

# The Influence of Pain: Quality of Life after *Pectus excavatum* Correction

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## Abstract

**Introduction:** The main indication for surgery of thoracic wall deformities (TWD) is psychological due to cosmetic complaints. The assumption is that appearances have a negative effect on self-esteem and quality of life (QoL). Correction should result in improvement. **Methods:** Prospective trial. QoL was assessed using the CHQ and the WHOQOL-bref. Measurements were taken before surgery (T1) and 6 weeks thereafter (T2). **Results:** Forty-two patients were included. WHOQOL-bref showed differences between pre-operative and six weeks past surgery on facet body image ( $p = 0.003$ ). Self-esteem (CHQ) did not show a significant improvement at T2. Concerning the scores on the single step questionnaire (SSQ), 33 patients were “very” to “extremely satisfied” with appearance and increased self-esteem ( $p < 0.001$ ). Concerning the domain “pain and physical complaints”, CHQ did show a significant change ( $p < 0.001$ ) with more complaints at T2. **Conclusion:** Six weeks after surgical correction of a TWD satisfaction with the “new” chest is good; pain seems to be a problem with possible negative influence on self-esteem.

## Keywords

Pain, Quality of Life (QoL), Pectus, Chest Wall Deformity

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## 1. Introduction

The most important anterior chest wall deformity is the *Pectus excavatum* (PE). It predominantly affects males. The incidence of PE is about 1 in 400 [1]. The most important complaint is cosmesis although a substantial part of the patients also complains of physical impairments, especially shortness of breath during exercise.

The NUSS procedure and the Ravitch procedure are used for correction of PE. Both procedures have been reported to give good cosmetic results [2]. In addition, studies reporting physical improvement after correction of PE are increasing in number [3] [4].

Both physical and cosmetic issues may lead to a decreased quality of life (QoL) and body image, especially in adolescents who are vulnerable to peer pressure [5]. Quality of life is defined by the World Health Organization as “an individual’s perception of his/her position in life in context of the culture and value systems in which he/she lives and in relation to his/her goals, expectations, standards and concerns” [6]. Thus, QoL refers to satisfaction with functioning in a wide range of areas.

Since the primary goal of surgical correction of a *Pectus excavatum* is improvement of cosmesis and thus body image and QoL, it is important to assess the factors that may negatively influence QoL.

A major concern in the early post-operative phase after pectus correction is pain [7]. In the literature this problem is recognized, however most studies only focus on pain management in the first days after surgery and describe methods to alleviate the pain immediately post-operatively [7]-[9]. The severity of post-operative pain is influenced by anxiety, with more anxious individuals reporting higher pain-scores [10]-[12]. So far, however, no studies have looked into the relation between anxiety and post-operative pain or assessed the influence of post-operative pain on QoL after *Pectus excavatum* correction.

The present study has a longitudinal, prospective set-up and aims to evaluate the early changes in QoL after surgical *Pectus excavatum* correction and assess the influence of pain on QoL.

We hypothesized that severe post-operative pain would negatively influence QoL scores in both adolescents and young adults.

## 2. Methods

### 2.1. Patients

Since October 2011 all consecutive patients who were referred to our outpatient clinic with a PE were asked to participate in this study. Patients younger than 12 years of age were not eligible for correction at our institution and therefore did not participate.

Patients or parents with insufficient knowledge of the Dutch language in reading or writing were excluded. Patients with Marfan’s syndrome or other associated connective tissue diseases were allowed to participate.

All patients over the age of sixteen gave informed consent.

Patients under the age of sixteen gave informed consent as did their parents.

The medical ethics committee approved the study.

### 2.2. Surgery

In patients with a PE the Nuss procedure was performed [13]. Surgery was performed by one of 6 surgeons. Post-operative pain management was preferably done with patient controlled epidural analgesia. Patients who refused an epidural or patients who did not experience sufficient pain relief with epidural analgesia received patient controlled intravenous analgesia using morphine and occasionally ketamin.

On the third day post-operative it was tried to decrease the epidural or intravenous analgesia and switch to oral pain medication (e.g. paracetamol in combination with an NSAID). With this medication patients were usually discharged and were advised to diminish the dosage at home, based on the pain they experienced.

### 2.3. Questionnaires

Patients were divided into 3 groups based upon age, being younger than 16 years, 16 - 18 years and older than 18 years of age. Questionnaires used differed per age group. Socio-demographic characteristics of the three age groups are shown in **Table 1**.

Measurement moments were pre-operatively and 6 weeks post-operative.

Quality of life was assessed using the Dutch version of the Child Health Questionnaire (CHQ-87) in patients

**Table 1.** Socio-demographic characteristics in the three age groups.

Socio-demographic characteristics	<16 years	16 < x < 18 years	>18 years
Mean age	14.6 years	16.9 years	20.6 years
Gender (male/female)	21/2	7/3	8/1
Education level	low 7, middle 9, high 7	Low 3, middle 4, high 3	Low 3, middle 3, high 3
Average family size	4.1	4.0	2.7

A higher score on education represents a more demanding school type. Average family size represents the number of currently together living family members which can include one or both parents.

younger than 16 and between 16 and 18 years of age and with the short version of the World Health Organization Quality of Life assessment instrument (WHOQL-bref) in patients between 16 and 18 years and older than 18 years of age.

The CHQ-87 is a generic QoL assessment tool that has good reliability and validity [14]. This questionnaire covers the physical, emotional and social well-being of children. Items are scored using a four to six point Likert scale and converted to a 0 to 100 point continuum, with higher scores indicating a better QoL. Norm values of the Dutch population are available and allow for comparison with “healthy” children [15].

The WHOQOL-bref is the short version of the WHOQOL-100 [16]. It consists of questions assessing QoL in four domains being physical health, psychological health, social relationships and environment and a general evaluative facet (overall quality of life and general health). For the purpose of our study two facets of the WHOQOL-100 have been added to the WHOQOL-bref being the facet pain and discomfort and the facet body image. Items are scored on a four point Likert scale. Higher scores indicate a better QoL.

Anxiety was assessed using the short versions of the State and Trait Anxiety Inventory [17] [18]. Trait anxiety concerns differences in individuals in the disposition to respond to stressful situations with varying levels of anxiety.

State anxiety refers to the momentarily experienced feeling of apprehension and tension. Items are scored on a four point Likert scale, these scores are added up and then dichotomized in high or not-high, with cut-off scores derived from the manual. The short versions have good reliability and validity [19].

In order to measure the satisfaction with surgery and the post-operative appearance of the thorax the single step questionnaire was used [4]. This assessment tool uses 16 questions to assess satisfaction. Scores are added and a score above 41, with a maximum score of 84 is considered to be a satisfactory outcome. This questionnaire was only completed post-operatively at T2. The concept of the questionnaire is that one measurement moment gives information concerning pre-operative and post-operative satisfaction.

Pain in rest and during activity post-operatively was measured using a 100 mm Visual Analogue Scale [20].

## 2.4. Statistical Analysis

Data analyses were conducted using IBM SPSS 20 software (SPSS Inc. Chicago, IL, USA). Descriptive statistics for variables of interest in this study are presented as percentage; means and SDs. Comparison between scores at measurement moment T1 and T2 for the enlisted variables from the study group were calculated using the paired Student T-test. The cut off point for significance was set at  $p < 0.05$ .

## 3. Results

Between October 2011 and July 2013 42 patients were included, 36 males and 6 females. All patients underwent a Nuss procedure because of a PE. The mean age was 16.4 years (SD 3.02) with 23 patients under the age of 16 years, 10 patients between 16 and 18 years and 9 patients being older than 18 years of age.

Scores on the WHOQOL-bref showed only a significant differences between pre-operative and six weeks past surgery on facet body image ( $p = 0.003$ ). Scores on the CHQ showed a significant increase in bodily pain and discomfort after 6 weeks ( $p < 0.001$ ; see **Table 2**).

State anxiety was significantly diminished after 6 weeks compared with the pre-operative scores ( $p = 0.009$ ).

Concerning the scores on the single step questionnaire (SSQ) 33 out of 42 patients were very to extremely satisfied with the overall post-operative appearance. Scores on post-operative self-esteem were significantly higher

**Table 2.** Comparison between scores on WHOQOL, CHQ, and STAI for T1 and T2.

Measurement moment	T1	T2	p-value
WHOQOL			
Facet pain	9.9 (2.3)	9.4 (2.5)	0.53
Facet body image	12.1 (3.7)	16.5 (3.0)	0.003
Overall Quality of life	7.8 (1.2)	8.0 (1.6)	0.54
CHQ			
Mental health	73.4 (16.1)	78.0 (17.4)	0.11
Self-esteem	73.2 (15.2)	75.7 (14.7)	0.26
Bodily pain and discomfort	74.5 (19.6)	51.3 (21.7)	0.001
General health	79.7 (18.2)	76.5 (20.1)	0.42
STAI			
State anxiety	11.3 (3.7)	9.6 (3.2)	0.009

Scores are represented in means (SD). Concerning scores: a higher score represents improvement, with the exception of pain measured with CHQ (higher score represents less pain) and scores on state anxiety (lower score, less anxiety).

compared with scores pre-operatively (8.1 (SD 1.4) on a score of 1 - 10 and 5.5 (SD 1.8) respectively;  $p < 0.001$ ). However, only 27 patients (64.3%) replied with yes on the question “going back, would you have the operation again”. Eleven patients were unsure and 4 patients said no.

Pain during hospital stay was severe to very severe in 30 patients, and pain at six weeks was still present in 32 of the patients with 5 still needing painkillers.

VAS-scores in rest at six weeks were 2.7 (2.3) and in activity 3.4 (2.3) (with scores ranging from 0 to 10).

## 4. Discussion

The primary goal of pectus correction is improvement of self-esteem body image and quality of life. However, certain surgery related factors may negatively influence the aforementioned outcome.

In this study it was found that even though the large majority of patients are very satisfied with the result of the surgery about a third would not have the surgery again. The only other factor that significantly changed between pre- and post-operative measurement moments is pain. Six weeks post-surgery almost two third of the patients still experience pain and 12% still need painkillers.

Considering the fact that other studies have shown a positive relationship between surgical correction of a thoracic wall deformity and improvement of body image and QoL [2] [3], the assumption is that 6 weeks after surgery pain is of such a large influence it hampers the improvement of QoL.

Factors that influence postoperative pain are age, anticipatory anxiety and total analgesics administered [12].

During the first informative outpatient consult concerning surgical correction of the pectus pain is mentioned extensively and patients are informed about the (possible) severity and the necessity of epidural analgesia post-operative in combination with oral pain medication.

The questions used in the current study did not inquire into the correctness of the information provided and whether or not the experienced pain fitted the expectations. This will be included in future questionnaires.

The relationship between pain and anxiety is known, especially in the early postoperative phase. Both the anxiety of patients and the anxiety of their parents have a negative influence on the level of pain, e.g. the higher the level of anxiety the higher the pain score [10] [11] [21].

Anxiety can be divided in momentarily experienced anxiety (state anxiety) and the personality characteristic anxiety e.g. the proneness to respond with anxiety to certain stressful situations (trait anxiety). Concerning trait anxiety 7 out of the 42 patients scored high on the questionnaire, implying that they are likely to respond with higher anxiety levels in certain situations. The levels of state anxiety however showed high scores for 15 out of the 42 patients pre-operatively and decreased to 2 out of 42 post-operatively. Because of the relatively small numbers included so far a significant relationship found between total score trait anxiety and pain in rest at six

weeks post-operatively ( $p < 0.001$ ), should be interpreted with caution.

Factors that may influence pain intensity are pain education [22] [23] and coping instructions [24]. Both studies show that being prepared and being able to cope does not necessarily reduce the experienced pain [22] but does prevent negative feelings concerning the pain and the medical care.

Limitations of this study are the relative small sample size, which makes it necessary to interpret the results with caution. Also the fact that the forty-two surgical procedures were carried out by 6 different surgeons, may have led to small variation in technique and hereby to possible variation in post-operative pain level.

## 5. Conclusions and Future Directions

Six weeks after surgical correction of a TWD satisfaction with the “new” chest is good; pain seems to be a problem with possible negative influence on self-esteem.

Future studies concerning pain after surgical correction of thoracic wall defects should include interventional studies using coping strategies and anxiety-reducing psychosocial interventions.

In addition, longer follow-up is necessary in the current study to see whether the equilibrium between pain and QoL shifts in favor of QoL.

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