A gastrocnemius recession is a practical and effective procedure to address an equinus deformity. It has been shown that an equinus deformity may lead to the development of plantar fasciitis, osteoarthritis and foot ulcerations. There have been multiple approaches described, however we have focused on two, the open and the endoscopic. Both are viable options, but as with any surgical technique there are associated complications. The purpose of this review was to evaluate and compare these postoperative complications.

**Methodology & Hypothesis**

A retrospective review of records from 2006 to 2016 was performed at the University of Florida – Jacksonville. A total of 75 patients underwent a gastrocnemius recession yielding a total of 81 procedures performed. Of the 75 patients, only one who underwent an endoscopic gastrocnemius recession did not meet the inclusion criteria due to the inability to follow-up. Thus the study population consisted of 80 gastrocnemius recession procedures in 74 patients with an average follow-up period of 12.8 months. This was then stratified revealing 41 open gastrocnemius operations (39 patients; average age 49.6 years old, range 11 to 77) and 39 endoscopic gastrocnemius recessions (35 patients; average age 50.7 years old, range 24 to 68).

**Procedure**

Open gastrocnemius recession was performed utilizing a linear incision over the medial aspect of the gastrocnemius aponeurosis. The site of incision was estimated at a location approximately 2 cm distal to the musculotendinous junction. All neurovascular structures were retracted. A metzenbaum scissors was then used to make a transverse incision from medial to lateral while an assistant maintained a dorsiflexory force on the foot. The incision site was copiously irrigated with sterile saline and closed using vicryl suture for deep closure and either 3-0 nylon or staples for skin closure.

Endoscopic gastrocnemius recession was performed by utilizing a 1cm incision through the skin approximately 2cm distal to the contour of the musculotendinous junction and approximately 2-fingerbreadths medial to the tibial crest over the aponeurosis. A small curved hemostat was used for blunt dissection to subcutaneous tissues. Using a freer elevator in the created portal, a proper tissue plane was verified. Using an EGR kit, we inserted the cannula and trocar from medial to lateral just superficial to the aponeurosis. The trocar was removed and a uniportal 4.0mm or 2.7mm endoscope was inserted from medial to lateral. Once there were no neurovascular structures identified in this plane, the hook blade was deployed and cautery was performed while retracting from lateral to medial. The aponeurosis was transected while an assistant maintained dorsiflexory force on the foot. As the aponeurosis is transected the underlying muscle belly was seen bulging through. Upon removal of the blade and arthroscopy the incision was irrigated with sterile saline and saturated with 3-0 nylon.

**Literature Review**

Although an endoscopic gastrocnemius recession is a novel technique to address a gastrocnemius equinus, this modality has been previously utilized to address other ailments such as carpal tunnel syndrome and plantar fasciitis. Palmer et al. revealed a quicker recovery of grip strength and wrist range of motion as well as an earlier return to work associated with the endoscopic carpal tunnel release. Similarly, endoscopic plantar fasciotomies have been shown to have a faster return to activity. Choy et al. performed a comparison in outcomes after endoscopic versus open plantar fasciectomy which demonstrated that patients who underwent an endoscopic plantar fasciectomy experienced significantly greater improvements in the subjective and objective functional outcomes, with less pain and greater satisfaction. The single portal endoscopic gastrocnemius recession technique was first detailed by Trevino & Panchbavi in 2002. They expanded upon their work with a retrospective study revealing the initial incision for portal entry was placed incorrectly in 2 of 31 procedures (6.5%) and that recession could not be accomplished in 1 of 31 procedures (3.2%). A superficial wound infection was noted in one patient (3.2%). Similar to their cadaver study, there was no damage noted to the sural nerve nor was there any damage noted to the Achilles tendon. This subsequent study revealed a statistically significant improvement in pain, stiffness, swelling and the overall average score with the endoscopic technique. A two portal technique was initially described by Tahijian et al. in a cadaver study. They initially found an 83% transaction rate of the gastrocnemius aponeurosis, but with technique modification, they demonstrated 90% of the clamping tendon margins with hemostats converting the natural curve of the gastrocnemius into a more linear segment, complete transaction rate increased to 100%. The sural nerve was only definitively identified in 5 of 15 specimens (33%) however sural nerve injury only occurred in 1 specimen (7%) despite poor visualization. So complete transaction may be obtained, but visualization of the sural nerve is poor with risk of iatrogenic nerve injury. Subsequent endoscopic gastrocnemius recession studies have demonstrated a successful increase in ankle dorsiflexion and decrease in morbidity.

**Results**

Open gastrocnemius recession procedures in 74 patients with an average follow-up period of 12.8 months. This was then stratified revealing 41 open gastrocnemius operations (39 patients; average age 49.6 years old, range 11 to 77) and 39 endoscopic gastrocnemius recessions (35 patients; average age 50.7 years old, range 24 to 68).

Overall post-surgical complications developed in a total of 10 (12.5%) of the 80 procedures; nine procedures (22%) had associated complications from 41 open gastrocnemius recessions and nine procedures (22%) had associated complications from 41 open gastrocnemius recessions with a resultant complication (2.6%) occurred from 39 endoscopic gastrocnemius recessions. In regards to the complications associated with the open gastrocnemius recession: 1 scar pain (2.4%), 5 surgical site dehiscences (12.2%), 1 infection (2.4%), 2 calf abcesses (4.9%), 2 nerve injuries (4.9%). Two patients from this group suffered more than one post-operative complication. One patient was afflicted by both a surgical site dehiscence and sural nerve injury. An additional patient in this group was affected by a surgical site dehiscence and iatrogenic injury to the sural nerve. No complications in regards to the complications associated with the endoscopic gastrocnemius recession: 1 dehiscence (2.6%) occurred. The rate of post-surgical complications was significantly lower in the endoscopic gastrocnemius recessions compared to open gastrocnemius recessions (p-value=0.015).

**Analysis & Discussion**

The advantages of performing a gastrocnemius recession have been known for many years, but only recently has this procedure been described through an endoscopic approach. As can be expected with any new technique, there is a paucity of literature and as such limited evidence to support performing this procedure endoscopically. Even though sparse, recent studies have indicated superiority of the endoscopic technique as it allows for direct visualization, earlier return to function and better cosmesis. Similarly, studies comparing the outcomes of endoscopic versus open release of plantar fascia and carpal tunnel have demonstrated superiority with the endoscopic technique as it was shown to decrease recovery times and morbidity.

To our knowledge this is the first study to retrospectively compare post-operative complication rates associated with open versus endoscopic gastrocnemius recessions at a single institution. When comparing the two techniques we found the increased frequency of complications associated with the open technique to be of statistical significance. Our study emphasizes the benefits associated with the endoscopic technique such as minimal dissection, reduced postoperative morbidity and its potential cost-effectiveness. The addition of the endoscopic technique to the surgeon’s armamentarium is apparent and may prove even more beneficial when addressing gastrocnemius equinus in those who are at the greatest risk of suffering the associated complications.

Weaknesses of our study include that we did not consistently obtain preoperative and postoperative ankle joint dorsiflexion and thus this complication was not included. Another weakness with this study is the short follow-up period. The two podiatric surgeons responsible for a majority of the cases have only been affiliated with the UF Health System for approximately 3 years. Thus future studies will improve the quality of the surgical intervention and will be able to perform this procedure endoscopically. Even as such limited evidence to support performing this procedure endoscopically. Even though sparse, recent studies have indicated superiority of the endoscopic technique as it allows for direct visualization, earlier return to function and better cosmesis. Similarly, studies comparing the outcomes of endoscopic versus open release of plantar fascia and carpal tunnel have demonstrated superiority with the endoscopic technique as it was shown to decrease recovery times and morbidity.

**References**

- Chou ET, Chang JS, Wang CY, Lee TS, Liang KY, Su YC. Endoscopic plantar fasciotomies have shown to be effective and safe with faster return to activity. Chou et al. performed a comparison in outcomes after endoscopic versus open plantar fasciectomy which demonstrated that patients who underwent an endoscopic plantar fasciectomy experienced significantly greater improvements in the subjective and objective functional outcomes, with less pain and greater satisfaction. The single portal endoscopic gastrocnemius recession technique was first detailed by Trevino & Panchbavi in 2002. They expanded upon their work with a retrospective study revealing the initial incision for portal entry was placed incorrectly in 2 of 31 procedures (6.5%) and that recession could not be accomplished in 1 of 31 procedures (3.2%). A superficial wound infection was noted in one patient (3.2%). Similar to their cadaver study, there was no damage noted to the sural nerve nor was there any damage noted to the Achilles tendon. This subsequent study revealed a statistically significant improvement in pain, stiffness, swelling and the overall average score with the endoscopic technique. A two portal technique was initially described by Tahijian et al. in a cadaver study. They initially found an 83% transaction rate of the gastrocnemius aponeurosis, but with technique modification, they demonstrated 90% of the clamping tendon margins with hemostats converting the natural curve of the gastrocnemius into a more linear segment, complete transaction rate increased to 100%. The sural nerve was only definitively identified in 5 of 15 specimens (33%) however sural nerve injury only occurred in 1 specimen (7%) despite poor visualization. So complete transaction may be obtained, but visualization of the sural nerve is poor with risk of iatrogenic nerve injury. Subsequent endoscopic gastrocnemius recession studies have demonstrated a successful increase in ankle dorsiflexion and decrease in morbidity.

**Figure 1:** Rheumatoid arthritis patient 4 months status post OGR