

**100 - EVALUATION OF VITAL CAPACITY (VC) IN PATIENTS WITH THORACIC SCOLIOSIS**

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**INTRODUCTION**

Scoliosis is a postural deviation characterized by muscle imbalance, which will meet in opposition to structures shortened muscle structures elongated. This deviation has shown its seriousness on the angles, which are measured by the Cobb angle. The curve tends to increase until the cessation of skeletal growth, and poorer prognosis of the chest, due to rotation of the thoracic cavity and consequent effect on respiration and cardiovascular system (THOMSON et al., 1994).

Second (KNOPLICH, 2003) Scoliosis is defined as a twisting of the basic elements of the spine around the vertical axis.

To (APLEY, 2003) recognized two types of scoliosis: mobile and fixed.

Scoliosis mobile - there is no structural abnormality of the vertebrae do not undergo rotation and the curvature is always reversible.

Scoliosis fixed (structural) - is always accompanied by vertebral rotation, vertebral bodies rotate toward the convexity, while the spinous processes rotate toward the concavity of the curve. The deformity is fixed and does not disappear with changes in posture.

It is called idiopathic when this change is not associated with paralysis, congenital malformations or metabolic diseases established.

The idiopathic scoliosis is responsible for most cases of structural scoliosis are not dependent on pathological processes of trauma or bone. The curve tends to increase until the cessation of skeletal growth, with the worst prognosis due to rotation of the thoracic rib cage and the consequent effect on respiration and cardiovascular system.

The height of the hump is directly correlated with the rate of progression of scoliosis, and also with the Cobb angle in the supine position. Scoliosis in the clinical sign most commonly presented is the deformity and the general examination includes the investigation of possible causes and an assessment of cardiopulmonary function which will be reduced in case of severe curvature. The position of the diaphragm and intercostal muscles, and respiratory work increases markedly. There is a reduction of respiratory muscle force resulting in an increased residual volume (RV) and a reduction in inspiratory muscles that results in a decrease in total lung capacity (TLC). The reduction in strength of inspiratory and expiratory muscle is related to a decrease in vital capacity (VC).

The vital capacity (VC) is the largest volume of air mobilized in the mouth between the positions of full inspiration and full expiration, is considered the normal value of 65ml/kg. This is an indication of ventilatory reserve. A patient presents with low vital capacity changes of the respiratory process.

Other factors than the anatomical architecture of a person and that affect the vital capacity are: (1) the person's position during the determination of vital capacity, (2) the strength of respiratory muscles and (3) the elasticity of the lungs and ribcage, which is called pulmonary compliance.

The mean vital capacity in young adult male is about 4.6 l and in the young adult female, about 3.1 l, although these values are much higher in some of the same weight than others. A tall, thin person, in general, has a vital capacity greater than an obese person, and a well-developed athlete may have a vital rate from 30 to 40% above normal, ie, 6-7 liters (BARRETO, 2002).

Another important factor for reduced lung function is obesity, second and Sue Collins. The effects of obesity on respiratory function must be studied separately in order to assess their role in these disorders. Differences in patterns of body fat distribution also promote changes in lung volumes.

**MATERIALS AND METHODS**

This is a prospective cross-sectional and quantitative nature that was conducted at the School of Alagoas, from August 2008 to February 2009, with 15 female patients, aged 18 to 35, suffering from thoracic scoliosis.

The research project was recommended in the protocol number 003/2008, by the Institutional Ethical Committee of the School of Alagoas - FAL.

All study participants signed a consent form in accordance with resolution 196/96 of the National Health Council, Ministry of Health (CNS/MS).

The study subjects underwent a clinical evaluation and pulmonary function test (PFT), and radiological assessment of vertebral deformity in AP, so that the Cobb angle was measured, thus identifying the existing degree of scoliosis and thus able to compare the impairment of lung function.

The measurement of CV was measured by the spirometer WRIGHT® brand, connected to a silicone mask, where each volunteer in a sitting position held maximal inspiration and then expired as soon as possible and forced. We performed three consecutive measurements with an interval of three minutes between each measurement, considering the extent of higher value.

**RESULTS AND DISCUSSION**

Characteristics of the sample consisted of 15 women from 18 to 35 years, found a mean age of 23 years, mean weight of 56kg and height of 1.60 m. The mean estimated CV was 3 L 633.8 and 3625.3 as L. The conditions presented next, because six subjects had a vital capacity greater extent than expected justifying such a result by the sample size.

Table 1 - Sample General

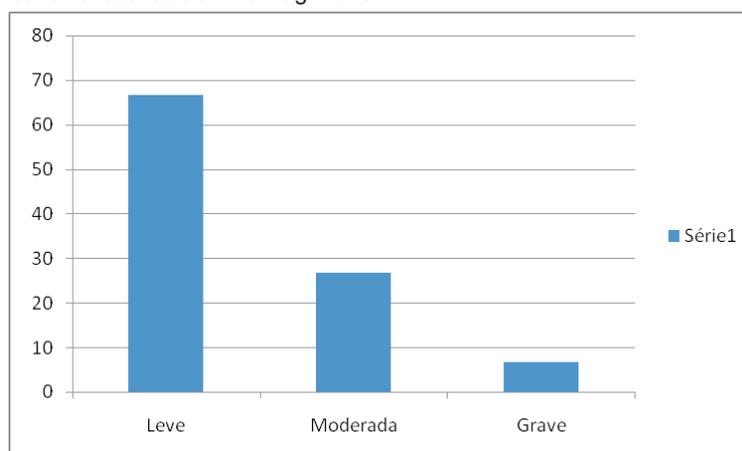
SUJEITO DA AMOSTRA	IDADE	PESO(Kg)	ALTURA (m)	IMC	PESO IDEAL (Kg)	GRAU DE ESCOLIOSE TORÁCICA	CV MEDIDA	CV ESPERADA
1	35	53,5	1,46	25,1	44,75	9°	3100	3477,5
2	22	49	1,60	19,14	54,09	35°	3650	3185
3	34	52	1,53	22,21	49,4	50°	2900	3380
4	25	44	1,69	15,41	60,12	28°	4500	2860
5	19	57	1,72	19,27	62,13	10°	2400	3705
6	21	47,5	1,52	20,56	48,73	6°	3290	3085,5
7	22	45,1	1,55	18,77	50,74	9°	4600	2931,5
8	26	84,5	1,65	31,04	57,44	11°	4500	5492,5
9	18	49	1,55	20,4	50,74	4°	2390	3185
10	24	57	1,60	22,27	54,09	20°	5200	3705
11	22	52	1,61	20,06	54,76	19°	3900	3380
12	23	61	1,69	21,36	60,12	16°	3550	3965
13	18	69,8	1,71	23,9	61,42	18°	4350	4537
14	18	59,2	1,57	24	52,08	21°	3200	3848
15	18	58	1,63	21,8	56,1	23°	2850	3770

Source: Research data

We can observe in the sample that six subjects had a CV higher than expected so far, with four underweight, overweight, and one an athlete. According to Barreto and Douce 2000, 2002, a tall thin person generally has a higher CV than an obese person and a well-developed athlete may have a vital rate from 30 to 40% above normal, ie, 6-7 L. It was also observed that 8 individuals appeared overweight this was not the aim of our study, but Luce JM 1980 states that obesity leads to a reduction in lung volumes when compared with the predicted values.

According to Pinheiro DLA, the magnitude of scoliosis is determined as mild 10 to 20 degrees, moderate > 20 to 40 degrees and severe above 40 degrees. In this study we found 10 cases of scoliosis mild, 4 moderate scoliosis and only 1 case of severe scoliosis, which shows little or no significance in relation to what the literature refers, since the sample was small for this confirmation.

Chart 1 - Classification of scoliosis on the magnitude



Source: Research data

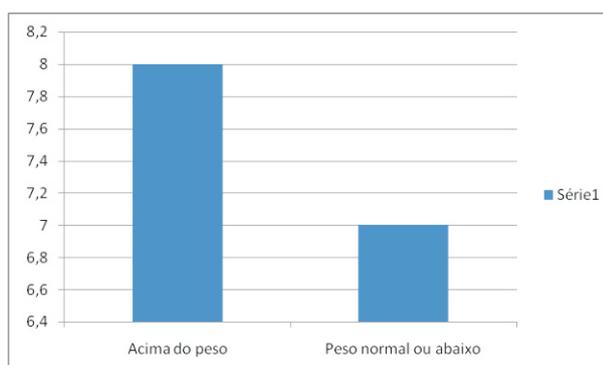
In this sample we found three types of classification as to the magnitude of scoliosis, as follows: 66.66% mild, moderate 26.66% and 6.66% severe. Concerning the degree of thoracic scoliosis, we could see a weak correlation with the decrease in vital capacity for this sample ( $r = -0.12$ ).

According to Koumbourlis Durmala 2006 and 2008, severe scoliosis is that it brings greater impairment of lung function, perhaps because of this the result has not found greater significance, because only one subject showed severe impairment.

It is believed that obesity causes pulmonary restriction due to decreased diaphragmatic excursion by increased abdominal fat or weight on the chest wall, leading to a reduction in lung volumes when compared with predicted values.

The stored fat in the abdominal cavity, probably exerts a direct mechanical effect on the rib cage and diaphragm by a compression mechanism, which, in turn, restricts lung expansion, causing a reduction in lung volumes.

Chart 2 - Changes in Weight



Source: Research data

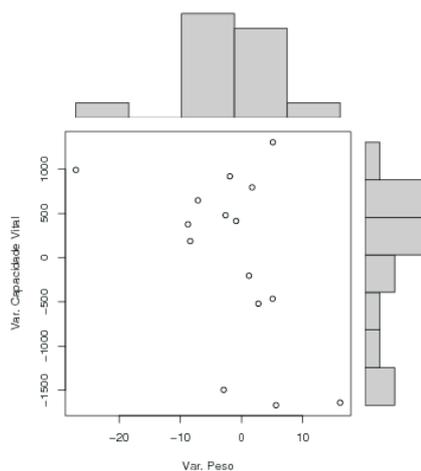
In this sample we can observe that 53% were overweight, while 47% were normal weight or below. From the statistical point of view, there was no significant difference in the degree of thoracic scoliosis among those with normal weight, above or below the ideal weight ( $p = 0.434$ ).

Studies that investigated the relationship between lung function and scoliosis angle, show that the pulmonary dysfunction increases as scoliosis progresses. However, studies suggest that the angle of scoliosis can not be the most important factor in this relationship. But the degree of scoliosis associated with pulmonary dysfunction, described in the literature are not explained by the radiographic characteristics of the deformity.

Concerning the degree of thoracic scoliosis, we could see a weak correlation between the degree of scoliosis and the decrease in vital capacity for this sample ( $r = -0.12$ ), with no significant difference in the degree of thoracic scoliosis among those below and overweight ( $p = 0.434$ ).

Regarding the variation between actual weight and ideal weight and its correlation with vital capacity was found that in 47% of cases (7 / 15, 95% CI 25% to 70%) had involvement of vital capacity of 574 ml on average. It was also observed a moderate correlation between weight change and the ideal vital capacity ( $r = 0.51$ ), where the higher the mass of weight that needs to be lost to achieve the ideal weight, the greater the commitment volume in vital capacity, or is, the higher the actual weight, the greater the impairment of vital capacity.

Graph 03 - Relationship between weight changes and changes in vital capacity



Source: Data from the study

In this study we noted that the second most significant variable was found with regard to the decrease in vital capacity than the primary variable.

## FINAL

We can observe in this study that there was a weak correlation between the degree of scoliosis and impairment of vital capacity, thus leading us to further studies into account the increase of the sample, in order to obtain a higher degree of significance with a confidence interval lower and that the second variable that emerged (obesity) can be studied individually, and therefore an exclusion criterion for studies, where one wants to observe the lung dysfunction correlated with the degree of scoliosis.

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## EVALUATION OF VITAL CAPACITY (VC) IN PATIENTS WITH THORACIC SCOLIOSIS

### ABSTRACT

Scoliosis is defined as a twisting of the basic elements of the spine around the vertical axis corresponds to the vital capacity greater air volume mobilized in the mouth between the positions of full inspiration and full expiration. This is an indication of ventilatory reserve. The aim of this study was to investigate the involvement of vital capacity and its relationship with the degree of thoracic scoliosis. Participants were 15 females aged between 18 and 35. Were evaluated by panoramic radiography of the spine and ventilation, this accomplished with the trademark WRIGHT® spirometer connected to a silicone mask, getting three consecutive measurements, considering the higher value. There was no correlation between degree of scoliosis and impairment

of vital capacity, however was found in 47% of cases a substantial impairment of vital capacity on average. It was also observed a moderate correlation between weight change and the ideal vital capacity ( $r = 0.51$ ), ie the higher the actual weight, the greater the impairment of vital capacity.

**KEYWORDS:** Scoliosis, Vital Capacity, Spirometry, Obesity.

### **ÉVALUATION DE LA CAPACITÉ VITALE (CV) CHEZ LES PATIENTS SCOLIOSE THORACIQUE**

#### **RÉSUMÉ**

La scoliose est définie comme un mouvement de torsion des éléments de base de la colonne vertébrale autour de l'axe vertical correspond au volume d'air de la capacité vitale plus grande mobilisation dans la bouche, entre les positions d'inspiration complète et d'expiration complète. Il s'agit d'une indication de la réserve ventilatoire. Le but de cette étude était d'enquêter sur l'implication de la capacité vitale et sa relation avec le degré de la scoliose thoracique. Les participants étaient âgés de 15 femmes âgées entre 18 et 35. Ont été évalués par radiographie panoramique de la colonne vertébrale et de la ventilation, ce que c'est possible avec la marque WRIGHT® spiromètre relié à un masque de silicone, prendre trois mesures consécutives, compte tenu de la valeur plus élevée. Il n'y avait aucune corrélation entre le degré de la scoliose et la déficience de la capacité vitale, a toutefois été constaté dans 47% des cas une déficience de la capacité vitale en moyenne. On a également observé une corrélation modérée entre les changements de poids et de la capacité vitale idéal ( $r = 0,51$ ), c'est à dire plus le poids réel, plus la dépréciation de la capacité vitale.

**MOTS-CLÉS:** scoliose, la capacité vitale, respirométrie, l'obésité

### **EVALUACIÓN DE LA CAPACIDAD VITAL (CV) EN PACIENTES CON ESCOLIOSIS TORÁCICA**

#### **RESUMEN**

La escoliosis se define como una torsión de los elementos básicos de la columna vertebral en torno al eje vertical corresponde al volumen de aire de la capacidad vital una mayor movilización en la boca entre las posiciones de inspiración y espiración completa. Esta es una indicación de la reserva ventilatoria. El objetivo de este estudio fue investigar la implicación de la capacidad vital y su relación con el grado de escoliosis torácica. Los participantes fueron 15 mujeres de edades comprendidas entre 18 y 35. Fueron evaluados por radiografía panorámica de la columna vertebral y la ventilación, esta realizado con la marca registrada® WRIGHT espirómetro conectado a una máscara de silicona, consiguiendo tres mediciones consecutivas, teniendo en cuenta el valor más alto. No hubo correlación entre el grado de escoliosis y el deterioro de la capacidad vital, sin embargo se encontró en el 47% de los casos, un deterioro sustancial de la capacidad vital en promedio. También se observó una correlación moderada entre el cambio de peso y la capacidad ideal vital ( $r = 0,51$ ), es decir, cuanto mayor sea el peso real, mayor es el deterioro de la capacidad vital.

**PALABRAS CLAVES:** la escoliosis, la capacidad vital respirometría, la obesidad.

### **AVALIAÇÃO DA CAPACIDADE VITAL (CV) EM PACIENTES PORTADORES DE ESCOLIOSE TORÁCICA.**

#### **RESUMO**

A escoliose é definida como uma torção dos elementos básicos da coluna em torno do eixo vertical e a capacidade vital corresponde ao maior volume de ar mobilizado na boca entre as posições de inspiração plena e expiração completa. Esta é uma indicação de reserva ventilatória. O objetivo deste estudo foi verificar o comprometimento da Capacidade Vital e a relação com o grau de escoliose torácica. Participaram 15 indivíduos do sexo feminino com faixa etária entre 18 e 35 anos. Foram avaliadas por radiografia panorâmica da coluna vertebral e ventilometria, essa realizada com o ventilômetro da marca WRIGHT® conectada a uma máscara de silicone, obtendo 3 medidas consecutivas, considerando a de maior valor. Não houve relação significativa entre grau de escoliose e comprometimento da capacidade vital, no entanto foi encontrado em 47% dos casos um considerável comprometimento da capacidade vital em média. Foi observada ainda uma correlação moderada entre a variação de peso e a capacidade vital ideal ( $r = 0,51$ ), ou seja, quanto maior o peso real, maior o comprometimento da capacidade vital.

**PALAVRAS CHAVES:** Escoliose, Capacidade vital, Ventilometria, Obesidade.