

Hamstring Graft Preparation Using a Modified Rolling Hitch Technique

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Abstract: Anterior cruciate ligament reconstruction using double-looped hamstring autograft is a common procedure in orthopaedic practice. However, during placement of the running, locking stitches at each end of the harvested tendons, the surgeon may face several potential obstacles, including the risk of damaging the tendon, predisposing the surgeon to needle-stick injury, and extended time consumption. We report a modified rolling hitch technique for hamstring graft preparation that is quick, cost-saving, and needleless as an alternative method. The original rolling hitch technique uses a traditional knot that attaches a rope to an object; the modified rolling hitch technique was created by adding 1 more turn before finishing with a half-hitch, which may prevent suture slippage off the tendon, thus providing sufficient fixation of the suture-tendon construct.

Anterior cruciate ligament reconstruction using double-looped hamstring autograft is a common procedure in orthopaedic practice. Whipstitching the ends of the semitendinosus and gracilis tendons has long been advocated for both harvesting and preparing the tendon graft to permit adequate tensioning of the graft.¹ However, placement of the running, locking stitches at each end of the harvested tendons can be time-consuming, and there are several potential disadvantages that require particular attention, such as the risk of damage to the tendon when the needle passes through the tendon graft, which predisposes the surgeon to needle-stick injury while sewing the stitches. In response, a number of needleless suture techniques to provide adequate traction for subsequent graft tensioning have been proposed.^{2,3} These cost-effective techniques reduce both exposure to needles and the amount of time necessary for the placement of the

stitches. The hamstring graft preparation technique proposed in this article is quick, saves costs, and is needleless.

Surgical Technique

The suture technique proceeds with a first wrap around the tendon graft at about 1 cm from the end and brings the working suture limb toward the direction of pull (Fig 1). Then, a second wrap is made around the tendon graft to complete a round turn, followed by a third wrap around the tendon graft, as with the second wrap (Figs 2 and 3). The wraps of these 3 round turns should progress toward the desired direction of pull. The working suture limb should then be crossed over the other limb away from the direction of pull (Fig 4). Finally, the surgeon completes the procedure with a half-hitch by making a turn around the tendon graft and passing the working suture limb over itself (Figs 5 and 6). The surgeon snugs the hitch around the tendon graft before pulling on both suture limbs to tighten the suture knot (Fig 7, Video 1).

Discussion

The rolling hitch, which refers to 2 round turns and 1 half-hitch, is a traditional knot to attach a rope to an object. It is designed to resist lengthwise pull movement along an object by the mechanics of compressing an object within the locking loops to decrease the radius of the locking loop when tensile forces are imparted on the rope along a longitudinal direction of pull.⁴ We adapted this technique for both the harvesting and

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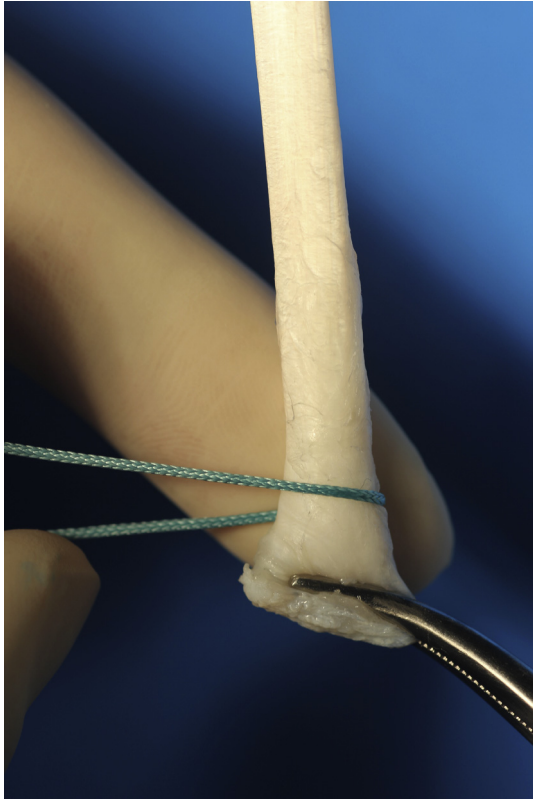


Fig 1. The technique begins by wrapping the suture line around the tendon graft and bringing the ends of both strings toward the operator.

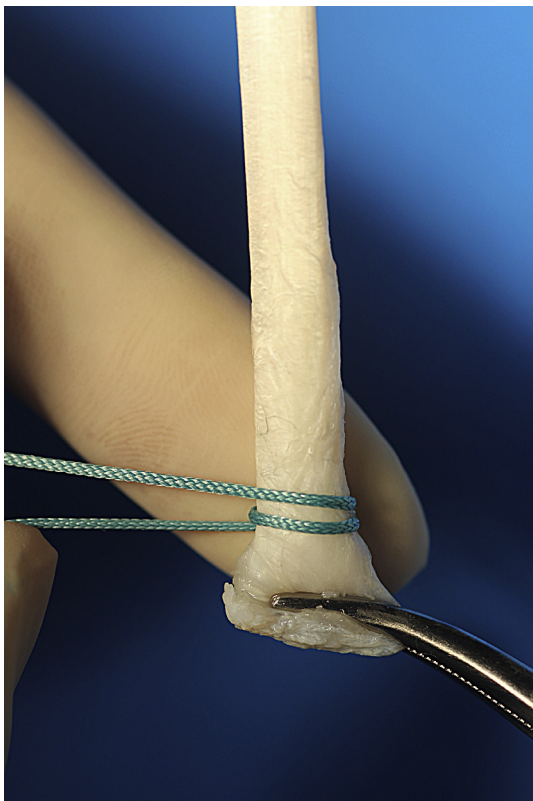


Fig 2. The surgeon uses his or her right hand to make a complete loop around the tendon graft.

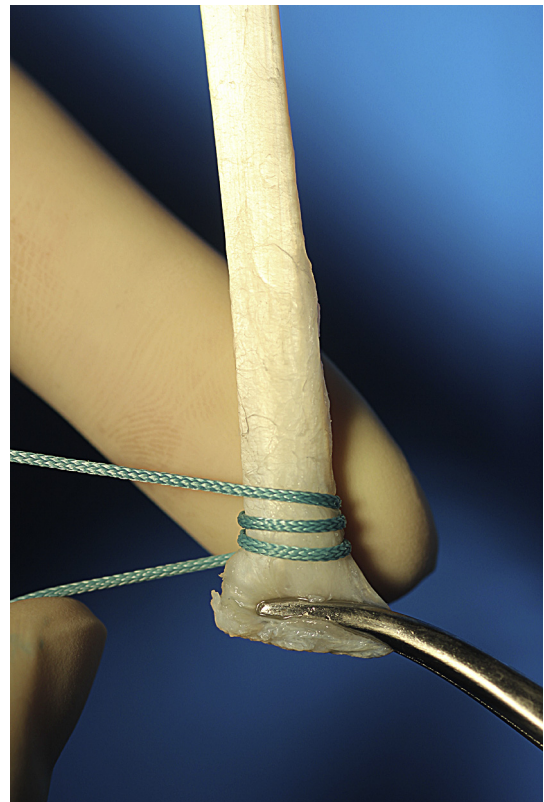


Fig 3. Another loop is added around the tendon graft. Our modified rolling hitch differs from a traditional rolling hitch by completing 2 loops instead of 1.

preparation of autograft gracilis and semitendinosus tendons for tensioning quadrupled hamstring tendon grafts during anterior cruciate ligament reconstruction. We modified the rolling hitch by adding 1 more round turn before finishing with a half-hitch, which may provide extra grip capacity by providing more contact area between the thread surface and the tendon to ensure the security of the configuration and thus decrease the amount of suture slippage off the tendon.

Several needleless suture loop techniques have been proposed in recent years for harvesting and preparing hamstring tendons. These techniques are cost-effective and can reduce the exposure to needles and decrease the time required to harvest and prepare the graft as compared with conventional whipstitching techniques. Martin and Falworth² presented the loop-the-loop traction suture technique, which creates a looped knot around the end of the graft by passing a suture loop twice around the tendon and tightening. This technique seems to be quick and simple and can be used with both open and closed tendon strippers. Wittstein et al.³ presented a suture loop technique that passes the free ends of the suture over the tendon and through the looped end of the suture, after which a second loop is created and the free suture ends are passed around the tendon and through the second loop and tightened. This technique provides adequate

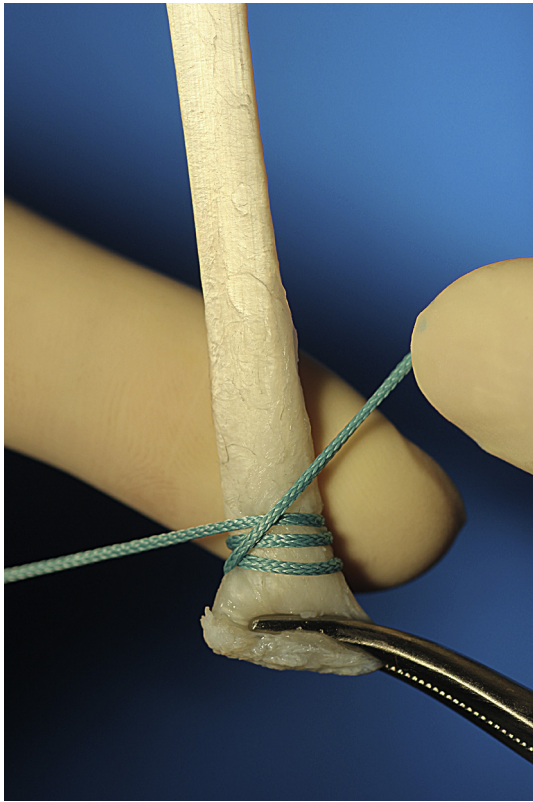


Fig 4. The suture line is pulled in the opposite direction so that it crosses over the previous 2 loops.

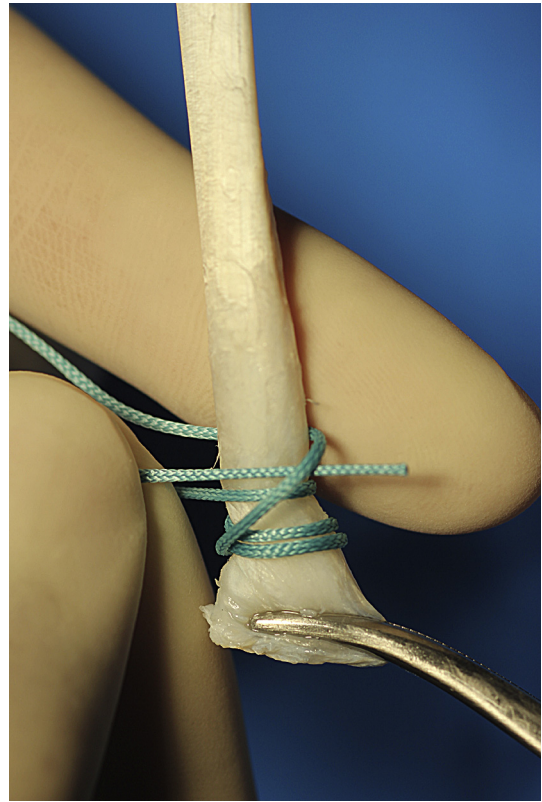


Fig 6. The working suture strand is passed underneath the loop.

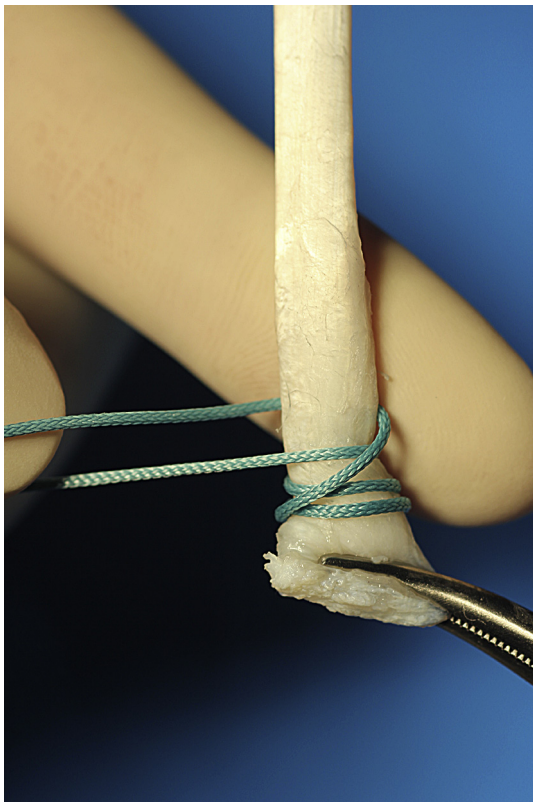


Fig 5. The procedure is completed with a half-hitch by making a turn around the tendon graft.

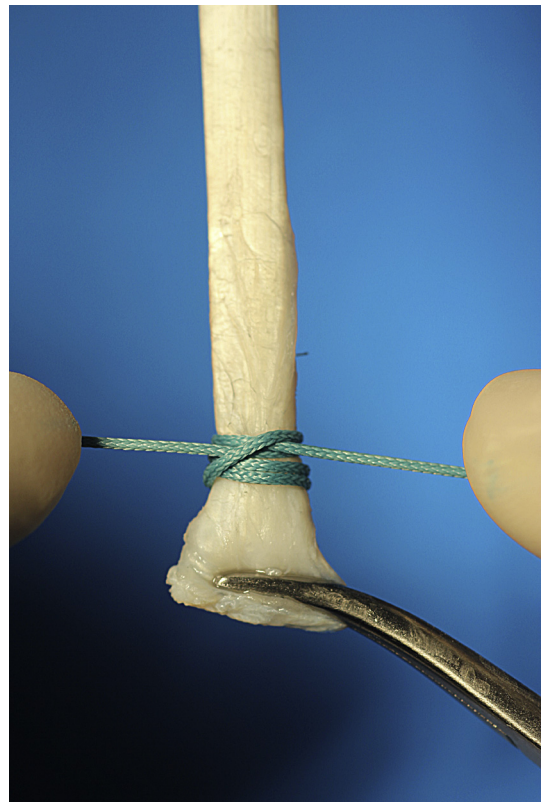


Fig 7. The surgeon snugs the loops together and pulls on both suture strands to secure the knot.

fixation to apply tension to the tendons as needed and can be applied to any tendon harvest or graft harvest.

The modified rolling hitch suture technique, which is needleless, safe, and quick, is an alternative to the commonly used whipstitch technique during preparation of the hamstring autograft in ligament reconstruction.

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