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Outcome of lateral retinacular nerve transection combined with release for recalcitrant iliotibial band friction syndrome

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In this retrospective study, a technique consisting in neurolysis of the lateral retinacular nerve combined with a partial release through elliptic excision of the iliotibial band (ITB) is evaluated for efficacy in recalcitrant ITB friction syndrome and compared with results from other techniques reported in literature.

From April 2014 to December 2017, 21 patients suffering from recalcitrant ITB friction syndrome were surgically treated with the aforementioned technique. 15 patients (15 knees) were available for a written retrospective reassessment after completion of a follow-up period of at least 12 months. Residual pain was scored using the Visual Analogue Scale (VAS). The functional outcome was evaluated by two patient reported outcome measurement scales (PROMs), the Lysholm and the International Knee Documentation Committee (IKDC) score. Return to sport was analysed by duration of the inactivity period as well as by the Tegner score. Overall satisfaction was evaluated using a modified Boyden scale.

At final follow-up of one year, the performed intervention resulted in a pain reduction (VAS 4.2 (1-8) to 1.4 (0-6)) and improved knee function (Lysholm 59.53 to 87.73, IKDC 75) with return to sport (Tegner 4.3 to 5.4) after a median of 23.8 weeks (6 to 52). Twelve patients reported good or excellent results (80%) at final follow-up, and 12 patients (80%) would undergo surgery again, if necessary.

The treatment of recalcitrant ITB friction syndrome by combining neurectomy of the lateral retinacular nerve with elliptic excision of the ITB resulted in good to excellent results in 80% of treated cases with return to sport in 93%.

Keywords: iliotibial band friction syndrome, neurectomy, surgical release, PROM, outcome.

INTRODUCTION

Iliotibial band (ITB) friction syndrome is a disorder characterized by effort-related pain at the lateral side of the affected knee, progressively changing into an inflammatory pattern with pain and stiffness as well as an impaired gait pattern[1,2]. The disorder was formerly known as "runner's knee" because it was the most common cause of lateral knee pain in runners[3], with an incidence of 1.6-14%. Interestingly, many sports including repetitive cyclic movements of the knee are known to lead to the same pain syndrome, including cycling (15-24%), soccer, tennis, and competitive rowing[1,4,5,6,7,8,9]. Inappropriate training and sudden changes in training schedules such as excessive increase in distance or hill running exacerbate the complaints[10]. Intrinsic risk factors such as increased tibial exorotation, varus knee alignment, and hip abductor weakness seem to increase strain on the ITB but have never been proven to play a role in pathogenesis[10].

Although the aetiology of the pain remains unclear, 3 hypotheses have been developed.

(i) As the name of the syndrome states, it was thought that repetitive friction of the ITB along the lateral femoral epicondyle would lead to an inflammatory response with oedema, and potential chronicity due to fibrosis, cicatrisation, neovascularization and -innervation[1,3,7,9,11,12,13]. (ii) Fairclough et al studied 15 cadavers and found a firm distal attachment of the ITB over the linea aspera, preventing its anteroposterior movement[14]. They excluded friction as a potential cause and identified a mediolateral movement with fat pad compression during knee flexion as a possible pain generator, without any signs of bursal hypertrophy[1,4]. Other findings were bursal oedema visible on MRI and reactive hypertrophy leading to bursal impingement[1,13]. (iii) Recent research about persistent knee pain after total knee arthroplasty suggests neuropathy as a potential source of chronic pain around the knee [15] and hypothesizes the involvement of small retinacular

nerve branches with pure sensory function, such as the lateral branch of the retinacular nerve arising from the geniculate nerve[16].

Several conservative treatment options for ITB friction syndrome are available. The current gold standard of care is composed of activity modification in combination with NSAID), physiotherapy with stretching of the ITB, and, if needed, corticosteroid infiltrations[2,4,10,11]. Insoles and sport gear adapta-tion should be considered[4,10].

In a small proportion of conservatively treated patients, symptoms persist. In general, surgery is proposed in cases with recalcitrant symptoms after 6 months of unsuccessful conservative therapy[1,2,8]. Up to now, these surgical procedures only target the mechanical aetiology. However, we think that outcome could be improved by addressing in addition the hypothesized neuropathic component. This is supported by the successful treatment of drug-resistant lateral knee pain through selective cryoablation of the lateral branch of the retinacular nerve arising from the geniculate nerve[15]. Therefore, the purpose of our study was to evaluate patients treated in our centre by neurectomy of the lateral retinacular nerve together with the well-known partial release trough elliptic excision[2] and to compare our initial results with those of other surgical techniques reported in literature.

MATERIALS AND METHODS

A cohort of 21 consecutively treated patients with 21 affected knees who underwent a neurectomy of the lateral retinacular nerve and an elliptic release of the ITB at our institution was analysed. All surgical interventions were performed between April 2014 and December 2017. Patient selection was carried out through our institutional database and results were obtained retrospectively. Patients were called by phone to provide information about the study and to ask for permission to send them a form for informed consent and a postoperative outcome questionnaire. Ethical commission approval for the study was obtained from the Comité voor Medische Ethiek (EudraCT No. B371201838188). Only patients with attainment of a follow-up period of at least 12 months postoperative (in December 2018) were included in the study. Perioperative and long-term complications during this time window were extracted from our patient records, as well as readmission rates and its reasons.

All operations were conducted at the operation ward of a regional teaching institution centre by the senior author (J.B.). All patients were treated by a combination

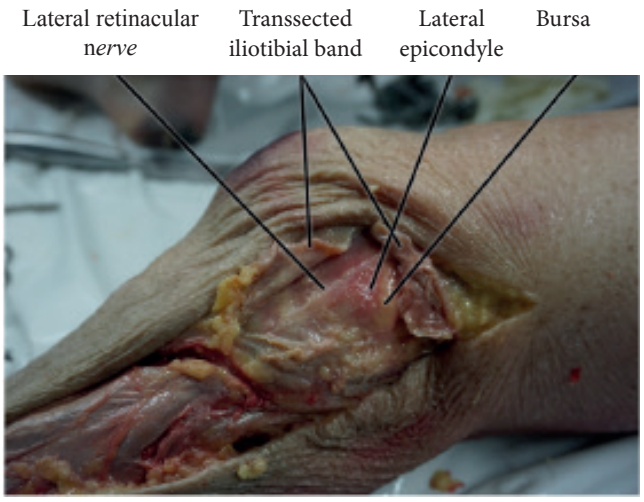

Figure 1 — Lateral retinacular nerve lying on top of the lateral femoral epicondyle, under the ITB.

of a supraselective neurolysis of the lateral retinacular nerve with an elliptic release of the ITB, similar to the technique described by Martens et al.[2].

The intervention was performed under general anaesthesia. The patient was installed in supine position with the affected knee fixed loosely in 90° of flexion by means of a McIntosh support at the level of the proximal thigh. A calf tourniquet was used to ensure good visual circumstances.

A curvilinear incision of approximately 5 cm was made over the lateral femoral epicondyle and a dissection was performed until the ITB being exposed at the level of the lateral femoral epicondyle.

In 60° of flexion, when the central fibres of the ITB are located over the lateral epicondyle, an elliptic incision over the ITB is made to uncover completely the lateral epicondyle, conserving the most posterior fibres to prevent losing tension of the fascia lata. Once the epicondyle is freed from the overlying ITB, the knee is flexed to 90° and subsequently extended to 30°. Any fibres still covering the lateral epicondyle in these positions are excised, leaving a fenestrated ITB without compression over a range of motion (ROM) of 30° to 90° flexion.

Finally, the lateral retinacular nerve branch running over the lateral epicondyle is identified (Fig. 1), carefully dissected and sharply transected at its most proximal point. The proximal stump is buried into the soft tissues to prevent neurinoma formation.

The intervention was completed by closing the subcutaneous tissues in a routine fashion with intradermal skin closure, while leaving the ITB fenestrated. Wounds were covered with sterile dressings. The knee was compressively bandaged, and a hinged brace fixed

Table I. — Study cohort characteristics

Demographic data (range)	
Number of patients	15
Male/female ratio	5/10
Mean age (years)	38 (22-58)
Mean duration of symptoms (months)	18.6 (3-118)
Preoperative treatment (percentage)	
Eccentric physiotherapy	11 (73%)
NSAID	11 (73%)
Infiltration with corticosteroids	10 (67%)
Insoles	5 (33%)
Percentages are expressed in relation to the total number of patients included in the study cohort.	

in 20° flexion was applied for 4 to 5 weeks to tension the remaining ITB fibers.

Immediately postoperative, a stepwise algorithm of analgesia was used depending on the patient's needs, consisting of tramadol 50 mg per orally, and acetaminophen 1 g per orally. All patients were discharged the same day once pain was under control.

The patient was instructed to use crutches, wear the brace in 20° flexion for 5 weeks and to proceed to full weight bearing as tolerated. Eccentric exercises were started after 5 weeks as soon as the pain was tolerable.

The surgical dressings were left unchanged as long as they remained dry. The family practitioner was asked to check the wound and remove the ends of the absorbable intradermal sutures after 2 weeks. At the first follow-up visit 5 weeks postoperative at our centre, pain and mobility were assessed, and physiotherapy was started.

Further follow-up visits were systematically performed at 15 weeks postoperative.

Reassessment took place in January 2019 and was conducted by the junior author (J.K.). It consisted of a phone call informing the patient about the interest as well as the circumstances of the study and asking for permission to send them a questionnaire with a form, including an informed consent and the patient reported outcome measurement scales (PROMs).

A VAS pain scale was used to evaluate subjective pain. On an unscaled line of 10 cm, the patient indicated the pain between 0 cm (no pain at all) and 10 cm (worst pain ever felt). The individual score corresponded to the distance of 0 cm to the marking drawn by the patient.

The Lysholm score is a PROM focussing on knee-specific symptoms during daily life activities such as walking, stair climbing, and squatting. These symptoms include mechanical locking, instability, or pain. The higher the score, the less symptoms they have throughout the day[17].

The International Knee Documentation Commitee (IKDC) scoring system rates symptoms, sports activity, and knee function on a scale of 100 points, 100 indicating normal knee function without pain in daily life and sports activities[18].

The Tegner activity grade system scales activity level in a numerical way from 1 to 10, depending on sports intensity, frequency, and strain on the knee. Higher scores indicate high-level activities with higher strain for the knee[17].

Satisfaction assessment is based on anamnestic information about pain, limitation in activities and satisfaction with the surgery, and the results are classified into 4 categories ranging from poor to excellent, similar to the Boyden scale[19]. The overall success rate of an intervention is based on the sum of good and excellent results[19].

Of each score, a validated and cultural adapted Dutch version was used to ensure the validity of scoring in our study population.

Friedman two-way ANOVA test with Dunn's multiple comparisons test was performed using Prism (GraphPad Software) to assess changes in VAS, Lysholm and Tegner scores. P values of ≤ 0.05 were considered statistically significant.

RESULTS

Of the 21 patients operated between April 2014 and December 2017, one patient did not respond to the initial phone calls and 5 patients did not send back their questionnaires after initial oral confirmation by phone, even after several personal reminders by phone calls.

The final study population was thus composed of five male and 10 female patients with an average age of 38 years at the moment of surgery (range 22-58 years). All but one were involved in some kind of sports.

The average duration of complaints before surgery was 18.6 months (range between 3-118 months). Before performing surgery, 11 patients (73%) had received eccentric training supervised by a physiotherapist before surgery, 11 patients (73%) had taken NSAID, 10 patients (67%) had undergone at least 1 infiltration with corticosteroids and five patients (33%) wore insoles. Only one patient (7%) did not get any conservative treatment before going to surgery.

At the final follow-up one year after surgery, the performed intervention resulted in pain reduction (VAS 4.2 (1-8) to 1.4 (0-6)) (Fig. 2, Table II) and improved knee function (Lysholm 59.53 to 87.73, IKDC 75) (Fig.

Table II. — Results of the PROMs

Score system (mean value)	preop	6 weeks	1 year
VAS (0 cm -10 cm) Lysholm (0-100) Tegner (1-10)	4.2 59.53 4.27	3.73 62.93 2.53	1.4 87.73 5.4
Complications	**postop**	**6 weeks**	**1 year**
n. peroneus palsy	2 (14%)	1 (7%)	1 (7%)
Outcomes at final follow-up (one year after surgery)			
IKCD Satisfaction Return to sport (weeks) Reconsider surgery?	75/100 0 poor, 3 fair, 4 good, 8 excellent 23.8 (6-52) 12 yes (80%)		
preop, at last preoperative consultation; postop, at the moment of discharge after surgery.			

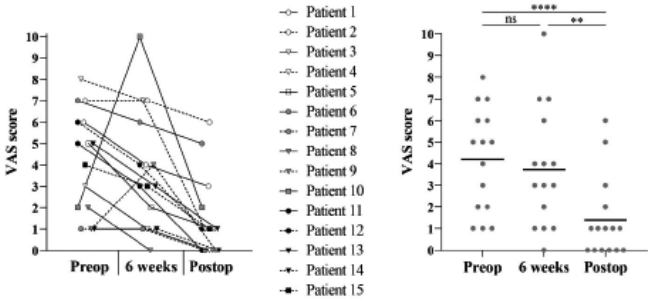

*Figure 2 — Evaluation of pain using VAS score. Patients rated their pain preoperative, after 6 weeks and after 1 year (ranging from 0 cm to 10 cm). On the left graph, each patient is represented by one line. The right graph illustrates the mean (horizontal line) and each circle corresponds to one patient (ns, non-significant; **, P < 0,01; ****, P < 0,0001).*

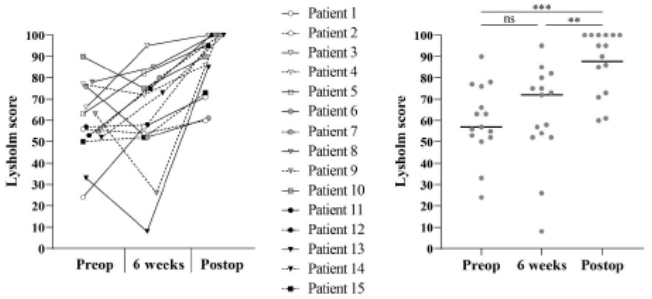

*Figure 3 — Evaluation of the knee function using Lysholm score. Patients rated their knee function preoperative, after 6 weeks and after 1 year (ranging from 0 to 100). On the left graph, each patient is represented by one line. The right graph illustrates the mean (horizontal line) and each circle corresponds to one patient (ns, non-significant; **, P < 0,01; ***, P < 0,001).*

3, Table II) with return to sport (Tegner 4.27 to 5.4) (Fig. 4, Table II) after a median of 23.8 weeks (6-52) (Table II). Furthermore, 14 out of 15 patients (93%) regained their previous activity level (Table II). At final follow-up, 12 patients reported good or excellent

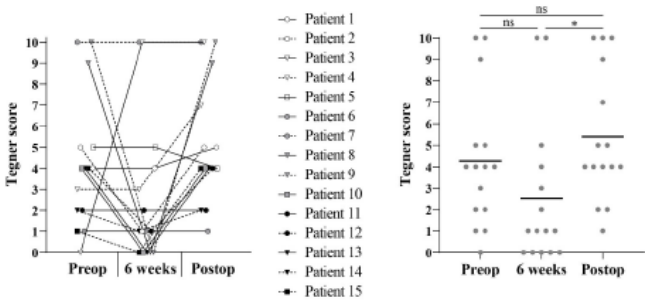

*Figure 4 — Return to sport using Tegner score. Patients described their sports activities preoperative, after 6 weeks and after 1 year, which were then scored from 0 to 10. On the left graph, each patient is represented by one line. The right graph illustrates the mean (horizontal line) and each circle corresponds to one patient (ns, non-significant; *, P < 0,05).*

results (80%), and 11 patients (80%) would undergo surgery again, if necessary (Table II).

After the operation, two patients (14%) had a postoperative palsy of the n. peroneus communis with altered sensibility (Table II). The first patient recovered spontaneously after removal of the brace 5 weeks postoperative, while complaints of hypoesthesia persisted in the other patient. At final follow-up, an electromyography showed slight recovery of motor and sensible conductance signals, most compatible with a temporary pressure neuropathy due to the postoperative brace immobilization. MRI excluded pressure through local hematoma formation.

DISCUSSION

The intention of this retrospective case series was to evaluate the outcome of an elliptic release of the ITB combined with a neurectomy of the lateral retinacular nerve for tenacious ITB friction syndrome resistant to multimodal conservative therapy and to compare our results with those of other surgical techniques described in literature.

Due to the lack of a common or specific knee scoring system for this pain syndrome, a broad range of scaling systems has been used in order to enable the comparison of our results with published data. The selection of the scoring system used in this study was therefore based on those used in former studies. Return to sport is a major evaluation criterion in this research field because it is the main goal for every active patient, although difficult to evaluate because of high variability between individuals (e.g., activity intensity) and between the practised sports (e.g., strains on the knee). Some authors evaluated the execution of recreative sports, while others assessed the return to the

patients' previous activity level. Therefore, we used a numerical grading system that compared sport activity before and after the procedure, which allowed us to evaluate a professional soccer player as well as a leisure tennis player. In our cohort, only one patient (7%) did not reach his previous level of activity, supporting the effectivity of our surgical intervention.

To the best of our knowledge, seven other studies, composed of similar cohort sizes, published so far results of their surgical techniques to treat tenacious ITB friction syndrome[2,11,12,20,21,22,23)]

Martens et al. performed an ellipsoid excision of the ITB and showed that after a mean duration of 7 weeks, all patients could return to sport, with 100% satisfaction and a Lysholm score of 85.86[2]. In our study, the final results were similar (Lysholm score of 87.7 and 93% satisfaction) but delayed as reflected by the lower short term Lysholm score after 6 weeks (62.9) and return to sport after 23.8 weeks (6 up to 52 weeks). This delay may be explained by the higher mean age of our study population (35 versus 24.5 years) and by our patients' post-operative immobilization of 5 weeks.

Holmes et al. performed an excision of an elliptical piece of the distal posterior iliotibial band off the lateral femoral epicondyle, exclusively on cyclists. Six to eight weeks after surgery, 81% of the treated patients had regained their preoperative level, of whom 71% were still cycling after six months. Fifty-two percent of the patients showed postoperative seroma or hematoma[20]. Our complication rate was lower with 14% and a comparable return to sport after 1 year of 93%, making it a safer and non-inferior intervention.

Drogset et al. performed a release of the posterior ITB fibres on 45 patients with 1 (2%) surgical site infection. In this cohort, 79% of the patients were satisfied and would consider undergoing the operation again, if necessary [11], which is in line with our findings.

In 2007, Barber et al. described a Z-shaped lengthening procedure with 100% return to sport without persistent pain, and 75% good and excellent results without complications after a mean follow-up of 75 months[12]. These results are in line with our findings, but do not precise the timing of return to sport.

Michels et al. treated 33 patients by an arthroscopic lengthening of the ITB. After an average of 12 weeks, all of them returned to sports with 97% patient satisfaction and only 1 (3%) hematoma[22]. The minimal invasive character of the intervention possibly explains the quicker return to sport compared to our group despite the similar mean age, as well as the lower complication rate.

Hariri et al. performed open bursectomy and observed a VAS drop from 8 to 2, with 72% of the patients returning to sports and an overall patient satisfaction of 82% after at least 20 months. No complications were described[23]. Our VAS drop from 4.2 to 1.4 shows a less dramatic change with comparable return to sport and patient satisfaction.

With 34 patients (mean age 20 years) available for follow-up, Inoue et al published results of the biggest operated cohort so far. Their minimal invasive technique of split thickness lengthening of the central portion of the ITB allowed return to competition after a mean of 5.8 weeks and an improvement in personal records in 76% of runners[21]. Here again, the delay to return to sport in our studied population could partially be explained by the higher mean age and the initial immobilization.

In our study, limited sensory side effects were observed. Only one patient experienced persistent altered sensibility in the peroneus-dermatome. This supports earlier findings stating that the transected nerve branch does not play a role in sensory innervation of knee region[15].

Limitations of our study are its retrospective design, a small study group and the absence of a control group. Prospective multicentric studies comparing different surgical techniques and evaluating the same parameters have the potential to overcome those limitations.

In conclusion, our results are comparable to earlier published surgical treatment methods of this recalcitrant syndrome, making the supraselective neurectomy an alternative to other well-established interventions.

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