Gastrocnemius Shortening and Heel Pain

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KEYWORDS

• Gastrocnemius • Shortening • Contracture • Heel pain

KEY POINTS

- Pain and reduced function caused by disorders of either the plantar fascia or the Achilles tendon are common.
- Although heel pain is not a major public health problem it affects millions of people each year.
- For most patients, time and first-line treatments allow symptoms to resolve. A proportion of patients have resistant symptoms. Managing these recalcitrant cases is a challenge.
- Gastrocnemius contracture produces increased strain in both the Achilles tendon and the plantar fascia. This biomechanical feature must be properly assessed otherwise treatment is compromised.

BACKGROUND

Heel pain is very prevalent.[1,2] Pain, especially after a period of rest, is the main symptom. Reduced ability to walk long distances and inability to participate in exercise and sport are other complaints. Heel pain is classified clinically as either posterior or plantar.[3] Posterior heel pain is most commonly caused by tendinopathy of the noninsertional portion of the Achilles tendon. This pain is associated with sport and is becoming an increasingly common complaint as people continue to exercise into older age.[4–9] Plantar heel pain is most commonly caused by plantar fasciitis. In the

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This article would not be possible without the inspiration of both L.S. Barouk and P. Barouk. Like so many surgeons in Europe, M.C. Solan and M.S. Davies both learned their forefoot surgery skills in Bordeaux, France. It was here that M.C. Solan was so impressed with the proximal medial gastrocnemius release technique that he extended its use to the management of recalcitrant heel pain.
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United States more than 1 million people seek help for this each year.[10] Most cases never come to hospital and are managed in primary care.

There are many different treatments that are used for both plantar fasciitis and noninsertional Achilles tendinopathy. The evidence for many forms of treatment is weak.[1,2] At present the use of formal calf stretching programs is widely considered to be the best first-line treatment of both plantar fasciitis and noninsertional Achilles tendinopathy.[1,11–26] The Achilles has even been shown to recover its normal structure after eccentric stretching.[27] For plantar fasciitis there are additional benefits with stretches to the fascia.[28,29] The mechanism by which these stretches help have not been fully elucidated. What is well established is that calf contracture is associated with a variety of clinical problems in the foot and ankle.[30,31] Laboratory evidence also supports the commonsense assumption that increased plantar fascia strain is seen with increased calf muscle tension.[32] Reducing a calf contracture therefore improves biomechanics.[33,34] For most patients, stretching with physiotherapy supervision is sufficient. If this fails, surgery to address the gastrocnemius contracture has been used in refractory cases of heel pain with good effect.[3,35]

MANAGEMENT OF HEEL PAIN

Optimum management of both plantar fascia pain and disorders of the Achilles tendon requires a thorough clinical assessment and appropriate radiological investigation. Many patients with recalcitrant heel pain have had the condition for years while unsuccessfully trying to improve their symptoms. The patients referred to our Heel Pain Clinic are assessed and most commonly investigated by ultrasonography scan, with color-Doppler capability. A critical part of the clinical assessment is physical examination of the calf muscle complex. There is a strong association between complaints of plantar fasciitis or Achilles tendinopathy and calf contracture. Gastrocnemius contracture in isolation is particularly important in this respect. Once assessed, patients can be divided into groups from their biomechanical profiles and the exact nature of the tendinopathy/fasciopathy. Treatment can be tailored accordingly. Many patients are evaluated, scanned, classified, and then begin their individualized treatment all at the first appointment in this 1-stop clinic.

The first distinction to make clinically is between plantar heel pain and posterior heel pain. The former is commonly caused by plantar fasciitis. Other orthopedic causes include a stress fracture of the os calcis or, less commonly, tarsal tunnel syndrome (**Box 1**). Inflammatory, neurologic, and rare neoplastic disorders must be borne in mind, especially if first-line treatments fail to improve symptoms.

Box 1
Guildford classification of heel pain

1. Posterior heel pain
   a. Tendinopathy of the main body of the Achilles
   b. Insertional tendinopathy
2. Plantar heel pain
   a. Plantar fasciopathy of the calcaneal insertion
   b. Atypical fasciopathy (distal/fibroma)

ACHILLES TENDINOPATHY

Posterior heel pain most commonly arises from the Achilles tendon. Clain and Baxter[36] classified Achilles pain as arising from the insertional portion of the tendon or from the noninsertional region. The distinction is helpful clinically.

Noninsertional Achilles tendon disorder is much more common than insertional tendinopathy. Like tendinopathies around the knee, shoulder, and hip there is degenerative change within the substance of the tendon, thickening of the paratenon, or a combination of the two. Contemporary research emphasizes that tendinopathy is a failed healing response rather than an acute inflammation.

TERMINOLOGY IN ACHILLES TENDON PAIN

Maffulli and colleagues[37] have proposed a logical nomenclature for describing Achilles tendon disorders.[38–40] This nomenclature has reduced the use of many synonyms that have confused the literature. The emphasis is on tendon degeneration and not inflammation (**Box 2**). The clinical presentation of pain, swelling, and impaired function is referred to as Achilles tendinopathy.[37] This terminology may also be used for the rotator cuff, patellar tendon, and other tendons that have painful overuse symptoms.[37,41] The term tendinopathy does not define the underlying pathologic processes causing the symptoms. In a chronic tendinopathy there is no inflammatory response and granulation tissue is rarely seen when tissues are examined in the laboratory. It is for this reason that the term tendinitis should be abandoned.[38]

The molecular biology of tendinopathy is gradually becoming better understood. It is the focus of much ongoing research.[42] Histology studies of tissue from the insertion of the tendon show necrosis and mucoid degeneration rather than inflammatory infiltration.[7,43]

LOCAL ANATOMY

To diagnose the cause of posterior heel pain or swelling arising in the region of the Achilles tendon insertion it is essential to have a thorough understanding of the anatomy (**Fig. 1**).

DEMOGRAPHICS

Achilles tendinopathy is common, but reliable epidemiologic data are not available.[44] An association with athletic training suggests that overuse is one principal cause.[43,45]

Box 2
Nomenclature in Achilles tendon pain

Terminology of Achilles tendon pain

Clinical

1. Tendinopathy: pain, swelling, and reduced function
2. Paratenonopathy: affects paratenon clinically
3. Panatendinopathy: affects both tendon and paratenon clinically

Histologic

1. Tendinosis: mucoid degeneration and collagen disorganization
2. Paratenonitis: hyperemia and inflammatory cells. Fibrosis and thickening. Most common in specimens from younger patients

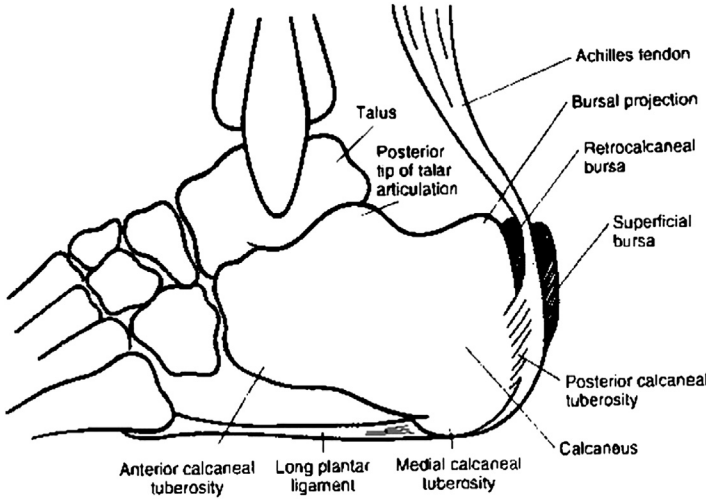

Fig. 1. Posterior heel anatomy. (*From* Stephens MM. Haglund's deformity and retrocalcaneal bursitis. Orthop Clin North Am 1994;25:41–6.)

Young athletes have a lower incidence of Achilles pain than older individuals participating in the same sport.[15,46] However, posterior heel pain can affect sedentary individuals as well.[47,48] It has been noted that older athletes have a higher prevalence of insertional tendinopathy than their younger counterparts.[48] Studies consistently show that noninsertional tendinopathy is 4 times more prevalent than symptomatic insertional tendinopathy (**Fig. 2**).[43,45]

EXAMINATION

Excessive heel valgus with a low medial longitudinal arch and forefoot varus causes overpronation of the foot and secondary Achilles tendon injury.[49] Patients with this planovalgus foot posture invariably have adaptive shortening of the gastrocnemius in isolation, demonstrable using the Silfverskiöld test. This test must be performed with the forefoot held in a position to ensure reduction of the talonavicular joint. If this joint is not reduced then false-negative findings occur, because the heel escapes

Fig. 2. Noninsertional Achilles tendinopathy.

into valgus, which masks the gastrocnemius contracture by shortening the distance between the knee and the Achilles insertion.[50]

INSERTIONAL TENDINOPATHY

This is characterized by posterior heel pain, with tenderness that is maximal in the center of the insertion of the tendon. There is often calcification within the central portion of the tendon and a spur may be seen arising from the middle one-third of the calcaneus on a lateral radiograph.

RETROCALCANEAL BURSITIS

In cases in which there is swelling and the maximal tenderness away from the midline of the heel, most commonly on the posterolateral aspect, then inflammation within the retrocalcaneal bursa is the likely cause. This condition is well shown on MRI scan or ultrasonography.

NONINSERTIONAL TENDINOPATHY

The main body of the Achilles tendon is assessed for thickening and tenderness. In rare cases of true paratendinopathy the location of the tender area does not alter with movement of the ankle. By contrast, the focal area of tendinosis moves proximal to distal as the ankle is put through a range of dorsiflexion and plantar flexion.

IMAGING

Plain radiographs are useful to assess the overall structure of the foot. They should include a lateral weight-bearing view of the foot an ankle. Anteroposterior (AP) weight-bearing views of both feet and an oblique view supplement the weight-bearing lateral film for the assessment of planovalgus deformity. For a foot with cavus deformity an additional weight-bearing AP ankle film and mortise view of the ankle are recommended.

Calcification in the insertional portion of the tendon is well shown with plain radiographs and is less well seen on MRI.

In cases of noninsertional Achilles tendinopathy the initial choice of imaging is ultrasonography.

Ultrasonography provides useful information about the tendon and bursae.[51] The principal disadvantage of ultrasonography is the absence of a permanent image to which the treating surgeon can usefully refer. This point is not relevant if surgeon and radiologist are present together at the time of the scan. The advantages of a dynamic assessment and the option to proceed to injection treatment mean that ultrasonography is the investigation of choice for Achilles problems.

Doppler ultrasonography can be used to identify associated neovascularization. Identification of hypervascularity on the anterior surface of the tendon allows sclerosant injection prolotherapy treatment (**Fig. 3**).

TREATMENT

Nonoperative Treatment

Stretching

Stretching regimens for noninsertional tendinopathy are extremely effective, with up to 90% of patients responding when the stretches are performed properly.[15] The results in cases of insertional tendinopathy are less good, with only one-third of patients

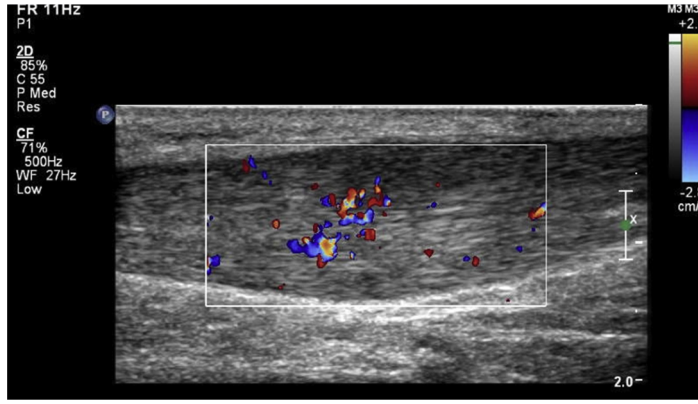

Fig. 3. Neovascularity of the main body of the Achilles tendon.

responding.[15] Stretches are still worth pursuing, particularly if adaptive shortening of the gastrocnemius is pronounced. If the hamstrings are tight with a large popliteal angle then stretches for this muscle group should be added to the regimen.[52]

Accurate assessment to identify the source of the pain guides treatment. Nonoperative treatment is preferred initially. Steroid injection is avoided wherever possible, and if performed ultrasonography guidance is used. The patient is counseled regarding the risk of rupture. For recalcitrant cases surgery has good results.[3] If an isolated gastrocnemius contracture cannot be corrected by physiotherapy then gastrocnemius release is considered.

Physiotherapy stretches for insertional tendinopathy are less reliable than when used for the treatment of noninsertional tendinopathy. For this reason gastrocnemius lengthening surgery is less frequently indicated in insertional Achilles disorders.

PLANTAR FASCIOPATHY

Plantar heel pain is most commonly caused by plantar fasciitis. This term implies acute inflammation and is therefore a misnomer. We prefer the term plantar fasciopathy, which is consistent with the current nomenclature used for disorders of the Achilles tendon. In the United States more than 1 million people seek help for this pain every year.[10] We see approximately 250 cases of recalcitrant heel pain in the Heel Pain Clinic each year. However, most cases never come to hospital and are managed in primary care (1500 cases/y in podiatry service alone).

EXAMINATION

Patients with recalcitrant plantar fasciopathy are either sedentary and overweight, often with a very high body mass index, or extremely athletic (**Fig. 4**). Long distance runners form a significant proportion of the patients in our Heel Pain Clinic. An assessment of the overall foot shape, when standing, is important. There is a strong association between planovalgus foot posture, gastrocnemius contracture, and heel pain. Hallux valgus and the adverse influence that this has on the stability of the medial column of the foot should also be noted. Careful examination of the plantar fascia is imperative. The site of maximal tenderness is usually at the medial calcaneal tuberosity. Any tenderness more distally in the fascia is relevant. Pulses and sensation should be documented, paying particular attention to the presence of any altered sensation or

Fig. 4. Plantar fasciopathy at the calcaneal origin.

positive Tinel sign behind the medial malleolus. These features may suggest the (rare) diagnosis of tarsal tunnel syndrome. A calcaneal squeeze test, if very tender, may indicate a calcaneal stress fracture, which is most likely in runners who have increased their training or in older female patients.

IMAGING

Intractable cases can prove difficult to treat. In current standard care plantar fasciopathy is not routinely imaged and treatment is empirical. This treatment is inadequate for stubborn cases.

In our Heel Pain Clinic, patients with intractable plantar heel pain undergo routine ultrasonography scanning. Our findings have led to an improved ability to distinguish between plantar fasciopathy that affects the insertion of the fascia at the os calcis and patients with atypical findings.

Patients referred to the clinic were prospectively followed. Their ultrasonography scans were reviewed to determine the characteristics of their plantar fascia disease (**Fig. 5**).

One-hundred and twenty-five feet (120 patients) were included. Sixty-four percent had typical insertional disorders only on ultrasonography scanning. The remaining 36% had atypical distal fascia disease or a combination of insertional and distal disease. Patients with distal disease had either distal thickening or discrete fibromas (**Fig. 6**).[53]

The high proportion of atypical noninsertional disease indicates that ultrasonography scanning is valuable in determining location and characterizing the disorders in the plantar fascia. Atypical characteristics, in this cohort of recalcitrant plantar fasciopathy, would otherwise not be detected.

Fig. 5. Ultrasound scan (USS) of plantar fascia.

We advocate the classification of plantar fasciopathies into insertional fasciopathy or noninsertional fasciopathy. This system is in keeping with current classification of Achilles tendinopathy, which is particularly relevant because therapies for insertional disease are more predictable and reliable than the same treatments when used for noninsertional fasciopathy. Empirical treatment is not adequate for recalcitrant cases of plantar fasciopathy.

TREATMENT

There are many different treatments that are used for plantar fasciitis. The evidence for many forms of treatment is weak.[1,2] Steroid injections, either blind or under ultrasonography control, are still widely used. However, there is good evidence that they are of limited value.[54] The risks of fat pad atrophy and fascia rupture are both of concern, and we do not recommend routine use of steroid injections.

At present the use of formal calf stretching with additional stretches for the plantar fascia is widely considered to be the best first-line treatment.[28,29] The mechanism by which these stretches help is not well established.[18,55–57] However, calf contracture is

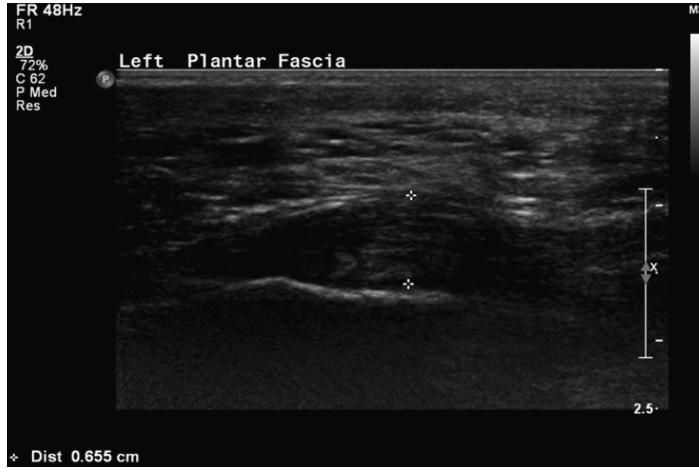

Fig. 6. Thickening of the calcaneal insertion of the plantar fascia.

associated with a variety of clinical problems in the foot and ankle.[30,31] There is also laboratory evidence that increased plantar fascia strain is seen with increased calf muscle tension.[32] Extracorporeal shockwave lithotripsy (ESWL) is a noninvasive treatment that administers pulsed, radial waves of energy that penetrate body tissues. In its original form it was used to break up kidney stones. Lower-dose treatments have been used with varying success to treat calcific tendinitis of the shoulder, tennis elbow, plantar fasciitis, and Achilles tendinopathy (both insertional and noninsertional).[58–67] There have been several modifications of the technology and this has led to confusion within the literature regarding the effectiveness of ESWL for treating musculoskeletal complaints.

Recently published, well-designed studies have shown that radial ESWL is useful in the management of patients with Achilles tendinopathy (both insertional and noninsertional) and plantar fasciitis.[68–70]

The UK National Institute for Clinical Excellence has reviewed the available evidence for the use of ESWL in plantar fasciitis and in Achilles tendinopathy. For both of these conditions the recommendation is that further high-quality research is required.

Our experience has been favorable when using ESWL for the treatment of plantar fasciopathy affecting the insertion of the fascia onto the calcaneum. However, if there is persistent biomechanical imbalance (contracture of the gastrocnemius) there is a much lower success rate. Patients who have gastrocnemius shortening are likely to fail to improve with ESWL, but the same patient is greatly improved after surgical gastrocnemius release. For this reason we advocate that gastrocnemius contracture that persists after 3 months of proper stretching, supervised by specialist physiotherapists, should be treated surgically (**Fig. 7**).

GASTROCNEMIUS CONTRACTURE

Pathomechanics of Calf Contracture

A precise figure for the amount of ankle dorsiflexion that is required for normal gait is controversial because of the difficulty in achieving reliable measurements. It is agreed that ankle dorsiflexion beyond neutral is required. At the end of the stance phase of gait, maximal ankle dorsiflexion occurs just before the heel lifts from the ground. At this moment of maximal ankle dorsiflexion the knee is in full extension (with the gastrocnemius at full stretch). The foot is supinated to create a rigid structure, largely through the action of the tibialis posterior.

In the presence of a tight calf, gait is affected in several ways. Early heel lift leads to increased pressure under the forefoot. The center of mass moves forward relative to the foot and allows the heel to reach the ground, which is achieved through compensatory lumbar lordosis, hip flexion, or knee recurvatum. Subtalar joint pronation and unlocking of the transverse tarsal joint permit dorsiflexion through the talonavicular and calcaneocuboid joints. Increased strain in the tibialis posterior tendon and spring ligament results and gastrocnemius contracture has been implicated in the cause of tibialis posterior dysfunction.[71] Isolated gastrocnemius tightness can increase midfoot and forefoot pressure during stance phase and causes the same degree of change as combined gastrocnemius-soleus tightness.[71]

The Silfverskiöld test is used clinically to distinguish between contractures that are predominantly in the gastrocnemius and those that affect both gastrocnemius and soleus. The proximal attachment of the gastrocnemius to the posterior surface of the femoral condyles means that this muscle is tight when the knee is extended. When the knee is flexed there is relaxation of the gastrocnemius. Thus a loss of ankle dorsiflexion that is evident when the knee is both flexed and extended must affect both

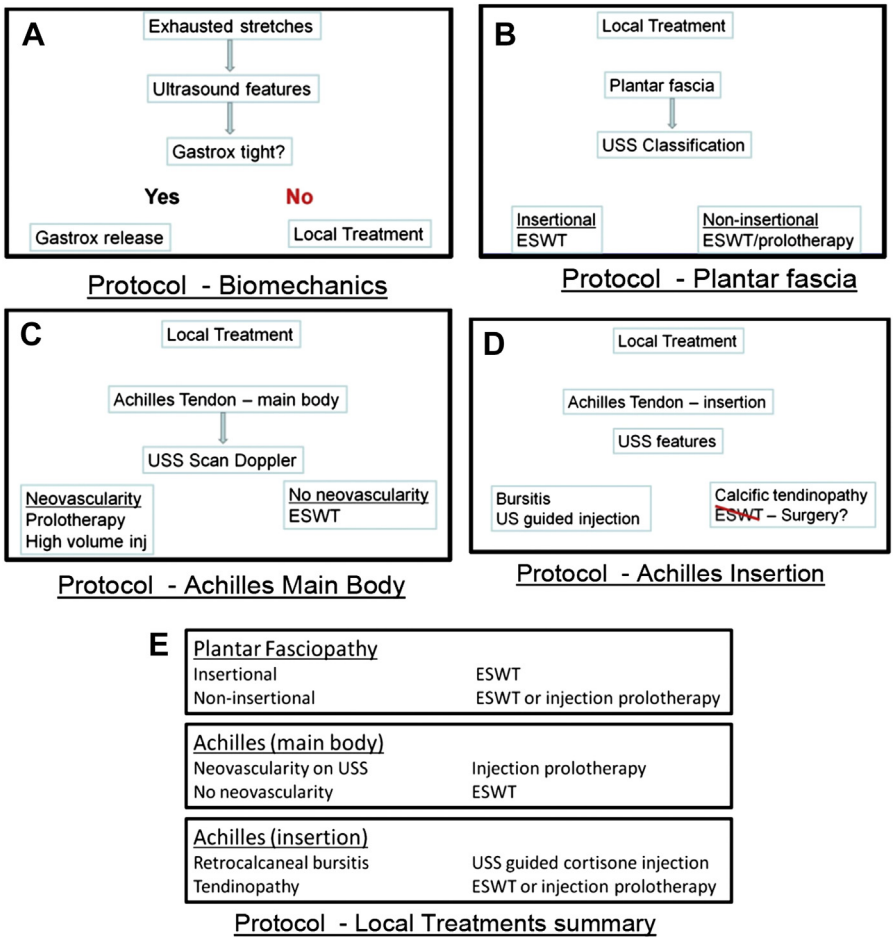

Fig. 7. Summary of treatment protocols. (*A*) Biomechanics. (*B*) Plantar fascia. (*C*) Achilles main body. (*D*) Achilles insertion. (*E*) Local treatments summary. ESWT, extra corporeal shockwave treatment; inj, injection; USS, ultrasound scan.

gastrocnemius and soleus. If the contracture is present with the knee fully extended but improves with knee flexion then the soleus is not contributing to the contracture.

CLINICAL AND EPIDEMIOLOGIC DATA

The best published evidence for the association between plantar fasciitis and contracture of the gastrocnemius is the recent article by Patel and DiGiovanni.[72] They prospectively reviewed 254 patients with plantar fasciitis. The diagnosis was clinical, and the criteria of DiGiovanni and colleagues[30] were used to define contracture of the gastrocnemius-soleus complex or the gastrocnemius. They further stratified the clinical groups into acute and chronic, choosing 9 months as the cutoff.

Eighty-three percent of patients had limited ankle dorsiflexion. Fifty-seven percent had an isolated contracture of the gastrocnemius, 26% had a contracture of the whole gastrocnemius-soleus complex, and 17% had no limitation of dorsiflexion. When patients with acute symptoms were compared with those with more than 9 months of

pain the figures were similar. The investigators have shown that limited ankle dorsiflexion is commonly associated with plantar fasciitis.

OPERATIVE TREATMENT

If surgery is considered for the treatment of a calf contracture it is essential that the chosen technique is appropriate to the type of contracture. The Silfverskiöld test[73] allows the surgeon to determine whether the contracture is in both the gastrocnemius and the soleus or confined to the gastrocnemius portion of the triceps surae.

Cadaver studies have shown that the degree by which forefoot pressures increase is similar when force is increased through either the whole triceps or just the gastrocnemius.[71] Surgical release of the Achilles tendon is associated with a risk of weakness caused by overlengthening. There is also a lengthy rehabilitation period. For these reasons, when the Silfverskiöld test confirms that the contracture is confined to the gastrocnemius, release of just this portion of the calf may be preferred.[71]

GASTROCNEMIUS LENGTHENING SURGERY

The pioneering work on gastrocnemius release was by Vulpius and Stoffel,[74] Silfverskiöld,[73] and Strayer.[75] Classification of the anatomic level of the gastrocnemius-soleus complex where the release is performed is helpful in understanding the surgical options (**Fig. 8**).[76]

Silfverskiöld[73] described a procedure whereby the 2 heads of gastrocnemius are released from their origin on the posterior femoral condyles (level 5). There were complications predominantly caused by postoperative knee swelling.

The Bauman procedure requires division of the aponeurosis covering the deep surface of gastrocnemius (level 4).[76] This procedure is performed through a medial incision and places the saphenous nerve and greater saphenous vein at risk.

Strayer[75] described a release at the gastrocnemius insertion onto the tendoachilles (level 3). He allowed the gastrocnemius to retract and reattached the muscle more proximally. Operations at this level place the sural nerve at risk. The sural nerve can be superficial to, deep to, or closely applied to the fascia at the level of a Strayer release.[77] After surgery the patient is immobilized in a cast or boot for a period of at least 2 weeks.[78,79] This immobilization is another disadvantage of a surgical release at this level. The Strayer release has been associated with an overall rate of complications of 6%: 5% of patients complained of poor wound cosmesis, and 3% of patients had nerve damage.

Endoscopic Strayer release has recently been described.[80–83] The sural nerve is still at risk,[83] with neuropraxia reported in 3 of 18 patients in one series.[82] The aponeurosis at this level is a thick structure and there are reports of difficulties using the shaver to release it completely. In a cadaver study half of the specimens had not been fully released.[83]

The Vulpius procedure (level 2) is used for children with spastic diplegia. The external aponeurosis of the gastrocnemius and the underlying superficial aponeurosis of soleus are sectioned transversely just distal to the gastrocnemius muscle belly.[74,84] The Vulpius procedure therefore lengthens both the gastrocnemius and the soleus. Sammarco and colleagues[85] described the effects of a gastrocnemius lengthening at level 2 and found a 5% incidence of paresthesia in the sural nerve distribution and 5% incidence of complaints related to the wound.

Level 1 is the Achilles tendon. Hoke, White, and Paley have each described surgical techniques for lengthening the tendon. Cadaver studies have shown that percutaneous methods are both unreliable[86] and risk damage to adjacent nerves.[87] Open

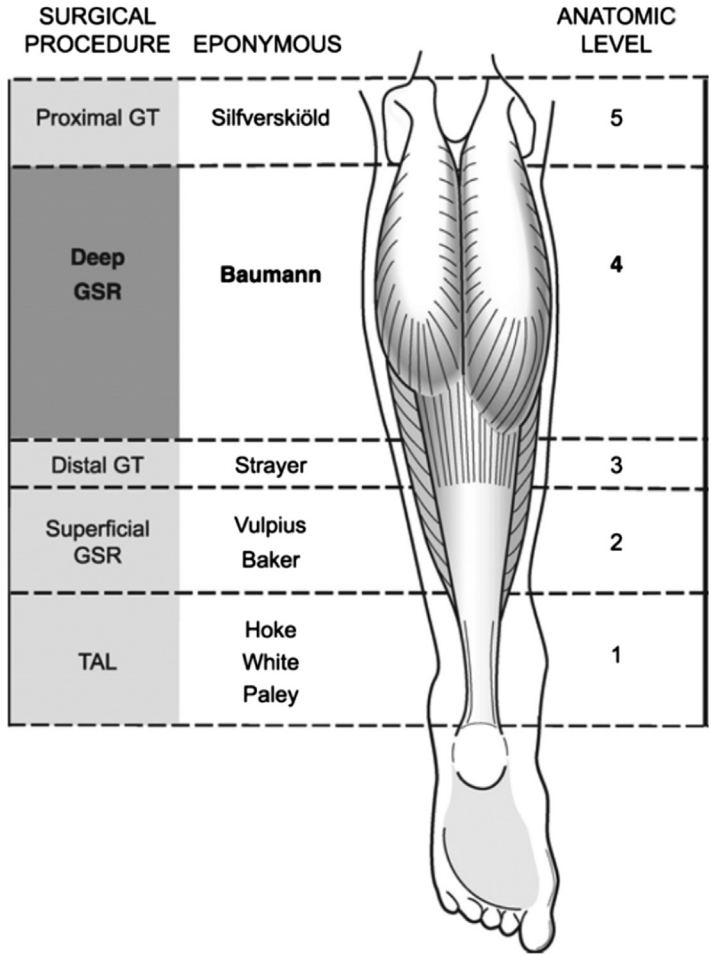

Fig. 8. Other levels of surgical lengthening. (*From* Lamm BM, Paley D, Herzenberg JE. Gastrocnemius soleus recession: a simpler, more limited approach. J Am Podiatr Med Assoc 2005;95:18–25; with permission.)

surgery is therefore recommended.[86] Wound healing and weakness caused by overlengthening are potentially serious complications.[88]

Level 4 is the ideal level to perform an isolated release of the gastrocnemius. The lengthening is restricted to the tight gastrocnemius aponeurosis. There is no damage to either the insertion or the origin of the muscle, and the risk of neurologic complication is extremely low.

Barouk and colleagues[34] and Kohls-Gatzoulis and Solan,[89] the latter using the technique they learned from L.S. Barouk and P. Barouk, reported a simple and safe gastrocnemius release in level 4 (this is reported in article "Technique, Indications, and Results of Proximal Medial Gastrocnemius Lengthening" in more detail by Dr Pierre Barouk in this issue). When the contracture is pronounced, both heads can be released through a single popliteal crease incision under general anesthesia (GA). Because the medial head has been found to be the source of most of the gastrocnemius tightness, less severe cases can be treated with a proximal release of the aponeurosis of the

medial head in isolation. This procedure is safe and can (in adults) be performed under local anesthesia with sedation. Furthermore, patients mobilize immediately after surgery without a protective plaster. The wound heals well with none of the complications seen with the Strayer (**Fig. 9**).[33,89]

RESULTS OF GASTROCNEMIUS LENGTHENING

Short-term reports have shown that ankle dorsiflexion with the knee extended improves by the same amount achieved with the knee flexed.[78] There are no studies to confirm that this correction is maintained over time.

There is limited literature examining whether there is a change in muscle strength with the various lengthening operations described. With the Strayer release there is concern that weakness could occur.[90] Fatty infiltration has been shown on MRI,[91] but little concern about weakness has been noted in surgical series.[30,92]

GASTROCNEMIUS LENGTHENING FOR RECALCITRANT HEEL PAIN

There is very little published literature on this topic. DiGiovanni and colleagues,[30] in a seminal article of 2002, noted plantar fascia and Achilles disorders as conditions that an isolated gastrocnemius contracture would influence. It may be because recalcitrant heel pain is not a priority for orthopedic surgeons that there has been so little attention devoted to the role of gastrocnemius lengthening to treat this group of patients.

Maskil and colleagues[92] recently reported the results of surgical release of the gastrocnemius at the musculotendinous junction. Thirty-eight patients were followed up with good results. This cohort of patients all had foot pain with no structural abnormality. As well as plantar fasciitis (n = 25) there were cases of metatarsalgia and arch

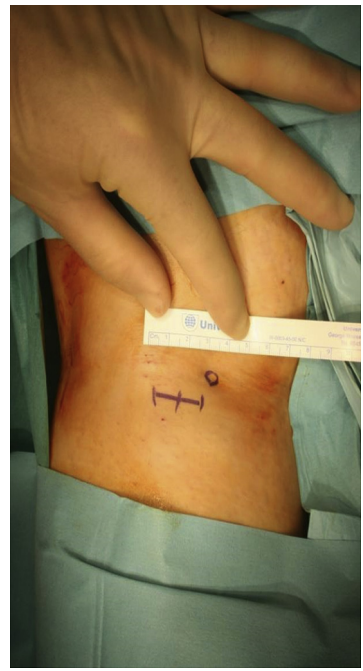

Fig. 9. Posterior view of the left popliteal fossa. Note the central incision.

pain. The investigators do not specify whether the diagnoses were entirely clinical or whether the plantar fasciitis was confirmed with imaging. A note from the journal editor, published alongside the article, notes that the relationship between gastrocnemius contracture and various foot disorders remains intriguing and controversial.

Abassian and colleagues[93] reported the results of proximal medial gastrocnemius release in a cohort of patients with refractory plantar fasciitis. All subjects had failed at least 1 year of nonoperative treatment. Treatment included orthotics, physiotherapy, and in some cases steroid injections. In addition to their previous physiotherapy, all patients underwent at least a further 3-month period of eccentric stretching (as popularized by Alfredson and colleagues[13]) under the supervision of a specialist physiotherapist.

Unlike patients in previous studies all of these patients had radiological as well as clinical diagnosis of plantar fasciitis. Imaging included radioisotope bone scan, MRI, or ultrasonography.

Patients rated the change in the level of their pain on a 5-point Likert scale. They were asked whether they had felt weaker on the released side. Calf power was assessed objectively, by asking the patients to perform 20 consecutive single-stance heel rises on the released side. The power was considered full if this was achieved. Postoperative complaints or complications were also noted. Subjects were also asked whether they would recommend this treatment to a family member.

Seventeen patients (21 heels) were included. The male/female ratio was 3:14 and the average age was 52 years (range, 31–70 years). The duration of heel pain before surgery was from 12 months to 6 years (average, 3.8 years). Fifteen patients (19 heels) had their surgery under local anesthetic infiltration and sedation. The others requested GA.

At an average of 24 months (range, 8–36 months) after surgery, 17 of the 21 heels (81%) reported total or significant pain relief. Note that 10 (58%) noticed this improvement within 1 to 2 weeks of their surgery. The remaining 7 reported a slow but progressive improvement over 3 to 6 months.

Fifteen patients (88%) would recommend this operation to a friend. There were no major complications. One minor wound complication occurred and this resolved without intervention.

PROXIMAL MEDIAL GASTROCNEMIUS RELEASE FOR ACHILLES TENDINOPATHY

The role of gastrocnemius lengthening for the treatment of Achilles pain is even less well researched than the role in plantar fasciopathy. There is a single published case report of Achilles tendinopathy that was treated by Strayer gastrocnemius lengthening,[94] producing a good result.

Gurdezi and colleagues[95] published the results of a small series of patients treated with a proximal release. They were followed for at least 1 year after proximal medial gastrocnemius release (PMGR) for the treatment of refractory Achilles tendinopathy. In this series tendinopathy of the main body of the Achilles (noninsertional tendinopathy) responded more favorably than insertional problems.

This is the only published series of patients to have a PMGR for Achilles tendinopathy. Eleven patients (5 female, 6 male) had 15 PMGRs. Four patients (4 Achilles tendons) required further surgery (1 release of the lateral head, 3 tendon debridements, 1 with supplementary FHL transfer.) Despite these additional procedures, the patient group reported that the gastrocnemius surgery was helpful. Clinical measurements showed the power in the gastrocnemius to be full following release and it was noted that the improvement in ankle dorsiflexion was maintained at 1 year. The investigators

concluded that patients with recalcitrant tendinopathy who have tight gastrocnemii can be helped with a PMGR without plaster immobilization. Proximal medial gastrocnemius release is a safe, well-tolerated, and effective procedure, particularly for those patients with noninsertional Achilles tendinopathy who fail an appropriate stretching program.

SUMMARY

Contracture of the gastrocnemius produces subtle alterations to gait and posture. There is a resultant increase in the strain in the Achilles tendon and also the plantar fascia. Patients with recalcitrant heel pain commonly have isolated gastrocnemius contracture that can be shown using the Silfverskiöld test.

Eccentric calf stretching is one of the few interventions that has been proved to be useful in the management of plantar fasciopathy and Achilles tendinopathy. As part of the investigation and management of recalcitrant heel pain any contracture of the gastrocnemius should be identified using the Silfverskiöld's method. If formal eccentric stretching of the gastrocnemius does not result in improvement in the symptoms and the contracture persists, then surgical gastrocnemius lengthening should be considered. PMGR is the preferred technique for most patients because the recovery is rapid, the procedure has a very low morbidity, and it can be performed under local anesthesia with sedation (avoiding the need for full GA in the prone position). If there is extreme contracture then the surgeon must decide whether to release the lateral head of the gastrocnemius proximally at the same time or perform a Strayer procedure instead.

Local treatments for either the Achilles tendon or the plantar fascia should be deferred until any calf contracture has been corrected, which is often by stretching under physiotherapy supervision, but orthopedic surgeons should be aware of the occasional need for gastrocnemius lengthening. The PMGR technique, developed by L.S. Barouk and P. Barouk in France, is an excellent method with extremely good functional results, a low risk of complications, no need for postoperative immobilization, and once mastered is performed under local anesthetic. In time this will become the technique of choice for gastrocnemius lengthening. In our practice the Strayer is reserved for extreme contracture only and in 95% of cases we prefer the Barouk method.

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