Ultrasound-Guided Sclerosis of Neovessels in Painful Chronic Patellar Tendinopathy

A Randomized Controlled Trial

Aasne Hoksrud,* Lars Öhberg,† MD, PhD, Håkan Alfredson,‡§ MD, PhD, and Roald Bahr,*‖ MD, PhD

*From the *Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway, †Department of Radiation Sciences, Diagnostic Radiology, University of Umeå, Umeå, Sweden, ‡Department of Surgical and Perioperative Science, Sports Medicine, University of Umeå, Umeå, Sweden, and §Department of Musculoskeletal Research, National Institute of Working Life, University of Umeå, Umeå, Sweden*

Background: Color Doppler ultrasound examination frequently reveals neovascularization in chronic painful Achilles and patellar tendinopathy. Sclerosing the area with vascular ingrowth using polidocanol has shown promising clinical results in patients with Achilles tendinopathy.

Purpose: To investigate sclerosing treatment using polidocanol on a group of elite athletes with patellar tendinopathy.

Study Design: Randomized controlled trial/cross-over study; Level of evidence, 1.

Methods: The authors recruited 33 patients (42 tendons), mainly from the Norwegian elite divisions in basketball, team handball, and volleyball. Seventeen patients (23 knees) were randomized to the treatment group (polidocanol injections in the area of neovascularization) and 16 patients (20 knees) to the control group (similar injections with lidocaine/epinephrine). After 4 months of treatment, the control group was crossed over to active treatment. Pain and function were recorded using the Victorian Institute of Sport Assessment score before the start of treatment and 4, 8, and 12 months after the first injection. Victorian Institute of Sport Assessment scores between groups were compared using multivariate analysis of variance for repeated measures.

Results: The treatment group reported a significant improvement in Victorian Institute of Sport Assessment score from 51 to 62 after 4 months; there was no change for the control group (group by time interaction, $P = .052$). After 8 months, when the control group had also received active treatment with polidocanol, they had a greater improvement in Victorian Institute of Sport Assessment score (58-79) than did the treatment group (54-70; group by time interaction, $P = .022$; time effect, $P < .0001$). There was no further time or group effect in Victorian Institute of Sport Assessment score to the 12-month follow-up (treatment, 72; control, 85).

Conclusion: Sclerosing injections with polidocanol resulted in a significant improvement in knee function and reduced pain in patients with patellar tendinopathy.

Keywords: jumper's knee; polidocanol; ultrasonography; color Doppler; functional tests; strength; jumping ability; Victorian Institute of Sport Assessment (VISA) score

Jumper's knee affects athletes in many sports, and elite jumping athletes appear to be the most susceptible group.[13,25] The prevalence of jumper's knee is 40% to 50% among high-level volleyball players[18,19,25,26] and about 35% to 40% among basketball players.[25] The high prevalence, low function scores, and chronic nature of the condition mean that in some jumping sports, patellar tendinopathy may cause at least as much impairment in athletic performance as acute knee injuries.[25]

Jumper's knee is an insertional tendinopathy most commonly affecting the patellar tendon's origin on the inferior pole of the patella,[7,9,13,20,23] and it is not an inflammatory condition.[1,6,7,11,24] When there are structural tendon abnormalities (visualized by ultrasound, MRI, or biopsies)

‖Address correspondence to Roald Bahr, MD, PhD, Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, PO Box 4014, Ullevaal Stadion, 0806 Oslo, Norway (e-mail: roald.bahr@nih.no).

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corresponding to the painful area, the condition is called tendinopathy. The initial treatment for patients with jumper's knee typically includes rest, ice, electrotherapy, massage, taping, corticosteroid injections, or even surgery if nonoperative treatment fails.[9,12,31] However, these treatment regimens have not been demonstrated to be effective, and thus they have no evidence-based support.[9,12,20,31] Another alternative may be eccentric exercises, which recently have been validated as an appropriate treatment program for midportion Achilles tendinopathy.[5,17,33,34] However, although pilot data are promising,[8,32,39] it is not clear whether the effect of eccentric exercise treatment is as good for insertional tendinopathies (such as patellar tendinopathy) as it is for midportion Achilles tendinosis.

In a study on midportion Achilles tendinosis, the researchers used color Doppler ultrasound to examine the tendon. This examination revealed neovascularization in the painful area with structural changes in all tendinosis tendons but not in pain-free normal tendons.[30] They later suggested that the good results achieved with the eccentric calf muscle training program could possibly be explained by direct mechanical effects on the area with vasculoneural ingrowth.[27]

This hypothesis led to a pilot study of a new treatment method sclerosing the area with neovessels using polidocanol,[28,29] and the results showed that the tendon pain was significantly reduced in the majority of the patients after 2 to 4 ultrasound-guided injections. In a subsequent study, immunohistochemical analyses of tendon biopsies showed that there were nerves in close relation to the vessels, and that small amounts of local anesthesia in the area with neovessels temporarily cured the tendon pain.[4] Taken together, these findings led to the hypothesis that the vessels, and most likely nerves accompanying the vessels, were involved in the pain mechanism in chronic painful Achilles tendinosis.[4] In a recent pilot study on 15 patients with patellar tendinosis, treatment with sclerosing injections showed promising clinical results in this group as well.[2]

Based on these results, we wanted to investigate this novel treatment approach. Similar to what has been seen in chronic painful Achilles tendinopathy, neovascularization is present in 60% to 80% of patients with chronic painful patellar tendinopathy.[16,21,35,37] Our hypothesis was that sclerosing the area with neovessels would decrease the level of patellar tendon pain during tendon-loading activity in a group of elite athletes with chronic painful patellar tendinopathy.

METHODS

Design

This randomized, double-blind, placebo-controlled study used a 2-group repeated-measures design in which the control group crossed over to receive active treatment after 4 months. Patients with patellar tendinopathy and neovascularization who volunteered for the study were randomly allocated to a treatment (polidocanol) or a control group (lidocaine with adrenaline). The study was divided into 2 treatment periods. During treatment period 1, patients in the treatment group received sclerosing injections, and patients in the control group received placebo injections. Both groups received a maximum of 3 ultrasound-guided injections at 3- to 5-week intervals. At the 4-month follow-up, after the end of treatment period 1, the patients in both groups were offered a maximum of 3 sclerosing injections (treatment period 2). Both knees were given the same treatment if the patient had bilateral symptoms. Pain and function were recorded before the start of treatment and 4 months (end of treatment period 1), 8 months (end of treatment period 2), and 12 months after the first injection.

The study was approved by the Regional Committee for Research Ethics and the Norwegian Medicines Agency.

Patient Recruitment

Clubs and players in the elite division in basketball, team handball, and volleyball for both male and female players in the southern part of Norway were contacted toward the end of the competitive season (mid-March) with an invitation to take part in a clinical screening examination (Figure 1). The coach and the club were informed of the purposes and procedures of the study by letter, and we visited each of the clubs at a time convenient to them to inform the players of the purposes and procedures of the study. In addition, a press release about the study led to coverage in a major newspaper, in which elite athletes from all sports were asked to contact the investigators to be screened for the study in the same way as for the team sports. After an oral presentation, players who were interested in taking part in the study were asked to take part in a clinical screening examination, which included a questionnaire detailing anthropometric details, history of knee pain, any treatment received, sporting profile, and activity level.

The following diagnostic criteria were used to identify patients with jumper's knee[26]: history of pain in the patellar tendon or the patellar insertion in connection with training or competition; tenderness to palpation corresponding to the painful area[15]; and symptoms from the patellar tendon for a minimum of 3 months. Patients who fulfilled the diagnostic criteria were asked to sign a written consent form and invited to the final inclusion examination, the ultrasound screening.

Ultrasound Examination

Patients who fulfilled the diagnostic criteria and completed the consent form were asked to report to the laboratory for an ultrasound examination and initial sclerosing treatment. Each patient spent about half an hour in the laboratory. The ultrasound examinations were performed by an experienced ultrasonographer (LÖ) using high-resolution gray-scale ultrasound with the aid of color Doppler (Philips EnVisor HD, Vingmed as, Høvik, Norway) with a linear high-frequency (13-MHz) probe (type L12-3), with a CD frequency of 7 MHz and a gain of 50. The velocity was set as slow as possible, usually 0.014 m/s. The pathologic

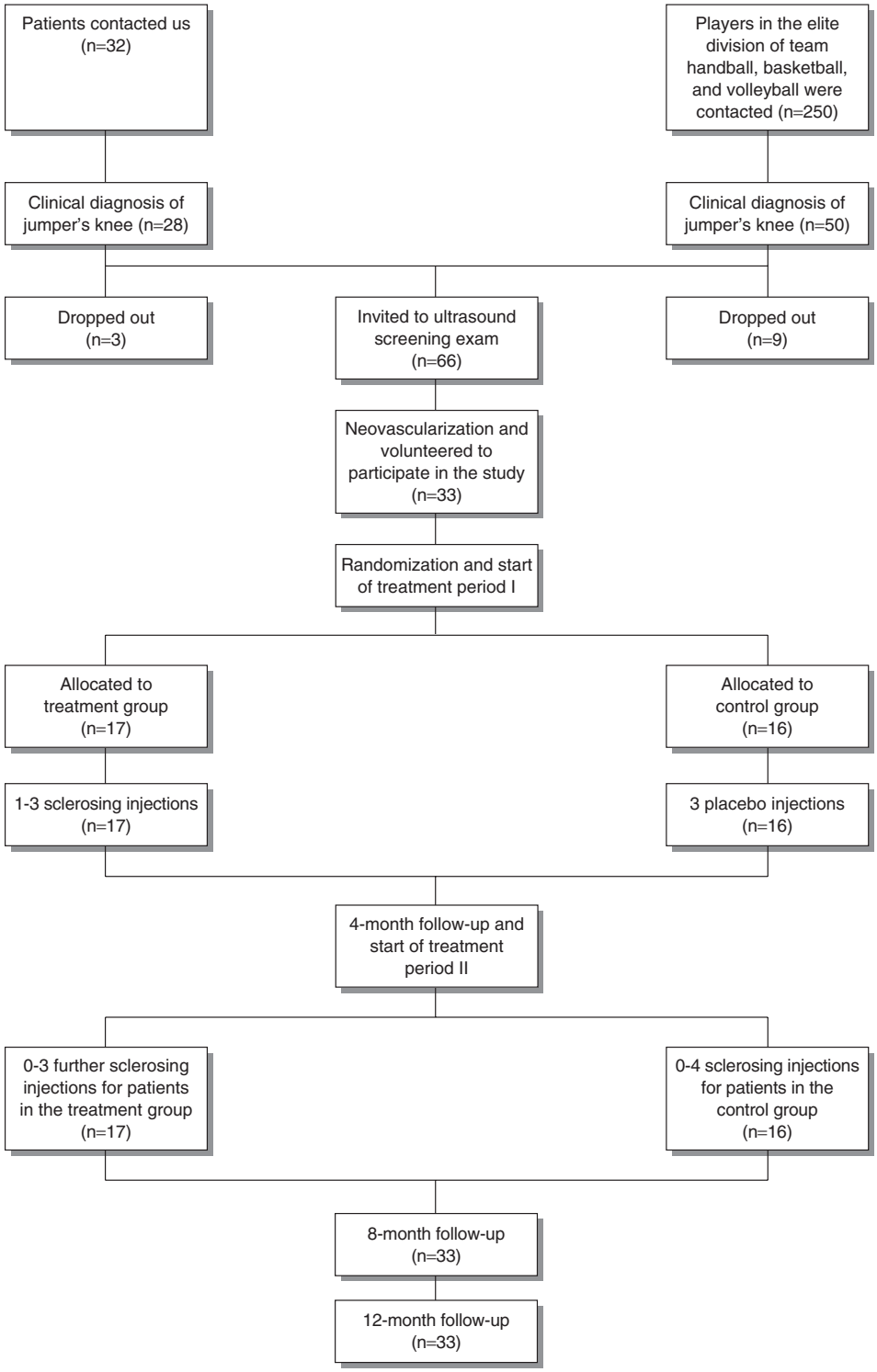

Figure 1. Flowchart depicting the patient recruitment process, randomization procedure, treatment, and follow-up.

changes in the patellar tendon were registered on a standard form. Color Doppler was used to diagnose the neovascularization, and digital color images were saved for the records. Both knees were examined, even if the contralateral tendon was symptom free.

Inclusion Criteria

To be included in the study, the subjects had to have a clinical diagnosis of jumper's knee, neovascularization corresponding to the painful area, and a Victorian Institute of

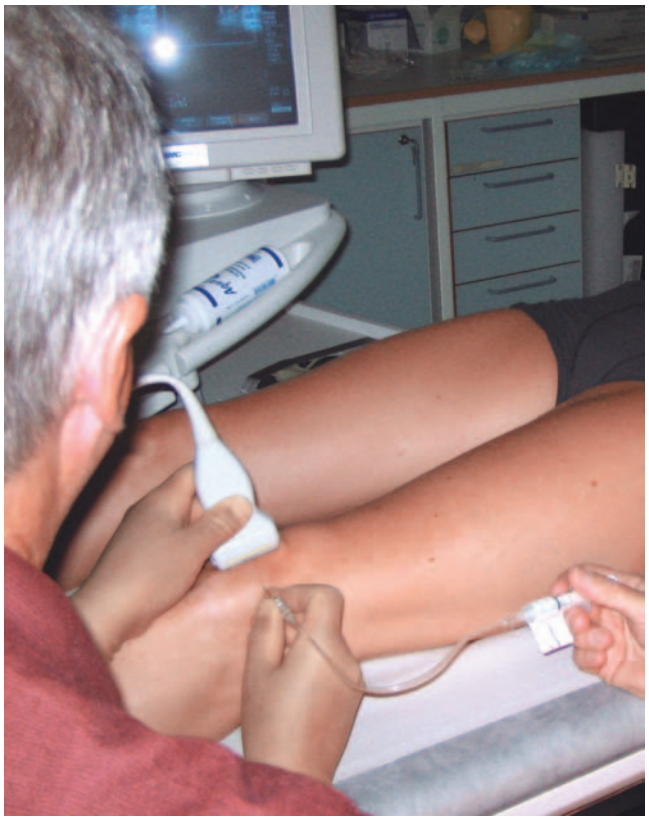

Figure 2. Treatment setup showing the placement of the ultrasound probe and injection technique.

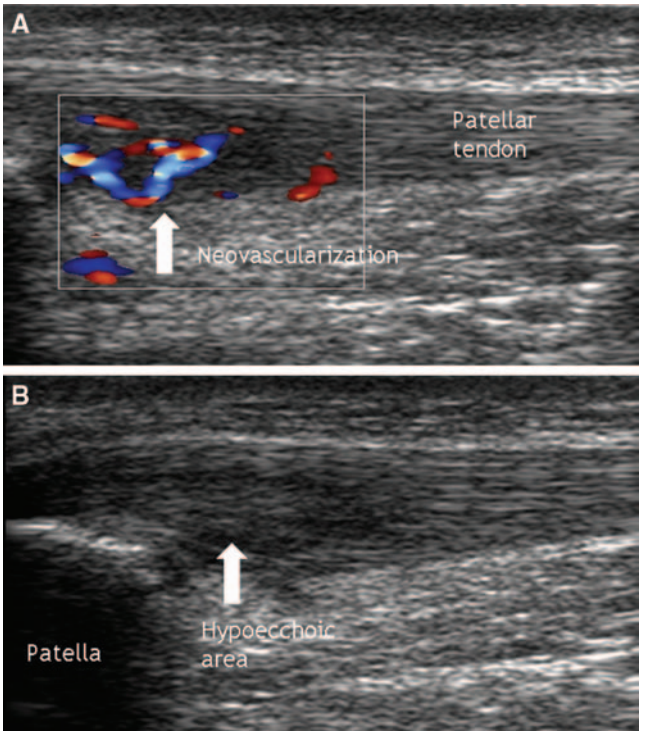

Figure 3. A, neovascularization in patellar tendinopathy. Gray-scale and color Doppler examination (longitudinal view) of a patellar tendon with tendinopathy in the proximal part. The affected area is thickened, irregular, and hypoechoic. Before sclerosing therapy, there is neovascularization outside and inside the dorsal part of the tendinopathic area. B, after sclerosing therapy, no blood flow can be seen on color Doppler examination.

Sport Assessment (VISA) score (0-100 points) of less than 75 points. Subjects were excluded if they had a history of knee problems caused by patellofemoral pain syndrome, inflammatory joint conditions, or degenerative conditions. Both knees were included if the patient had bilateral problems. Subjects had to be between 18 and 40 years old, residents of Norway, and able to understand oral and written Norwegian.

Randomization and Blinding

After the ultrasound examination, subjects were randomized into treatment or control groups by our statistician (IH), who was blinded to the identity of the patients. The pharmacy produced ampoules of polidocanol and placebo, both containing 4 mL of injection fluid. The ampoules were visibly indistinguishable and labeled by the pharmacist according to the randomization list provided by the statistician. The subjects, the ultrasound examiner (LÖ), the assistant (HA), and the clinical assessor (AH) were blinded to group allocation.

Initial Ultrasound-Guided Sclerosis Treatment

Polidocanol (Aethoxysklerol [10 mg/mL], Inverdia AB, Stockholm, Sweden) was used as the sclerosing agent. The active substance is an aliphatic, nonionized, nitrogen-free surface anesthetic. The placebo substance, lidocaine with adrenaline (Xylocaine-Adrenalin [5 mg/mL + 5 μg/mL], AstraZeneca, Oslo, Norway), produces the same immediate effects as polidocanol, that is, transient vasoconstriction of the neovessels and immediate pain relief. However, in contrast to the sclerosing agent, these effects subside within a few hours. Before the treatment, the skin was washed with a solution of chlorhexidine and alcohol. Polidocanol was then injected with a 0.7 × 50-mm needle connected by a line to a 2-mL syringe by an experienced assistant (HA).

Injections were given from the lateral side, directing the needle parallel to the dorsal aspect of the patellar tendon (Figure 2). Guided by linear high-resolution ultrasound, the needle was aimed against the area with vessels entering the patellar tendon from behind. The injections were performed dynamically; the ultrasound ensured injection close to, and occasionally into, the vessels. The ultrasound probe was held on the ventral side of the patellar tendon parallel with the fibers. It was necessary to use color Doppler to identify these small vessels and thereby make it possible to place the tip of the needle close to the vessels entering the patellar tendon. When the tip of the needle was positioned correctly, a small amount of polidocanol was gradually injected until all vessels were closed. A maximum dose of 2 mL was injected into each knee, and we registered the total amount

of fluid injected. It was possible to observe the immediate effect of the injection on ultrasound (Figure 3). When the needle was positioned correctly (inside or very close to the vessels), the circulation stopped quickly. The injections continued until the circulation was stopped in the vessels in the affected area.

Before and after the injection treatment session, the patients were asked to perform 5 squats on a 25° decline board on the affected leg (at a frequency of 15 squats per minute). They were instructed to use approximately 3 seconds for the eccentric part of the squat and 1 second for the concentric part. To assess whether patients in both groups were symptom free at that time, they were then asked to report the level of pain in the patellar tendon on a 10-cm visual analog scale.

Treatment Period 1: Follow-up and Further Sclerosing Treatment

The procedure was the same for all patients after each injection treatment session. The first 2 weeks after treatment, the patients were asked to reduce their levels of training. The first week, only walking and light bicycling were allowed; in the second week, light sport-specific training could be started. However, no maximum jumping, running, or weight lifting was allowed. After the first 2 weeks, the patients were allowed to train as much as their pain allowed. They were allowed to take anti-inflammatory (nonsteroidal anti-inflammatory drugs, Cox II inhibitors) or pain medication without restrictions, but any such use was recorded.

The patients were scheduled for follow-up visits in the laboratory after 1 and 2 months. They first completed a VISA score and were then reexamined using ultrasound. All knees that were symptomatic at baseline were examined, regardless of symptoms. Subjects who reported pain and reduced function were offered a new sclerosing injection if they had persistent neovascularization.

Treatment Period 2

After 4 months, the patients were again scheduled for a follow-up visit. They completed a VISA form and were reexamined using ultrasound. After the examination, the patient and treating physician were informed of the group to which the patient belonged. Patients in both groups who had symptoms and persistent neovascularization were offered sclerosing therapy at this time (start of treatment period 2). Finally, the patients were asked to complete mail-in questionnaires after 8 and 12 months.

Treatment Evaluation

The primary outcome measured over the study period was knee function using VISA score. The VISA score was designed specifically to quantify knee function in subjects with patellar tendinopathy and has been shown to be a reliable and valid measure.[36] Secondary outcome was overall satisfaction with treatment using a visual analog scale, in which not satisfied was recorded as 0 and fully satisfied as 10.

Statistics

To test the principal null hypothesis, that there was no group difference in VISA scores, groups were compared using multivariate analysis of variance (MANOVA) for repeated measures, assessing whether there was a group by time interaction during treatment period 1 or 2. Within-group comparisons were done using paired t tests and between-group comparisons using unpaired t tests. An intention-to-treat analysis was used, which means that for patients who were referred for surgery during the follow-up period, their final scores before surgery were carried forward until the 12-month follow-up. We used a significance level of 5%, and results are presented as the means with their SDs or 95% confidence intervals (CIs), as appropriate.

The sample size was calculated based on the primary outcome measure, VISA score, using a significance level of 5% and a test power of 90%. A baseline score of 55 points in symptomatic players and 95 points without patellar tendinopathy was expected. To detect an improvement of 20 points (equivalent to a 50% treatment effect), we needed to include 15 players in each group. Because about 70% of the patients with patellar tendinopathy display neovascularization (Cook et al, personal communication), we aimed at recruiting about 40 patients for the ultrasound screening examination.

RESULTS

Baseline Characteristics

After screening 66 patients with clinical symptoms of jumper's knee, we included 33 patients (5 female and 28 male patients) with 43 tendons with neovascularization, that is, 10 patients with bilateral problems. After randomization, there were 17 patients (23 knees) in the treatment group and 16 patients (20 knees) in the control group (Figure 1). The patients mainly represented team handball (n = 15), basketball (n = 5), and football (soccer; n = 6). The baseline characteristics and training history for the treatment and control groups are shown in Table 1. The training volume for both groups is shown in Table 2.

Treatment Period 1

The patients in the treatment group were given from 1 to 3 (2.5 ± 0.7) sclerosing injections during treatment period 1, whereas patients in the control group received 2 or 3 (2.9 ± 0.4) placebo injections during the same period. Both groups reported a significant reduction in pain during squat testing immediately after all injection treatment sessions, compared with the pain level before the injections (overall mean change, 3.6; 95% CI, 2.7-4.6, paired t tests). There was no difference between the 2 groups in recorded pain during squat testing after the first (control group, 2.6; 95% CI, 1.3-3.9; treatment group, 1.9; 95% CI, 1.4-2.4) and third injections (control, 2.3; 95% CI, 1.2-3.4; treatment, 3.5; 95% CI, 2.7-4.3), whereas the control group (1.9; 95% CI, 1.1-2.7) reported less pain than did the treatment group (3.3; 95% CI, 2.8-3.8) after the second injection.

TABLE 1
Subject Characteristics at Baseline for Treatment and Control Groups[a]

	Treatment Group (n = 17)	Control Group (n = 16)
Age, y	25.4 ± 7.5 (17–42)	24.3 ± 4.5 (17–35)
Height, cm	184.7 ± 7.2 (165–202)	179.9 ± 9.0 (170–201)
Weight, kg	81.7 ± 9.2 (55–102)	80.1 ± 10.2 (57–100)
No. of females	3	2
No. of bilateral symptoms	6	4
VISA score	54 ± 15 (19–78)	53 ± 12 (33–71)
Duration of symptoms, mo	41 ± 37 (4–240)	33 ± 43 (6–180)
Specific sport activity training, h/wk	10.1 ± 3.2 (1.0–8.0)	10.5 ± 3.6 (1.3–7.7)
Weight training, h/wk	3.4 ± 2.0 (2.0–28.5)	3.6 ± 2.0 (2.5–15.5)
Jump training, h/wk	0.4 ± 2.1 (0.0–9.0)	0.2 ± 0.3 (0.0–6.3)
Total training volume, h/wk	14.3 ± 5.0 (2.0–28.5)	15.3 ± 5.5 (2.0–21.6)

[a]Values are presented as mean ± SD (range). VISA, Victorian Institute of Sport Assessment.

There was a strong trend toward a group by time interaction in VISA score during treatment period 1 (F = 4.0, P = .052, MANOVA) (Figure 4). The treatment group reported a significant improvement in VISA score during treatment period 1 (P = .01, paired t test), whereas there was no change for the control group (P = .86, paired t test) (Figure 4).

Treatment Period 2

In the treatment group, 13 patients received from 1 to 4 further sclerosing injections during treatment period 2 (mean number, 1.9 ± 0.6). In the control group, 12 patients received from 1 to 3 sclerosing injections (mean number, 2.3 ± 0.9). Thus, for the patients who received sclerosing treatment, the total number of injections was 3.6 ± 1.5 for patients in the treatment group and 2.3 ± 0.9 for patients in the control group (P < .001, unpaired t test).

Between the 4-month and 8-month follow-ups, 1 knee in the control group and 4 knees in the treatment group underwent arthroscopic surgery. In 4 cases, arthroscopic debridement of minor retropatellar chondral defects was performed, and in 1 case (control group), a plica medialis was resected. None of the tendons were debrided during any of these procedures. These patients were also examined after 8 and 12 months, but their final scores before surgery (ie, after 4 months) were carried forward in the statistical analysis.

There was a group by time interaction in VISA score during treatment period 2 (F = 5.76, P = .022, MANOVA) and a strong time effect (F = 24.9, P < .0001, MANOVA), with a greater improvement in VISA score from 4 to 8 months for the control group than for the treatment group (Figure 4). For both groups taken together, the VISA score had improved from 54 (95% CI, 50-58) at baseline to 75 (95% CI, 68-82) at the 8-month follow-up after the end of treatment period 2 (P < .0001, paired t test). There was no further time or group effect in VISA score to the 12-month follow-up (F = 1.31, P = .72, MANOVA), when the combined VISA score was 77 (95% CI, 70-84; P < .0001 vs baseline, paired t test).

Overall Treatment Satisfaction

After treatment period 1, the treatment group was more satisfied with their treatment compared with the control group (P < .001, unpaired t test). After the end of treatment period 2 and at the 12-month follow-up, treatment satisfaction had improved significantly in the control group, and there was no significant difference between the 2 groups (Figure 5). After 12 months, 9 patients (12 tendons) in the sclerosing treatment group were training fully and without symptoms, 5 (6 tendons) were training fully but with mild or moderate symptoms, whereas 4 (5 tendons) were in reduced training (1 patient scored his knees in different groups). In the control group, 11 patients (13 tendons) were training fully and without symptoms, 3 (5 tendons) were training fully but with mild or moderate symptoms, whereas 2 (2 tendons) were in reduced training.

Adverse Events and Medication

No adverse events or side effects were recorded. None of the patients reported using nonsteroidal anti-inflammatory drugs or pain killers during the treatment periods.

DISCUSSION

This randomized controlled trial showed that in patients with chronic painful patellar tendinopathy, sclerosing injections with polidocanol resulted in a significant improvement in knee function and reduced pain. Using the criteria established by Coleman et al,[9] the combined success rate after 12 months was 84%.

When interpreting the results of the present study, there are some limitations that should be kept in mind. Ideally, we would have wanted the placebo period to last for more than 4 months—preferably an entire season. However, the patients included in this study were elite athletes, who are not easily recruited to take part in randomized trials. Another constraint was that we thought that it would be unethical to give patients in the control group more than 3 placebo injections. The compromise, a placebo period of 4 months followed by a similar period with polidocanol injections, was made because we wanted to examine the effect of sclerosing therapy on a group of jumping athletes with patellar tendinopathy who wished to compete at the highest national level. In addition to using what could be claimed to represent the most relevant patient group, another strength of the present study is that it was done with a prospective randomized design, albeit with a short placebo period. As pointed out by Cook and Khan[12] in their

TABLE 2
Training Volume[a]

	Pretreatment		4-Month Follow-up		8-Month Follow-up		12-Month Follow-up	
Type of Activity	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Matches	1.0 ± 0.9	1.0 ± 0.7	0.5 ± 0.6	0.9 ± 0.8	1.4 ± 1.9	0.8 ± 0.9	1.1 ± 1.9	1.4 ± 2.6
Sport-specific training	3.5 ± 2.2	4.7 ± 3.7	6.3 ± 3.3	3.7 ± 2.2	4.7 ± 2.1	3.0 ± 2.7	4.5 ± 3.0	3.1 ± 2.5
Weight training	2.0 ± 2.8	2.3 ± 2.4	1.8 ± 1.9	3.7 ± 2.2	2.3 ± 1.9	2.5 ± 1.3	3.5 ± 3.0	1.6 ± 1.2
Jump training	0.0 ± 0.1	0.1 ± 0.3	0.2 ± 0.4	0.2 ± 0.3	0.3 ± 0.5	0.2 ± 0.5	0.4 ± 0.6	0.2 ± 0.3
Other training	2.4 ± 2.1	1.5 ± 1.6	1.2 ± 1.5	1.6 ± 1.9	2.5 ± 1.7	3.2 ± 2.7	2.3 ± 1.9	2.8 ± 3.4
Total training	8.9 ± 3.2	9.5 ± 4.4	10.0 ± 3.7	8.4 ± 3.0	11.1 ± 4.4	8.7 ± 4.1	11.8 ± 4.9	9.2 ± 4.8

[a]Training volume is reported as the mean number of hours per week (±SD) during the 4-week period before the start of treatment and each follow-up.

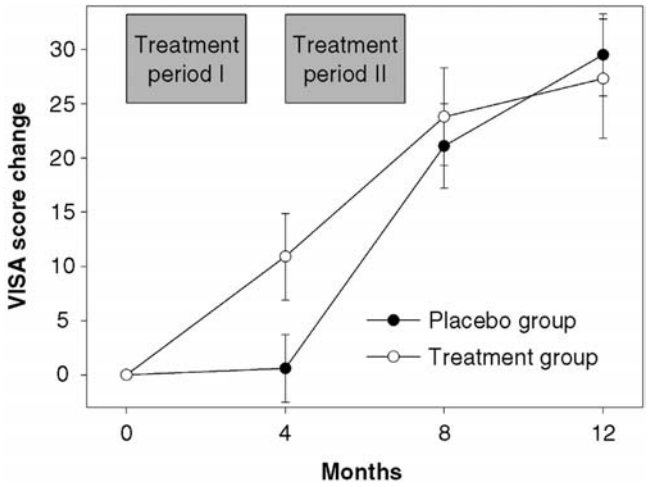

Figure 4. Change in VISA score (mean 95% confidence intervals) in both groups after 4 months (after treatment period 1), 8 months (after treatment period 2, the cross-over period), and 12 months (follow-up). VISA, Victorian Institute of Sport Assessment.

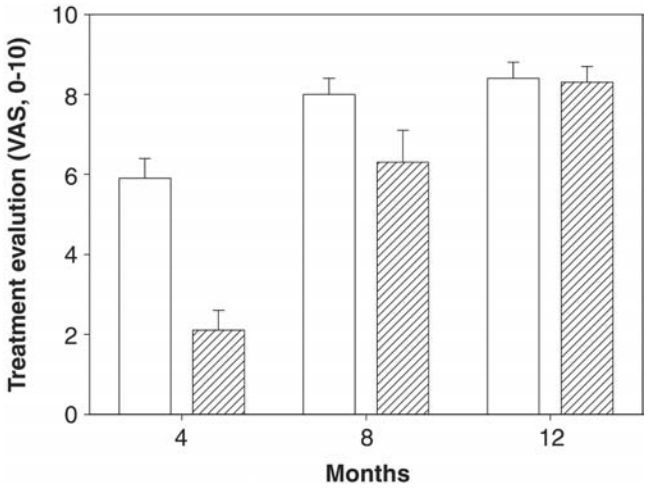

Figure 5. Overall treatment satisfaction (mean 95% confidence intervals) in both groups after 4 months (after treatment period 1), 8 months (after treatment period 2, the cross-over period), and 12 months (follow-up). VAS, visual analog scale. White bars, treatment group; hatched bars, placebo group.

review on treatment options for patellar tendinopathy, there is a remarkable lack of properly designed studies in the literature. Our results, showing improved function and reduced pain levels in the active treatment group and no effect in the control group during the placebo period, followed by a dramatic improvement in the control group when they were offered active treatment, represent convincing evidence that the changes observed can be attributed to the sclerosing injections.

The limited placebo period also means that some of the patients in the active treatment group were not treated optimally during the initial 4-month period. The pilot study by Alfredson and Ohberg[2] suggested that a mean number of 3 injections was required for a good clinical result. Because the injection technique was considered to be technically difficult to perform, we wanted to use experienced personnel to deliver treatment. For practical reasons, this meant that treatment could only be given on specific dates. Patients who were ill or could not make their appointments for other reasons lost 1 injection. It is possible that the rate of improvement during treatment period 1 would have been even better, as in the pilot study in which 12 of 15 patients became symptom free,[2] if some appointments had not been missed. As can be seen from Figures 4 and 5, further improvements were observed in the active treatment group when the patients were offered further injections.

This study also illustrates the difficulty with specific diagnostic criteria for patellar tendinopathy.[12,14] We included patients based on a typical pain history, including pain maps, reproduction of symptoms through palpation of the patellar tendon, and the presence of tendon changes on ultrasound, including neovascularization. Despite this, it appears that 5 of the patients had coexisting conditions: 4 had chondromalacia patellae, and 1 had a plica medialis syndrome involving the patellofemoral joint. This meant that their pain and function scores remained low until they had surgery, even if tendon pain improved after sclerosing injections. However, it should be noted that the effect of concomitant surgery was eliminated during data

analysis because we used an intention-to-treat model in which their last function scores before surgery were carried forward until the 12-month follow-up.

The subjects, the ultrasound examiner, the assistant, and the examiner were blinded to the nature of the substance that was injected. The fluids were visibly indistinguishable, and the immediate effects were the same for both fluids. To assess whether the patient blinding was successful, the subjects performed decline squats before and after each injection treatment session and reported whether they were symptom free immediately after the injections. Similar pain relief was reported, which indicates that the blinding was successful.

If we compare the present study with the randomized controlled trial on patients with Achilles tendinosis performed by Alfredson and Ohberg,[3] the results are very similar. They also reported a significant reduction in pain during the intervention period in the treatment group but not in the control group and subsequent improvements in both groups when both groups were offered sclerosing injections.

Polidocanol was first developed as a local anesthetic but is now widely used as a sclerosing agent with very few side effects in the treatment of varicose veins and telangiectasias.[10,22,38] Polidocanol has a selective effect in the vascular intimae, causing thrombosis of the vessel, even if the injection is performed extravasally, which is important when very small vessels are targeted. In their original pilot study on sclerosing therapy for Achilles tendinosis,[28] the authors hypothesized that sclerosing the vessels would also affect nerves adjacent to the neovessels either directly by destruction or indirectly through ischemia. Whether this is the explanation for the effects we have observed is not known. Interestingly, in the same patients, they also showed that when an ultrasound examination was done 2 years after sclerosing treatment, the Achilles tendon thickness had decreased, and the structure looked more normal on ultrasound (Ohberg and Alfredson, personal communication, 2005). The long-term effects on patellar tendon structure after this type of treatment have not been studied.

Two recent reviews document that although a multitude of treatment options have been suggested for patellar tendinopathy, there is surprisingly little evidence to guide the clinician.[12,31] Cook and Khan[12] identified only 10 prospective randomized trials, 7 of these on anti-inflammatory medication. Notably, they found no adequate studies on surgical treatment. They concluded that based on the available evidence, it was impossible to suggest that any treatment method is more appropriate than any other to treat patellar tendinopathy. Similarly, Peers and Lysens[31] recently concluded that current nonsurgical therapeutic protocols are characterized more by anecdotal experience than evidence and that no conclusive evidence can be drawn from the literature regarding the effectiveness of surgical treatment for patellar tendinopathy. Hence, it appears that sclerosing treatment represents a much needed and promising treatment option, although the present results need to be confirmed in larger studies on different patient populations.

CONCLUSION

Sclerosing injections with polidocanol resulted in a significant improvement in knee function and reduced pain in patients with chronic painful patellar tendinopathy.

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