

Sympathetically mediated anterior knee pain

Scintigraphy and anesthetic blockade in 19 patients

P. Adrian Butler-Manuel¹, Douglas Justins² and Frederick W. Heatley¹

Nineteen patients with anterior knee pain without the classical features of reflex sympathetic dystrophy (RSD) were investigated by local anesthetic sympathetic blockade. Scintigraphy was performed before the sympathetic blockade in all the cases, and the scintigraphic appearances were correlated with the clinical response. Eleven patients responded to the blockade (9 good and 2 fair). Only 1 out of 10 patients

with increased scintigraphic uptake failed to respond, whereas 7 out of 9 patients with normal uptake failed to respond. Our study suggests that a sympathetically mediated component may exist in patients with anterior knee pain without RSD, and that scintigraphy is useful in identifying those patients for whom sympathetic blockade may be helpful.

Department of ¹Orthopedics and ²Pain Relief Clinic, St. Thomas' Hospital, London SE1 7EH, England.
Correspondence: Mr. P. A. Butler-Manuel, Royal Sussex County Hospital, Brighton, BN2 5BE, England
Tel +44-273 696955. Fax +44-273 605341
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Reflex sympathetic dystrophy (RSD) has been defined as "continuous pain in a portion of an extremity after trauma, which may include fracture but does not involve a major nerve, associated with sympathetic hyperactivity" (International Association for the Study of Pain Subcommittee on Taxonomy 1986). In the knee, RSD is characterized by a continuous burning pain, extreme local tenderness, increased sweating, and alteration in skin temperature and color. Although the etiology of RSD is not fully understood (Tietjen 1986, Seale 1989), previous studies have demonstrated that the majority of knees with RSD have increased scintigraphic uptake (Katz and Hungerford 1987, Ogilvie-Harris and Roscoe 1987, Butler-Manuel et al. 1990).

We have identified cases of anterior knee pain with increased scintigraphic uptake, but without the classical features of RSD. This paper reports the effect of local anesthetic sympathetic blockade in this group of patients.

Patients and methods

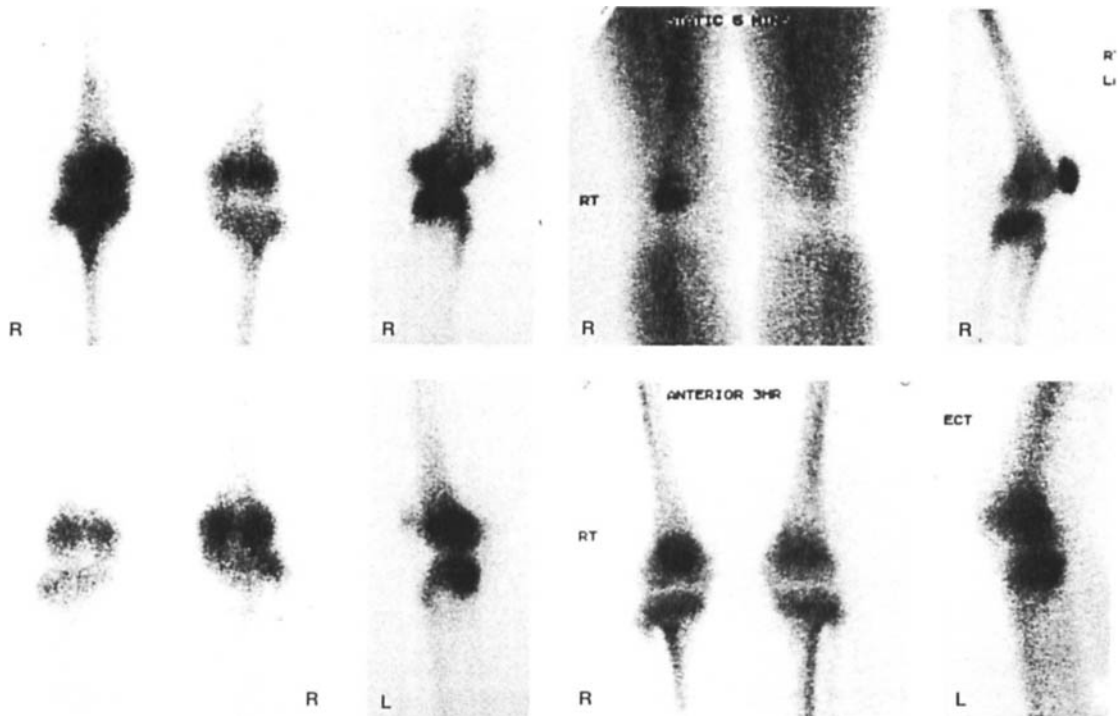
Twenty outpatients referred to a specialist knee clinic for anterior knee pain syndrome were investigated. There were 3 males and 17 females with a mean age of 28 (18-48) years. No patients complained of altered sweating, skin temperature, or color changes indicative of RSD. All 20 patients underwent arthroscopy. The underlying diagnoses were as follows:

1. Chondromalacia patellae, defined as softening of the patellar articular cartilage, was identified arthroscopically in 11 patients.
2. Patellar maltracking existed in 1 patient.
3. Postpatellectomy syndrome, defined as chronic anterior knee pain with weakness and giving way following patellectomy, was present in 1 patient.
4. There were no diagnoses in 7 patients.

Bone scintigraphy was performed before lumbar sympathetic blockade in all the cases. Anterior, posterior, and lateral static images of both knees were recorded with an IGE maxi gamma camera 3 hours after injection of 550 MBq of ^{99m}Tc-HMDP. The scans were classified as (1) normal uptake, (2) focal increased uptake in the patella, and (3) diffuse increased uptake affecting the whole knee (Figure 1).

All the patients then underwent lumbar sympathetic blockade, performed as a day case by a consultant anaesthetist in the Pain Relief Clinic using 0.5 percent bupivacaine injected under sedation with image intensification control. No intravenous analgesic drugs were administered during the procedure, and all the patients were asked to avoid using analgesic drugs during the study period.

The technical success of the blockade was confirmed by detecting a rise in skin temperature of more than 3 °C compared with the contralateral leg and abolition of the skin potential response, which is dependent on a functional sympathetic nervous system (Cronin and Kirsner 1979). Nineteen of the 20 patients had technically successful sympathetic blocks using these criteria.



Normal appearance in the left knee (L) and diffusely increased uptake in the right knee (R).

Normal appearance in the left knee and focally increased uptake in the right patella.

Figure 1. Bone scan classification.

The clinical response to the block was recorded in a pain diary, which was kept for 7 days before and after the block. The severity of the pain before and after the block was assessed using a visual analog scale. The scale used was a 100-mm-long linear scale with no pain corresponding to 0 mm and the worst imaginable (excruciating) pain corresponding to 100 mm. The most severe pain, the least severe pain, and the average pain for each day of the study period were recorded on this scale. This scale allowed the average daily pain score to be expressed as a percentage of the patient's worst imaginable knee pain.

The mean values of the average daily pain scores were calculated (1) for the 7 days before the sympathetic blockade and (2) for the first 2 days following the blockade. A good response was defined as a fall of more than 20 percent in the patient's worst imaginable knee pain in the first 2 days following the block. Using the same criteria, a fair response was defined as a fall of 10-20 percent, whereas a poor response was defined as a fall of less than 10 percent.

Repeat blocks were not performed routinely, although 3 patients did subsequently undergo further sympathetic blockade.

Results (Table 1)

Nine patients had good responses to the sympathetic blockade, and 7 of these had increased scintigraphic uptake (4 focal, 3 diffuse). Two patients had fair responses (1 diffuse, 1 focal), and 8 patients had poor responses (1 focal, 7 normal uptake).

In the good-response group, the responses were sustained for more than 6 weeks in 4 of the 9 patients. Two of these patients have remained asymptomatic, whereas the other two had repeat blocks that were also successful for approximately 6 weeks. Three other patients had responses that were sustained for between 2 and 6 weeks. In the remaining 2 patients, the response was not sustained for the full 7-day study period. However, 1 of these patients had a repeat block performed that resulted in a more prolonged period of pain relief lasting for 2 weeks.

There was a correlation between the appearance of the bone scan and the clinical response to the sympathetic blockade. Only 1 out of 10 patients with increased uptake had poor responses, whereas 7 out of 9 of those with normal uptake had poor responses. Using Fischer's exact test, this difference was found to be highly significant ($P < 0.01$).

Table 1 Relationship between the diagnosis, scan appearance, and the response to the sympathetic blockade for each patient

| Case | A | B | C | D | E | F | G | H |
|------|----|---|---|---|-------------------|----|-----|---|
| 01 | 21 | F | 1 | 1 | 84 | 78 | -06 | P |
| 02 | 20 | M | 4 | 1 | 47 | 17 | -30 | G |
| 03 | 23 | M | 4 | 1 | 59 | 73 | +14 | P |
| 04 | 38 | M | 4 | 1 | 59 | 73 | +14 | P |
| 05 | 27 | F | 4 | 1 | 62 | 60 | -02 | P |
| 06 | 26 | F | 2 | 1 | 41 | 40 | -01 | P |
| 07 | 28 | F | 1 | 2 | 65 | 55 | -10 | F |
| 08 | 18 | F | 1 | 3 | 51 | 02 | -49 | G |
| 09 | 26 | F | 1 | 3 | Ineffective block | | | |
| 10 | 23 | F | 3 | 3 | 74 | 47 | -27 | G |
| 11 | 31 | F | 1 | 1 | 60 | 71 | +11 | P |
| 12 | 29 | F | 1 | 2 | 71 | 18 | -53 | G |
| 13 | 24 | F | 1 | 1 | 36 | 02 | -34 | G |
| 14 | 28 | F | 1 | 2 | 98 | 70 | -28 | G |
| 15 | 28 | F | 1 | 2 | 92 | 54 | -38 | G |
| 16 | 36 | F | 1 | 2 | 53 | 32 | -21 | G |
| 17 | 48 | F | 4 | 1 | 47 | 52 | +05 | P |
| 18 | 36 | F | 1 | 2 | 50 | 57 | +07 | P |
| 19 | 18 | F | 4 | 3 | 33 | 23 | -10 | F |
| 20 | 25 | F | 4 | 3 | 71 | 09 | -62 | G |

A Age

B Sex

C Diagnosis

1 chondromalacia patellae

2 maltracking

3 postpatellectomy syndrome

4 no diagnosis

D Scan appearance

1 normal

2 focal

3 diffuse uptake

E Preblockade pain score

F Postblockade pain score for the first 2 days

G Change in pain score (E-F)

H Response to blockade

Of the 4 patients with diffuse increased uptake, 3 had good responses and 1 had a fair response. Of the 6 patients with focal increased uptake, 4 had good responses, 1 had a fair response, and 1 had a poor response. Normal uptake was the most common finding in the no diagnosis group, focal uptake was only seen in the chondromalacia patellae group, and diffuse uptake was seen in all the groups except for maltracking. However, the numbers of patients in each of these groups was small.

Discussion

In this study, none of the patients had clinical evidence of sympathetic hyperactivity as indicated by abnormalities of skin temperature, sweating, or color. They did not therefore fulfill the diagnostic criteria for RSD.

However it has been noted that the vasomotor disturbance in RSD of the knee is usually less florid than in RSD of the upper limb (Coughlan et al. 1987), and the chronicity of the pain and the paucity of abnormal clinical and arthroscopic findings suggested that there may be a sympathetically mediated component to the pain in some cases. Further support was given to this hypothesis, because many of the patients had increased uptake on bone scintigraphy, which is the usual finding in RSD (Katz and Hungerford 1987, Ogilvie-Harris and Roscoe 1987, Butler-Manuel et al. 1990).

Our results have confirmed that a substantial number of patients with anterior knee pain without RSD have a sympathetically mediated component to their pain, for 11 out of 19 of our patients responded to lumbar sympathetic blockade. Further, bone scintigraphy has been shown to be helpful in identifying those patients that are most likely to respond to sympathetic blockade; patients with a positive bone scan were significantly more likely to respond than those with a negative scan ($P < 0.01$). Unfortunately, there were insufficient numbers of patients with increased uptake to determine whether patients with diffuse uptake were more likely to respond to sympathetic blockade than those with focal uptake. This would be expected, because diffuse uptake has been shown to be more commonly associated with RSD than has focal uptake (Katz and Hungerford 1987, Butler-Manuel et al. 1990).

Despite the short duration of pharmacologic action of the local anesthetic, the sympathetic blockade in most cases gave prolonged symptomatic improvement. Although it can not be expected that a single diagnostic local anesthetic block will cure the sympathetic dysfunction, once a sympathetic component to the pain has been identified, definitive treatment may then be performed. This may be by a series of local anesthetic sympathetic blocks, by phenol sympathectomy, or by surgical sympathectomy.

Our findings may help explain why orthopedic surgeons have found anterior knee pain syndrome such an unpredictable and unrewarding condition to treat by purely surgical means. If patients with anterior knee pain also have a sympathetic component to their pain, it would seem logical to augment surgical treatment with sympathetic blockade.

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References

- Butler Manuel P A, Guy R L, Heatley F W, Nunan T O. Scintigraphy in the assessment of anterior knee pain. *Acta Orthop Scand* 1990; 61 (5): 438-42.
- Cronin K D, Kirsner R L. Assessment of sympathectomy the skin potential response. *Anaesth Intensive Care* 1979; 7 (4): 353-7.
- Coughlan R J, Hazleman B L, Thomas D P, Sattelle L, Crisp A J, Jenner J R, Dandy D J. Algodystrophy: a common unrecognized cause of chronic knee pain. *Br J Rheumatol* 1987; 26 (4): 270-4.
- Classification of chronic pain. Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. *Pain Suppl* 1986; 3: 1-226.
- Katz M M, Hungerford D S. Reflex sympathetic dystrophy affecting the knee. *J Bone Joint Surg (Br)* 1987; 69 (5): 797-803.
- Ogilvie Harris D J, Roscoe M. Reflex sympathetic dystrophy of the knee. *J Bone Joint Surg (Br)* 1987; 69 (5): 804-6.
- Seale K S. Reflex sympathetic dystrophy of the lower extremity. *Clin Orthop* 1989; 243: 80-5.
- Tietjen R. Reflex sympathetic dystrophy of the knee. *Clin Orthop* 1986; 209: 234-43.