Original Article

Relationship between Right Descending Pulmonary Artery Size on a Chest Radiograph and Body Mass Index

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Objective: The purpose of the authors' study is to evaluate the correlation between the size of the right descending pulmonary artery and the body mass index in the chest radiograph.

Materials and Methods: A total of 363 patients undergone chest radiograph examination were included in the present study. The subjects were aged between 18 and 20 years with no underlying disease, no previous surgical history, no abnormal physical examination, normal laboratory results, and normal chest radiograph. In present study, the posteroanterior chest radiograph was evaluated. The right descending pulmonary artery size was measured. The correlation between right descending pulmonary artery and body mass index, weight and height were calculated by means of Pearson's correlation test.

Results: The present study suggested that the size of right descending pulmonary artery was dependent on body mass index, weight and height.

Conclusion: This outcome is the beginning in an effort to understand the correlation between the size of right descending pulmonary artery and body mass index. Further studies with a larger sample and a greater variety of subject demographics are required to reach a clear-cut conclusion and to establish a new accepted value as varied by body mass index for the right descending pulmonary artery.

Keywords: right descending pulmonary artery, body mass index, chest radiograph

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Chest radiography is the most common diagnostic tool for the screening of pulmonary and cardiovascular diseases such as chronic pulmonary obstructive disease[1,2], and mitral valve stenosis[3] which relates to pulmonary hypertension[4]. A reliable radiographic sign of pulmonary arterial hypertension is an enlarged right descending pulmonary artery[3,5]. The previous study of 1085 patients[6] showed that the size of the right descending pulmonary artery can be used as a reference size. Factors such as gender, age, height and weight can be used to indicate a normal size of the artery. However, two other studies, using computed tomography[7,8], showed that the size of the pulmonary artery was related to body mass index(BMI). So, if the size of the right descending pulmonary artery as shown on a chest radiograph was significantly correlated to BMI, the reference size of the right descending pulmonary artery in common use might need to be adjusted. This possible correlation has not previously been investigated. The purpose of the authors' was to find the relationship existence. As well as testing for any correlation with the BMI, the correlation between the size of the right descending pulmonary artery and body weight and height, individually, were also investigated.

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Materials and Methods

The present report was a retrospective study of 2,782 subjects undergone chest radiograph examination before admission to Naresuan University Hospital in 2016. Inclusion criteria were subjects aged between 18 and 20 years with no underlying disease, no previous surgical history, no abnormal physical examination or abnormal laboratory results, and normal chest radiograph**.** Before data collection, the ethical approval was obtained from the Naresuan University Human Research Ethics Committee. Ultimately, 226 male and 137 female subjects were included, 363 in all. For the subjects included in the present study, all posteroanterior chest radiographs were obtained at full inspiration, good exposure, good position, and no rotation. The right descending pulmonary artery

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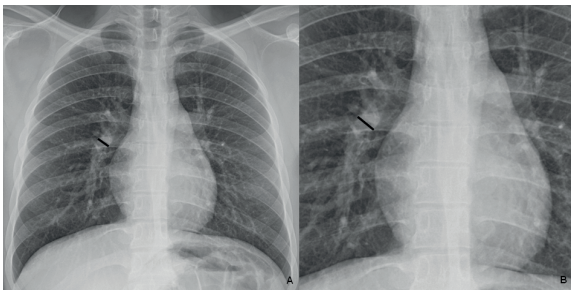

Figure 1. (A) The measurement of the right descending pulmonary artery (RDPA). It is measured at the widest point of the right descending pulmonary artery before branching into the middle and lower lobe arteries perpendicular to bronchus (black line)**. (B)** The zoom area of right hilum where the right descending pulmonary artery was measured.

(RDPA) was measured on the chest radiograph at its widest point before branching into the middle and lower lobe arteries perpendicular to the bronchus, measured in millimeters, (Figure 1). The RDPA was measured independently and in random order by two radiologists, with 2 and 10 years of experience, and the final assessment was achieved by consensus if there was disagreement on the measurements. The BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). The correlation between RDPA and BMI, weight, and height were calculated by means of Pearson's correlation test.

Results

The data of size of RDPA, weight, height, and BMI of entire subjects was shown in Table 1.

There were significant and very low correlations between the size of RDPA and BMI (R = 0.178, p = 0.001), RDPA and weight (R = 0.262, $p < 0.001$), and height (R = 0.246, $p < 0.001$).

Discussion

The result of the present study showed that there was a significant correlation between the size of the right RDPA on a chest radiograph and the BMI. These findings correspond well to the study by Quynh A et al[7], which showed a statistically significant correlation between the mean value of the main pulmonary artery (mPA) on non-contrast cardiac computed tomography, and obesity (BMI > 30 kg/m2). Our findings are also the same as the Turkish study[8], which showed statistically significant, medium-strength correlation, between the diameter of the main pulmonary arteries and BMI, and weight. Our findings, however, showed very low correlation between the size of the right RDPA and BMI, which is probably due to small sample size and the BMI that is calculated from weight divided by height squared.

Table 1: Values of RDPA and factors of all samples.

Entire subject	N	mean±SD	Minimum	Maximum
RDPA(mm)	363	12.5±1.9	6.6	19
Weight(kg)	363	64.63±15.98	38	127
Height(cm)	363	166.50±7.63	147	188
BMI(kg/m2)	363	23.27±5.44	15.06	50.24
For male				
RDPA(mm)	226	13.0±1.8	9	19
Weight(kg)	226	66.15±14.33	42	115
Height(cm)	226	170.38±5.92	154	188
BMI(kg/m2)	226	22.75±4.66	15.5	38.87
For female				
RDPA(mm)	137	11.6±1.6	6.6	16.2
Weight(kg)	137	62.12±18.16	38	127
Height(cm)	137	160.10±5.53	147	176
BMI(kg/m2)	137	24.11±6.45	15.06	50.24

In addition, the Quynh A. et al. study[7] also demonstrated a correlation between mPA and height, similar to the authors' study, whereas the Turkish study did not. The present subject sample size was limited. It remains for future studies with larger population group to find the answer.

Interestingly, in the present study, the size of RDPA in males was larger than in females, which was similar to Chang Study. However, the limitation of our study was the correlation between sex and RDPA could be analyzed because this variable was not continuous data. In the future, the authors plan to conduct a study with a larger sample.

In conclusion, the results of the authors' study suggest that the size of the RDPA is dependent on BMI, weight, height. The present findings are a beginning for a greater understanding of the variability of the size of the RDPA. Further studies with a larger sample and a greater variety of subject demographics are required to reach a more clear-cut conclusion and to establish a new accepted value of the RDPA size for each range of BMI values.

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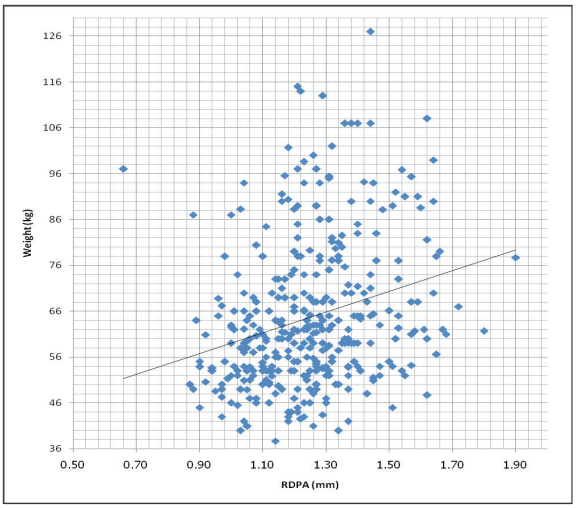

Figure 2: Correlation between the RDPA and weight.

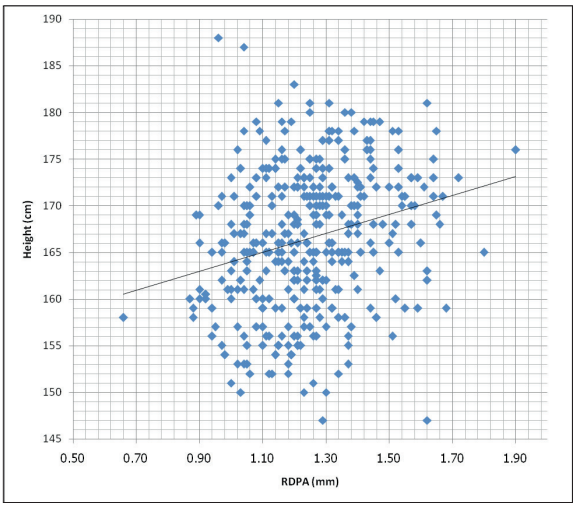

Figure 3: Correlation between the RDPA and height.

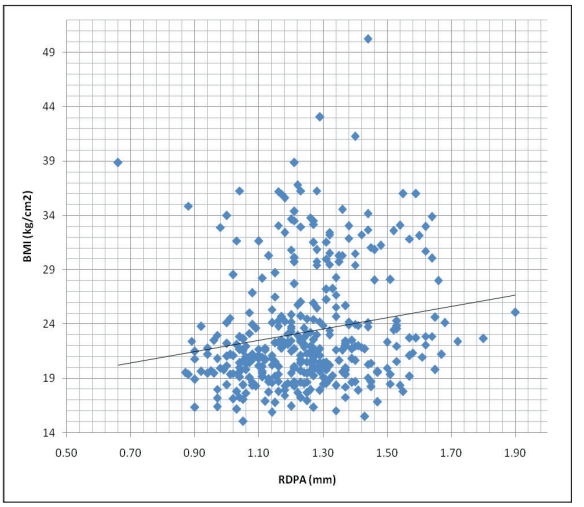

Figure 4: Correlation between the RDPA and BMI.

What is already known on this topic?

A reliable radiographic sign on chest radiograph of pulmonary arterial hypertension is an enlarged right descending pulmonary artery. A previous study of 1,085 patients showed that the size of the right descending pulmonary artery can be used as a reference size. However, two later studies, using computed tomography showed that the size of the pulmonary artery is related to body mass index.

What this study adds?

The previous studies, using computed tomography suggested that size of the right descending pulmonary artery was significantly correlated to BMI. To our knowledge, no previous study has been investigated about this correlation by using chest radiograph.

The findings support that the size of right descending pulmonary artery is dependent on body mass index. This is the beginning in an effort to understand this correlation. Further studies with a larger sample and a greater variety of subject demographics are required to establish a new accepted value as varied by body mass index for the right descending pulmonary artery.

Potential conflicts of interest

The authors declare no conflict of interest.

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