

ORIGINAL RESEARCH

Assessment of cases of funnel chest managed with Ravitch's procedure

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ABSTRACT

Background: Funnel chest, medically known as pectus excavatum, is a congenital deformity of the chest wall where the breastbone (sternum) and ribs grow abnormally, causing a depression or caved-in appearance in the center of the chest. The present study was conducted to assess cases of funnel chest managed with Ravitch's procedure.

Materials & Methods: 54 cases of funnel chest of both genders were enrolled. Parameters such as degrees of depression, asymmetry, and flatness of the chest wall was recorded. All were subjected to echocardiography. All underwent Ravitch's surgical procedure. A preoperative and post-operative CT of the chest wall was done to compare outcome of treatment

Results: Out of 54 patients, males were 34 and females were 20. Degree of depression before and after operation was 2.40 and 2.98, degree of asymmetry was 0.97 and 0.91 and degree of flatness was 1.82 and 1.14 respectively. The difference was significant ($P < 0.05$). Electrocardiographic abnormalities were incomplete right bundle branch block in 20, complete right bundle branch block in 13, ventricular premature beat in 10, arterial premature beat in 7 and atrioventricular block in 4 cases. The difference was significant ($P < 0.05$).

Conclusion: An operation to lengthen the ribs would be required to improve the degree of a/b, a transient support with struts should be used in patients with a severely depressed funnel chest, as expressed by a b/c value over 3.0 on computed tomography, and finally, a more cautious approach for asymmetry correction should be taken to improve the surgical outcomes.

Key words: bundle branch, Electrocardiographic, Funnel chest

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Introduction

Funnel chest, medically known as pectus excavatum, is a congenital deformity of the chest wall where the breastbone (sternum) and ribs grow abnormally, causing a depression or caved-in appearance in the center of the chest.¹ This depression can range from mild to severe and is more commonly observed in males than females. The condition is usually noticeable at birth or becomes more prominent during adolescence when growth spurts occur.²

The exact cause of funnel chest is not always clear, but it is believed to result from an overgrowth of connective tissue between the ribs and sternum during the early stages of fetal development.³ Some cases of pectus excavatum may be associated with certain genetic conditions or syndromes, but in the majority of cases, the cause is idiopathic (unknown). Symptoms of funnel chest can vary depending on the severity of the deformity. In mild cases, there may be little to no impact on breathing or heart function, and the main concern may be cosmetic appearance.⁴

Several procedures have been developed into this field since Brown, Ochsner, and Delsakey's initial description of the correction of pectus excavatum in 1939.⁵ There have only been a few publications on the association between the objective and subjective outcomes of surgically correcting funnel chest, despite some reports stating that the long-term effects of correcting the distorted chest wall were "not as satisfactory as had been expected."⁶

The present study was conducted to assess cases of funnel chest managed with Ravitch's procedure.

Materials & Methods

The present study consisted of 54 cases of funnel chest of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Parameters such as degrees of depression, asymmetry, and flatness of the chest wall was recorded. All were subjected to echocardiography. All underwent Ravitch's surgical procedure. A preoperative and post-operative CT of the chest wall

was done to compare outcome of treatment. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I: Distribution of patients

Total- 54		
Gender	Males	Females
Number	34	20

Table I shows that out of 54 patients, males were 34 and females were 20.

Table II: Assessment of parameters

Parameters	Before operation	After operation	P value
Degree of depression	2.40	2.98	0.02
Degree of asymmetry	0.97	0.91	0.05
Degree of flatness	1.82	1.14	0.01

Table II, graph I shows that degree of depression before and after operation was 2.40 and 2.98, degree of asymmetry was 0.97 and 0.91 and degree of flatness was 1.82 and 1.14 respectively. The difference was significant (P< 0.05).

Graph I: Assessment of parameters

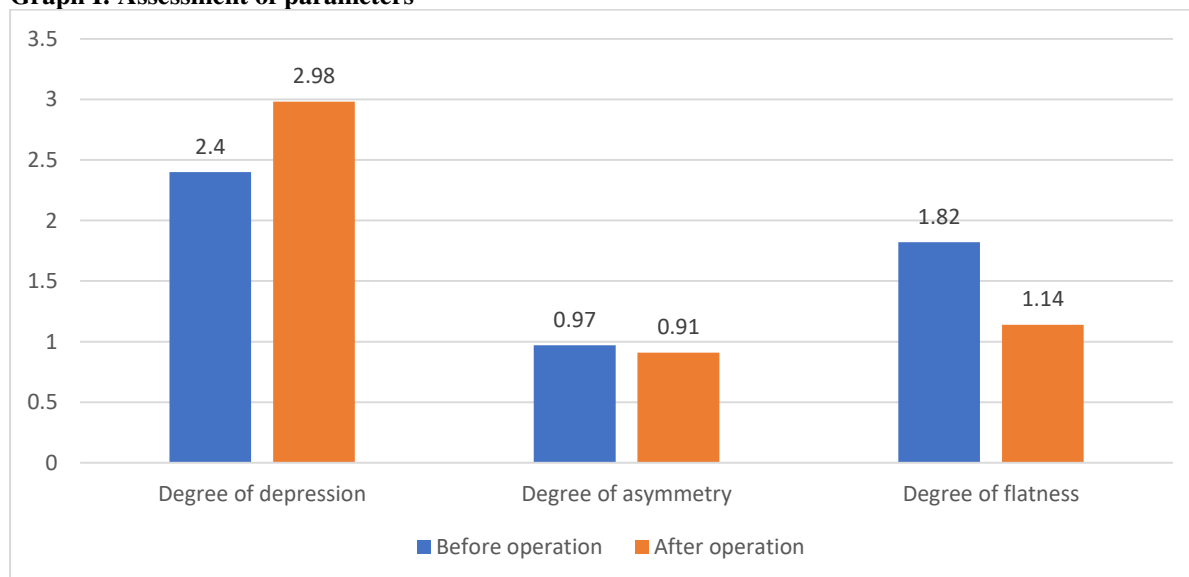


Table III Assessment of Electrocardiographic abnormalities

Electrocardiographic abnormalities	Number	P value
incomplete right bundle branch block	20	0.05
complete right bundle branch block	13	
ventricular premature beat	10	
arterial premature beat	7	
atrioventricular block	4	

Table III shows that electrocardiographic abnormalities were incomplete right bundle branch block in 20, complete right bundle branch block in 13, ventricular premature beat in 10, arterial premature beat in 7 and atrioventricular block in 4 cases. The difference was significant (P< 0.05).

Discussion

The deformity can lead to difficulty breathing, especially during physical activity, reduced lung capacity and impaired respiratory function, chest pain or discomfort, fatigue and decreased stamina, heart murmurs in some cases, due to the compression of the heart within the chest cavity.^{7,8}Diagnosis is usually made based on a physical examination. In some cases, imaging studies such as X-rays or CT

scans may be used to assess the severity and impact of the condition on the chest and internal organs.⁹Treatment options for funnel chest depend on the severity and age of the individual. In mild cases where symptoms are minimal, no treatment may be necessary, and the focus may be on monitoring the condition. However, in moderate to severe cases or if the deformity is causing significant symptoms. A surgical procedure called the Nuss procedure or the Ravitch technique may be recommended to correct the deformity.¹⁰ The Nuss procedure involves placing a curved metal bar under the sternum to push it outward, while the Ravitch technique involves removing the deformed cartilage and repositioning the sternum.¹¹The present study was conducted to assess cases of funnel chest managed with Ravitch's procedure.

We found that out of 54 patients, males were 34 and females were 20. Nakahara et al¹² in their study in 66 patients with funnel chest, the surgical outcome was favorable in 60.6% of cases and fair in 39.4%. No patient gave the outcome a less-than-satisfactory rating. Operative result was good in 60.6% and fair in 39.4%. None of the patients rated the result as unsatisfactory. In patients with a good result, bI c and b/b were weD corrected, while in patients with a fair postoperative result, they were stiU significantly different from those in subjects with normal chest waDs. Moreover, 85.7% of the patients (6/7) with b/c over 3.0 before operation had a fair postoperative result. The degree of alb was not corrected in patients with either good or fair postoperative results.

We found that degree of depression before and after operation was 2.40 and 2.98, degree of asymmetry was 0.97 and 0.91 and degree of flatness was 1.82 and 1.14 respectively. We found that electrocardiographic abnormalities were incomplete right bundle branch block in 20, complete right bundle branch block in 13, ventricular premature beat in 10, arterial premature beat in 7 and atrioventricular block in 4 cases. Hausmann et al¹³ in their study observations gained from the study of fifty-one operated and ten non-operated cases of funnel chest. Three children, 1 year, 2 years, and 5 years of age, respectively, with very small defects were observed over a period of several years. The deformity did not increase in size in any of these, and although surgery was offered for purely cosmetic reasons, it was refused by the parents. Three infants who had additional severe congenital defects (tetralogy of Fallot, exstrophy of the bladder, celiac disease) are still being observed, and corrective measures will probably be taken when and if the other problems are resolved. This group of cases substantiates the fact that morbidity and mortality of surgical correction are negligible. The corrective surgical technique is fairly well standardized and productive of very satisfactory results in most instances

The limitation the study is small sample size.

Conclusion

Author found that an operation to lengthen the ribs would be required to improve the degree of a/b, a transient support with struts should be used in patients with a severely depressed funnel chest, as expressed by a b/c value over 3.0 on computed tomography, and finally, a more cautious approach for asymmetry correction should be taken to improve the surgical outcomes.

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