



Quality of life in adults with childhood-onset of Complex Regional Pain Syndrome type I

Edward C.T.H. Tan^{a,*}, Nienke van de Sandt-Renkema^a, Paul F.M. Krabbe^b,
Daniel C. Aronson^c, René S.V.M. Severijnen^c

^a Department of General Surgery – Traumatology, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

^b Department of Epidemiology, Biostatistics & Health Technology Assessment, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

^c Department of General Surgery – Paediatric Surgery, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

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ABSTRACT

Introduction: The clinical presentation of Complex Regional Pain Syndrome type I (CRPS I) in children differs compared to the presentation in adults. Reported results of treatment of CRPS I in children are usually more favourable and seem better than the reported treatment of adults with CRPS I. We investigated the quality of life (QoL) in adults who have been treated for childhood-onset CRPS I.

Methods: We performed a retrospective chart review on signs, symptoms and treatment of all patients, seen and treated for CRPS I in childhood (age <16 years). At one time point a survey was sent by mail to all adult patients with onset CRPS I in childhood with a postal reminder after one month. The first part of the survey consisted of questions focused on the experience of chronic pain and other current complaints in the affected extremity. The second part consisted of a generic-health-related quality of life instrument (SF-36).

Results: Forty-two patients (75%) responded to our survey. The median follow-up period was 12 years (SD 4.7; range 2–22). Fifty-two percent of all patients complained about pain at the time of follow-up. Of the 12 symptoms and signs, 4 are improved, 1 is worse and the remainder are unchanged. Fifteen patients experienced one or more documented relapses. General health and physical functioning (2 out of 8 scales on the SF 36) were lower in patients compared to those of the literature.

Conclusion: In contrast to the literature, the prognosis of childhood-onset CRPS I seems less favourable than usually reported, and is comparable to the prognosis of the adult-onset CRPS I in view of a decreased quality of life and a large relapse percentage (33%) at long-term follow-up.

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Introduction

Complex Region Pain Syndrome type I (CRPS I) is a potentially incapacitating syndrome which can occur after a minor injury or limb operation. In approximately 10% of patients, CRPS I occurs without previous injury. CRPS I impacts all tissues and can impair all functions of the affected extremity, possibly resulting in severe impairment and therapy-resistant pain.²⁶ In our department, children were managed according to a standardised treatment protocol, consisting of free radical scavenger and vasodilator treatment, attention to painful trigger points and physical therapy, similar to the treatment for adults with CRPS I.²³ Since 1995,

psychological counselling was added to the standard treatment protocol. Reported results of treatment of CRPS I in children are usually favourable and seem better than treatment reports of adults with CRPS I.^{18,22,27} We therefore hypothesised that the quality of life is better in adults with childhood-onset CRPS I as compared to adults with adult-onset CRPS I. We conducted a follow-up study of adults with childhood-onset CRPS I at the Radboud University Nijmegen Medical Centre to evaluate their physical, social and psychological effects at long-term follow-up. These effects were measured with a health-related quality of life (HRQoL) instrument. The aim of this study was to investigate the HRQoL of adults patients with a history of childhood-onset CRPS I.

Patients and methods

At first we performed a retrospective analysis of the history, signs and symptoms and treatment of all patients who have been seen and were treated for CRPS I in childhood (age <16 years) between January 1980 and December 2003 at the Radboud

* Corresponding author at: Department of General Surgery – Traumatology, Radboud University Nijmegen Medical Centre, 690 Internal Postal Code, P.O. Box 9101, 6500 HB, Nijmegen, The Netherlands. Tel.: +31 24 361 38 71; fax: +31 24 354 05 01.

E-mail address: E.Tan@chir.umcn.nl (Edward C.T.H. Tan).

University Nijmegen Medical Centre (RUNMC). Data were collected from patient charts and office notes and collected in a database. CRPS I was diagnosed based on the criteria as formulated by Veldman et al.²⁶ The following diagnostic criteria were used since the start of this study:

- (1) Presence of at least 4 of the following 5 signs and symptoms: (a) unexplained diffuse pain and tenderness in the distal part of the extremity, (b) difference in skin colour in relation to the healthy symmetrical limb, (c) diffuse oedema, (d) difference in skin temperature relative to the healthy symmetrical limb and (e) limited range of movement.
- (2) The above signs and symptoms increased during exercise.
- (3) The above signs and symptoms were present in an area much larger than the area of primary injury or operation and included the area distal to the primary injury.

After identification of the patients with childhood-onset CRPS I, a survey was sent by mail with a postal reminder after one month to only the adult patients (age >16 years) with childhood-onset CRPS I. The survey was divided into two parts. The first part of the survey consisted of questions focused on the experience of chronic pain and other current complaints in the affected extremity. These results were compared with the signs and symptoms, documented at the first consult. The second part consisted of an HRQoL instrument, namely the Dutch version of the Medical Outcome Study Short Form-36 (SF-36).⁹ The SF-36 is made up of 36 items and standardised response choices. This instrument has been used in a variety of studies and also in several studies on musculoskeletal disorders and CRPS I. Psychometric properties of this instrument have been studied in detail and are considered adequate.^{5,6,24} The 36 items are converted to eight scales representing generic health domains. These eight health domains are: physical functioning (PF), role function-physical aspect (PR), bodily pain (BP), general health perception (GH), vitality (VT) social functioning (SF), role function-emotional aspect (RE) and mental health (MH). Higher scores represent a better HRQoL in the particular domain PF, RP and BP are a measure of physical dimensions, and RE and MH measure mental dimensions. GH, VT and SF correlate with both physical and mental domains.

All statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences version 12.01 for Windows; SPSS Inc., Chicago, Ill). The paired-sample *t*-test was used to compare the signs and symptoms between first consult and follow-up. A *p*-value of <0.05 was considered statistically significant. To identify possible prognostic factors regarding the relationship between short- and long-term outcome measures (signs and symptoms as noted in the first part of the survey), location of CRPS I, and the history of trauma was estimated with linear regression analysis.

Results

Sixty-two adult patients were identified with childhood-onset CRPS I (age <16 years), according to the Veldman et al. criteria, and were approached to participate in this study.²⁶ One patient died from severe CRPS I (euthanasia), two patients refused for unknown reasons and three patients could not be located. Hence, 56 patients were available for the study. Forty-two responded to our survey (Table 1). At first consult, when the diagnosis of CRPS I was made, the median age of these patients was 13.2 years (SD 2.2, range 6–16). When the survey was conducted, the median age of the patients was 25.5 years (SD 4.8, range 16–34). Thirty-seven were females. The median follow-up period was 12 years (SD 4.7, range 2–22). All were Caucasian.

Table 2 shows the signs and symptoms both from the first consult and at follow-up. Fifty-two percent of all patients complained about

Table 1

Clinical characteristics of 42 adults patients with onset CRPS I in Childhood.

Characteristics	Descriptives
Female (%)	37 (88)
Median age in years (range)	25.5 (16–34)
Median follow-up in years (range)	12 (2–22)
History of trauma (%)	37 (88)
Upper extremity involved (%)	8 (19)
Lower extremity involved (%)	32 (76)
Upper and lower extremity involved (%)	2 (5)
Left (%)	23 (55)
Right (%)	17 (42)
Bilateral involvement (%)	2 (5)

Table 2

Signs and symptoms at time of first visit and at follow-up of 42 adults patients with onset CRPS I in childhood (<16 years).

	First consult n (%)	Follow-up n (%)	<i>p</i> -Value
Pain	40 (95.2)	22 (52.4)	<0.01*
Increase of complaints after exercise	25 (59.5)	24 (57.1)	0.82
Hypersensitivity	6 (14.3)	14 (33.3)	0.03*
Decrease in tactile sense	21 (50.0)	8 (19.0)	<0.01*
Difference in skin colour	31 (73.8)	12 (28.6)	<0.01*
Difference in skin temperature	36 (85.7)	19 (45.2)	<0.01*
Swelling	14 (33.3)	8 (19)	0.35
Limited range of motion	25 (59.5)	19 (45.2)	0.57
Involuntary movements	10 (23.8)	7 (16.7)	0.78
Tremor	13 (30.9)	5 (11.9)	0.08
Decrease in muscle strength	15 (35.7)	15 (35.7)	0.66
Discoordination	11 (26.2)	5 (11.9)	0.32

* *p* < 0.05.

pain at the time of follow-up. The initial median documented VAS (Visual Analogue Score) score at first visit at our outpatient clinic was 6.0 (SD 2.4, range 2–10), and at follow-up was 4.5 (SD 2.4, range 1–8.5). Patients reported that this pain increased with exposure to cold (15) and/or heat (4). Ten patients did not have any complaints at follow-up. Recurrence of signs and symptoms which could be attributed to CRPS I, after treatment was found in 63% of the patients, but in the patient charts and office notes, only an objectively documented recurrence rate of 33% was found.

Results of the SF-36 are shown in Table 3. Analysing gender differences, a significant difference was observed in 6 out of 8 domains (*p* < 0.05). On all eight domains, males scored better than females.

The linear regression analysis showed that the longer the follow-up period since the first attendance at our outpatient clinic, the better the patients scored on the domain 'role physical' (*p* = 0.02). The age of the patient at the time of first consult did not significantly predict the outcome of the HRQoL scores, except for the general health domain. Neither the history of trauma nor the location of CRPS I was found to be prognostic factor.

Table 3

Long-term follow-up SF-36 means scores (SD) of 42 Dutch adults with onset CRPS I in childhood.

	Adults with onset CRPS I in childhood (n = 42)
1. Physical functioning	82.9 (20.4)
2. Role functioning physical	77.4 (36.1)
3. Bodily pain	79.8 (25.01)
4. General health	58.7 (25.9)
5. Vitality	67.7 (23.2)
6. Social functioning	83.03 (22.2)
7. Role functioning emotional	92.9 (22.7)
8. Mental health	78.0 (19.1)

Table 4
Outcome of CRPS I in childhood (<16 years).

Study	Children <i>n</i> ^a	Favourable outcome <i>n</i> (%)	Mean follow-up years
Tan (this study)	42	10 (24)	11.5
Wilder et al. ²⁸	70	32 (46)	2
Sherry et al. ¹⁸	49	43 (88)	5.3
Murray et al. ¹⁵	43	40 (93)	0.5
Greipp et al. ⁷	27	1 (4)	4.2
Stanton et al. ²⁰	36	25 (69)	Unspecified
Lee et al. ¹²	25	25 (100)	2.5
Bernstein et al. ⁴	20	12 (60)	2.4
Low et al. ¹³	20	18 (90)	2

^a Final number of patients analysed.

Discussion

The clinical presentation of Complex Regional Pain Syndrome type I in children differs compared to the presentation in adults.²² CRPS I is seen specifically in children from 12 to 14 years, with a range of 5–17 years.^{3,4,15,20,22,28} The youngest child reported with CRPS I was 2.5 years.⁸ The reason for the predilection of adolescent girls to develop CRPS I is unknown,¹⁹ although some suggest that psychosocial aspects may play a role.²⁵ No accurate data are available concerning the prevalence and incidence of CRPS I in children. After a median follow-up period of 12 years, only 23.8% of the patients were free of complaints. The reported long-term outcome of the children in our study appeared to be less favourable than previously published in other studies (Table 4),^{4,7,13,15,18,20,28} All of these studies, however, had a much shorter follow-up period.

To our knowledge, this is the first description of long-term outcomes expressed by health-related quality of life in adults with childhood-onset CRPS I. The questionnaire conducted had a high response rate (75%). Contrary to our hypothesis, the results of the present study showed that CRPS I outcome and prognosis in children seem comparable to adults. Most adults with childhood-onset of CRPS I have a poorer HRQoL as compared to a standard Dutch age-matched group (16–40 years) of 1585 healthy subjects of the general population.¹ Analysing all 8 items of the SF-36, adults with childhood-onset CRPS I seem to have a lower physical health status but seem to have better emotional and mental health function as compared to normal controls. This emphasises the major impact of this disease in patients confronted with CRPS I in childhood. Children may develop different coping strategies in these psychosocial domains, a phenomenon whose end result is also observed in adults operated in childhood for a benign disease.¹⁷ However, the observations of these studies are in contrast to the observation, that paediatric cancer survivors usually have a good HRQoL and a higher rating of physical health and social emotional functioning, possibly related to the change in the survivors outlook on life that resulted from the cancer experience, by which they may be much happier with the various details of life.¹⁶ When comparing our results with 65 Dutch adult patients with CRPS I diagnosed and treated in adulthood (mean age 50.2 years, SD 14.9), with a mean follow-up of 5.5 years for 3 HRQoL domains, comparable results for role physical 77.4 (36.1) versus 71.2 (40.8) and social functioning 83 (22.2) versus 82.7 (23.3) were observed.⁶ The higher social emotional functioning we found in the childhood-onset CRPS I group 92.9 (22.7) as compared to the Dutch adolescent age-matched group (84.1 (32.3)) and as compared to the adult-onset group (78 (36.9)), may be explained by the higher proportion of females in this specific group, who may have different coping strategies than males.¹¹

In line with the literature reports that describe a high recurrence rate of 27.5–50% in children,^{12,15,20} in our study a (well-documented) recurrence rate of 33% was found. Children and

parents could therefore be prepared for the occurrence of episodes of recurrent complaints, which may lead to anxiety, fear and pain, and to immobility and renewed occurrence of CRPS I like symptoms. We preventively instructed them how to handle these episodes of recurrent complaints by themselves, and most children were able to do so with occasional help in the first episode of the recurrence.

There are a number of alternative explanations as to why our findings, that long-term results after childhood-onset CRPS I do not differ much from adult-onset CRPS I, and are rather different from earlier literature reports. First, this study has all the drawbacks of a retrospective study. Second, the patient population studied was composed only of unselected patients referred to our university tertiary referral centre, which functions as the single reference centre for CRPS I in the Netherlands. It is therefore likely that the CRPS I patient populations evaluated elsewhere consisted of a selected group of patients (selection bias) and also different therapeutic approaches may have been applied.² Primary care physicians and other general paediatricians would often consult or refer patients with CRPS I directly to the RUNMC. It can thus be argued that the patients included in our study do not comprise a smaller subset of more severely affected patients, but constitute a large, and probably unbiased group of children and adolescents with CRPS I. Our multidisciplinary approach warrants equal treatment strategies for all patients. In our study group more females than males were included compared to the standard population. All other social demographics were almost equally distributed among the CRPS I patient group. From many HRQoL studies and also in our study it is known that males show a slightly better HRQoL,^{1,10} but due to small sample size this pattern may not be visible. Third, there can be a definition bias as other studies used different inclusion criteria for the diagnosis of CRPS I. Currently there is no consensus concerning the criteria for this diagnosis in children. In our opinion the Veldman and Goris criteria,²⁶ which have been developed by the RUNMC are more likely to be specific for CRPS I or II than the criteria used by Sherry and Weisman.¹⁹ Retrospectively, we found that 81% of our patients fitted the criteria for CRPS I according to the International Association for the Study of Pain (IASP), and did not fulfil the criteria for CRPS II.^{14,21} Fourth, baseline data were not available per patient so we had to use the healthy standard population as a substitute baseline to compare the HRQoL measurement with the test point after the onset of CRPS I. Finally, one of the components of our treatment strategies with free radical scavengers and vasodilators has barely been used outside Europe. One could argue that these medical interventions could have been responsible for the less favourable outcome described by other studies, but it is questionable that this is very likely. Psychological treatment was not part of the standard treatment for children with CRPS I before 1995, though on indication by the multidisciplinary team psychological consultation was requested before 1995. Further investigations by means of randomised controlled trials should be performed to evaluate and validate the effect of scavenger therapy and peripheral vasodilators in children with CRPS I.

In conclusion, while previous publications generally suggest a more favourable prognosis for childhood-onset CRPS I, our series showed that at long-term follow-up, a considerable proportion of patients continued to experience moderate pain and they have modest reductions in median HRQoL subscores, compared to the control group. Recurrent episodes are also common in one-third of cases. Therefore children treated for childhood-onset CRPS I do not have a better quality of life as compared to adult-onset CRPS I.

Conflict of interest statement

We declare that we have no conflict of interest.

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