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Psychosocial functioning in pediatric patients with pectus excavatum and pectus carinatum

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Background/aim: Pectus excavatum and pectus carinatum are the most commonly seen anterior chest wall deformities. Recent studies reveal that minimal invasive repair of pectus deformities improves the quality of life. Our aim is to assess the psychosocial functioning and sociodemographic characteristics of pediatric patients with pectus deformities and evaluate the differences between patients operated on with minimal invasive repair techniques and nonoperated patients.

Materials and methods: Thirty-two patients with pectus deformities who were operated on 6 months or more before and 31 nonoperated patients participated in the study. The Children's Depression Inventory, Piers-Harris Children's Self-Concept Scale, Capa Social Phobia Scale for Children and Adolescents, Strengths and Difficulties Questionnaire - Self-Report Version (SDQ-SR), and State-Trait Anxiety Inventory for Children - Trait Version were completed by the patients. The SDQ-Parent Report Version (SDQ-PR) was completed by their parents.

Results: There were no statistically significant differences between operated and nonoperated patient groups in terms of total scores on the psychiatric rating scales. Prosocial behavior subscale scores in SDQ-SR ($P = 0.013$) and SDQ-PR ($P = 0.019$) were lower in the operated group.

Conclusion: Prosocial behavior levels were lower in the operated group. Further exploration of the psychosocial profile of pediatric patients with pectus deformities would better elucidate their needs in the course of their socioemotional development.

Key words: Funnel chest, pectus carinatum, psychosocial aspects

1. Introduction

Pectus excavatum (PE) is the first and pectus carinatum (PC) is the second most commonly seen anterior chest wall deformity (1). They are most frequently encountered in males. In PE sternal and costal depression and in PC sternal and costal protrusion are prominent. Since pectus deformities may cause both physical and psychological problems, issues related to the quality of life of these patients are of particular concern (2–5). Pectus deformities were found to be associated with decreased quality of life, low self-esteem, and increased psychosocial problems (3,6–8).

Minimal invasive repair of PE (MIRPE) was defined by Nuss in 1998 (9) and has been modified since then (10).

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MIRPE has advantages over the Ravitch technique, such as shorter operation duration and less remaining scar tissue (11,12). Abramson (13) also applied a similar technique for PC (MIRPC) in 2004. Recent studies suggest that minimal invasive repair of pectus deformities improves the quality of life, body image, and self-esteem (3,4,6,7,14–16).

Particularly in adolescence, physical appearance is an important subject because of the physical and psychological changes that adolescents go through (17). 'Adolescent egocentrism', a specific cognitive immaturity seen in early adolescence, causes the adolescent to think that other people are as preoccupied with him as he is with himself in terms of his appearance and behavior. The adolescent cannot discriminate between the thoughts

of others and his own mental preoccupations (18). The 'imaginary audience' is an important feature of 'adolescent egocentrism'. Adolescents have a feeling of increased self-consciousness and they are apprehensive about other people's opinions related to their appearance and actions, as if a real audience watching them exists (18,19).

Patients with pectus deformities tend to avoid social activities (3,20) in which they think their physical appearance may be in the limelight. Dissatisfaction related to body image may generate risk for the development of psychological problems (17,21).

In the present study we aimed to assess the multiple aspects of psychosocial functioning (generalized and social anxiety levels, depressive symptoms, self-esteem, emotional and behavioral problems) and sociodemographic characteristics of pediatric patients with pectus deformities and evaluate the differences between patients operated on with minimal invasive repair techniques and nonoperated patients. As far as we know, this article is the first to compare the psychosocial functioning of operated and nonoperated pediatric patients with pectus deformities with a wide range of psychiatric rating scales covering various symptom areas.

2. Materials and methods

2.1. Participants

Sixty-three patients aged 9 to 17 years with pectus deformities from the Marmara University Hospital Thoracic Surgery Clinic participated in the study. Consecutive referrals who did not meet the exclusion criteria were included in this cross-sectional study. This study was approved by the Marmara University Medical School Research Ethics Board. Parents provided written informed consent and patients provided written assent to participate. Thirty-two of the patients had been operated on 6 months or more before and 31 of the patients had not been operated on. For the operated group, patients operated on with techniques other than MIRPE or MIRPC and patients with a postoperative period of shorter than 6 months were not included in the study. For both the operated and the nonoperated group, patients with complex anomalies, patients with marked impressions of mental retardation, and illiterate patients or patients with both parents illiterate were not included in this study.

2.2. Procedures and measurements

Physical and medical examinations were done and sociodemographic data were collected. In order to assess psychosocial functioning, the following psychiatric rating scales were completed.

Children's Depression Inventory (CDI): This is a self-report assessment scale for depressive symptoms in children and adolescents. It was developed by Kovacs (22). Öy (23) performed the validity and reliability study of the

Turkish version of the scale. The CDI consists of 27 items; for each of the items the child is expected to choose from one of 3 statements that defines himself best. Higher scores reflect higher depressive symptoms.

Piers-Harris Children's Self-Concept Scale (PHCSCS): This scale was developed by Piers and Harris (24,25). Adaptation of the scale into Turkish and the reliability study of the Turkish version of the scale were done by Çataklı and Öner (26,27). This 80-item self-report scale with yes/no answers is used to evaluate self-concept. Subscales are 'happiness and satisfaction', 'freedom from anxiety', 'popularity', 'behavioral adjustment', 'physical appearance and attributes', and 'intellectual and school status'. Higher scores indicate better self-concept/self-esteem.

Capa Social Phobia Scale for Children and Adolescents (CSPSCA): This is a Turkish psychiatric rating scale developed by Demir (28) to assess social anxiety in children and adolescents. The validity and reliability study of the scale was done by Demir et al. (29). It has 25 items and each item is scored on a 5-point Likert scale. Higher scores indicate higher social anxiety.

Strengths and Difficulties Questionnaire - Self-Report Version (SDQ-SR) and SDQ - Parent Report Version (SDQ-PR): The SDQ, developed by Goodman (30-32), is a 25-item behavioral screening questionnaire for children and adolescents. The validity and reliability study of the Turkish version of the SDQ was done by Güvenir et al. (33). The SDQ has 5 subscales and 5 items per subscale scored on a 3-point Likert scale. Subscales are emotional symptoms, conduct problems, hyperactivity-inattention, peer relationship problems, and prosocial behavior (32) (www.sdqinfo.com). The prosocial behavior subscale reflects prosocial behaviors, such as being kind and considerate, displayed by the child (30). Higher scores on this subscale indicate more prosocial behavior. The prosocial subscale is not included in the total difficulties score of the SDQ. Higher total (difficulties) scores indicate more emotional and behavioral problems. The Parent Report Version is completed by parents and the Self-Report Version is completed by adolescents.

State-Trait Anxiety Inventory for Children - Trait Version (STAIC-T): The STAIC has two subscales, each containing 20 items, that assess state and trait anxiety. The STAIC was developed by Spielberg (34) and validity and reliability study of the Turkish version of the scale was done by Özusta (35). The STAIC-T measures trait anxiety based on a 3-point Likert scale. Higher scores indicate higher anxiety levels.

2.3. Statistical analysis

SPSS (SPSS Inc., Chicago, IL, USA) was used for the statistical analyses. Descriptive analyses were performed to reveal the characteristics of patients in the operated and nonoperated groups. Most of the data were not normally

distributed, so we used nonparametric analysis methods when comparing the two patient groups. Categorical variables of the groups were compared with the chi-square test, and for the comparison of the continuous variables the Mann–Whitney U test was used. Spearman's correlation analyses were done to compare the prosocial behavior and conduct problems subscale scores of SDQ-PR within operated and nonoperated patient groups separately. $P < 0.05$ was accepted as significant.

3. Results

In our study, there were two patient groups: patients operated on ($n = 32$) and not operated on ($n = 31$) for their pectus deformities. The mean ages of the operated and nonoperated patients were 14.7 ± 1.9 and 14.2 ± 2.2 years, respectively, and 81.2% of the operated patients and 83.9% of the nonoperated patients were male. In the operated group 75% of the patients had PE and 25% had PC; in the nonoperated group 46.7% of the patients had PE and 53.3% had PC. There were no statistically significant differences between the groups in terms of age, sex, and body mass index (BMI). Characteristics of the patients and patients' knowledge about their deformities are displayed in Tables 1 and 2. Operated patients' preoperative body image satisfaction scores were significantly lower when

compared with nonoperated patients. In the operated group, patients mostly decided to come to the hospital themselves.

Familial characteristics of the patients and family history of pectus deformities and associated anomalies are displayed in Tables 3 and 4. No differences were detected between the two groups, except for a higher rate of consanguineous marriages among the parents of the operated patients.

In the operated group, mean age at operation was 12.9 ± 2.9 years. Postoperative satisfaction with body image (scale of 0–10) was 7.8 ± 2.1 . As expressed in terms of days, duration of postoperative pain was 27.7 ± 22.5 , duration of postoperative painkiller usage was 19.3 ± 18.8 , and duration of time until returning to normal activities was 43.1 ± 38.2 . Of the operated patients, 59.4% were 'quite satisfied' and 'very satisfied' with the outcome of the surgical operation, and 83.9% of patients reported discomfort from the inserted bar. The underlying reason for bar discomfort in 54.8% of the patients was lying on the side, in 25.8% was heavy lifting, in 22.6% was cold weather, and in 6.5% was hot weather.

When total scores were compared, there were no statistically significant differences between the operated and nonoperated groups in terms of CDI, PHCSCS,

Table 1. Patient characteristics.

		Operated (n = 32)	Nonoperated (n = 31)	P
Sex	Male	26 (81.2%)	26 (83.9%)	0.523
	Female	6 (18.8%)	5 (16.1%)	
Age		14.7 ± 1.9	14.2 ± 2.2	0.395
BMI		18.5 ± 2.2	18.4 ± 3.1	0.549
Associated anomaly*		1 (3.2%)	1 (3.2%)	-
Other diseases		4 (12.5%)	9 (29%)	0.095
Deformity was first recognized**		10.2 ± 3.8	9.6 ± 4.6	0.906
Deformity was first diagnosed**		11.7 ± 3.6	12.0 ± 4	0.463
Preoperative satisfaction of body image (0–10)		3.4 ± 2	5.0 ± 2.5	0.019
Deformity was recognized by:	Patient	5 (16.7%)	7 (23.3%)	0.791
	Parent	20 (66.7%)	19 (63.3%)	
	Doctor or other	5 (16.7%)	4 (13.3%)	
Decision about referring to the hospital was made by:	Patient	25 (78.1%)	15 (50.0%)	0.040
	Parent	3 (9.4%)	3 (10.0%)	
	Other	4 (12.5%)	12 (40.0%)	
Deformity was diagnosed at:	Marmara University Hospital	13 (46.4%)	10 (32.3%)	0.199
	Other	15 (53.6%)	21 (67.7%)	

*Scoliosis, **Age.

Table 2. Patients’ knowledge about their pectus deformities.

	Operated (n = 32)	Nonoperated (n = 31)	P
Had heard of PE/PC before	3 (9.4%)	4 (13.3%)	0.463
Had information about PE/PC	16 (50.0%)	11 (35.5%)	0.182
Received information from Internet	12 (75.0%)	10 (90.9%)	0.302
Received information from doctor	7 (43.8%)	5 (45.5%)	0.619
Received information from TV	1(6.2%)	1 (9.1%)	-
Received information from other sources	1(6.2%)	1(9.1%)	-

Table 3. Familial characteristics of the patients.

		Operated (n = 32)	Nonoperated (n = 31)	P
Parents’ marital status	Married	29 (90.6%)	28 (93.3%)	0.531
	Divorced/separated/widowed	3 (9.4%)	2 (6.6%)	
Mother’s age		40 ± 5.5	40.9 ± 4.8	0.703
Father’s age		44.7 ± 4.7	44.8 ± 4.5	0.933
Mother’s education	Illiterate	2 (6.2%)	3 (9.7%)	-
	Primary school	18 (56.2%)	15 (48.4%)	
	Secondary school	4 (12.5%)	3 (9.7%)	
	High school	8 (25%)	9 (29%)	
	University	0 (0%)	1 (3.2%)	
Mother’s occupation	Unemployed	24 (75%)	21 (67.7%)	0.572
	Employed	6 (18.8%)	9 (29%)	
	Retired	2 (6.2%)	1 (3.2%)	
Father’s education	Illiterate	0 (0%)	1 (3.3%)	-
	Primary school	11 (37.9%)	12 (40%)	
	Secondary school	12 (41.4%)	4 (13.3%)	
	High school	5 (17.2%)	5 (16.7%)	
	University	1 (3.4%)	8 (26.7%)	
Father’s occupation	Unemployed	1 (3.4%)	6 (20%)	0.117
	Employed	26 (89.7%)	21 (70%)	
	Retired	2 (6.9%)	3 (10%)	

CSPSCA, SDQ-PR, and SDQ-SR, and STAIC-T ($P > 0.05$) (Table 5). Prosocial behavior subscale scores in SDQ-SR and SDQ-PR were lower in the operated group ($P = 0.013$, $1-\beta = 0.746$; $P = 0.019$, $1-\beta = 0.447$, respectively). Conduct behavior subscale scores of the SDQ-PR were higher in the operated group, though this result did not reach statistical significance ($P = 0.053$). The hyperactivity/inattention subscale score of the SDQ-SR was higher in the operated group ($P = 0.040$). When operated and nonoperated patient groups were compared in terms of PHCSCS subscales, results were not significant (Table 5).

For SDQ-PR, lower levels of prosocial behaviors were negatively correlated with higher levels of conduct problems subscale scores both in the operated ($r = -0.483$, $P = 0.006$) and the nonoperated ($r = -0.579$, $P = 0.001$) patient groups.

4. Discussion

We compared multiple aspects of psychosocial functioning in operated and nonoperated pediatric patients with pectus deformities. There were no statistically significant differences in terms of total scores of the psychiatric rating

Table 4. Additional familial features, family history of pectus deformities, and associated anomalies.

		Operated (n = 32)	Nonoperated (n = 31)	P
Number of siblings		2.1 ± 1.1	2.2 ± 1.7	0.707
Consanguineous marriage among the parents		12 (37.5%)	4 (12.9%)	0.024
Economic status	Low	3 (9.4%)	4 (12.9%)	0.365
	Middle	19 (59.4%)	22 (71%)	
	High	10 (31.2%)	5 (16.1%)	
PE in parents/siblings		1 (3.2%)	1 (3.3%)	-
PE in other relatives		3 (10.0%)	5 (16.7%)	0.448
PC in parents/siblings		1 (3.2%)	0 (0.0%)	-
PC in other relatives		3 (10.0%)	1 (3.3%)	0.301
Associated anomaly in parents/siblings		4 (12.5%)	1 (3.3%)	0.198
Associated anomaly in other relatives		7 (21.9%)	6 (20.0%)	0.553

Table 5. Comparison of psychiatric rating scales between the operated and the nonoperated patient groups.

	n	Operated,	n	Nonoperated,	P-value
		mean ± SD		mean ± SD	
State-Trait Anxiety Inventory for Children	32	32.28 ± 5.83	30	34.9 ± 6.73	0.201
Capa Social Phobia Scale for Children and Adolescents	32	45.03 ± 11.95	31	46.9 ± 14.22	0.901
Child Depression Inventory	32	11.13 ± 5.82	31	10.61 ± 8.01	0.311
Piers-Harris Children's Self-Concept Scale	32	59.97 ± 6.42	31	58.48 ± 10.56	0.956
SDQ-PR Version Total	31	13.26 ± 5.89	31	11.13 ± 6.42	0.099
Emotional symptoms	31	3.03 ± 2.18	31	2.48 ± 2.31	0.239
Conduct problems	31	2.61 ± 2.35	31	1.65 ± 2.39	0.053
Hyperactivity/inattention	31	4.42 ± 1.75	31	4.16 ± 2.3	0.472
Peer relationship problems	31	3.19 ± 1.52	31	2.84 ± 1.46	0.303
Prosocial behavior	31	7.26 ± 2.39	31	8.36 ± 2.26	0.019
SDQ-SR Version Total	32	14.09 ± 7.45	29	11.55 ± 5.28	0.086
Emotional symptoms	32	2.84 ± 2.29	29	2.79 ± 2.23	0.913
Conduct problems	32	3.09 ± 2.9	29	2.14 ± 1.41	0.406
Hyperactivity/inattention	32	5.03 ± 2.04	29	4.07 ± 2.05	0.040
Peer relationship problems	32	3.13 ± 1.96	29	2.55 ± 1.59	0.338
Prosocial behavior	32	7.25 ± 2.71	29	8.76 ± 1.46	0.013

scales between the operated and nonoperated patients. Prosocial behavior scores in the SDQ-SR and SDQ-PR were both lower in the operated group. Higher levels of prosocial behaviors are found to be related with higher levels of empathy (36).

MIRPE and MIRPC are mainly considered for cosmetic reasons (3,4,7,20). In our study the operated patients' preoperative body image satisfaction scores were

significantly lower in comparison to the nonoperated patients. Patients in the operated group mostly decided to come to the hospital themselves. Besides considering the age period they are in, these findings suggest the operated patients' increased concern about their bodies. Focusing on their body may have resulted in being relatively less concerned about the people in their environment in the operated group when compared with nonoperated patients.

From another perspective, patients may have negative self-perception because of their appearance, may try to avoid social situations (16,37), and may be relatively reluctant to offer help to others due to a fear of rejection. This attitude may be one of the reasons for the difference between the two patient groups in terms of prosocial behavior levels. A study by Andersson et al. (38) revealed that children with burn injuries displayed less social initiative and prosocial orientation and more externalizing and concentration problems.

Any reason such as physical symptoms related to pectus deformities, patients' increased attention to their physical appearance, or fear of rejection in social situations may lead to being less socially concerned with others or avoiding interactions with others, which may appear as being less empathetic.

The conduct problems subscale score of the SDQ-PR was higher in the operated group, but this finding did not reach statistical significance. Discrepancy between adolescents' and parents' reports of psychiatric symptomatology and diagnosis, including conduct disorder, has been revealed (39). We also did not find any differences between the operated and nonoperated patient groups in terms of conduct problems in the SDQ-SR. Patients with conduct disorders are found to have lower

empathy levels in comparison to controls (40). In our study, in the SDQ-PR lower levels of prosocial behaviors were significantly and negatively correlated with higher levels of conduct problems in the operated group.

Our study has several limitations: 1) with a larger sample including both patient groups we could better demonstrate the psychosocial functioning of the patients from a broader perspective; 2) following up with the same patients before and after MIRPE/PC would give more information about the psychological changes that patients have gone through.

In our study, we revealed that prosocial behavior levels were lower in the operated group. To the best of our knowledge, this finding related to prosociality in operated patients with pectus deformities is revealed for the first time in the literature. Prosocial development is considered to be associated with positive consequences in terms of self-esteem and social and academic skills (36,41). Prosociality should be explored in studies with larger samples from a more comprehensive perspective. If our findings are replicated in future studies, interventions could be developed to improve the socioemotional development and well-being of pediatric patients with pectus deformities.

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