Symptomatic Pectus Excavatum in Seniors (SPES)

Symptomatic Pectus Excavatum in Seniors, as such, was never mentioned in literature before we published about SPES. Quite often our surgical procedures for patients with SPES took place after they had been turned away by colleagues, who were not familiar with the clinical picture.

"Symptomatic Pectus Excavatum in Seniors" (SPES) is usually not recognized by physicians because they are not familiar with the clinical picture. Sometimes it is even denied that a funnel chest possibly could cause of compression of the heart. In a period of 3 years (2006-2009) 138 patients with a PE were examined by our group, who consulted for cosmetic and somatic problems at our regional Zuyderland Medical Centre in the south of the Netherlands

Table 1 Publications on symptomatic pectus excavatum in seniors (SPES)

First author	Adult patients	Refers to	Year of publication	Reference
Majid et al.	1	48-year-old man	1979	[7]
Fonkalsrud	47	Patients with severe pectus deformities with worsening symptoms and limitations	1999	[50]
Saxena et al.	>1	Range 2-53 years Median age 14.9	2007	[33]
Guldemond et al.	1	68-year-old man	2008	[19]
Jaruszewski et al.	1	78-year-old man	2009	[48]
Krueger	>1	Range 17-54 years Median age 28	2010	[49]
Park et al.	1	68-year-old man	2010	[46]
Neviere et al.		Range 18-62 years Median age 28	2011	[42]
Kragten et al.	19	Patients with serious and invalidating symptoms	2011	[23]

The 96 patients younger than 49 years came mainly for esthetic reasons, but 27 % (n = 26) appeared to have mild to considerable somatic complaints. Two pairs of patients were brother and sister. Nearly all 42 senior patients (n = 38) were referred to our department after Dutch newspapers had drawn attention to a case history published by our group, which reported that symptoms such as shortness of breath and tiredness in elderly people could be related to an already long existing funnel chest [19, 23, 51]. The clinical picture of the 42 senior patients showed complaints of fatigue and low exercise tolerance, shortness of breath, palpitations, inspiratory obstruction and sometimes chest discomfort or pain. Nearly 45 % of the 42 patients (n= 19) were diagnosed as suffering from SPES. They had a rather deep funnel chest, considerable signs and symptoms and cardio-compression was visible on CT or MRI. There was a long history of a slow but steady progression of their complaints and a declining quality of life. It was remarkable that the serious, and sometimes invalidating, complaints had started only in their fourth or fifth decade of life. 63% of our SPES patients (n=12) were labeled as "patients with unexplained cardiovascular complaints". The first surgical procedure for a patient with SPES took place at our Centre after he had been turned away often by (thoracic) surgeons.

Clinical Picture of Symptomatic PE in Adults and Seniors (SPES)

Signs, symptoms and pathological findings most frequently encountered in children and adults with a symptomatic PE are fatigue, reduced exercise tolerance, shortness of breath, palpitations, mitral valve prolapse and chest pain.
Being young and in good health, these complaints occur during high level exercises and are often not mentioned or taken seriously for that reason. Senior patients develop gradually and in slow progression exactly the same clinical picture, at lower levels of exercise.
Certainly, at advanced age, ischemic heart disease and COPD could fit into this clinical picture and therefore should be excluded.

Palpitations

In PE the mechanical pressure on the heart can initiate Premature Ventricular Contractions (PVCs), which patients describe as "palpations", as they are experienced as hard blows to the excavated part of the chest wall. Although this is not a serious complaint, these palpations are very frightening for the patient. The PVCs are sometimes quite frequent, unregulated and chaotic. Occasionally they initiate a nodal or supraventricular tachycardia (Fig. 21.1).

Other Complaints

Some patients in our research population observed that their edema of the legs, hemorrhoids , carpal tunnel complaints or tendovaginitis stenosans of some fingers had disappeared after corrective surgery. No reference to this subject was found in literature.

Electrocardiography (ECG)

The radiological findings of heart compression and displacement are usually associated with pathological ECG findings. There are no specific ECG changes that can be pathognomic for the diagnosis PE with heart compression.
Barauskas found in a period of 35 years (1968-2002) pathological ECG changes in 382 (71.8 %) of his pediatric patients, postoperatively ECG findings were within normal limits in 330 (86.8%) of the cases. In 52 (13.2%) patients, all belonging to the age group of over 10 years, pathological ECG findings persisted postoperatively. The most common findings were incomplete right bundle branch block, repolarization disturbances, electrical axis deviation, tachycardia and bradycardia. He correlated pathological ECG findings with the data obtained by radiological examination and the correlation between them was statistically significant.

Transthoracic Echography (Ultrasound Examination of the Chest)

Due to the abnormal anatomical shape of the chest in pectus excavatum, information obtained through the apical view of a transthoracal echogram (TTE) is unreliable and therefore disputable. The effect of mechanical pressure on the heart is often not clearly visible on the TTE. Transesophageal echo-cardiography (TEE) is superior to TTE, but not easily applicable in normal routine as it is a patient-unfriendly method of investigation. On the other hand preoperative and postoperative TEE is an important tool in monitoring the haemodyamic changes after relieving cardiac compression.
Mitral valve prolapse and/or mitral insufficiency have an incidence of about 1 % in a normal pop-ulation. In several publications incidences about PE incidences varying from 8 to 58 % are mentioned.

Complaints and Synonyms used in some publications

Complaints	Synonym used in some publications
Exercise intolerance	Exercise limitation; progressive loss of stamina and endurance with exercise; lack of endurance; limited work performance; decrease in stamina and endurance during exercise
Fatigue	General weakness; early fatigability; becoming easily fatigued
Dyspnea at rest	Short of breath at rest; short of breath even under moderate exertion
Exertional dyspnea	Short of breath during strenuous exercise; difflculty climbing more than two flights of stairs without becoming short of breath
Tachypnea	Tachypnea with physical exertion
Chest pain	Pain in the anterior chest; dull precordial pain; chest tightness
Palpitations*[1]	Heart pounding; irregular heartbeats
Frequent respiratory infections, asthma	Asthma/asthma-like symptoms; mild restrictive lung disease
Lightheadedness	Dizziness
Poorly eating	Appetite loss which may be the result of compression of the stomach by the deformed chest wall
Other (infrequent)*[2]	Edema of the legs, hemorrhoids, carpal tunnel syndrome, snapping fingers

Incidence of Complaints, symptoms and pathological findings of 557 surgical patients in one clinic, *median age 13.3 years, with a range from 21 months to 29 years*

Complaints, symptoms and pathological findings	**%**
Shortness of breath, lack of endurance, exercise intolerance	93
Frequent respiratory infections	34
Asthma/asthma-like symptoms	34
Chest pain, with or without exercise	71
Cardiac compression (by CT, echo)	85
Cardiac displacement (by CT, echo)	74
Murmur on examination	26

Postural Components and Position of Diaphragm

Postural complaints and symptoms are quite usual in PE. In the upright or forward bending position the sternum is pressed inward even further.

A full stomach will push up the diaphragm and reduce the space in the chest even more.

Ventricular catheterization studies have demonstrated diminished stroke volume and cardiac utput in preoperative patients during upright exercise, which improved considerably after

repair. These findings are not demonstrable in supine patients evaluated at rest and may account for some of the reports of minimal physiologic impairment in PE patients

Most physicians are not aware of this postural effect and therefore do not ask specific questions regarding this aspect of the complaints and symptoms. Patients complaining about dyspnea will tell their physicians, if asked for more information, that they experience the shortness of breath as an obstruction or "clogging" of the trachea. While breathing they have to inhale air rather forcefully against a resistance in their airways. Breathing through the mouth, abdominal breathing and lifting up the ribcage will facilitate breathing and reduce the complaints (Fig. 21.3). Most senior patients are good observers and have invented their own methods to decrease their complaints (Table 21.6; Figs. 21.2, and 21.3).

Postural components and position of diaphragm

Components worsening symptoms	Measures taken to reduce symptoms
Local pressure	
On the sternum	Wider pants
On the upper abdomen (belt)	No belt, but braces to keep the
On the neck (tie)	pants up. No tie
Leaning forward	
Work in stooping posture	Avoid leaning forward as much as possible
Reading book or paper	Read Standard
Administrative work	Higher level of desk
Working on the computer	Placing the computer monitor at eye level
Fixing shoelaces	Putting feet on a chair while fixing shoelaces
Walking	Walk upright and admire the tops of the trees
Cycling	Higher positioning of steering wheel
Rotating or bending the neck	
Looking down	Avoid this attitude at daytime
Maximal rotation of the neck	Proper position while sleeping
Normal lunch or dinner	Eat small portions, more often