Pain 104 (2003) 375–380

PAIN

www.elsevier.com/locate/pain

The internal obturator muscle may cause sciatic pain

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Received 8 May 2002; accepted 27 January 2003

Abstract

Six patients suspected to have piriformis syndrome were operated in the hip region in an attempt to relieve pressure on the sciatic nerve. The piriformis muscle and tendon as well as their relationship to the sciatic nerve were found to be normal. However, the internal obturator muscle was found to be very tense, slightly hyperaemic and pressing the sciatic nerve. During Lasegue's testing on the operating table the internal obturator and not the piriformis muscle impinged on the nerve at an early stage in the hip flexion movement. A sectioning of the tendon to the internal obturator muscle near its insertion at the trochanter was performed. Median pain score was found to be reduced from the preoperative value (8.5) to that at 6 weeks (3.5) ($P < 0.05$) and 3 (3.5) ($P < 0.05$) and 6 months (5.5) (N.S.) postoperatively. No significant reduction of pain was found in a control group of six patients followed during the same period. Three patients who needed opioids preoperatively managed without such drugs 6 months after the operation. Two patients in the operated group were at work 50 and 100% after having been out of work for 3 and 10 years, respectively.

Keywords: Piriformis muscle; Internal obturator muscle; Sciatic nerve entrapment; Operation

1. Introduction

A syndrome was described in 1928 by Yeoman where he proposed that arthritic changes in the sacroiliac joint may cause sciatic pain due to secondary inflammatory reaction in the piriformis muscle (Yeoman, 1928). Since then a similar syndrome has been investigated in a number of studies. It has been argued that the piriformis muscle may irritate the sciatic nerve due to an anatomical abnormality such as an hypertrophic muscle (Mullin and De Rosayro, 1990; Sayson et al., 1994; Benson and Schutzer, 1999). Robinson (1947) has been credited with introducing the term piriformis syndrome (Solheim et al., 1981; Mullin and De Rosayro, 1990; Benson and Schutzer, 1999) and entrapment and irritation of the sciatic nerve in the hip region has largely been ascribed to influence from the piriformis muscle. Anatomical variations such as a bipartite piriformis muscle (Chen, 1994) and the piriformis muscle lying anterior to the nerve (Sayson et al., 1994) have been described as irritating the sciatic nerve. Operating to relieve the nerve from the pressure of the tense muscle has resulted in immediate pain relief (Chen, 1994; Sayson et al., 1994; Benson and Schutzer, 1999). In the latter report, Benson found adhesions between the piriformis muscle and the sciatic nerve. In the present study, a problem which seemed similar to those described by others (Mullin and de Rosayro, 1990; Durrani and Winnie, 1991; Sayson et al., 1994; Benson and Schutzer, 1999) was diagnosed in a number of patients. These were recruited for a small prospective, randomised study with intervention and control groups. The complaints included problems such as buttock pain and tenderness extending from the sacrum to the greater trochanter, and pain radiating to the lower extremity. The sciatic nerve was suspected to be irritated.

2. Methods

2.1. Patients and control subjects

Twelve patients, three male and nine female, mean age 51 (25–79) years with pain in the buttock, radiating pain distal to the knee, and intolerance to sitting for more than about 40 min, were included in a prospective, randomised study. The patients were randomly allocated using sealed opaque envelopes to either operative or conservative treatment. The duration of their problems had been between

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0304-3959/03/$30.00
doi:10.1016/S0304-3959(03)00045-9

3 and 7 years. All of them had pain and tenderness when examined with deep digital palpation over the small external rotators at the back of the hip, and also over the sciatic nerve at the trochanteric region (Table 1). The preoperative examination included test for pain and weakness on resisted abduction and external rotation of the thigh in a sitting position (Pace's sign), pain and weakness on forced passive internal rotation of the extended thigh (Freiberg's sign), and buttock and leg pain during passive straight leg raising (Lasegue's sign). Three of the patients had been through back surgery because of sciatic pain, in two cases affecting the actual and in one case the opposite extremity. All patients had been through long periods of conservative treatment with either physiotherapy or injections with local anaesthetic agents combined with steroids after diagnosis of problems in the small external rotators in the hip. None of the operated patients was able to work. All patients provided written informed consent, and the study protocol was approved by the institutional ethical review board.

All three authors took part in the preoperative clinical examinations, they planned and performed the operations together, and also made the postoperative assessments together.

2.2. Pain in the two groups

Pain was registered using a 0–10 point numerical rating scale preoperatively and at 6 weeks, 3 and 6 months postoperatively (Table 2). The use of analgesic and anti-inflammatory drugs for each patient was expressed by increasing points with increasing amount of drugs. Zero points meant no drug, one point paracetamol irregularly, two points paracetamol/codeine or NSAID regularly, three points paracetamol/codeine and NSAID regularly, and four paracetamol/codeine and additionally either buprenorphin, tramadol or morphine. These evaluations were done at the start of the study and at 6 months in both the operative and control groups (Table 2). The number of days off sick was registered for both groups.

All patients went through radiological examination of the pelvis and hip, and CT scan or MRI of the back did not reveal actual spinal pathology giving any indication for back surgery.

2.3. Surgical procedure

An explorative operation was done using a posterolateral approach in the hip region. The fascia lata was split, the external rotators and the sciatic nerve were identified (Fig. 1). An examination of the anatomy as well as the relationships between structures during passive flexion, internal rotation and Lasegue's test were performed during the operation. Prophylaxis against infection was cefalotin 2 g given intravenously before the operation. Weight bearing supported by crutches was allowed immediately after surgery. A liberal gradual increase in activity guided by

Table 1
History, symptoms and clinical findings in patients with suspected piriformis syndrome allocated to two different groups, one operated and one control

Pas no	Gender	Buttock/sciata	Problem sitting	Limp	Sensibility and reflex altered	Muscle atrophy	Tenderness on deep digital palpation	Tender rectal palpation	Freibergs sign positive	Pace's sign positive	Trendelenburg	Lasegue	Trauma
Operated													
1	F	+	+	+	+	−	+	−	+	+	+	+	−
2	M	+	+	+	−	+	+	+	+	+	+	+	+
3	M	+	+	+	+	+	+	+	+	−	−	+	+
4	F	+	+	−	−	+	+	+	+	−	+	−	−
5	F	+	+	+	+	−	+	−	+	+	+	+	−
6	F	+	+	+	−	+	+	+	+	+	−	+	−
Control													
7	F	+	+	−	+	−	+	−	+	−	+	−	+
8	F	+	−	+	−	−	+	−	+	−	−	−	−
9	F	+	+	+	+	+	+	+	+	+	+	+	−
10	F	+	+	−	−	−	+	+	+	+	−	+	−
11	F	+	+	+	−	+	+	−	+	−	−	+	+
12	M	+	+	+	+	+	+	+	+	+	−	+	−
		100%	92%	75%	50%	58%	100%	50%	83%	67%	42%	83%	17%

Table 2
Pain as expressed on a numerical rating scale and the amount of analgesic drug consumption for patients in the operated and control groups during the study for suspected piriformis syndrome

Pas no	Pain Score				Analgesics	
	Start point	+6 weeks	+3 months	+6 months	Start point	+6 months
Operated						
1	9	9	10	10	3	3
2	9	5	5	8	4	0
3	10	1	2	8	4	2
4	7	5	5	5	3	1
5	8	2	2	2	3	0
6	7	0	0	0	4	0
Control						
7	8	1	1	9	3	3
8	4	1	1	7	1	1
9	9	6	6	7	4	4
10	7	7	7	7	1	1
11	8	8	8	5	3	2
12	5	5	5	4	2	2

the patients themselves was allowed. All patients were re-examined at 6, 12 and 24 weeks postoperatively. No new approach for treatment was begun in the control group during the observation period.

2.4. Statistical evaluation

Wilcoxon Signed Ranks Test was used to test the outcome of the treatment on pain. $P < 0.05$ was considered statistically significant.

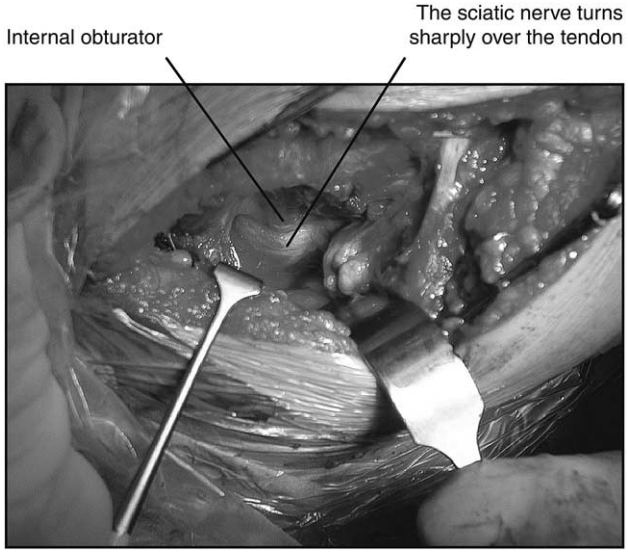

Fig. 1. The sciatic nerve and the internal obturator tendon as found during operation for suspected piriformis syndrome. The internal obturator tendon is tense and hypertrophic, lying in close contact with the sciatic nerve, which turns sharply over the tendon.

3. Results

In this study all patients had buttock pain with sciatica, and also tenderness when palpating the sciatic notch (Table 1). Two of them had been through trauma to the actual gluteal region. A total of 92% had difficulties sitting more than 40 min because of pain. Pace's sign was positive in four and Freiberg's sign was positive in all the operated patients (Table 1).

At operation the sciatic nerve was found to pass anterior to the piriformis muscle in all cases, with no part of the nerve passing through this muscle. As for the superior gemellus and internal obturator muscles, the sciatic nerve passed behind these. The internal obturator muscle was very tense, slightly hyperaemic and hypertrophic, and it was found to lie in close contact with the sciatic nerve (Fig. 1). The nerve was slightly flattened where the obturator muscle was lying against it, and was also slightly hyperaemic. As far as the operating team could observe during the Lasegue manoeuvre performed on the operating table, the internal obturator and not the piriformis muscle impinged on the nerve at an early stage in the hip flexion movement. These relationships between the internal obturator muscle and the sciatic nerve were defined as pathological. To relieve the tension on the sciatic nerve from the obturator muscle, a sectioning of the tendon to the internal obturator muscle was performed at its insertion on the greater trochanter in all cases operated. An immediate release of the tension in the sciatic nerve during Lasegue's test was observed after the sectioning of the tendon (Fig. 2).

At the start of the study all of the patients in the operative group had a serious pain problem, as the median pain score was 8.5 (Table 2). A reduced median scoring was seen both at 6 weeks (score 3.5) ($P = 0.043$), 3 (score 3.5) ($P = 0.046$) and 6 months (score 5.5) ($P = 0.058$, N.S.)

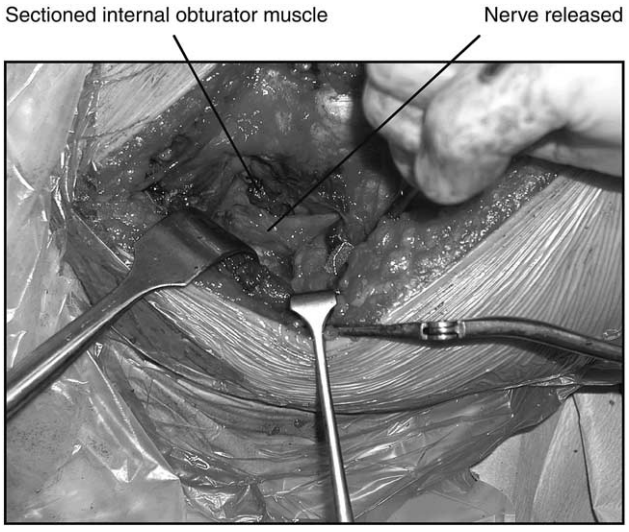

Fig. 2. After sectioning the internal obturator tendon the sciatic nerve is released from the impact from the tendon.

postoperatively in the operated group when comparing to the preoperative values (Fig. 3). No significant reduction of pain was found in the control group at any point of time in the follow up period (Fig. 4).

There was an obvious tendency towards less consumption of drugs in the operative group at 6 months. It was for example found that two patients on a combination of drugs including opioids before the operation used no drugs at all at 6 months (Table 2). Such a tendency towards less drug consumption was not found in the control group in the observation period (Table 2). Two patients in the operated group (Table 2, patients number 5 and 6) were back at work 6 months postoperatively, one at 50% and the other at 100%,

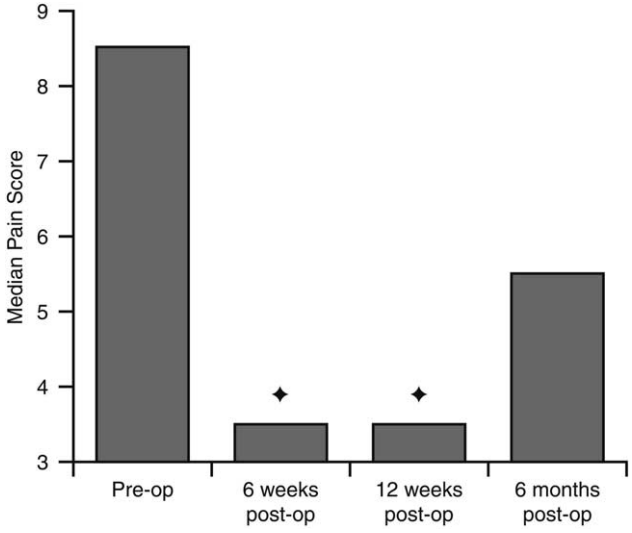

Fig. 3. Median pain score as reported on a 0–10 point numerical rating scale in the operated group of patients at the start of the study and at 6 and 12 weeks as well as 6 months postoperatively. There was a significant reduction in pain at 6 and 12 weeks postoperatively as compared to the preoperative value ($P < 0.05$).

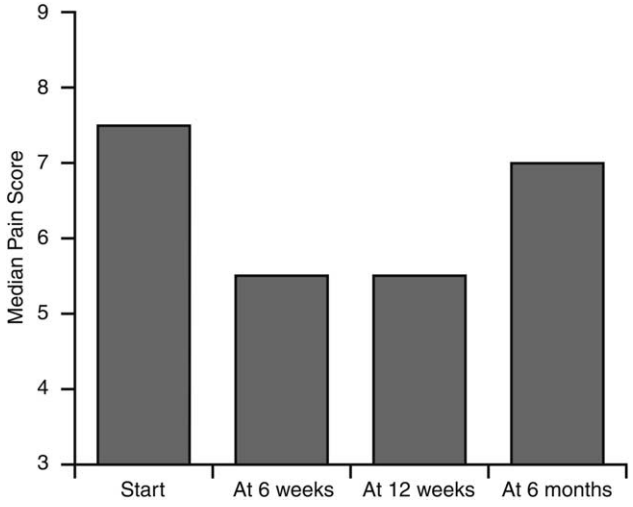

Fig. 4. Median pain score as reported on a 0–10 point numerical rating scale in the control (non-operative) group of patients at the start of the study and at 6 and 12 weeks as well as at 6 months. No significant reduction in pain was seen at any time point as compared to the start value.

after having been unable to work for about 3 and 10 years, respectively.

4. Discussion

Six patients with buttock pain with additional sciatica were operated for a suspected entrapment of the sciatic nerve in the hip region. All of them were found to have a pathologically tense internal obturator muscle, which was in an abnormally close contact with the sciatic nerve, especially during Lasegue's test performed on the operating table. After sectioning the internal obturator tendon at the greater trochanter, these patients reported less pain both at 6 weeks, 3 and 6 months postoperatively compared to the preoperative status. At 6 weeks and 3 months these differences were significant ($P < 0.05$ and $P < 0.05$, respectively). In the control group there was no significant reduction of pain at any point of time in the follow up period.

There was a tendency towards less consumption of drugs in the operated group at 6 months. Therefore, the operation had reduced pain postoperatively.

At the start of the study the pain was described as relatively intense, as four of the patients chose the extreme of either nine or ten on the numerical rating scale. Three patients in the operated group used some mixture of analgesic drugs which included opioids. It is interesting that, postoperatively, none were using opioids in the operated group, and three in this group did not use any analgesic drugs at all. The two patients in the control group who used opioids still used them after 6 months.

One of the most successfully operated patients had been out of work for about 3 years, and returned to work at 50% postoperatively with reduced pain and on no analgesic

drugs. Another had been unable to work for the last 10 years, and was at work 100% 6 months postoperatively. This patient had a reduction of pain from 7 to 0 on the numerical rating scale, and used no analgesic drugs even though she had been on opioids preoperatively. None of the patients in the control group were found to have increased their capacity for work, and no significant reduction in pain nor any reduction in the amount of analgesic drugs was found in this group. Two patients in the control group had a period of quite remarkable spontaneous but incidental improvement as found on the numerical rating scale in the observation period (patient number 7 and 8) (Table 2). This illustrates that some of these patients have periods of temporary recovery from their symptoms.

This study had only two patients with a history of trauma, differing from an earlier study (Benson and Schutzer, 1999) in which all patients, with similar symptoms to those described in this report, had suffered some form of trauma. Excessive exercise has also been mentioned as a reason for a similar syndrome (Beauchesne and Schutzer, 1997), but there is no proof of that in our study. Anatomical variations affecting the piriformis muscle together with the sciatic nerve have been mentioned as an etiology for syndromes affecting the external rotators (Mullin and de Rosayro, 1990; Durrani and Winnie, 1991; Sayson et al., 1994; Chen, 1994) but such variations were not found in any of the patients in our study. As in other reports, a hypertrophic (Rask, 1980; Jankiewicz et al., 1991) or spastic muscle (Solheim et al., 1981; Sayson et al., 1994) was found to cause the pain by affecting the sciatic nerve.

The symptoms and clinical findings in the two groups were similar to those previously described for the piriformis syndrome. All patients had buttock pain with sciatica, and 11 of them had difficulties with sitting (Sayson et al., 1994). Also a limp has been described in the piriformis syndrome (Solheim et al., 1981), and this was found in nine cases in our study. When examined, all patients had pain with deep digital palpation in the region at the insertion of the piriformis where also the internal obturator tendon inserts. They also reported about pain during palpation of the area for the sciatic nerve passing the great sciatic notch (Durrani and Winnie, 1991; Benson and Schutzer, 1999). Freiberg's sign was found positive in ten of the 12 patients, and Pace's sign was positive in eight cases (Solheim et al., 1981; Jankiewicz et al., 1991; Durrani and Winnie, 1991). Both the piriformis and the internal obturator muscles are external rotators. Passive internal rotation, which stretches the piriformis muscle, will in most cases also stretch the internal obturator muscle. If such stretching triggers pain because of tendinitis, both the piriformis and internal obturator muscles may therefore be sources of pain during passive internal rotation of the hips. In this study a pathology in or around the internal obturator muscle was not suspected in the operative group before the explorative procedure, as symptoms and findings preoperatively did not vary from what could be suspected in cases of a piriformis syndrome. The pathological findings around the internal obturator tendon were described peroperatively, and the functional testing with moving the hip joint was important to determine how much the internal obturator muscle pinched the sciatic nerve in certain positions. In the operative group one patient was found with Lasegue's sign negative preoperatively, but on the operating table all patients had an impact from the obturator tendon on the sciatic nerve at an early stage in the movement when doing this test.

The treatment options for the syndrome affecting the piriformis muscle have been described as rectal massage (Mullin and De Rosayro, 1990; Jankiewicz et al., 1991), physical therapy (Mullin and de Rosayro, 1990) injections of anaesthetic agents together with steroids (Mullin and de Rosayro, 1990; Durrani and Winnie, 1991), and surgical release of tendons (Solheim et al., 1981; Sayson et al., 1994; Benson and Schutzer, 1999). In our small number of patients, the short time result seemed to be most striking, as the pain had been reduced at 6 weeks. The improvement of pain on the numerical rating scale was no longer significant at 6 months, but the reduction in the use of analgesic drugs in the operative group is impressive also at 6 months.

Thus, a formerly undescribed pathology affecting the internal obturator muscle and its relationships to the sciatic nerve seems to be responsible for much of the pain and diffuse neurological symptoms which were first ascribed to a piriformis syndrome in this study.

In conclusion a syndrome clinically similar to the piriformis syndrome has been described. Peroperatively the internal obturator tendon was found to make contact with the sciatic nerve. Sectioning the internal obturator tendon reduced pain postoperatively as measured by the numerical rating scale. There was an obvious tendency towards reduction in the amount of analgesic drugs consumed in the operative group 6 months after operation. Also, two of the operated patients had commenced employment after relatively long time out of work.

Acknowledgements

We would like to thank The Clinical Research Unit at Tromso University Hospital for excellent assistance in this study.

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