THE REASONS FOR POOR RESPONSE TO TREATMENT OF POSTTRAUMATIC REFLEX SYMPATHETIC DYSTROPHY

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One hundred twelve patients with posttraumatic reflex sympathetic dystrophy were treated using 4 methods : regional intravenous blocks with lignocaine and methylprednisolone, mannitol i.v. (free-radical scavenger), calcitonin i.m. and physical therapy (program of exercises). Good results occurred in 73 cases (65%), moderate in 27 (24%) and poor results (persistence of spontaneous pain and/or malfunction of the hand) in 12 (11%). The method of treatment had no significant influence on the frequency of poor results. The following factors were analyzed in order to assess their influence on the results of the treatment : age, sex, psychological status, type and severity of the initial injury, duration and stage of the disease, initial deficiency of finger flexion, presence of changes on x ray and bone scans ; the results were subjected to statistical analysis ("z" test comparing frequency for two independent trials). The incidence of poor results was significantly higher in patients with duration of reflex sympathetic dystrophy longer than 12 months, in the second and third stages of disease, and in cases with coexisting nerve injuries or compression as a consequence of initial trauma. The other factors analyzed had no significant influence on the unfavourable result of the treatment of reflex sympathetic dystrophy.

Keywords : reflex sympathetic dystrophy ; intravenous blocks ; calcitonin.
Mots-clés : algodystrophie ; blocs intraveineux ; calcitonine.

Reflex sympathetic dystrophy (RSD), also called algodystrophy, Südeck's atrophy or complex regional pain syndrome type 1 is a clinical syndrome or complex of symptoms, consisting of pain, swelling, vasomotor instability, tenderness, dystrophic skin changes and stiffness. Besides fully developed dystrophies, incomplete, partial, limited and variant forms of RSD may exist (3, 7) ; the condition involves all structures and functions of the affected part of the extremity (13). Radiological and scintigraphic examinations may be used to confirm the diagnosis. RSD develops most often as a consequence of trauma to the limb. The source of pain (usually injury) and personal susceptibility are considered the main causes (3, 7). The pathogenesis of the condition remains unclear ; disorders of pain modulation in which the sympathetic nervous system is involved were suggested by many authors ; however some new data cause these opinions to be challenged (2, 3). Various treatment approaches have been used in RSD : sympathetic blocks, regional intravenous blocks using sympatholytic agents or steroids, calcitonin, systemic corticosteroids, free radical scavengers and physical therapy (2, 3, 6, 10). The proportion of satisfactory responses to treatment is reported from 30% to 100%, and failures (persistence of pain and malfunction of the hand) from 0 to 40% (3, 7, 9). It is generally believed that early recognition and treatment is essential ; the role of other factors on the course of the treatment, particularly on the unsatisfactory outcome, is not confirmed by reliable clinical data.

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For these reasons the author has undertaken a retrospective study to investigate the possible influence of certain factors on unsatisfactory outcome of the treatment.

MATERIAL AND METHODS

The results of the treatment of 112 patients with posttraumatic RSD of the upper extremity in various stages, performed in the years 1987 to 1995, were reviewed retrospectively. There were 75 (67%) female and 37 (33%) male patients aged from 23 to 84 years (average 58.2) ; the predisposing events of RSD were : distal radius fractures — 68 patients (61%), other trauma (isolated fractures, contusions and sprains) — 22 (20%), complicated hand injuries (injury to bones, tendons, nerves and vessels) — 16 (14%), surgery for Dupuytren's contracture and carpal tunnel syndrome — 6 (5%). The diagnosis was made by detailed clinical, radiographic and scintigraphic examination. Four methods of treatment were used : 36 patients (32%) received regional intravenous blocks with methylprednisolone and lignocaine (three blocks in two-days intervals) ; 31 (28%) received intravenous mannitol (2 × 250 ml 10% mannitol over 7 days ; mannitol acts as a free-radical scavenger) ; 21 patients (19%) received salmon calcitonin 100 units/day i.m. for 30 days ; in 24 patients (21%) only physiotherapy was used (program of exercises grounded on Mucha's system [6]). In all patients, except the last group, the treatment was followed by conventional physical therapy (finger exercises and whirpool) during the course of treatment and for the next 4 weeks. The patient selection for the separate treatment trials was random, except the group treated with the program of exercises ; this group included only patients with early RSD (duration of symptoms from 1 to 4 months).

Late results were assessed 6 to 12 months from the onset of the treatment. They were graded according to the following criteria : good — little or no pain and full range of motion ; fair — persistent pain on loading or loss of finger flexion less than 3 cm ; poor — persistent spontaneous pain or loss of finger flexion of more than 3 cm.

The following parameters were analyzed in order to assess their influence on the results : age, sex, psychological status, type and severity of initial trauma, duration and stage of the disease, initial deficiency of finger flexion, presence of typical features on x rays and bone scans and presence of coexisting nerve injuries or compression as a consequence of the initial trauma. The same factors were analyzed in the group with satisfactory and fair outcome (100 patients) and in the group with poor response (12 patients). Results were subjected to statistical analysis ("z" test comparing frequency for two independent trials, value $z = 1.96$ was considered significant by alpha = 0.05).

RESULTS

According to the criteria for assessment described above, 73 (65%) good, 27 (24%) fair and 12 (11%) poor results were obtained in the treatment of the whole group ; no statistically significant differences in frequency of good and poor results among the methods of treatment were noted. Among 12 patients with an unsatisfactory response, spontaneous pain persisted in 7, loss of finger flexion more than 3 cm in 3, and both factors were present in 2 patients.

The frequency of poor results according to the factors analyzed is presented in table I. Duration of the disease longer than 12 months, second and third stages of the syndrome and the coexistence of misdiagnosed nerve injury or compression, had a significantly unfavourable influence on the outcome, irrespective of the treatment approach that was used. The other factors analyzed appeared nonsignificant (table I), although the failures occurred more frequently in men than in women, when the disease lasted more than 3 months, in psychologically labile patients, in patients with initial loss of finger flexion of over 3 cm and in individuals with nonspecific changes on the bone scans ; there was also no significant difference in the mean age between good and poor responders (average 58.6 versus 56.8 years) and in type and severity of predisposing event : among 78 patients with an isolated fracture, 6 (8%) had poor outcomes ; after complicated hand injuries (injury to the bones, tendons, nerves and vessels) — 3 of 15 patients (20%) ; after isolated soft tissue injury (including surgery for Dupuytren's contracture and carpal tunnel syndrome) — 2 of 11 patients (18%) and after sprains or contusions of the hand or wrist — 1 of 8 patients (12%).

The following nerve injuries were recognized among the nonresponders : carpal tunnel syndrome as a sequel of distal radius fracture (con-

Table I. — The frequency of poor results according to the factors analyzed

	Factors	Number of patients	Number of failures	Statistical significance
1. Sex	female male	75 37	6 (8%) 6 (16%)	n.s.
3. Psychological status	stable labile	60 52	5 (8%) 7 (14%)	n.s.
4. Duration of the disease	< 3 months 3-12 months > 12 months	71 36 5	4 (6%) 4 (11%) 4 (80%)	statistically significant
5. Stage of the disease	I II III	79 30 3	3 (4%) 6 (20%) 3 (100%)	statistically significant
6. Loss of finger flexion	< 3 cm > 3 cm	45 58	3 (7%) 9 (14%)	n.s.
7. Radiographic changes	distinct moderate or lack	61 51	6 (10%) 6 (12%)	n.s.
8. Scintigraphic changes *	distinct moderate or lack	61 38	5 (8%) 7 (18%)	n.s.
9. Nerve injury or compression	present absent	12 100	8 (67%) 4 (4%)	statistically significant

* Three-phase bone scans were performed in 99 patients.

firmed by electromyographic examination) in 4 patients, digital nerve entrapment at the metacarpal or finger level (after complicated hand injuries) in 3, median nerve entrapment in the scar, as a consequence of carpal tunnel syndrome management, in one patient. In 4 other cases of RSD with coexisting nerves injuries which responded satisfactorily to the treatment, all damaged nerves were reconstructed immediately after trauma (epineural suture). Of the 4 patients with a poor rating and without apparent nerve trauma, two were in the third stage of the disease, with severe contractures of the fingers ; although partial pain relief was noted, impaired hand dexterity due to stiffness was the main disability in these patients ; operative arthrolysis of the affected joints of one finger, performed in one case, failed to improve the lesion. In the other case (second stage), in the course of the treatment the condition developed in the contralateral hand without any apparent cause, and further treatment also failed to improve the condition ; this patient demonstrated a typical psychological pattern, defined as "psychological lability" : emotionally unstable, nervous, anxious, depressive and insecure. In one 73-year-old female patient in the second stage of RSD as a sequel of Dupuytren's contracture surgery, stiffness of the affected hand developed progressively without any response to treatment ; severe spontaneous pain, reported by the patient at the beginning of the treatment, ceased little by little, but the hand stiffness progressed, ending in severe disability.

DISCUSSION

Duration of the symptoms longer than 12 months, second and third stage of the disease and the coexistence of misdiagnosed nerve injuries or compression appeared to have a significantly unfavourable influence on the outcome, irrespective of the treatment approach that was used. The results of the present study confirm the general impression, that early recognition and treatment of the condition is essential. Rothkirch at al. (77 patients treated with i.m.calcitonin and physio-

therapy) obtained 5.5% poor outcomes in the first, 30% in the second and 60% in the third stage of RSD (10). Poplawski *et al.* (27 patients received regional intravenous steroid blocks, 26% poor results) noted that response to the treatment was significantly better when it was administered within 6 months of the development of RSD ; most late stages of the disorder failed to improve ; duration of the disease in all nonresponders was 9 months and longer in his series (9). Olcott et al. (36 patients subjected to sympathectomy, 9% failures) concluded that the efficacy of the management is inversely proportional to the severity of the condition (8).

Since Mitchell *et al.* reported occurrence of RSD (causalgia) after nerve injury, many reports have followed stating that a nerve lesion plays an important role in the pathogenesis of the condition (4, 14). The present study shows that nerve entrapment or compression in the course of RSD significantly worsens the results of the treatment. Grundberg and Reagan recognized features of carpal tunnel syndrome in 22 of 93 RSD patients (24%) who did not respond to the treatment with long-acting corticosteroids ; operative decompression of the nerves significantly improved the patients' condition (1). The necessity of identifying and eliminating small skin nerve entrapment (trigger points) in refractory dystrophies was mentioned by Tountas and Noguchi (12). Monsivais et al. reported peripheral nerve compression in 30 of 35 RSD patients (86%) (5). Sudmann et al. believed that median nerve (in the upper extremity) and deep peroneal nerve compression (in the lower extremity) are the causes of unsatisfactory outcomes in some cases of RSD ; they reported that simple distal fasciotomy rapidly relieved the pain in 9 of 10 patients complaining of pain at rest ; other authors advocated this procedure in refractory dystrophies (11).

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SAMENVATTING

A. ZYLUK. Factoren voor een slechte beantwoording aan de medicamenteuse behandeling van reflex sympatische dystrofie.

Honderd en twaalf patienten met een algodystrofie werden behandeld met één van de volgende methodes : intraveneus blok met lidocaine en prednisolone, intra-

veneuse Mannitol toediening, intramusculaire calcitonine of een aangepast kinesitherapieprogramma.
Men bekwam een goed resultaat bij 73 (65%) een matig resultaat bij 27 (24%) en een faling bij 12 (11%) met persisterende spontane pijn en/of verlies van handfunctie. Het type behandeling had geen statistische invloed op het resultaat. Volgende factoren werden statistisch nagekeken : leeftijd, geslacht, psychische toestand, type en ernst van de initiële pathologie, duur en stadium van de aandoening, stramheid van de vingers, een radiologische of scintigrafische aantasting. Een slecht resultaat werd bekomen bij dystrofies langer dan 12 maanden durend, stadium II à III en bij gevallen met geassocieerde zenuwletsels of compressie.

RÉSUMÉ

A. ZYLUK. Les facteurs des mauvaises réponses au traitement médical de l'algodystrophie.

Cent-douze patients présentant une algodystrophie réflexe sympathique furent traités à l'aide d'une des quatre méthodes suivantes : bloc intraveineux à la lignocaine et méthylprednisolone, mannitol par voie intraveineuse (capteur de radicaux libres), calcitonine par voie intramusculaire ou programme adapté de kinésithérapie. Les auteurs rapportent 73 bons résultats (65%), 27 résultats moyens (24%) et 12 échecs (11%) avec persistance de douleurs spontanées ou de perte fonctionnelle de la main. Le type de traitement n'a pas eu d'influence statistique sur les résultats. L'influence des facteurs suivants a été statistiquement analysée («z» test comparant la fréquence sur essais indépendants) : âge, sexe, état psychologique, type et gravité de la lésion initiale, durée et stade de l'affection, enraidissement digital initial, coexistence d'une atteinte radiologique ou scintigraphique. Les mauvais résultats se sont révélés significativement plus fréquents chez les patients dont l'algodystrophie évoluait depuis plus de 12 mois, chez les patients aux stades II et III de l'affection, et en cas de lésions traumatiques ou compressives associées de nerfs périphériques.