

Original Article

Preventing Recurrence of Reflex Sympathetic Dystrophy in Patients Requiring an Operative Intervention at the Site of Dystrophy after Surgery

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Abstract: The development of reflex sympathetic dystrophy (RSD) is a common complication after surgery. Exacerbation or recurrence of RSD is a major concern after a second intervention at the site of previous surgery and consecutive RSD. It is unclear whether the risk of recurrent RSD can be reduced by using appropriate precautions. The objective of our study was to examine, in a case series of consecutive patients, whether recurrences in patients with a history of RSD after surgery, who were reoperated at the same location, can be avoided by using a standardised intervention protocol containing perioperative calcitonin prophylaxis. None of the patients experienced a recurrence of RSD. We concluded that the recurrence of RSD in patients requiring operative intervention at the site of former dystrophy after surgery appears to be unlikely with careful perioperative management.

Keywords: Algodystrophy; Calcitonin; Prevention; Reflex sympathetic dystrophy; Surgery

Introduction

The development of reflex sympathetic dystrophy (RSD) is a common complication after surgery, the incidence varying according to intervention, site of surgery and

setting. Estimates range from 2.3% in a large series of 10 262 patients undergoing arthroscopic surgery [1], around 2.5% for carpal tunnel release [2–5], to up to 12.5% in patients undergoing various operations on the knee, foot and wrist [6].

A difficult decision arises when patients having developed RSD require a second intervention, e.g. to remove internal fixation or to perform an arthrolysis at the site of RSD, because of the fear of exacerbation [7] or recurrence [8,9]. Surgery is therefore usually delayed until the signs and symptoms of RSD have vanished [2,8], and it is generally contraindicated with surgical interventions that cause further irritation [10–12]. Based on the currently available data, we have no reliable estimate of the rate of exacerbation or recurrence with surgery, and therefore we do not know the added risk, as spontaneous recurrence occurs in up to 50% of cases [13,14].

It is unclear whether the risk of recurrent RSD can be reduced by using precautions such as effective preoperative and postoperative analgesia, early mobilisation and accurate fixation of the affected location, or a fast, minimally invasive and thorough operation technique, allowing minimal duration of tourniquet homeostasis [15,16], or adjunct prophylactic therapy with calcitonin [6,17]. The objective of our study was to examine, in a case series of consecutive patients, whether recurrences in patients with a history of RSD after surgery, who were reoperated at the same location, can be avoided by using a standardised intervention protocol taking the aforementioned potentially preventive measures.

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Table 1. Diagnostic criteria for RSD (From Veldman [18])

Presence of at least 4 of the following 5 signs and symptoms:
 Unexplained diffuse pain and tenderness in the distal extremity
 Difference in skin colour in relation to the healthy symmetrical limb
 Diffuse oedema – often with periarticular prominence
 Abnormal skin temperature in relation to the healthy symmetrical limb
 Limited active range of motion
 Above signs and symptoms increase during exercise
 Above signs and symptoms are present in an area much larger than the area of primary injury or operation and including the area distally of the primary injury

Table 2. Preventive measures according to the standardised protocol

1. Wait until the acute signs and symptoms of RSD have vanished.
2. Intervention performed by the same experienced team that did the first surgical procedure whenever possible.
 Minimise the time of operation and the use of tourniquet homeoostasis.
 Thorough and minimally invasive surgery.
3. Administer calcitonin daily 100 IU from 2–3 days before the operation until up to 2 weeks after operation.
4. Treat pain effectively in the whole perioperative period.
5. Apply early functional mobilisation, accepting limits imposed by the occurrence of pain.

Patients and Methods

From 1988 to 1994 consecutive patients from a single rheumatology practice, working co-operatively with an orthopaedic centre in St Gall, Switzerland, were included in the study, which was approved by the ethics committee of the University Hospital, Zurich, Switzerland. Inclusion criteria were a second intervention at the site of prior RSD after surgery (according to the criteria of Veldman, Table 1 [18]).

All patients were managed according to the standardised procedures containing calcitonin as perioperative prophylaxis shown in Table 2, in order to prevent a recurrence of RSD.

Data Collection

Data collection included a medical record review, review of radiographs and a clinical follow-up, taking place from September to October 1998.

Medical records were reviewed for the following:

1. The presence of diagnostic signs and symptoms according to Veldman (Table 1 [18]);
2. The presence of additional signs and symptoms associated with RSD (hyperaesthesia, hyperpathy, atrophy of skin, atrophy of nails, atrophy of muscles, hyperhidrosis, increased growth of hair, diminished growth of hair, altered growth of nail);
3. The type of intervention;
4. The course of the RSD after the interventions, e.g. recurrence or exacerbation after the second intervention;

Table 3. Standardised questionnaire used to assess the presence of vasomotor instability

1. Have you noticed any changes in appearance at the location of former RSD compared to the other side since the second operation?
2. Have you noticed any changes in colour at the location of former RSD since the second operation?
3. Has your location of former RSD felt any different from the other side since the second operation?
4. Has the temperature of your location of former RSD felt in any way different from the other side since the second operation?
5. Since the second operation, has your location of former RSD been bluer than the other side, or bluer than it used to be?
6. Since the second operation, has your location of former RSD been redder than the other side or redder than it was before the accident?
7. Since the second operation, has your location of former RSD felt warmer than the other side?
8. Since the second operation, has your location of former RSD felt cooler than the other side?
9. Since the second operation, has your location of former RSD responded differently to changes in environmental temperature?
10. Have you noticed your location of former RSD going red and warm in a hot temperature and blue and cold in a cool environment?
11. Since the second operation, has your location of former RSD sweated more than it used to, or more than the other side?

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5. Sociodemographic information (age, gender, profession, disability, impairment at work).

Radiographs were reviewed for the presence of patchy osteoporosis characteristic of RSD. RSD severity was then graded based on the signs and symptoms, and radiographic involvement according to Steinbrocker 1958 [19].

At clinical follow-up, patients underwent a comprehensive interview in which vasomotor instability, perception of the second intervention and generic health (SF-36) were explored, and a clinical examination was performed. Patients were asked about local vasomotor instability at the location of former RSD compared to the corresponding contralateral side using 11 specific questions (Table 3 [20]). Patients were also asked about their perception of the second intervention and whether they would again opt for that intervention. In addition, they were asked to fill in a self-administered questionnaire for generic health, the Short-Form 36 (SF-36) [21]. In the clinical examination range of movement (ROM), pain at rest, pain at motion and oedema were assessed. The diagnostic signs and symptoms according to Veldman (Table 1) were evaluated.

Results

Review of Medical Records and Radiographs

Table 4 summarises the patient characteristics, the interventions and the course of the disease. Ten patients fulfilled the inclusion criteria and were therefore included in the study. There were seven women and

Table 4. Characteristics of the patients

Pat. ID	Age, sex	Profession	Location	Operation 1, (age at operation)	RSD duration (months)	Time interval (months)	Operation 2
1	1947, F	Office worker/ Housewife	Knee	Arthroendoscopic meniscectomy, (45)	18	22	Arthroendoscopic arthrolysis and mobilisation of the joint
2	1947, F	Housewife	Knee	Arthroendoscopic meniscus resection, supra-condylar osteotomy, (44)	8	11	Removal of internal fixation
3	1920, F	Old age pensioner	Foot	Osteosynthesis, (69)	11	17	Removal of internal fixation
4	1953, F	Office worker/ Housewife	Knee	Luxation of patella and transition of tuberosity, (48)	12	14	Removal of internal fixation
5	1956, M	Technical businessman	Shoulder	Arthroendoscopic debridement and bursectomy, (37)	5	5	Mobilisation under narcosis, Partial prosthesis because of glenoid necrosis
6	1970, M	Carpenter	Knee	Arthroendoscopic meniscectomy and open synovectomy, (21)	8	1. 3 2. 7 3. 9	1. Mobilisation under narcosis 2. Arthroendoscopic arthrolysis 3. Open arthrolysis
7	1945, M	Estate agent	Knee	Necrotomy on the femur-condylus, osteotomy of the tibial head, plastic surgery of spongy bone, (47)	16	18	Removal of internal fixation
8	1963, F	Hairdresser	Knee	Arthroendoscopic meniscectomy, (26)	18	22	Revision of joint with LCA ligamentoplasty
9	1936, M	Masseur	Hand	Colles' fracture, open reposition and osteosynthesis, (55)	5	6	Removal of internal fixation
10	1949, F	Office worker/ Housewife	Knee	Osteotomy of the tibial head, (45)	4	6	Removal of internal fixation

three men, ranging in age from 24 to 74 years (median 55.6). Four patients had muscle atrophy (ID: 1, 4, 5, 7), two had hyperaesthesia (ID: 4, 10) and hyperhidrosis (ID: 5, 9); hyperpathy (ID: 9), increased hair growth (ID: 9) and altered nail growth (ID: 10) were all documented.

Surgery on the knee was performed in seven patients; the remaining three underwent surgery of the shoulder, foot and hand. When the location was operated on for the second time, RSD had been present for between 4 and 18 months (median 10.5). The time interval between the two operations ranged from 3 to 22 months (median 13.3). Duration of follow-up after the second operation ranged from 48 to 99 months (median 73.1).

None of the 10 patients reported a recurrence of RSD after the second intervention, and all reported that they would opt again for the second operation.

Based on the review of radiographs and records, all patients had at least RSD stage II (according to Steinbrocker [19]) after the first intervention.

Clinical Follow-up

Table 5 summarises the results of SF-36, clinical examination and vasomotor instability. At the clinical follow-up, deficits related to a status after RSD and operation, with respect to physical function, vasomotor instability and pain, were found in the majority of patients (Table 5). Compared to age and gender-specific population reference values [21], the physical function

deficits were mostly mild. The seven patients who had limitations in their physical functioning according to the SF-36 had pain either in the bodily pain dimension of the SF-36, or reported pain on clinical examination. Four out of the seven patients with a deficit in physical function in the SF-36 also had a deficit in their physical role. Six patients still suffered from mild vasomotor dysfunction.

In four cases (ID: 5, 6, 8, 9), the former RSD location continues to influence the ability to work. However, one of these (ID: 6) did not intend to work any longer; another one (ID: 9) works for 50 hours a week as masseur despite his limitations; another patient (ID: 8) works as an independent hairdresser and has her own business. One patient (ID: 5) underwent a first and a second operation before suffering several further dorsal luxations of the shoulder after his initial accident (a 360 V electric shock); at present he is on 100% worker's compensation. The other six patients do not feel restricted in their daily work because of previous RSD.

Discussion

The main result of our study is the lack of recurrence of RSD in a consecutive series of 10 patients who required an intervention at the site of a prior RSD, after an operation. Although it is not possible to attribute this positive result to the standardised treatment protocol used in our observational study, it is likely that a

Table 5. Synopsis of deficits (%) at clinical follow-up in SF-36, clinical examination and vasomotor instability

SF-36	Clinical examination and vasomotor instability	Patient ID									
		1	2	3	4	5	6	7	8	9	10
Physical functioning, limitation of activities	Range of movement	+	+	□	+	++	+	++	++	□	□
Role: physical, limitations due to physical health		+	++	□	□	+++	+	+	□	+	□
Bodily pain		□	□	□	□	++++	+	□	+++	+++	□
	Pain at rest	+	□	□	□	+++	+	++	+++	++	□
	Pain at motion	□	□	□	□	++	+	□	□	+	□
General health		+	+	□	□	+++	□	+	□	+	□
Energy/fatigue (vitality)		□	+	□	□	+++	□	□	+	□	□
Social functioning		□	□	□	□	++	□	+	□	□	□
Role: emotional, limitations due to emotional problems		□	□	□	□	+++	□	□	++	□	□
Mental health, emotional wellbeing		□	□	□	□	+++	□	□	++	□	□
	Vasomotor instability	□	□	+	□	++	□	+	□	□	□
	Oedema	+	□	+	+	++	□	+	+	□	□
		□	□	□	□	□	□	□	□	□	□

Annex: Rating of SF-36, clinical examination and vasomotor instability

Measure	Rating
SF-36	Deficit (%): 0=□; ≤25=+; ≤50=++; ≤75=+++; ≤100=++++
Clinical examination	
Range of movement (ROM)	Deficit in mobility (%): 0=□; ≤25=+; ≤50=++; ≤75=+++; ≤100=++++
Pain at rest	No pain=□; mild pain on deep palpation=+; severe pain on deep palpation=++; severe pain on superficial palpation=+++
Pain at motion	No pain=□; mild pain at forced motion=+; mild pain at motion=++; severe pain at motion=+++
Oedema	No=□; mild=+; moderate=++; severe=+++
Vasomotor instability	8-11=□; 6-8=+; 3-5=++; 0-2=+++ (number of negative answers according to Table 3)

comprehensive set of measures as used in this study can reduce the risk of RSD recurrence as well as minimise health status deficits.

After RSD most patients still have mild vasomotor complaints, pain and physical functional deficits. Our findings agree with those found in a 5.5-year follow-up study using the RAND-36 form on 65 patients with RSD of the upper extremity, after trauma or surgery [22]. Compared to the general population, our patients had significantly more pain – this seems to be the most persistent and disabling symptom after RSD [22,23]. In addition, we found that more than half of our patients had mild physical function deficits, which in a few cases interfered with their roles and may have interacted with their ability to work. These results may be explained by the sequelae of RSD and repetitive surgery or trauma at that site.

Regarding Table 2, the most important and best-evaluated measure to avoid the recurrence of RSD after a second operation is to wait until acute signs and symptoms have vanished [2,8,9]. Fast, minimally invasive and thorough operation by an experienced surgeon allows for a minimal duration of tourniquet homeostasis [9]. Effective preoperative and postoperative pain treatment is necessary, with the use of non-steroidal anti-inflammatory drugs (NSAIDs) and stronger analgesics [24]. Early functional mobilisation, accepting the limits imposed by pain and fixation of the operated limb in a painless and elevated position at

rest, allows the patient to maintain the range of motion and to control peripheral oedema [15,16].

In contrast to the measures mentioned above, it is unclear whether or not to use calcitonin, which has been used in the treatment for RSD for quite some time [25,26]. Riou [6] found that calcitonin cannot prevent RSD after surgery in patients without a history of RSD. Kissling [17], on the other hand, compared patients with a history of RSD with a retrospective control group of 74 patients and a group of 18 patients having had perioperative calcitonin prophylaxis. Recurrence was seen in 28% against 3%, respectively, and therefore prophylactic administration of calcitonin was recommended [17]. However, Riou and Kissling used different inclusion criteria. Riou examined calcitonin prophylaxis on patients undergoing surgery without a history of RSD, whereas Kissling did not reoperate at an RSD location. It may be advisable to use calcitonin at least in those patients where it has been used successfully to treat RSD in the past.

In conclusion, the recurrence of RSD in patients requiring operative intervention at the site of former dystrophy after surgery is unlikely with careful perioperative management. However, prospective controlled studies are now necessary for further evaluation.

Acknowledgement. The authors wish to thank Leanne Pobjoy for the help in the preparation of this manuscript.

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Received for publication 29 September 1999

Accepted in revised form 11 August 2000