

Outcomes of Carpal Tunnel Release in Complex Regional Pain Syndrome/Reflex Sympathetic Dystrophy/Sudeck Disease Patients

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Quality of Care



Background: The clinical features of classic carpal tunnel syndrome are well known. However, some patients who display atypical symptoms and signs of pain and dysesthesias in the hand, worsening of symptoms at night, and above all, inability to make a full fist, respond equally well to carpal tunnel release. This same clinical picture was shared by some patients labeled as having complex regional pain syndrome. Because of the poor outcome of complex regional pain syndrome patients with current regimens, the authors tested the hypothesis that carpal tunnel release could be effective on them. The purpose of this article is to report the outcome of carpal tunnel release in complex regional pain syndrome patients who presented the above signs and symptoms.

Methods: Fifty-three patients with an average age of 55 years presenting the above cluster of symptoms were operated on. All were unilateral cases, had sustained trauma, and were treated for complex regional pain syndrome before referral for an average of 16 months. All patients underwent carpal tunnel release.

Results: At a minimum of 6 months' follow-up, pain dropped 7.5 points on a numerical rating scale of 0 to 10 ($p < 0.001$). Disabilities of the Arm, Shoulder and Hand scoring fell from 82 to 17 ($p < 0.001$). Six patients had an unsatisfactory result.

Conclusions: Some patients with complex regional pain syndrome may respond successfully to a carpal tunnel release operation. Recognition of this possibility is crucial, as the symptoms and signs might lead the clinician away from the proper diagnosis and treatment. (*Plast. Reconstr. Surg.* 150: 93, 2022.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

All great truths begin as blasphemies.

—George Bernard Shaw

We have observed a group of patients who do not display the typical carpal tunnel syndrome signs and symptoms.^{1,2} Their main complaints are pain and allodynia, often not limited to the median nerve distribution, worsening at night, and above all, inability to make a full fist (Fig. 1, above and center). Despite the different presentation from the typical carpal tunnel syndrome patient, they respond equally well to carpal tunnel release (Fig. 1, below).

From private practice.

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Apparently unrelated to the description above, or to a problem in the carpal canal, is the condition known as complex regional pain syndrome of the upper limb (also known as reflex sympathetic dystrophy, Sudeck disease, or algodystrophy). Its clinical picture is characterized by trophic and vasomotor changes and, above all, pain out of proportion, which may be constant, present at rest or with the slightest movement, and with varying severity of allodynia and hyperalgesia. Disturbed sleep is the norm. The hand appearance changes over time: initially red, warm, and swollen, it later becomes whiter, drier, cooler, and stiffer.³⁻¹⁰ Despite the abundant literature and research, complex regional pain syndrome has an

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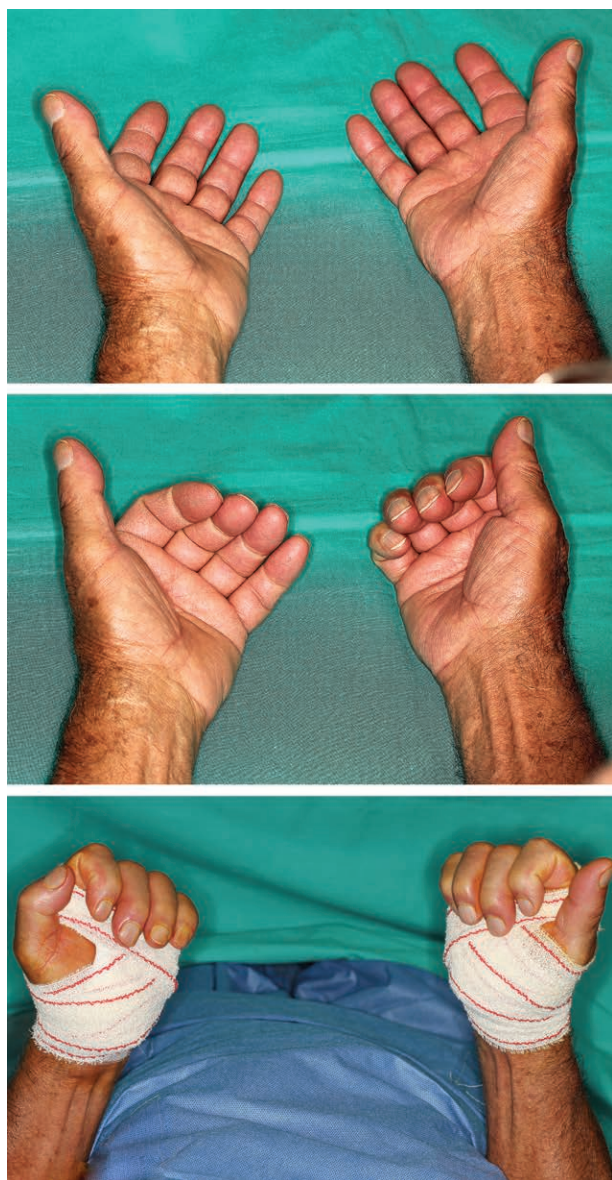


Fig. 1. (Above and center) This 79-year-old man presented bilateral hand pain, allodynia, and dysesthesias in glove distribution. He is shown (center) being asked to make a tight fist. No antecedent trauma could be recalled. (© Dr. Piñal 2020.) (Below) Improvement in range-of-motion immediately after carpal tunnel release under local anesthesia. (© Dr. Piñal 2020.)

unknown pathophysiology^{8,11,12} and lacks effective curative treatment.^{13–15}

We hypothesized that complex regional pain syndrome and the more allodynic/stiffer forms of carpal tunnel syndrome, reported above, were different intensities of the same underlying condition as, in essence, the clinical picture appears similar. After appropriate informed consent, we offered carpal tunnel release to complex regional pain syndrome patients. The purpose of this

article is to present the surgical outcomes in an unselected, prospectively collected population of complex regional pain syndrome patients.

PATIENTS AND METHODS

This is a prospective study comprising 53 consecutive patients enrolled from January of 2018 to September of 2019, experiencing the following symptoms: allodynia and dysesthesias in the hand; worsening at night; and the inability to make a full fist. All had had antecedent trauma. All had been diagnosed with and treated for complex regional pain syndrome for an average of 16 months (range, 3 to 120 months), before requesting a second opinion. Any patient with an evident cause for their pain, not recognized by their previous doctors (such as malunions or nerve injury), was excluded. All remaining patients were included. All satisfied the criteria described by Veldman et al.³ and the so-called Budapest Criteria for complex regional pain syndrome¹⁶; likewise, the complex regional pain syndrome severity score^{6,17} was pathologic (>4) (average, 8.5; range, 6 to 10) (Fig. 2). The female-to-male ratio was 7:1 (46 women and seven men); the average age was 55 years (range, 23 to 87 years); all were unilateral cases; and 32 involved the dominant hand. Precipitating injuries had been as follows: 23 distal radius fractures (12 operated and 11 casted), seven operated on for carpal tunnel syndrome, four shoulder fractures or arthroscopy, one scaphoid casted, and 10 major and eight minor hand procedures or trauma (e.g., Dupuytren, tumor excision, fractures, sprains). To control the neuropathic pain, patients had been on different strategies, as follows: opioids (51 of 53); anti-convulsants-antidepressants (43 of 53); stellate ganglion (single/multiple) or continuous axillary blocks (20 of 53 and 13 of 53, respectively); thermal radiofrequency (three of 53); spinal cord stimulator (two of 53); and various other drugs (e.g., steroids, nonsteroidal anti-inflammatory drugs, bisphosphonates). Furthermore, surgery had been performed to control pain in nine. (See **Table, Supplemental Digital Content 1**, which contains detailed data pertaining to patients, <http://links.lww.com/PRS/F131>.)

All patients underwent physical examination, which included tests for carpal tunnel syndrome and other nerve compressions. The pulp-to-palm distance—the distance from the fingertip pulp to the distal palmar crease—was measured in centimeters. Passive range of motion of the fingers was universally painful, but the joints were stressed



Fig. 2. This 68-year-old woman sustained bilateral distal radius fractures that were anatomically reduced and treated in a cast (by her brother, himself an orthopedic surgeon). Although the right side had a normal evolution, the left side developed all the signs and symptoms of severe acute complex regional pain syndrome. The swelling on the involved side is evident (*above*). (*Below*) The patient is attempting to clench her fist 3 months after fracture (pain, 9.5; electromyography, normal) (see also Fig. 4). (copyright © Dr Piñal 2020.)

gently to verify whether the stiffness was rigid, yielded partially, or was supple. Several patients had limited shoulder, elbow, and wrist motion, but because this could have been influenced by the original injury, these were disregarded. No interfering comorbidities were noticed.

Patients diagrammed their upper extremity pain and allodynia and indicated whether they had proximal extension or shoulder pain. (See **Table, Supplemental Digital Content 2**, which shows the distribution of dysesthesias and allodynia in the hand, and proximal extension, <http://links.lww.com/PRS/F132>.) Furthermore, they were asked to rate their pain, allodynia, sense of swelling, and stiffness of the fingers (“stickiness”) throughout the day, on a numerical rating scale, where 0 was no/minimum and 10 was unbearable/maximum.¹⁸ All patients completed the Disabilities of the Arm, Shoulder and Hand^{19,20} questionnaire

preoperatively, during the first week, at 6 weeks, at 3 months, and, at a minimum, 6 months after their operation (average follow-up, 15 months; range, 6 to 27 months). Finally, they were asked to rate their satisfaction with the operation using a numerical rating scale (0 = not satisfied to 10 = very satisfied).

Electrodiagnostic studies were not available for all patients (45 of 53), as some declined once informed that these were not essential for surgery but were for research purposes only. Results were normal in 24; mild or moderate involvement of the median nerve in the carpal canal was present in 19 (this includes six of seven with previous carpal tunnel release that had triggered the complex regional pain syndrome, considered by the neurophysiologist as being normal changes after surgery).²¹ In only two of 45 was the compression of the median nerve graded as moderate-severe or severe.

Surgery consisted of open carpal tunnel release for all patients. Additional surgery in the wrist (hardware removal, osteotomies, arthroscopic arthrolysis) was carried out in nine; finger joint release was performed in six; and minor scar revisions and the like were performed in another six. When the median nerve was found scarred from previous carpal tunnel release, we provided additional cushioning with vascularized fat from the hypothenar eminence (five cases)²² (see **Table, Supplemental Digital Content 1**, <http://links.lww.com/PRS/F131>).

Carpal tunnel release was carried out under local anesthesia to test for the improvement in active range of motion; axillary block was reserved for cases where concomitant surgery so required. [See **Video 1 (online)**, which shows the immediate response to surgery in patient 10.] A tourniquet was always used. After surgery, no patient received sympathetic blocks or narcotic medication. However, previously prescribed drugs for the neuropathic pain were maintained and gradually removed. Formal physical therapy was required for cases of associated wrist surgery and especially for cases with unyielding finger joints. The latter required the closest follow-up for splinting to deal with the contractures. Specifically, deficits of extension of the proximal interphalangeal joints were managed with night aluminum foam splints and progressive castings; lack of flexion at the metacarpophalangeal joints necessitated knuckle bender type splints.

Institutional review board approval is not necessary in private practice in our country. Nevertheless, our institution holds a certificate ISO 9001:2015 with registration number 202880/A/001/UK/SP, which guarantees that data collection, management of data, and informed consent comply

with regulation (European Union) 2016/679 of the European Parliament (copy in the Editorial Office). All procedures were in accordance with the 1975 Declaration of Helsinki (2008 revision). Furthermore, all patients were cognizant about the treatment aims and understood the risks and possible benefits of the operation. Specifically, they were informed about the experimental nature of this approach for complex regional pain syndrome. They all signed an informed consent.

Statistical Analysis

Because variables did not follow a normal distribution, nonparametric tests were used. The Wilcoxon test was used to analyze differences between pain; allodynia; dysesthesias; swelling; pulp-to-palm distance; and Disabilities of the Arm, Shoulder and Hand score. The Mann-Whitney *U* test was used to compare differences between the groups of acute (<1 year) or chronic (>1 year) complex regional pain syndrome and pain; Disabilities of the Arm, Shoulder and Hand score; pulp-to-palm distance; and satisfaction. Values of *p* < 0.05 were considered statistically significant. Statistical analysis was performed using IBM SPSS version 24 (IBM Corp., Armonk, N.Y.).

RESULTS

The results of this series are summarized in Table 1 and Figure 3.

Pain, allodynia, and dysesthesias abated after surgery in all but four patients, to be discussed

later. Thirty-four of 39 patients with supple or partially yielding joints achieved full range of motion immediately or in a matter of weeks (Fig. 4). [See Video 2 (online), which shows the expected response to surgery in a moderately stiff hand in patient 2. See Video 3 (online), which shows the physical examination of a typical patient with irritative carpal tunnel syndrome and the immediate response to surgery in a supple hand (patient 27).] Three who did not were involved in litigation. Only five of the 14 with severely contracted joints achieved a full fist.

Complications and Others

One patient who sustained a radius shaft fracture while removing the hardware reported very little improvement with the operation. Five more rated their result as unsatisfactory (scored <5 in satisfaction), four of them were involved in litigation for a pension. None of the remaining 47 had litigation issues and rated their satisfaction as 8.96.

Forty-seven of 53 were successfully weaned off neuropathic drugs. Furthermore, 11 of 13 labeled as “complex regional pain syndrome/malingers” were cured and returned to activities.

DISCUSSION

All patients in this study fell under the complex regional pain syndrome constellation and had been struggling with incapacitating pain for an average of 16 months; however, a carpal tunnel release provided lasting pain relief in 47 of 53.

Table 1. Results*

	Scale	Preoperatively	First Week	Sixth Week	Third Month	Final	<i>p</i>
Pain	(NRS, 0–10)						<0.001
Median		9	2	1	1	1	
IQR		8–10	1–3	0–2	0–2	0–1	
Allodynia	(NRS, 0–10)						<0.001
Median		8	1	0	0	0	
IQR		6–9	0–3	0–2	0–0	0–0	
Dysesthesias	(NRS, 0–10)						<0.001
Median		9	2	1	0	0	
IQR		6–9	0–3	0–1.5	0–1	0–1	
Stiffness	(NRS, 0–10)						<0.001
Median		8	2	2	1	0.25	
IQR		7–10	1–5	1–3	0–3	0–1	
Swelling	(NRS, 0–10)						<0.001
Median		8	3	2	1	0	
IQR		7–9	2–4	1–3	0–2	0–1	
PPD, cm							<0.001
Median		4	1	0.5	0	0	
IQR		2–7	0–3	0–2	0–2	0–1	
DASH	0–100						<0.001
Median		84	—	40	19	9	
IQR		77–94	—	30–58	12–36	4–19	

NRS, numerical rating scale (0 = minimum to 10 = maximum); IQR, interquartile range; PPD, pulp-to-palm distance; DASH, Disabilities of the Arm, Shoulder and Hand.

**n* = 53 hands. Statistical analysis was performed between the preoperative and final results.

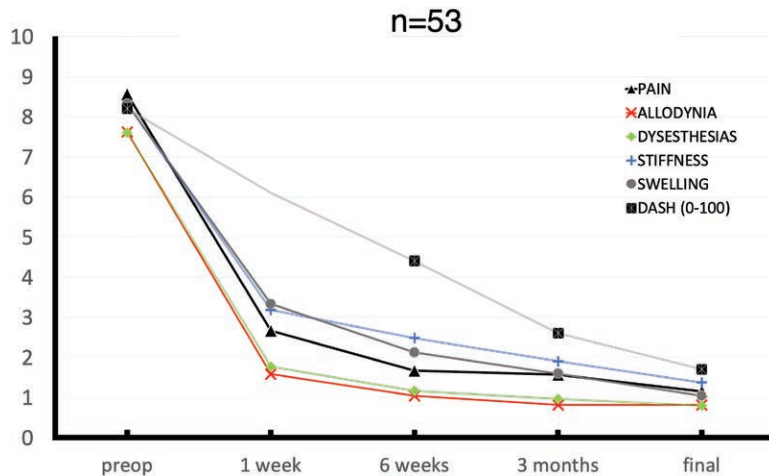


Fig. 3. Graphic representation of the most relevant parameters in Table 1.

The patients presented clinical features of classic and atypical carpal tunnel syndromes. The typical carpal tunnel syndrome patient presents paresthesias in the median nerve distribution, worsening of the symptoms at night, and,



Fig. 4. Reduction of swelling (above) and improvement in range of motion (below) at the time of stitch removal 2 weeks after the operation is evident in this patient who is shown preoperatively in Figure 2. Her pain fell to 0 on the numerical rating scale (patient 47 in Table, Supplemental Digital Content 1, <http://links.lww.com/PRS/F131>). (Copyright © Dr Piñal 2020.)

in time, thenar atrophy and loss of sensibility in the median nerve distribution.^{1,2} Some patients, still within the classic syndrome, may present brachialgia or neck pain,^{23,24} paresthesias in glove or non-median nerve territory,²⁵ and swelling.²⁶ In the so-called atypical carpal tunnel syndrome,^{27,28} the lack of normal nerve gliding causes traction neuritis and elicits causalgic symptoms: burning pain, allodynia, and dysesthesias.

Despite partially sharing the above, other features of these patients pointed away from a problem in the carpal tunnel. It is perplexing that 40 percent of the patients reported allodynia and dysesthesias in the ulnar nerve territory only, or in the knuckles or dorsum (20 percent) when the abnormality apparently involves the median nerve. Moreover, electrodiagnostic studies were equivocal in 43 of 45 performed.

Surgery is not contemplated in the complex regional pain syndrome scenario^{6,8,12,29,30} or only exceptionally when a neurophysiologically proven nociceptive focus, which has to have responded preoperatively to a sympatholytic block, is identified.^{4,9,31} On the basis of such an approach, most of our patients would have been deprived of beneficial surgery. Taking into account the results of this work, our recommendation is to proceed with surgery in most cases where complex regional pain syndrome is in the diagnostic algorithm. Likewise, the standard recommendation of using prolonged sympatholytic blocks after any procedure in a complex regional pain syndrome patient^{4,9,31-33} is unsubstantiated in the current study. Obviously, before proposing surgery, all other sources of pain should have been ruled out, as parenthetically complex regional pain syndrome has long been used to shelter bad doctoring.^{34,35}

Indicating any operation, when the current literature recommends *refraining* from surgery, may create anxiety to the reader-surgeon. However, we should stress that such advice is not based on scientific grounds but on clinical lore. We have seen several clinical features and stress tests that were repeated across the board and that may help in the decision-making process when identifying these patients (Fig. 5). Although the specificity and sensitivity of such criteria are unknown, we

recommend going ahead with surgery if three or more criteria are satisfied in the setting of a patient with complex regional pain syndrome–like symptoms (Fig. 6). Forty-seven of 52 patients who displayed three or more of the required items were satisfied with the operation.

Five patients, despite complying with more than three criteria, were unsatisfied. One who sustained a radius shaft fracture has been reported above. Another, whose pain fell from 10 to 6 on

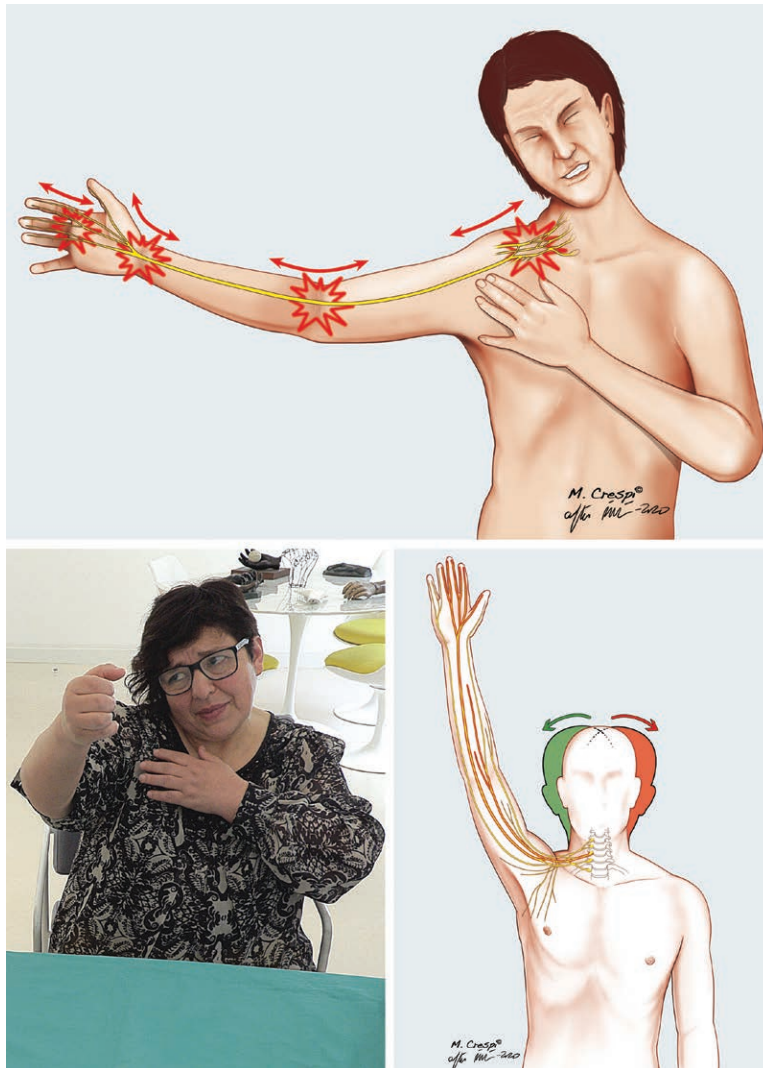


Fig. 5. In the crumpling sign, the patient is asked to abduct the arm above the head. In its fully blown presentation, the patient is unable to raise the arm above the head, and crumples the neck toward the involved side. In a variant form, the string puppet sign, patients report a sense of having a tight rope that goes from the thumb to the neck; extension of all joints and abduction of the arm causes shoulder pain and (painful) paresthesias and pain further exacerbated when the head is tilted away from the affected side. [See [Video 3 \(online\)](#), which shows the physical examination of a typical patient with irritative carpal tunnel syndrome and the immediate response to surgery in a supple hand (patient 27).] (Copyright © Dr Piñal 2020.)

CRITERIA

- INABILITY TO MAKE A FULL FIST
- DISTURBING PAIN AT NIGHT.
- SIGNS OR SYMPTOMS OF CTS
- PAINFUL PASSIVE FINGER FLEXION
- ALLODYNIA /BURNING PAIN
- MULTIPLE TRIGGER POINTS
- CRUMPLING WHEN ABDUCTING ARM
- STRING SIGN



Fig. 6. Author’s flowchart for decision-making. CTS, carpal tunnel syndrome; CRPS, complex regional pain syndrome; CTR, carpal tunnel release; EMG, electromyography.

the numerical rating scale, was under chemotherapy for metastatic breast cancer. She had unyielding stiffness of her finger joints preoperatively that was a possible source of her disappointment. Fourteen patients presented unyielding stiffness preoperatively, and this was associated with poorer results (pain, $p = 0.037$; Disabilities of the Arm, Shoulder and Hand score, $p = 0.008$; pulp-to-palm distance, $p < 0.001$; and satisfaction, $p = 0.003$). Patients should be warned about this. Another patient never felt satisfied and had, from the outset, multiple concomitant personal and litigation issues. In the last two, the pain returned despite a dramatic fall registered on the numerical rating scale for at least 6 weeks. Reforming of the carpal ligament has been described,²⁴ and could explain the recurrent symptoms in both patients. Excision of the ligament has proved curative,^{24,36} and we are currently contemplating offering this option. Alternatively, another nerve may be responsible for the symptoms,^{37,38} or perhaps spurious interests were present, as both patients were litigating.

The only patient who did not meet the criteria, and whose condition worsened after surgery, had a causalgic-dystonic hand.³⁹ Dystonia–complex regional pain syndrome is thought, by neurologists, to result from some malfunction at the spinal cord; good results have been reported in a

case series with intrathecal baclofen.⁴⁰ The value of such an approach is disputed though,⁴¹ and other neurologists consider the condition to be overtly psychologically mediated,^{42–45} as do most surgeons.^{46,47} Nevertheless, there is a gray line in dystonia/psychogenic hand–complex regional pain syndrome⁴⁸ in which patients may be allocated erroneously to one or the other,⁴⁵ and we have explored that “frontier.” We operated on five patients with dystonia–complex regional pain syndrome: three of them could not make a fist and were included in this study. One of them was cured [See Video 4 (online), which shows the immediate response to surgery in a dystonia–complex regional pain syndrome hand patient (patient 35)]; another had less pain and some range-of-motion improvement; and the third patient’s condition worsened, as reported. Further studies are needed before we can advise on how to proceed in the dystonia–complex regional pain syndrome population.

Several limitations of this observational study exist because of the lack of a control group. Nevertheless, a control group cannot be expected in a forefront approach to an uncommon and debilitating clinical entity.⁴⁹ Furthermore, it should be stressed that 13 patients were already in the chronic complex regional pain syndrome stage,^{4,6,9} with a low likelihood of being cured,^{4–10,12,50,51} and served as their own controls for any new treatment. No differences in outcome could be found between the groups of acute (<1 year) or chronic (>1 year) complex regional pain syndrome (pain, $p = 0.812$; Disabilities of the Arm, Shoulder and Hand score, $p = 0.169$; pulp-to-palm distance, $p = 0.537$; and satisfaction, $p = 0.93$). Observational studies are strengthened by a single observer. In the current work, the author interviewed all patients, recorded all data, and operated on all patients. The occurrence of systematic error was prevented because the data presented are subjective, and validated questionnaires were administered. In this sense, it should be stressed that pain reported by the patient on a numerical rating scale is considered the standard in any protocol dealing with the management of a painful condition.⁵² Another possible concern is our short (minimum, 6 months) follow-up. Nevertheless, this seems very reasonable in the setting of complex regional pain syndrome where authorities deem successful “any” response to medication, even if temporary,⁶ to the extent that 3 months may be considered “long-term.”⁵³ In no case did our results deteriorate after 3 months.

Performing surgery of previously unproven benefit can raise ethics issues, but animal experiments and several case reports have already suggested a link between carpal tunnel syndrome and complex regional pain syndrome.^{54–59} At worst, even if carpal tunnel release had been useless, it would have resulted in much less morbidity than when using other, universally accepted yet unproven treatments (e.g., ketamine coma, multiple stellate ganglion blocks, spinal cord stimulator, sympathectomy).

The findings of this study strongly suggest that carpal tunnel release is beneficial for some complex regional pain syndrome patients, although the mechanism of relief remains obscure. Perhaps slow conducting A δ and C fibers—which carry pain and burning sensation—are *irritated*, this being undetected by standard tests,⁶⁰ or a new receptor for pain may be the underlying cause.⁶¹ The lack of normal nerve gliding might be the answer.⁶² Possibly, this study will spark the interest for further research to shed more light and solve this conundrum.

CONCLUSIONS

This study casts a shadow on the notion we have of complex regional pain syndrome as a condition unresponsive to surgery: standard carpal tunnel release was curative for nearly all cases. Nevertheless, it should be stressed that complex regional pain syndrome is an intricate condition, with various types, and this study only dealt with one such type. Further research is ongoing to fully unravel the condition.

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PATIENT CONSENT

Patients provided written informed consent for the use of their images.

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Discussion: Outcomes of Carpal Tunnel Release in Complex Regional Pain Syndrome/Reflex Sympathetic Dystrophy/Sudeck Disease Patients

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Complex regional pain syndrome is a controversial diagnosis within the scope of practice of hand surgeons, plastic surgeons, orthopedic surgeons, neurologists, anesthesiologists, and pain management specialists. Unlike other conditions or injuries affecting the hand where there are objective tests, such as radiologic imaging or nerve conduction studies to confirm the diagnosis, complex regional pain syndrome is unique in that, despite patients complaining of pain out of all proportion to their original injury or surgery, there is no definitive diagnostic test to confirm this diagnosis, and physicians have to rely on less objective signs or consensus criteria.^{1,2}

Although a potential connection between carpal tunnel syndrome and complex regional pain syndrome has already been reported,³ the present study⁴ strongly suggests that a subset of patients “labeled” with the diagnosis of complex regional pain syndrome have an underlying trigger of carpal tunnel syndrome, which is surgically correctable by simple carpal tunnel release; and this surgical intervention has been documented to relieve the patient’s intractable pain and improve their range of motion. This hypothesis may not be accepted either by pain management specialists who rely on complex regional pain syndrome for their fees or by surgeons who use this diagnosis to explain their complications.

Fifty-three consecutive patients with a history of trauma who experienced symptoms of allodynia and dysesthesias and difficulty making a fist with their injured hand were diagnosed with complex regional pain syndrome and treated by conventional pain management. Even though 53 percent had normal nerve conduction studies, the author was so convinced that these patients’ underlying trigger point was irritation or compression of the

median nerve within the carpal tunnel, he consequently performed a conventional open carpal tunnel release on these patients under local anesthesia (so that improvement in active finger flexion could be documented immediately) and under tourniquet control, not wide awake local anesthesia no tourniquet.⁵ Unlike conventional teaching, sympathetic nerve blocks were not used postoperatively.

Remarkably, both pain scores and complex regional pain syndrome scores improved. Eighty-nine percent of patients were successfully weaned off their neuropathic medications and reported a mean satisfaction score of 8.96 of 10 after their carpal tunnel surgery. Eighty-seven percent of patients with supple or partially supple joints were able to achieve full range of motion either immediately or within a few weeks, but only 36 percent of patients with severely contracted joints achieved full range of motion.

The single most important message from this study is that the author has demonstrated emphatically that a subset of patients diagnosed with complex regional pain syndrome and who have difficulty making a fist may potentially have their pain relieved and their range of motion improved by a simple carpal tunnel release. This proposition is strengthened by the fact that all the preoperative and postoperative data were recorded by the author himself, who also operated on all 53 patients.

For this hypothesis to be confirmed scientifically, it will require the author or other surgeons to design a prospective, randomized, controlled trial involving two groups of these complex regional pain syndrome patients: one group assigned to carpal tunnel release surgery, and a second group who continue with nonoperative pain management.

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Obviously, this study does not address another subset of patients whose “misdiagnosis” of complex regional pain syndrome obscures a definitive underlying pathologic abnormality or erroneously conceals a true postoperative complication, such as an arteriovenous fistula mistakenly created by anastomosing the radial artery to a subcutaneous vein during revascularization of a partially amputated hand⁶; a complete laceration of the median nerve during carpal tunnel surgery⁷; or screws penetrating the radiocarpal joint or distal radioulnar joint after volar plating of a distal radius fracture. I continue to emphasize to residents and hand fellows that if they are asked to evaluate a patient with complex regional pain syndrome, they should ignore this “diagnosis” and start from the beginning again by taking a careful history and performing a detailed reexamination to exclude similar underlying abnormalities.

Furthermore, two other important conclusions from this study directly challenge our conventional teaching about complex regional pain syndrome. First, we are taught that surgical intervention is usually contraindicated in patients with complex regional pain syndrome, unless a defined focus of pain can be identified and only if the patient’s symptoms can be improved temporarily by a sympathetic nerve block.^{8–11} However, based on this established recommendation, the 47 patients in this cohort who obtained successful relief of their pain and improved Disabilities of the Arm, Shoulder and Hand questionnaire scores would never have been offered carpal tunnel release surgery and would therefore have been deprived of a successful outcome. Second, if a patient with complex regional pain syndrome has to undergo hand surgery, current opinion is that it should be performed under a sympathetic nerve block followed by continuing postoperative nerve blocks to prevent exacerbation of the patient’s complex regional pain syndrome symptoms.^{12,13} However, this established dogma is again contradicted by the results of this study, because sympathetic nerve blocks were not maintained after the carpal tunnel operations.

In conclusion, the take-home message from this study is very simple but important: there is a subset of complex regional pain syndrome

patients whose pain and difficulty making a fist is somehow triggered by irritation or compression of the median nerve within the carpal tunnel. If these specific patients can be identified, their symptoms can be completely relieved or significantly improved by an open carpal tunnel release. Unfortunately, this controversial proposition may still be resisted or may not even be accepted by other surgeons and specialists.

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