

Endoscopic Gastrocnemius Intramuscular Aponeurotic Recession



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Abstract: Gastrocnemius aponeurotic recession is the surgical treatment for symptomatic gastrocnemius contracture. Endoscopic gastrocnemius recession procedures has been developed recently and reported to have fewer complications and better cosmetic outcomes. Classically, this is performed at the aponeurosis distal to the gastrocnemius muscle attachment. We describe an alternative endoscopic approach in which the intramuscular portion of the aponeurosis is released.

Gastrocnemius contracture can lead to various problems, including Achilles tendinosis, flatfoot, lower-back pain or strain, knee hyperextension (genu recurvatum), plantar fasciitis, midfoot pain or arthritis, metatarsalgia, posterior tibial tendon insufficiency, osteoarthritis, and foot ulcers.¹⁻⁴ Gastrocnemius recession surgery is performed if the symptomatic contracture cannot be eliminated with stretching exercises. The aim of surgery is to weaken or eliminate the gastrocnemius muscle's plantar-flexor action on the foot.⁵ Classically, this is performed as an open procedure. The level of recession can be either at the gastrocnemius aponeurosis distal to the gastrocnemius muscle attachment⁶⁻⁸ or at the anterior surface of the muscle-bound portion of the gastrocnemius aponeurosis.^{5,9-12} Endoscopic gastrocnemius recession procedures have been developed recently and reported to have fewer complications and better cosmetic outcomes.^{1,2,13-23} The endoscopic techniques have mostly used an endoscopic approach of the Strayer type of gastrocnemius aponeurosis recession. We describe an alternative endoscopic approach in which the recession is at the intramuscular portion of the gastrocnemius aponeurosis.

Technique

The patient is supine with the legs spread. A thigh tourniquet is applied to provide a bloodless surgical field. A towel roll is put under the ankle to free the calf from the table. The distal border of the gastrocnemius muscle is palpated and marked. The medial portal is located on the medial side of the calf and 3 cm proximal to the distal border of the gastrocnemius muscle. It is ideal if the portal incision is made over the interval between the gastrocnemius and soleus muscles (Table 1). This can be identified by flexion and extension of the knee, keeping the ankle in dorsiflexion. The gliding of the gastrocnemius muscle over the soleus muscle can be palpated. A 1.5-cm medial portal incision is made (Fig 1). Blunt dissection of the subcutaneous tissue is performed with a hemostat, and the deep fascia is incised open. The plane between the aponeuroses of the gastrocnemius and soleus muscles is identified. If the plantaris tendon can be identified, it is cut at this point. A 4.0-mm 30° arthroscope (Dyonics; Smith & Nephew, Andover, MA) is inserted through the medial portal, and the correct plane is confirmed if both the gastrocnemius and soleus intramuscular aponeuroses can be assessed by rotating the arthroscope anteriorly and posteriorly, respectively. The arthroscope is advanced laterally through this plane until the lateral borders of the gastrocnemius and soleus intramuscular aponeuroses are reached. The arthroscope is removed, and the arthroscopic cannula (Dyonics; Smith & Nephew) is left in situ. A Wissinger rod is inserted through the arthroscopic cannula and penetrates the deep fascia of the lateral calf. The lateral portal incision is made at the exit point of the rod. The cannula is then advanced along the rod and exits through the lateral portal incision. The rod is removed, and the arthroscope

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Table 1. Pearls for Endoscopic Gastrocnemius Intramuscular Aponeurotic Recession

1. The portal incisions should be placed over the interval between the soleus and gastrocnemius muscles.
2. To avoid penetration of the instruments into the muscle bellies, the arthroscopic cannula should pass through the portals in the intermuscular plane under arthroscopic guidance.
3. To minimize postoperative bleeding and pain, it is important to avoid excessive cutting of the muscle fibers.
4. It is important to ensure release of the medial and lateral edges of the aponeurosis to achieve complete aponeurotic recession.

is inserted into the cannula. The arthroscope is then withdrawn, and a retrograde knife (Smith & Nephew) is inserted through the lateral portal under arthroscopic guidance until the midpoint of the gastrocnemius intramuscular aponeurosis is reached. The aponeurosis is penetrated by the knife, and the lateral half of the aponeurosis is released by the retrograde knife. After completion of the lateral half of the aponeurosis, the arthroscope is advanced again to the lateral portal. Penetration into the gastrocnemius or soleus muscle can be avoided by arthroscopic guidance. After the arthroscope passes through the lateral portal incision, the arthroscope is removed, and the Wissinger rod is inserted into the cannula again (Fig 2). The cannula is removed, and the rod is left in situ. The cannula is inserted along the rod through the lateral portal. The rod is then removed, and the arthroscope is inserted into the cannula. The retrograde knife is inserted and advanced through the medial portal under arthroscopic guidance until the medial end of the lateral cut of the gastrocnemius intramuscular aponeurosis is reached (Fig 3). The medial half of the aponeurosis is released by the retrograde knife. The ankle is in dorsiflexion with the knee extended. The even separation of the cut

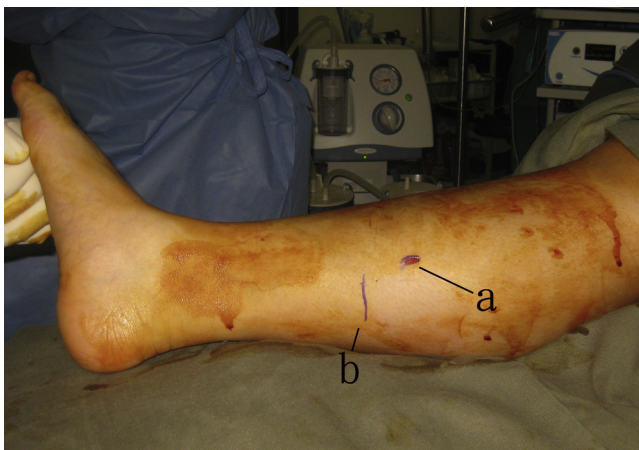


Fig 1. Endoscopic gastrocnemius intramuscular aponeurotic recession in a right leg. The medial portal (a) is made about 3 cm proximal to the distal border of the gastrocnemius muscle (b).

edges of the aponeurosis confirms completeness of the gastrocnemius intramuscular aponeurotic recession (Video 1).

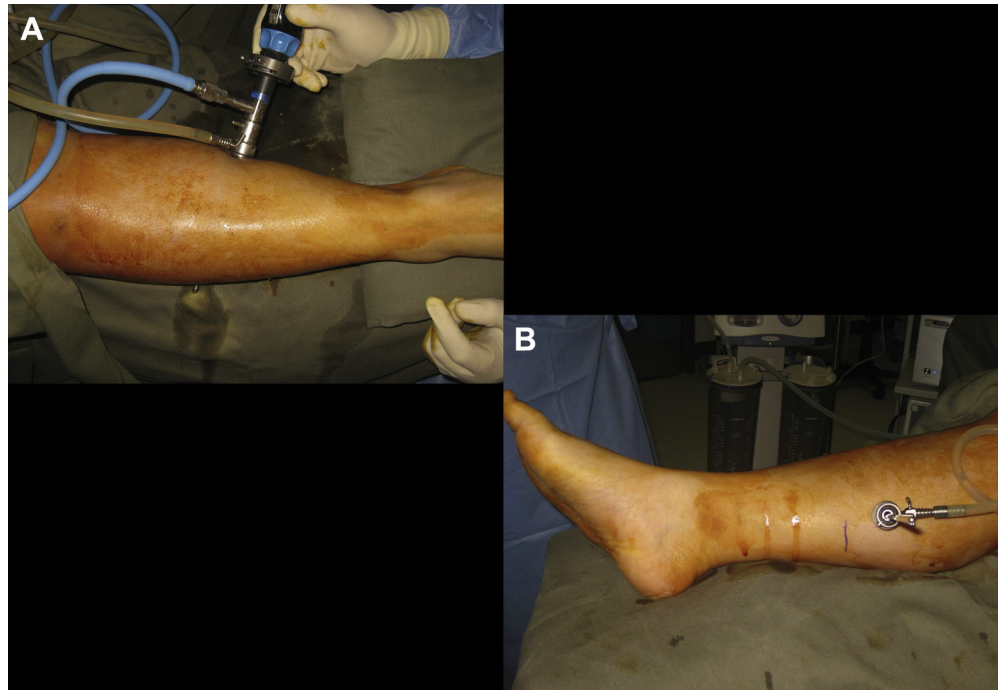
If combined soleus-gastrocnemius intramuscular aponeurotic recession is planned, the arthroscope can be turned 180° to visualize the soleus aponeurosis. The procedure can be repeated to release the soleus intramuscular aponeurosis (Fig 4). Postoperatively, the patient is instructed on full-weight bearing walking and gastrocnemius stretching exercises.

Discussion

Endoscopic gastrocnemius aponeurosis recession procedures allow release of the gastrocnemius aponeurosis under arthroscopic visualization through small portal wounds. The reported techniques target the exposed inferior portion of the aponeurosis that is not directly covered by muscle.^{1,2,13-23} The portal incisions should be placed accurately at the level of the muscle-void portion of the gastrocnemius aponeurosis. Otherwise, the wounds would need to be extended, and the goal of “minimal incision surgery” is defeated. Different surface landmarks have been used to locate the muscle-void portion of the gastrocnemius aponeurosis, including the distal border of the gastrocnemius muscle,^{19,20} the fibula length,²⁴ and the medial malleolus.¹⁹ However, the location where the gastrocnemius aponeurosis joins the soleus aponeurosis and the length of the muscle-void portion of the gastrocnemius aponeurosis can be variable, and the gastrocnemius muscle can even insert directly onto the tendinous superficial surface of the soleus.⁹ Therefore intraoperative identification of this portion of the aponeurosis by surface landmarks is not reliable.

On the other hand, endoscopic recession of the intramuscular gastrocnemius aponeurosis has more constant surface landmarks.²⁵ The level of recession is 3 cm proximal to the distal border of the gastrocnemius muscle, ensuring that the intramuscular portion of the aponeurosis is reached even if the gastrocnemius muscle inserts directly onto the tendinous superficial surface of the soleus. This approach preserves the insertion of the gastrocnemius, allowing for both an intramuscular and aponeurotic lengthening.^{5,10} It can lessen the force applied by the gastrocnemius muscle on the foot without entirely decommissioning the muscle’s biomechanical influence.⁵ In contrast to the Strayer-type endoscopic gastrocnemius aponeurosis recession, preservation of the gastrocnemius insertion allows the gastrocnemius to maintain a “weakened” effect on the foot and the amount of calf atrophy will be diminished.¹⁰ Moreover, the sural nerve will be protected by the gastrocnemius muscle during endoscopic recession of the muscle-bound portion of the gastrocnemius aponeurosis, and the risk of iatrogenic sural nerve injury will be lessened.^{10,21} Furthermore, the palpable

Fig 2. Endoscopic gastrocnemius intramuscular aponeurotic recession in a right leg. The visualization portal is switched from medial to lateral. (A) The arthroscope is advanced to the lateral portal. (B) The arthroscope is removed, and a Wissinger rod is inserted into the cannula.



(if not visible) gap at the site of recession that is frequently noted after Strayer-type endoscopic gastrocnemius aponeurotic recession will be covered by the gastrocnemius muscle in this endoscopic gastrocnemius intramuscular aponeurotic recession.²⁵ However, it can be difficult to identify the interval between the soleus and gastrocnemius muscles, especially in

obese patients. The placement of the medial portal incision may not be at this interval, and the portal incision may need to be extended to identify the plane between the muscles. Moreover, some of the muscle fibers are cut during aponeurotic release, and more postoperative pain and bleeding may occur as compared with Strayer-type endoscopic gastrocnemius

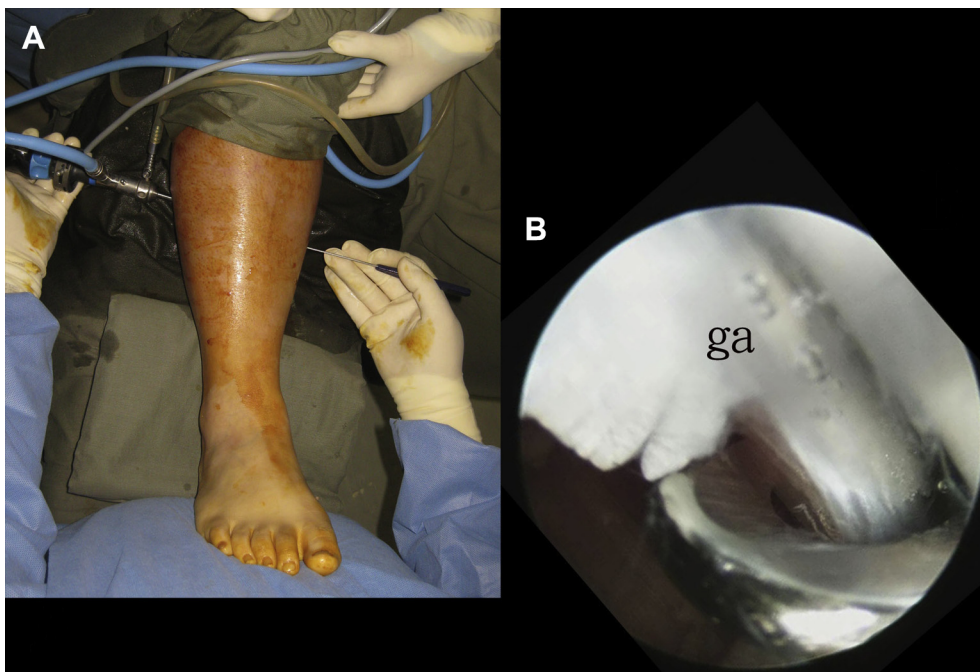


Fig 3. Endoscopic gastrocnemius intramuscular aponeurotic recession in a right leg. (A) Release of the medial half of the aponeurosis. (B) Arthroscopic view of the reach of the medial end of the lateral gastrocnemius aponeurotic recession (ga).

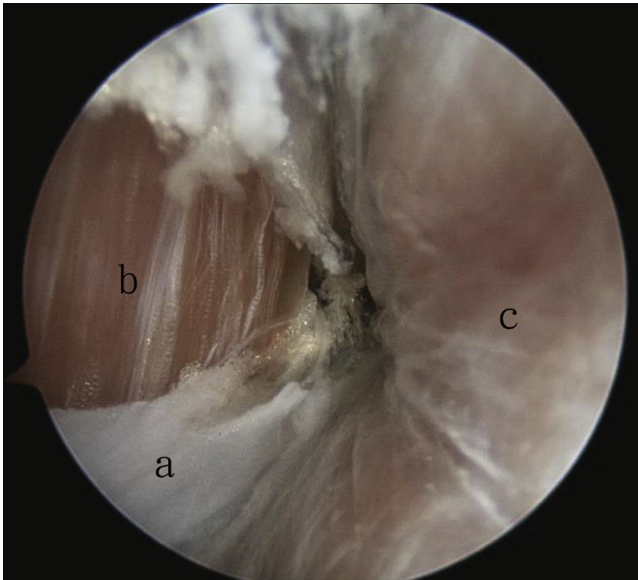


Fig 4. Endoscopic gastrocnemius intramuscular aponeurotic recession in a right leg, showing arthroscopic view with visualization through medial portal. Release of the soleus aponeurosis (a) with the soleus muscle (b) exposed. The gastrocnemius aponeurosis is already released with the gastrocnemius muscle (c) exposed.

aponeurotic recession. Supervised postoperative gastrocnemius stretching exercises are advisable. Finally, gastrocnemius-soleus intramuscular aponeurotic recession may be indicated in patients with spastic diplegic cerebral palsy.¹¹ This can be performed through the same portal incisions.

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