

Can Parents Adjust to the Idea That Their Child Is at Risk for a Sudden Death?: Psychological Impact of Risk for Long QT Syndrome

Karin S.W.H. Hendriks,^{1*} F.J.M. Grosfeld,¹ J.P. van Tintelen,² I.M. van Langen,³ A.A.M. Wilde,⁴ J. van den Bout,⁵ and H.F.J. ten Kroode¹

¹Department of Medical Psychology, University Medical Center Utrecht, Utrecht, The Netherlands

²Department of Clinical Genetics, Groningen University Medical Center, Groningen, The Netherlands

³Department of Clinical Genetics, Academic Medical Center Amsterdam, Amsterdam, The Netherlands

⁴Experimental and Molecular Cardiology Group, Academic Medical Center Amsterdam, Amsterdam, The Netherlands

⁵Department of Clinical Psychology, Utrecht University, Utrecht, The Netherlands

Can a parent adjust to the idea that its child is at risk for a sudden death? This question is raised by a diagnostic procedure in which children were tested for an inherited Long QT Syndrome (LQTS). This potentially life-threatening but treatable cardiac arrhythmia syndrome may cause sudden death, especially in children and young adults. The long-term psychological effects are described for parents whose children were tested for inherited LQTS. The adverse short-term impact of such testing has been described previously. The goal of this investigation is to determine whether this distress endures. Thirty-six parents completed measures of psychological distress. With the twenty-four parents of carrier children, a semi-structured interview was held 18 months after DNA disclosure. Parents of carrier children reported more distress than parents of non-carrier children. Parents of carrier children remained vulnerable to high levels of distress; up to one-third of these parents showed clinically relevant high levels of distress. High levels of distress were reported by parents of carrier children who (1) were highly distressed at previous assessments, (2) were familiar with the disease for a longer time, (3) had experienced a sudden death in the family, (4) were lesser educated, and who (5) were unsatisfied with the given information.

Parents were particularly concerned about possible hazardous behavior during puberty. We conclude that the continuous threat of developing LQTS symptoms despite prophylactic treatment affected the psychological well-being of the parents for a long time. In light of the tempestuous developments in the areas of cardiac genetics, periodical information on new insight and developments may act as a buffer for the parents' (growing) concerns about their child's inherited disorder. © 2005 Wiley-Liss, Inc.

KEY WORDS: LQTS; genetic testing; adjustment; long-term distress; parents

INTRODUCTION

The Long QT syndrome (LQTS), a heterogeneous potentially life-threatening familial arrhythmia syndrome, may cause sudden death within families, especially in children and young adults who have not been diagnosed before. Affected children are at high risk for cardiac events, depending on type of mutation: up to 53% of the children have had their first cardiac event by the age of 15 [Zareba et al., 2003]. Morbidity and mortality in children can be reduced by offering them prophylactic treatment after diagnosis. This highly effective treatment usually consists of preventive medication (beta blockade) but in some cases a pacemaker or an implantable cardioverter defibrillator (ICD) is required. Restrictions of activities of daily life (ADL) such as avoiding mental stress, physical exhaustion by sports or work, and also avoiding loud noises are advised [Priori et al., 1999; Schwartz et al., 2001]. The ultimate diagnosis for LQTS rests on the medical history of the child and electrocardiographic evaluation (electrocardiogram (ECG)) followed by DNA testing.

Scarce are the studies on psychological effects of genetic testing of children on parents and even non-existing is literature on such effects for LQTS or any other inherited cardiac disorder. Fairly favorable results were reported in the few psychological studies in the field of testing children for hereditary cancer disorder [Codori et al., 1996, 2002; Grosfeld, 2000; Grosfeld et al., 2000].

Whether the impact of genetic testing on parents of children at risk for LQTS is comparable with the impact in these populations, is questionable. In an earlier study, we reported that no less than 50% of the parents who were informed that their child is a mutation carrier showed clinically relevant high levels of distress at the short term [Hendriks et al., 2005]. In view of this high figure, it was relevant to examine if our group

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Karin S.W.H. Hendriks, F.J.M. Grosfeld, J. van den Bout, H.F.J. ten Kroode are Psychologists; J.P. van Tintelen and I.M. van Langen, the Clinical Geneticists, and A.A.M. Wilde, a Cardiologist.

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*Correspondence to: Karin S.W.H. Hendriks, Department of Medical Psychology, University Medical Center Utrecht, P.O. Box 85060, 3508 AB Utrecht, The Netherlands.
E-mail: karinhendriks@yahoo.com

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of parents would react, as favorable in the long term as the parents mentioned in the other studies.

In this study, we assessed with standardized questionnaires levels of specific distress (disease-related anxiety) and general distress (situational anxiety and depression) to find out, to what extent parents were distressed, 18 months after having received a DNA test result for LQTS in their children. From interviews with the parents of carrier children, we describe the different distress reactions at that time. Parents at risk for high distress were identified by examining the relationship between distress and sociodemographic, personality, attitude characteristics, and the experiences with the disease.

MATERIALS AND METHODS

Participants

Participants were parents who applied for genetic testing of their children less than 17 years of age. These parents were included as couples consisting of one parent carrier from a genetically affected family and the other unrelated from an unaffected family.

Procedure

During a combined consultation with a cardiologist and a clinical geneticist, the disease and the diagnostic procedures of ECG assessment and DNA testing were (again) discussed with the parents and their children. If agreed to, the child of the applicant was screened by electrocardiography (ECG) at the first consultation. The medical history was recorded and blood was taken after informed consent. In case of a clearly deviant ECG and/or clinical symptoms, treatment of most carrier children ($n=9$) was started, and for a minority of carrier children ($n=5$), treatment was started after the outcome of DNA-testing.

This study was introduced at the end of the combined consultation. The parents received a letter with a brief description of the study. Questionnaires were sent after they had given their written consent at home. A prospective design was chosen with data assessment within 2 weeks after the first consultation (T_1), and 2 weeks (T_2) and 18 months after DNA test disclosure (T_3). Each individual parent was asked to complete the questionnaires within 2 weeks. A semi-structured home interview with both parents of carrier children was held by a psychologist at T_3 .

This study was approved by the Medical Ethical Review Committee of the University Medical Center Utrecht.

Measures

At three measurements, the Impact of Event Scale (IES), the Spielberger State Anxiety Inventory (STAI-s), and Beck Depression Inventory (BDI) were administered. Disease-related anxiety was assessed with the 15-item IES [Horowitz et al., 1979; Brom and Kleber, 1985]. This instrument examines the intrusion and avoidance of impressions as a result of a distressful event such as having a child at risk for LQTS. Scores of 0–8 indicate a minor, 9–19, a moderate, and above 20, a clinically important reaction [Kaasa et al., 1993]. A cut-off score above 26 was considered as a traumatic impact [Grosfeld et al., 2000]. General situational anxiety was assessed with the widely used 20-item STAI-s [Van der Ploeg et al., 1980]. The average norm of a Dutch population of general practitioner patients is 34.8 (SD 9.8) and cut-off scores for males/females $\geq 38/39$ indicative for high anxiety [Van der Ploeg et al., 1980; Grosfeld et al., 2000]. Depression was assessed with the 21-item BDI [Beck et al., 1961; Beck, 1996]. Scores 0–9 are considered normal, 10–16 suggest mild depression symptoms, and scores higher than 16 suggest moderate to severe depression

symptoms [Beck and Beamesdefor, 1974; Lee et al., 2001]. The average norm is 4.7 (SD 5.0) for a non-clinical sample, and a cut-off score of >10 indicates the depression of symptoms [Lee et al., 2001].

Socio-demographic data and experience with the disease were assessed with a questionnaire composed by the authors. To assess social support, we used the 12-item Social Support Questionnaire (SSQ) measuring the number of people available for support and satisfaction with their support [Sarason et al., 1987]. To assess coping, we used the Utrecht Coping List (UCL) measuring active coping, social support seeking, and avoidance reactions [Schreurs et al., 1988].

Attitudinal characteristics of the parents were assessed with a semi-structured interview (see the online Appendix at <http://www.interscience.wiley.com/jpages/1552-4825/suppmat/index.html>). To optimize the reliability of the interview data, each audiotaped interview was transcribed and judged independently by two additional psychologists. The three raters attributed scores to the different answers of subjects. In case of a difference in scores of more than 1 (in 10% of scores), they tried to reach intersubjective agreement.

Statistical Analysis

Independent *t*-tests were used for measuring differences in post-test levels of distress between our group of applicants and a normal population. To evaluate the long-term effect of the test results on the psychological outcomes of the parents, we determined differences between parents of carrier and non-carrier children after DNA disclosure by using non-parametric (Mann–Whitney test and Wilcoxon matched-pairs) tests. To determine the course of distress for the two subgroups, the paired Wilcoxon test was used. To test differences between the two study groups on the course of distress, Restricted Maximum Likelihood (REML) estimation handling datasets with missing values was used to analyze the dataset according to a repeated measurements model.

Because of the relatively small number of subjects in our study, univariate analyses on parents with carrier children were performed. Cut-off scores for specific and general distress were applied to dichotomize the group of parents with carrier children into a high distress group (high distress on at least one distress measure) and a low distress group. To determine differences between the high and low distress group, chi-square tests for categorical variables (sex, education, religion, experience of sudden death in close relatives, time familiar with the disease, experience of an arrhythmia-related event in close relatives, satisfaction with provided information) and *t*-tests for continuous variables (age of the parent, age of the children at diagnosis, distress at previous assessments, coping, social support) were used.

RESULTS

Study Population

Forty parents were invited to take part in our study. Thirty-six parents, 17 parental couples, and 2 single parents, participated; four parents (10%) refused. From the 36 parents who continued participation in the follow-up, scores lacked on one of the three measurements for 5 parents; 2 parents received the first questionnaire after they received the DNA disclosure, 1 parent did not return the post test questionnaire because she felt it was too burdensome to fill it out and 2 parents did not return the T_3 follow-up questionnaire because of marital problems.

From the 36 parents, 41 children were tested: 17 of them were identified as a carrier (41%) and 24 as a non-carrier (59%). Twenty-four parents were informed that at least one of their children carries a mutation and 12 parents received favorable

TABLE I. Sociodemographical and Medical Characteristics of the Children

	Children (n = 41)
Age	
Mean (range)	6.8 (0–17)
Sex	
Female	20
DNA test results	
Carrier	17
Treatment carriers	
No treatment yet	4
Medication	7
Pacemaker	6

DNA test results for their child. No significant differences were found between both groups of parents regarding demographic characteristics, coping style, and availability of and satisfaction with social support (Tables I and II).

Between T₂ and T₃, a 15-year-old girl had a syncopal event on beta-blockade and therefore an ICD was implanted. In five families, children were treated with drugs and restrictions of ADL were prescribed and in six children of five families, a pacemaker was implanted. In the three families in which four children were not yet treated, parents were advised cardiological screening of the children on a regular basis until they would reach the age on which on clinical arguments prophylactic treatment would be indicated in these children.

Levels of Psychological Distress in Parents

Mean scores for disease-related anxiety, situational anxiety, and depression before and two times after DNA disclosure (T₁, T₂, and T₃) are presented in Table III. The initial distress at T₁ remained high at T₂ for parents of carrier children. A significant decline occurred in test related anxiety scores of parents of non-carrier children [Hendriks et al., 2005]. At the 18-months follow-up (T₃), the parents of carrier and non-carrier children differed in the amount of disease-related anxiety and depression they reported. Parents of carrier children had scores on both distress measures, which were significantly higher than those of parents of non-carrier children and also above normal population levels. Parents of non-carrier children showed levels comparable with those in a normal population. However, no statistically significant differences in levels of distress were found between T₂ and T₃ on any psychological measures for both groups. At T₃, levels of distress still remained high in the group of parents with carrier children (see Fig. 1).

TABLE II. Sociodemographical and Medical Characteristics of Parents

	Parents of carrier children (n = 24)	Parents of non-carrier child(ren) (n = 12)	P
Age			
Mean (range)	36.8 (28–48)	38.4 (30–42)	0.665
Sex			
Female	12	5	0.637
Education			
Low	11	6	
Middle	8	4	
High	5	2	0.951
Religion			
Practising	7	3	0.792

TABLE III. Disease-Related Anxiety, General Anxiety, and Depression of Carrier Parents Versus Not At-Risk Parents

	N	T ₁		Between group analysis		T ₂		Between group analysis		T ₃		Between group analysis		Within-group analysis between T ₂ and T ₃	
		Mean (SD)	P	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P		
Disease-related anxiety (IES)	24	23.80 (12.7)		21.2 (12.9)		20.23 (12.6)		0.751							0.751
Parents of carrier children	12	17.7 (7.4)	0.112	7.3 (7.1)	0.000	7.5 (5.6)	0.011	0.600							0.600
Parents of non-carrier children	12	42.4 (14.1)		40.6 (12.2)		38.6 (11.9)		0.549							0.549
General anxiety (STAI)	24	35.20 (11.2)	0.142	31.3 (7.9)	0.016	35.7 (9.8)	0.763	0.107							0.107
Parents of carrier children	12	7.6 (7.1)		6.0 (6.7)		6.0 (7.7)		0.985							0.985
Parents of non-carrier children	12	4.3 (4.2)	0.121	2.6 (2.4)	0.043	1.0 (1.7)	0.031	0.066							0.066

Values represent mean with SD in parentheses.

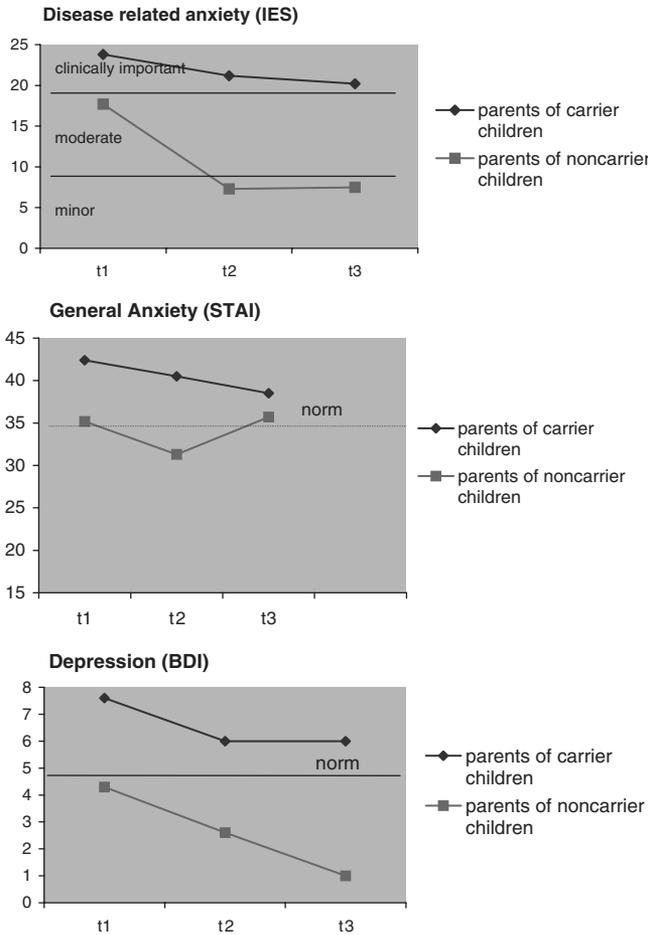


Fig. 1. The course of distress.

Psychological Morbidity

Applying cut-off scores of high distress revealed that the incidence of clinically high distress scores, 18 months after the test outcome was significantly higher in the group with carrier children than in the group with non-carrier children: one-third of the parents of carrier children had high levels of disease-related anxiety and a quarter had high levels of depression opposed to none in the group of parents of non-carrier children ($\chi^2 = 5.14, P = 0.023; \chi^2 = 3.6, P = 0.05$). There was no difference between both groups in the number of parents with high levels of general situational anxiety (38% vs. 25% resp, $\chi^2 = 0.563, P = 0.45$). Almost all parents of carrier children with high distress scores on the previous assessment (T₂) also reported high levels of distress at 18 months follow-up (T₃).

Worrying 18 Months Later

Most of the parents (75%) showed signs of anxiety. What they seemed to fear most was the continuous threat for their children of suddenly developing symptoms of the disease, these parents were vigilant for these symptoms. Although most of the children were prophylactically treated and almost two-third of the parents felt they had made a well-considered decision on treatment of their children, only 20% of the parents expressed full confidence in the efficacy of the treatment. Fifty-five percent of the parents had experienced the treatment of

their child as very burdensome. However, it brought relief for one-third of the parents. These latter parents felt comfortable and were satisfied with the prophylactic treatment because they felt that their child benefited from the treatment.

Another source of concerns was the future of the children. Parents feared adverse consequences for their children's career (63%), its dating or marriage (54%), and anticipated stigmatisation (46%). Of specific concern was the coming puberty of the child (54%). As one mother lucidly expressed: "We most fear the period our child will enter puberty and becomes obstinate, since we may then lose control on her medicine regime."

Fifty-five percent of parents had feelings of dissatisfaction with the accessibility to direct information about the disease. Fifty percent of the parents said to be disappointed in the support from the physicians, especially the lack of support from the general practitioner and the referring cardiologist from the regional hospital. The parents felt they had to inform these physicians about the nature of their disease instead of the other way round. Interestingly, none of the parents did regret the participation of their children in the DNA diagnostics.

Variables Related to High Levels of Distress in Parents of Carrier Children

Prone to high disease-related anxiety are either parents with low education, or who had high disease-related anxiety scores at both previous measurements, or who were familiar with the disease for a longer time and who had experienced a sudden death in the family. Also, parents who were not satisfied with the given information were more likely to have higher disease-related anxiety scores than parents who were pleased with the information.

Two variables related to high levels of specific distress were also related to high levels of general anxiety and depression; familiar with the disease for a longer time and not satisfied with the given information (Table IV).

DISCUSSION

This is the first prospective follow-up study addressing the experiences of applicants with predictive testing of minors for an inherited cardiac syndrome. The results of this study suggest that most parents who have carrier children seem to experience difficulties adjusting to the new status of their children. The high levels of distress, these parents reported shortly after DNA disclosure remained unchanged 18 months later. Thirty-three percent of these parents kept a strong preoccupation with the disease during the follow-up of this study. They reported higher distress than parents of children with favorable test results did. This strong relationship between the test-outcome and levels of distress in the long term was not found in any other prospective study on long-term effects [Broadstock et al., 2000]. In this respect, the results of this study seem unique and alarming showing a less favorable outcome on the adjustment of the parents after predictive LQTS testing.

Three-quarters of the parents with carrier children were strongly focused on symptoms of the disease. These parents perceived their children already as patients, yet most of them were prophylactically treated after the detection of carriership and did never experience any symptom. In the eyes of the parent the child had become vulnerable, as illustrated by the following example of a woman with an 11-year-old daughter with an LQTS mutation: "I sleep with the doors open and the slightest sound from her room awakens me in a startle. A long period of silence awakens me as well, only to go check if she is still alive. I am relieved when I see her wake up in the morning, and it is difficult again at bedtime."

TABLE IV. Factors Significantly Related to High Distress in Parents of Carrier Children

Variable	Disease-related anxiety			General anxiety			Depression		
	Low	High	χ^2/t	Low	High	χ^2/t	Low	High	χ^2/t
Sociodemographic factors									
Education									
Low	10	8	4.00*						
High	6	0							
Psychological variables									
Distress at baseline	19.83	30.71	2.26*						
Distress at T ₂	17.07	28.88	1.82***						
Experiences with the disease									
Experience of a sudden death									
Yes	8	7	3.49***						
No	8	1							
Time familiar with the disease									
<1 year	10	2	6.47*	9	3	4.89***	11	1	5.70*
1–5 years	4	1		4	1		4	1	
>5 year	2	5		2	5		5	4	
Medical experience									
Satisfaction with the provided information									
Yes	8	1	4.12*	7	2	3.43***	8	1	2.78***
No	5	6		4	7		6	5	

Note: Values are row numbers and Chi-square values with significance level, except for the psychological variables where row represent mean scores and t values and significance of t is displayed.

* $P < 0.05$.

*** $P < 0.10$.

A plausible reason why our parents adjusted not so favorable as in other studies may be the sudden development of the potential fatal symptoms in LQTS [Grosfeld, 2000; Codori et al., 2002]. Parents in our study have to reconcile with the idea that their child may experience a possible sudden fatal arrhythmia event even when prophylactically treated. Another reason for this may be the impact of prophylactic treatment itself, which started within the first months after the combined consultation. The effectivity of the treatment was, however, engaged with scepticism, which may have added to the distress.

The psychological well-being of the majority of parents of children with favorable test results for their children remained within normal limits after 18 months. Even though in every couple, one of the parents had recently been identified as a LQTS mutation carrier, none of these parents seemed overwhelmed by thoughts and feelings about LQTS or showed a tendency to avoid these thoughts and feelings at the time of measurement. This is in line with findings of other studies [Croyle et al., 1997; Dudok de Wit et al., 1998; Lodder et al., 2000]. It is our conclusion that parents apparently are more focused on the well-being of their children than on their own health. This was also found by our study group in a case study of an extended LQTS family consisting of five couples with children [Ten Kroode et al., 2000].

This study also aimed to explore variables related to the high levels of distress in parents of carrier children 18 months after DNA disclosure to identify the parent(s) who need additional support. Like most other studies, we found a strong relation between distress at long term and the previous experience of such distress; the parent who was distressed at pre-test was more likely to be distressed 18 months later [Croyle et al., 1997; Dudok de Wit et al., 1998; Decruyenaere et al., 1999; Grosfeld, 2000].

Another relationship was found between education and distress: parents without secondary education displayed the most adverse long-term psychological reactions. Several other studies have also demonstrated a strong correlation

between education and distress [Vernon et al., 1997; Grosfeld et al., 2000]. In the Netherlands, health care is equally accessible to all. Hence, this is not an explanation for this relationship, but people in lower social economic strata are more vulnerable to undesirable life events and have less feelings of control and a low self-esteem and miss cognitive flexibility to overcome these events [Schein et al., 2003; Oosterwijk, 2004].

We also found that parents who were familiar with the disease for a longer time and who had experiences with the disease and its dramatic consequences in their close relatives, showed higher levels of distress than parents who lacked such experiences. The risk status of their child apparently imposes a tangible instead of a hypothetical threat for these parents. We suggested earlier that the re-experiencing of events related to sudden or near deaths in the family may also explain this finding [Hendriks et al., 2005].

The relatively small number of participants limits the statistical power of our analysis. However, as far as we know, all suitable patients attending cardiogenetics outpatient clinics in the Netherlands were invited in this psychological study. Second, the statistical analysis should be interpreted as exploratory analysis and not as a confirmation of prespecified hypotheses.

We conclude that parents of carrier children at risk for symptoms of LQTS remain preoccupied with the disease for a long time (at least for 18 months). Due to the continuous threat of the life endangering condition and the psychological consequences from it, it is questionable if these parents will adjust in the long term. Therefore, it is probably important to give these parents adequate information regularly and keep them informed on the most recent developments in the areas of LQTS. Especially for those with low educational levels, more comprehensive counseling is needed. Periodical information on new insights and developments in the area of cardiogenetics seems not only important for parents but also important for general practitioners and cardiologists from regional hospitals.

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