expansion at 1 – 2 years follow-up.

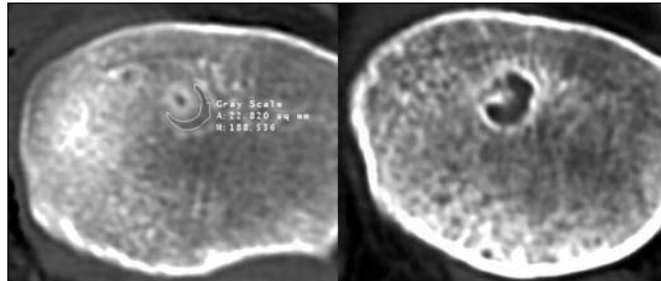


Figure 3

### Design Rationale

The WasherLoc™ Tibial Fixation Device used in conjunction with a bone dowel promotes early tendon tunnel healing, resists slippage, and prevents tunnel widening. The WasherLoc™ Tibial Fixation Device is a multispiked washer with four long peripheral spikes, designed to engage cortical bone (Figure 4). Shorter spikes engage the soft tissue graft. The component is available in two lengths (long and standard) and three diameters (14mm, 16mm, and 18mm), allowing matching of the diameter of the washer to the graft.

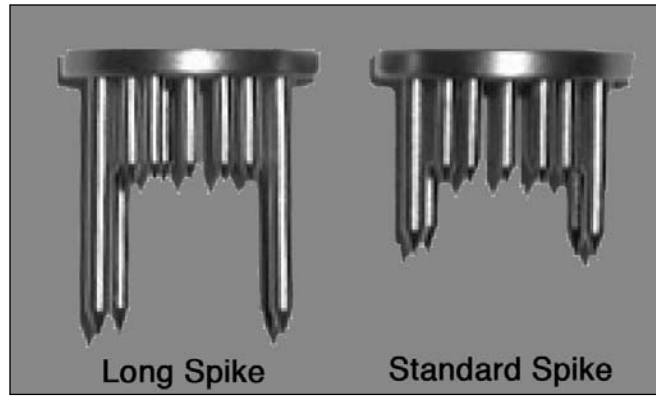


Figure 4

This design has demonstrated superior clinical and biomechanical performance.<sup>7,8,9</sup> The site of component fixation is at the distal end of the tibial tunnel (Figure 5), resulting in a long tunnel, promoting circumferential healing, and superior slippage resistance of the graft construct.

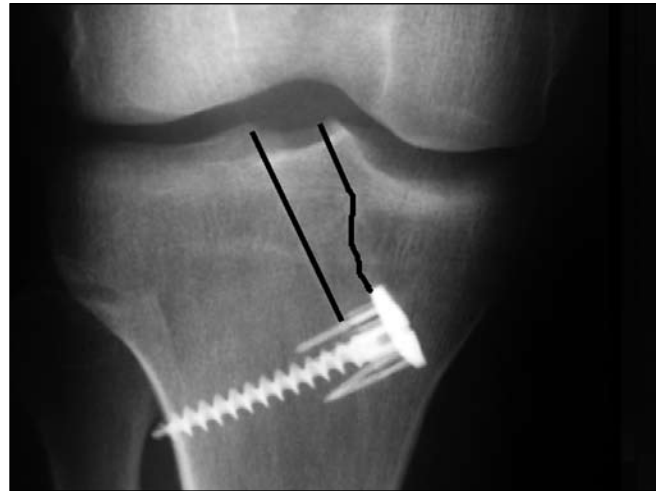


Figure 4

### Summary

The WasherLoc™ Tibial Fixation Device utilized with a bone dowel provides a simple, low profile fixation technique for soft tissue ACL graft construction. This technique promotes early tendon tunnel healing, resists slippage, and prevents tunnel widening. Significant is the placement of the graft fixation site at the end of the tibial tunnel, which does not interfere with the biologic formation of the interface between the tendon and the tunnel wall. In contrast, those devices utilizing intratunnel fixation, such as the interference screw, may not adequately resist slippage and prevent circumferential healing.

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