Morbidity Associated With High Gastrocnemius Recession: Retrospective Review of 126 Cases

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To evaluate morbidity associated with surgical lengthening of the gastrocnemius, medical records were reviewed retrospectively for 126 patients (mean age, 49.7 years; range, 8-78 years) who had undergone open gastrocnemius recession. Ten patients had isolated recession; 116 had gastrocnemius recession with an additional foot or ankle procedure on the ipsilateral limb. During a mean follow-up period of 19 months (range, 6-50 months), all patients were examined for any postoperative complications associated with the recession. Complications were defined as the presence of postoperative infection, wound dehiscence, nerve problems, decreased muscle strength, scar problems, or calcaneus gait (overlengthening). Uncomplicated outcome was defined as absence of all these complications and return to regular activity, both occurring during a follow-up of at least 6 months. Postsurgical complications developed in 9 (6%) of the 126 patients: 6 (4%) had scar problems, 2 (1.33%) had wound dehiscence, 2 (1.33%) had infection, 3 (2%) had nerve problems, and 1 (0.67%) developed complex regional pain syndrome. No patient complained of either a limp or gait disturbance. Neither persistent decrease in muscle strength nor calcaneus gait was seen. These data suggest that the open gastrocnemius recession procedure has low associated morbidity. (The Journal of Foot & Ankle Surgery 45(3):156–160, 2006)

Key words: Achilles tendon lengthening, equinus deformity, gastrocnemius recession

Original studies on gastrocnemius-soleus contracture focused on patients with neurologic or spastic imbalance (1–15). In these patients, long-term sequelae from gastrocnemius-soleus contracture resulted in gait abnormalities and foot and ankle breakdown (2, 16–25). In 1974, Fulp and McGlamry (26) described isolated gastrocnemius lengthening for treatment of a nonspastic equinus deformity, which they linked to such foot conditions as Achilles tendinitis, metatarsalgia, plantar fasciitis, Morton's neuroma, and peroneal tendinitis.

Gastrocnemius contracture leads to a loss of dorsiflexion in the ankle mortise and resultant compensation through the knee and foot (27). Abundant evidence suggests that the deforming force placed on the forefoot and midfoot contributes to clinical problems, such as peritalar subluxation, plantar fasciitis, first-ray hypermobility, lesser metatarsal overload, and Charcot arthropathy (21, 23, 26–28). Since Delpech's early description of tendo Achilles lengthening for treatment of spastic equinus (29), many authors have described surgical lengthening techniques and treatments for gastrocnemius-soleus equinus (9–15, 17, 30, 31) that have resulted in improved gait, decreased muscular imbalance, and a slowed progression of foot deformities (5, 6, 8, 15, 21, 32–34). However, few authors have reported on the morbidity associated with surgical lengthening. In 156 patients treated for spastic equinus, only 1 wound complication and no calcaneus gait (overlengthening) complications were reported (13); we know of no studies reporting complications after treating nonspastic equinus.

Endoscopic techniques have recently been used to perform gastrocnemius recession in an attempt to reduce morbidity associated with open techniques. Tashjian et al (35) reported their results using a 2-portal technique for endoscopic recession of 15 cadaver limbs. Sural nerve injury occurred in 1 (7%) of the 15 specimens, and the authors concluded that visualization of the sural nerve was poor in some specimens and thus possibly risked iatrogenic nerve injury (35). Saxena and Widtfeldt reported on 18 cases of endoscopic gastrocnemius recession. Three of their patients

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had sural nerve complications with this technique (36). In addition, only 1 patient had a complication related to cosmesis. To compare the open technique with the endoscopic approach, we describe morbidity associated with open lengthening of the gastrocnemius aponeurosis in a large number of patients with nonspastic gastrocnemius equinus.

Materials and Methods

Medical charts and electronic databases were retrospectively reviewed for 187 consecutive patients (221 feet) who received high, open gastrocnemius recession—recession of the gastrocnemius aponeurosis just distal to the gastrocnemius myotendinous junction—during the study period, August 1999 through October 2003. The operative technique and postoperative management were applied similarly for each patient by 3 different surgeons (S.M.R., L.A.F., G.A.H.). Operative technique varied slightly with respect to wound closure, given findings of cosmetically problematic scarring among early study patients. Each patient received follow-up clinical examination by the operating surgeon (S.M.R., L.A.F., G.A.H.). Only patients who had at least 6 months of postoperative follow-up were included in this study. The study was exempt from Institutional Review Board review.

In all patients, isolated gastrocnemius equinus was diagnosed by the operating surgeon during range-of-motion assessment of the ankle joint. Clinical assessment of equinus was performed without subtalar and midtarsal compensation as described in previous reports (16, 27, 31). Gastrocnemius equinus was defined as the inability to dorsiflex the ankle beyond perpendicular when the knee was extended, although this degree of ankle dorsiflexion was possible when the knee was flexed. Goniometric evaluation was not used because of user inconsistency and the inability to obtain accurately reproducible results. In our study, diagnosis of gastrocnemius equinus was based on examination results recorded by each surgeon in the medical chart. At each postoperative visit, the operating surgeon collected data on clinical gait evaluation, presence or absence of complications, and ability to return to regular activities. Quantitative gait analysis was not conducted.

Complications were defined as presence of superficial or deep postoperative infection; wound dehiscence; disorders of the saphenous or sural nerve; muscle strength less than 5/5 as determined by manual testing with unassisted toe rise in appropriate cases; and scar problems, including induration around the scar and calcaneus gait. An uncomplicated outcome was defined as return to regular activities and absence of all these complications during a follow-up period of at least 6 months.

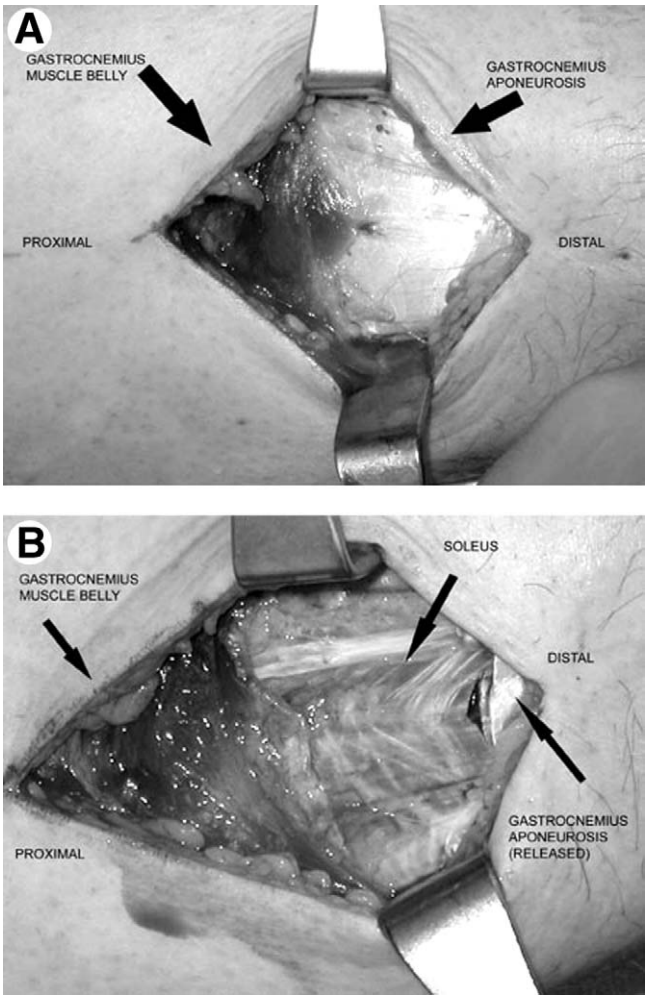

FIGURE 1 Surgical field of high gastrocnemius recession shows medial head of gastrocnemius muscle (*A*) before transection of the aponeurosis and (*B*) after high gastrocnemius recession. Note intact soleus muscle directly beneath aponeurosis. (Reproduced with permission of the author and publisher [Elsevier] from Hamilton GA, Ford LA, Perez H, Rush SM. Diabetic foot salvage with bone resection and tendon balancing—a retrospective review of 10 patients. J Foot Ankle Surg 44:37–43, 2005)

Operative Technique

The surgical technique used was previously described by Strayer (15) and later modified by Hansen (31). The procedure was performed with the patient in the supine position. If an assistant was not available to elevate the leg, the leg was placed on an elevated Mayo stand with the heel padded. A posteromedial approach to the gastrocnemius aponeurosis was used, centered over the distal third of the medial head of the gastrocnemius muscle (Figure 1A). This procedure was routinely performed without tourniquet hemostasis.

Beginning at the inferior aspect of the medial head of the gastrocnemius muscle belly, a longitudinal skin incision measuring 3 to 5 cm was placed medial to midline, avoiding

the sural nerve laterally (the sural nerve is located immediately superficial to the paratenon) and the saphenous bundle medially. Sharp dissection was continued to the crural fascia and paratenon, which was incised longitudinally to expose the gastrocnemius aponeurosis (Figure 1A,). Overaggressive dissection in this area is to be avoided, because it can result in increased scarring and induration of the operative site. The surgeon's index finger was used to bluntly dissect the paratenon free of the gastrocnemius fibers and aponeurosis from the medial to the lateral aspect. After the underlying soleus fascia was identified and separated from the aponeurosis, the gastrocnemius aponeurosis was sharply transected from the lateral to the medial aspect (Figure 1B,). The plantaris tendon also was transected if it was encountered. The foot was gently dorsiflexed during recession. The surgeon allowed for a slide of 1 to 3 cm occurring between the cut ends of the gastrocnemius aponeurosis. The paratenon, subcutaneous tissue, and skin were closed in layers. To avoid postoperative induration, the paratenon layer was reapproximated with 3.0 absorbable sutures, and the skin was closed in a running subcuticular manner.

Postoperative management for isolated recession included use of a removable fracture boot positioned at 90° and worn at all times for 2 weeks. The patient was allowed to bear weight as tolerated while using a cane or crutches. At 2 weeks postoperatively, isometric exercises and calf stretches were started, and the patient was allowed to bear weight without wearing the boot. However, the boot was worn at night for an additional 2 weeks to maintain the lengthened position. Strengthening exercises were initiated at 4 to 6 weeks postoperatively. For patients who received recession as adjunctive treatment, postoperative care was determined by the other procedures performed.

Results

The study included 126 patients (150 procedures) who received postoperative follow-up extending a mean of 19 months (range, 6-50 months); the study excluded 61 patients, for whom follow-up was less than 6 months. There were 43 men and 83 women, with a mean age of 49.7 years (range, 8-78 years). Ten recession procedures were performed as isolated procedures, and 116 recession procedures were performed in combination with other foot or ankle surgery (Table 1).

Postsurgical complications developed in 9 (6%) of the 126 patients (Table 2). In 3 (2%) patients, superficial wound dehiscence occurred without infection. All 3 patients were successfully treated with local wound care. Superficial wound infection developed in 2 (1.3%) of the 126 patients and was successfully treated with oral antibiotic drugs. No deep infection occurred. Sural neuritis developed in 2 (1.3%) patients, both of whom complained of localized pain and were treated with oral gabapentin (neurontin). One patient had complete relief of symptoms and normal sensation over the course of the sural nerve 1 month later, whereas the other patient's symptoms resolved after 3 months. In 1 (0.67%) patient, sural nerve entrapment and complex regional pain syndrome (CRPS) developed. This patient received extensive pharmacologic and multidisciplinary pain management as well as reoperation with nerve transposition, funiculectomy, and epineural closure. Slow improvement was seen in this patient during the next 12 months. When last seen approximately 4 years postoperatively, the patient had returned to work without functional impairment. Saphenous nerve neuropraxia with numbness developed in 1 (0.67%) patient and resolved after 9 months. A patient who had previous polytrauma to the surgical leg and ipsilateral knee arthroplasty lost 300 mL of blood intraoperatively from laceration of a leg varicosity; the vein was ligated, and the patient had no postoperative sequelae. Seven (4.67%) patients complained of an indurated postoperative scar that was cosmetically unsatisfactory. These patients had surgery early in the study period. No patient complained of a painful scar. No hypertrophic or keloid scars were recorded. No patient complained of a limp or gait disturbance, and no calcaneus gait was observed.

TABLE 1 Procedures performed on the ipsilateral foot in 126 patients receiving high open gastrocnemius recession

Type of Procedure	Total No. of Procedures
Isolated recession	18
Plantar fascia release	4
Digital procedure	30
First ray, including Lapidus arthrodesis	71
Lesser metatarsal osteotomy	21
Lesser metatarsal ostectomy	4
Forefoot amputation	3
Midfoot arthrodesis	16
Rearfoot arthrodesis/osteotomy	25
Rearfoot tendon transfer	16
Charcot reconstruction	4
Other	9

TABLE 2 Complications associated with high open gastrocnemius recession in 126 patients

Type of Complication	Total No. of Complications
Nerve problems	4
Wound dehiscence	3
Postoperative infection (superficial)	2
Postoperative infection (deep)	0
Calcaneus gait	0
Weakness	0
Scar problems	7
Other	2

Discussion

We know of no studies evaluating the morbidity associated with open gastrocnemius recession in a large number of patients. The overall complication rate was 6% for our series of patients and included scar and nerve problems, CRPS, wound dehiscence, and superficial infection. The simplicity of this procedure may account for the low rate of complications observed in our series. A higher incidence of scar problems (induration) was observed early in our series. Closure of the paratenon was not used in these patients. Once a layered closure was instituted, particularly of the paratenon, the incidence of scar induration diminished. Nerve-related problems were observed in 4 (2.67%) patients. This result compares favorably with the only recorded study on endoscopic gastrocnemius recession, which reported a 7% incidence of nerve injury (35). One patient in the current series did develop CRPS as a devastating complication that showed slow improvement, but this poor outcome further emphasizes the importance of meticulous dissection to carefully avoid neurovascular structures.

Our original intention was to assess single-limb heel rise in all patients and determine whether recession affected the ability to perform an adequate heel rise postoperatively. This parameter proved too difficult to assess, however, owing to the large number of reconstructive procedures performed in conjunction with recession. Many patients with extensive osseous reconstruction (that is, midfoot arthrodesis) were unable to achieve single-limb heel rise at 6 months postoperatively. The bony component of the reconstruction proved to be the rate-determining factor in each patient's postoperative recovery, such that early capacity for single-limb heel rise could not be assessed. Moreover, many patients who had bony deformity correction were unable to achieve single-limb heel rise preoperatively. In our study population, all patients who received isolated gastrocnemius recession could adequately perform 5 single-limb heel rises at 6 months postoperatively.

A limitation of this study was that data were gathered by simple observation; during data collection or inpatient charting, some observer bias could have occurred. In addition, absolute assessment of equinus is subjective. Therefore, instead of focusing on degree of equinus, our study focused on the morbidity associated with the surgery used to treat this condition.

Conclusion

This study reports a low complication rate for open high gastrocnemius recession in a large patient population. Meticulous dissection and layered closure may provide low morbidity rates and favorable outcome in patients receiving this procedure.

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