Characterization of the Serum α1-Antitripsine Level in Primary Spontaneous Pneumotorax Patients

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Diagnosis of primary or idiopathic spontaneous pneumothorax is one of exclusion, and in fact defines an entity that may have a difficult or impossible cause to be highlighted by current means, we consider it appropriate to study these etiopathogenic aspects. There is a definite association between alpha-1 antitrypsin deficiency and pulmonary emphysema and indirect spontaneous pneumothorax secondary to an emphysematous pulmonary lesion. Dose of alpha-1 antitrypsin is an immunoturbinimetric method for in vitro determination of alpha-1 antitrypsin in human serum and plasma. This product is calibrated to be used for the Daytona RX analyzer. The serum level of alpha-1-antitrypsin is not a determining factor in the postoperative evolution characterized by the interval until air loss disappears, but certainly exerts some influence, the exact level of which remains to be determined.

Keywords: alpha-1 antitrypsin, primary spontaneous pneumothorax, pulmonary emphysema

Given the paradigm that the diagnosis of primary or idiopathic spontaneous pneumothorax is an exclusion and defines an entity that may have a difficult or impossible cause to be highlighted by current means, we consider it appropriate to study these etiopathogenic aspects [1].

It is known that there is a definite association between alpha-1 antitrypsin deficiency and pulmonary emphysema and indirect spontaneous pneumothorax secondary to an emphysematous pulmonary lesion. Thus, determining the level of alpha-1 anitrypsin in patients with primary spontaneous pneumothorax could be a useful test in investigating this cause and detecting homozygous (Pi ZZ) patients, but especially heterozygous, whose alpha-1 antitrypsin values †are located at the lower limit of normal (90-140 mg / dL) [2,3].

The advantages of this approach are that these patients will be tracked over time, advised on the risk factors, and will be able to benefit from substitution therapy by general or aerosol alpha-1 antitrypsin [4,5].

At the same time, in patients with alpha-1 deficiency antitrypsin, there is a possible association with other pathologies undiagnosed until the time of pneumothorax. Thus, the following conditions may be related to the deficiency of alpha-1 antitrypsin: pulmonary emphysema in patients under 45 years, emphysema in the absence of known risk factors (smoking, chronic exposure to dust), basal hypertrophic emphysema, affection hepatitis of unknown cause, necrotizing paniculitis, 3-positive anti-proteinase vasculitis (C-ANCA), familial history of any of the following: pulmonary emphysema, bronchiectasis, liver or paniculitis, bronchiectasis an obvious etiology [6, 7].

Dose of alpha-1 antitrypsin is an immunoturbinimetric method for in vitro determination of alpha-1 antitrypsin in human serum and plasma. This product is calibrated to be used for the Daytona RX analyzer [8,9].

Measuring the level of alpha-1 antitrypsin in serum and plasma helps diagnose some maladies including juvenile liver cirrhosis and adulthood. Additionally, the deficiency of alpha-1 antitrypsin is associated with pulmonary emphysema [10, 11].

Experimental part

Matherials and methods

Heparinized serum or plasma on EDTA should be kept at a temperature of +2 to +8°C for up to one week or frozen at -20 ° for up to 6 months (can not be refrozen).

The normal values of alpha-1 antitrypine are between 110-230mg / dL.

47 samples were analyzed from the patients in the Iasi Thoracic Surgery Clinic, obtaining a value range of 89 - 637mg / dL.

These patients agreed to blood sampling for enzymatic dosing, and that the data were used for scientific purposes.

A number of these patients were known to the clinic with PSP history and were under the annual control of blood sampling.

The blood taken was analyzed in a private and accredited medical analysis laboratory.

Results and discussions

In this study the serum level of alpha1 antitrypsin was determined in 47 patients, randomly selected from the total group. The included lot presented an average of this

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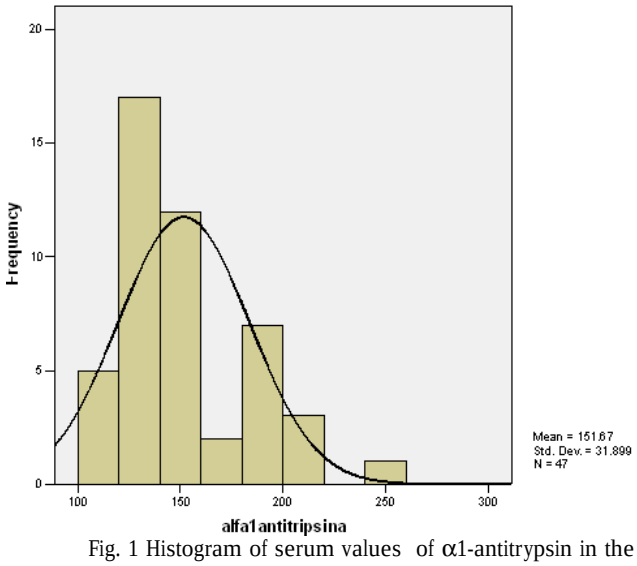

Fig. 1 Histogram of serum values of α1-antitrypsin in the study group

parameter of 151.6 +/- 31.8, with a median of 142 extremes being the values of 106 and 254. The distribution of the values was normal, slightly asymmetric (fig. 1, table 1).

In the case of the present group, there is no correlation between the duration of admission and serum alpha1 antitrypsin (correlation index Pearson -0.168). However, a moderate negative correlation between the magnitude of the time span from intervention to discharge (correlation index -0.466), significant significance difference p = 0.019 may be described, suggesting a less favorable postoperative progression in patients with deficit or borderline values. This correlation appears to be somewhat stronger if we exclude the influence of age (correlation index -0.476, p = 0.01) but not in the case of smoking exclusion (correlation index -0.437, p = 0.03). In the same vein, the question arises as to whether the tremendous or unfavorable post-operative evolution can be considered as an indication of a possible enzymatic deficiency.

Table 1
VALUES OF SERUM LEVELS OF α1-ANTITRYPSIN

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	106	1	.2	2.1	2.1
	108	1	.2	2.1	4.3
	112	1	.2	2.1	6.4
	114	1	.2	2.1	8.5
	118	1	.2	2.1	10.6
	124	1	.2	2.1	12.8
	128	3	.5	6.4	19.1
	129	2	.4	4.3	23.4
	131	1	.2	2.1	25.5
	132	1	.2	2.1	27.7
	133	1	.2	2.1	29.8
	136	1	.2	2.1	31.9
	136	1	.2	2.1	34.0
	138	5	.9	10.6	44.7
	140	1	.2	2.1	46.8
	142	3	.5	6.4	53.2
	143	3	.5	6.4	59.6
	143	1	.2	2.1	61.7
	143	1	.2	2.1	63.8
	144	1	.2	2.1	66.0
	149	1	.2	2.1	68.1
	151	1	.2	2.1	70.2
	156	1	.2	2.1	72.3
	177	1	.2	2.1	74.5
	177	1	.2	2.1	76.6
	182	1	.2	2.1	78.7
	183	1	.2	2.1	80.9
	194	3	.5	6.4	87.2
	194	1	.2	2.1	89.4
	195	1	.2	2.1	91.5
	205	1	.2	2.1	93.6
	207	2	.4	4.3	97.9
	254	1	.2	2.1	100.0
	Total	47	8.3	100.0	
Missing	System	519	91.7		
Total		566	100.0		

The relatively low number of patients known to have elevated serum alpha-1-antitrypsin levels in the present study does not, however, allow definitive conclusions to be drawn in this regard.

We found that there is a possible link between the level of VSH at admission and the serum level of alpha-1-antitrypsin, the correlation being weak and positive, given the multiple factors that can influence this parameter of inflammation, we can not draw a conclusion in this regard despite a the threshold of p is 0.06. This hard-to-explain effect could be generated by pulmonary alterations in the context of the pneumothorax, which involves the release of alpha1-antitrypsin in the circulation, which is suggested by the very high values seen in patients who were harvested during the early postoperative period.A similar relationship was found in the case of 22 surgically treated patients, between serum alpha1 antitrypsin and the duration until loss of air loss expressed in days, the correlation being weak and negative and the significance threshold of 0.16. This relationship was maintained in case of elimination of the estimated effects of the age on the evolution, the correlation coefficient increasing from -0.309 to -0.354 for a significance threshold p = 0.116. The degree of correlation increased further after the correction for smoking / non-smoking status and age, the correlation index increasing to -0.413 for p = 0.07. These data seem to suggest that the serum level of alpha-1-antitrypsin is not a determining factor in the postoperative post-traumatic evolution, but certainly exerts some influence, the exact level of which remains to be determined .

We have not noticed the existence of any significant correlation between the serum level of alpha1-antitrypsin and the case evolution parameters in patients treated conservatively or by pleurotomy and drainage, a possible explanation being the lower number of subjects who received complete data, for financial reasons.

We found the presence of a statistically significant difference (p = 0.03) between mean serum alpha1-antitrypsin levels in patients with and without relapses, the values being 155.9 +/- 33.5 in single episode patients pneumothorax, respectively 135 +/- 18 in relapses known. This situation can be explained probably by the potentially more inflammatory status of patients in patients with repeated pneumothorax episodes.

Conclusions

A correlation between the duration of admission and the serum level of alpha-1 antitrypsin can be seen. Also, a moderate negative correlation between the amount of time elapsed from surgery to discharge can be described, suggesting a less favorable postoperative progression in patients with deficient or borderline values.

There is a possible link between the level of VSH on admission and the serum level of alpha-1 antitrypsin.

Considering all these aspects, we consider that the serum level of alpha-1-antitrypsin is not a determining factor in the postoperative evolution characterized by the interval until the air loss disappears, but certainly exerts some influence, its exact level remaining either fixed.

References

1.BINTCLIFFE O, MASKELL N. Spontaneous pneumothorax. BMJ. 2014 May 8;348:g2928;

2.SERAPINAS D, OBRIKYTE V, VAICIUS D, ET AL. Alpha-1 antitrypsin deficiency and spontaneous pneumothorax: possible causal relationship. Pneumologia. 2014 Jan-Mar;63(1):32-5;

3.TRUFA DI, ARHIRE LI, GRIGORESCU C, MIHALACHE L, NITA O, GRAUR M, ET AL. Assessment of preoperative and postoperative prealbumin in thoracic surgery – a two months experience in a Romanian university hospital. Rev Romana Med Lab. 2015;23(1):75-86;

4.JOOBEUR S, CHEIKH MHAMED S, MRIBAH H, ET AL. Predictive factors of recurrence in spontaneous pneumothorax. Tunis Med. 2015 Jun;93(6):389-91;

5.HINGANU MV, COZMA RS, CIOCHINA P, SCUTARIU IA, ASIMIONOAIEI-SIMIONESCU C, HINGANU D. The morphometry of the laryngeal phonatory system – base of the anatomical study of the voice aptitudes. Rom J MorpholEmbryol 2017, 58(4): 1365-1369;

6.SCLAR DA, EVANS MA, ROBISON LM, ET AL. á1-Proteinase inhibitor (human) in the treatment of hereditary emphysema secondary to á1-antitrypsin deficiency: number and costs of years of life gained. Clin Drug Investig. 2012 May 1;32(5):353-60;

7.HINGANU D, STAN CI, TARANU T, HINGANU MV. The anatomical and functional characteristics of parotid fascia. Rom J MorpholEmbryol 2017, 58(4): 1327-1331.

8.STRANGE C, BEIKO T. Treatment of Alpha-1 Antitrypsin Deficiency. SeminRespirCrit Care Med. 2015 Aug;36(4):470-7;

9.DANCIU M, LUNGULEAC T, GRIGORESCU C. Incidental finding of a sclerosinghemangioma in a Caucasian woman. Rom J MorpholEmbryol. 2015;56(2):545-8;

10.HINGANU M.V., COZMA R.S., CIOCHINA P., SCUTARIU I.A., ASIMIONOAIEI-SIMIONESCU C., HINGANU D., Rom J MorpholEmbryol, 58, no. 4, 2017, p. 1365;

11. ROMANEC, C., PACURAR, M., DECUSARA, M., SCUTARIU, MM., HINGANU, D., HINGANU, M.V., CIUPILAN, C., Labio-palatine Cleft, Morphological Substrate. Rev. Chim. (Bucharest), **69**,no.4, 2018,p.1002-1005.

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