Endoscopic Gastrocnemius Recession vs Open Gastrocnemius Recession: A Meta-analysis Comparing Postoperative Complications

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Statement of Purpose:

Gastrocnemius recession (GR) is a practical and effective procedure to address gastrocnemius equinus. The two most common approaches to gastrocnemius recession are open and endoscopic, yet few studies have directly compared open gastrocnemius recession (OGR) and endoscopic gastrocnemius recession (EGR) in terms of functionality, healing rates, amount of ankle joint dorsiflexion correction achieved and complications encountered postoperatively. In this study, we seek to examine the postoperative complications seen with GR procedures and determine if there is a difference in the rates of complications between OGR procedures vs EGR procedures via a retrospective meta-analysis.

Methodology:

- Search Strategy:
  - Relevant publications were identified by electronically searching the PUBMED database in October 2018
  - Two keywords were used: “Gastrocnemius” AND “Recession”
  - Articles were reviewed for inclusion/ exclusion by two authors (ZJ & DB)
- Inclusion:
  - Clinical studies evaluating effects of GR and reported complications
  - Published in peer-reviewed journal on or after January 1st, 2002
- Exclusion:
  - Review articles
  - Cadaveric studies
  - Studies evaluating patients under age 18 years
  - Studies with level of evidence 5 or a case study
  - Studies solely evaluating a neurological or systemic disease
  - Studies without a minimum mean follow-up time of 6 months

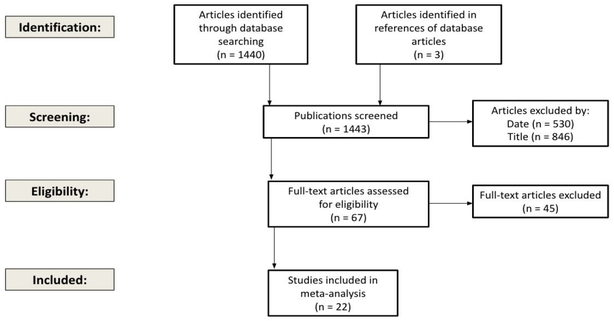

Figure 1. Diagram of article selection process.

Literature Review:

Isolated gastrocnemius and gastrocnemius–soleus contractures are commonly encountered in patients with a variety of foot and ankle pathologies. DiGiovanni et al., reported a symptomatic prevalence of isolated gastrocnemius contracture in 65% to 88% of non-neuropathic patients with midfoot and forefoot symptoms, compared with only 25% in asymptomatic controls. Gastrocnemius contractures have been linked to a variety of foot and ankle pathologies, including plantar fasciitis, Achilles tendinopathy, plantar arch pain, metatarsalgia, plantar ulcerations, and hallux valgus. To address this commonly encountered pathology, the GR has emerged as an increasingly popular treatment modality in recent years. The procedure itself dates back to the 1800s, originally used as a treatment for acquired plantarflexion contractures in pediatric cerebral palsy patients. Vulpius and Stoffel reported the first gastrocnemius recession procedure in 1924, which was later followed by a variation described by Strayer in 1950. Other described techniques include the Baumann proximal medial gastrocnemius release, and, most recently, a single portal endoscopic technique described by Trevino & Panchbhavi in 2002 and a dual portal technique described by Tashjian in 2003.

Results:

- In total 22 articles were included in the final data analysis:
  - Open GR = 13 studies
  - Endoscopic GR = 7 studies
  - Endoscopic & Open GR = 2 studies
- Quality and Level of Evidence
  - 16 Retrospective studies
  - 6 Prospective studies
  - Level of evidence 3 = 2 studies
  - Level of evidence 4 = 20 studies
- Majority of studies reported GR as a concomitant procedure
- Postoperative Complications
  - Twice as likely to have a postoperative complication with OGR procedure vs EGR procedure (12.89% vs 6.87%)
  - Infection rate 9x higher with OGR vs EGR
  - Surgical site dehiscence rate 9x higher with OGR vs EGR
  - CRPS and DVT/ PE complications only seen with OGR procedure
  - Neurological injury common complication for both procedures, but seen slightly less with EGR procedure vs OGR procedure (1.56% vs 2.19%)

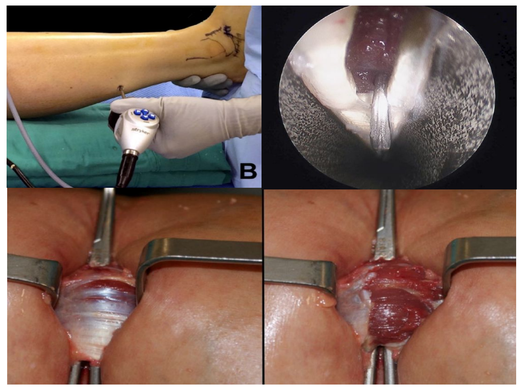

Figure 2. Pictures of incised gastrocnemius aponeurosis from EGR procedure (above), taken from Phisitkul et al. 2014; and OGR procedure (below), taken from Morales-Munoz et al. 2016.

Results Continued:

Endoscopic GR Article	Patients	Limbs	Total # Complications
DiDomenico (2005)	28	31	4
Harris (2018)	35	39	1
Phisitkul (2014)	320	344	11
Saxena & Widfeldt (2004)	15	18	4
Saxena (2007)	47	54	13
Schroeder (2012)	53	60	1
Tallerico (2015)	7	7	0
Thevendran (2015)	54	56	9
Trevino (2005)	28	31	1
Total:	**587**	**640**	**44**

Figure 3. Table of EGR articles with total number of complications per article.

Open GR Article	Patients	Limbs	Total # Complications
Abbassian (2012)	17	21	0
Duthon (2011)	14	17	0
Ficke (2017)	17	18	11
Gurdezi (2013)	9	10	1
Harris (2018)	39	41	11
Holtmann (2017)	55	64	10
Kiewiet (2013)	8	8	0
Maskill (2010)	29	34	1
Messerschmidt (2018)	20	20	2
Molund (2014)	73	73	24
Monteagudo (2013)	30	30	1
Morales-Muñoz (2016)	52	78	1
Rush (2006)	126	150	13
Smith (2018)	25	25	2
Tallerico (2015)	4	4	0
Total:	**518**	**593**	**77**

Figure 4. Table of OGR articles with total number of complications per article.

Complications of Gastrocnemius Recession		
Listed Complications	**Open GR**	**Endoscopic GR**
Limbs evaluated	593	640
Lower Leg Weakness	27	20
Neuritis/Dysesthesia/Neurological Injury	13	10
Cosmetic Issue (i.e. skin furrowing)	8	10
Infection (superficial/ deep/ abscess)	9	1
Dehiscence	9	1
Hematoma	3	2
DVT/PE	4	0
CRPS	3	0
Painful Scar	1	0
Total Complications	77	44
Postoperative Complication Rate	**12.98%**	**6.87%**

Figure 5. Table of specific complications seen in OGR vs EGR.

Discussion:

The most frequent complication seen was lower leg weakness. Phisitkul et al. recommended that proper healing of the tendon combined with supervised physiotherapy for strength may allow for decreased recovery time in loss of plantarflexion strength, which is typically seen over a 3-18 month period post-surgery.

Regarding neurological injury, we defined a true nerve injury in our study as postoperative loss of normal nerve sensation or dysesthesia in the lower extremity that did not resolve during the follow-up period. In our meta-analysis, this resolution of reported nerve injuries was seen 63% of the time with EGR and 35% of the time with OGR. EGR had a slightly lower true neurological injury rate compared to OGR (1.56% vs 2.19%, respectively), but it had a nearly 30% higher resolution of neurological injuries when compared to OGR. Phisitkul et al. stated that a stretching injury of the sural nerve can occur post gastrocnemius recession due to immediate lengthening of soft tissue in the superficial posterior compartment, which can mimic a neurological injury.

Of note, infection and surgical site dehiscence complications were seen nine times more often in OGR procedures vs EGR, while CRPS and DVT/ PE complications were only seen with the OGR procedures. Thus, we concluded that a surgeon is twice as likely to encounter a postoperative complication with an OGR procedure vs an EGR procedure.

Conclusion:

We found the overall rate of postoperative complications in the EGR group to be half that of the OGR group, emphasizing the benefit of using the endoscopic approach. These findings could prove invaluable when addressing gastrocnemius equinus in those with a greater risk of postoperative complications.

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