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Clinical Research

Hipertrofi Ventrikel Kiri Disertai Dengan Pembesaran Diameter Osteum Vena Pulmonal

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Latar Belakang : Penyakit jantung hipertensi yang ditandai dengan hipertrofi ventrikel kiri dan biasanya disertai disfungsi ventrikel kiri, sering dijumpai pada populasi umum. Kondisi ini diikuti oleh penambahan diameter osteum vena pulmonal. Penelitian ini mencari hubungan antara diameter vena pulmonal dengan hipertrofi ventrikel kiri.
Metoda dan Hasil : Osteum vena pulmonal terdiri atas empat bagian yaitu superior kiri, superior kanan, inferior kiri, dan inferior kanan, Empat puluh enam subyek diikutkan dalam penelitian ini, kesemuanya dalam irama sinus. Hipertrofi ventrikel kiri ditentukan dengan pencitraan multisliced computed tomography (MSCT), dengan mengukur ketebalan septum interventrikular. Ada dua puluh tiga pasen dengan hipertrofi ventrikel kiri. Dengan menggunakan analisis korelasi Pearson, didapat korelasi positif bermakna antara derajat hipertrofi ventrikel kiri dan diameter osteum vena pulmonal superior kanan, inferior kanan dan superior kiri ($p<0.05$).
Kesimpulan : Dilatasi vena-vena pulmonal superior kanan, inferior kanan dan superior kiri menyertai hipertrofi ventrikel kiri.

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Kata kunci : vena pulmonal, hipertrofi ventrikel kiri

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Penelitian Klinis

Left Ventricular Hypertrophy is Associated with Increased Ostial Pulmonary Vein Diameter

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Background: Hypertensive heart disease, characterized with left ventricular hypertrophy (LVH), which is usually accompanied with left ventricular dysfunction, is prevalent in the community and associated with increased of ostial pulmonary vein diameter. We investigate pulmonary vein diameter in its relationship to left ventricular hypertrophy.
Methods and Results: Ostial pulmonary veins divided into four parts, left superior (LS), right superior (RS), left inferior (LI), and right inferior (RI), were assessed by spiral multisliced computed tomography (MSCT) in 46 sinus rhythm subjects. LVH was analyzed by measuring the thickness of interventricular septum by MSCT. There were 23 patients with LVH, and the rest were normal. According to Pearson correlation analysis, we found a significant positive correlation between the degree of LVH and ostial diameter of RS, RI, and LS ($p<0.05$).
Conclusion: Left ventricular hypertrophy is associated with right superior, right inferior and left superior pulmonary veins dilatation.

Keywords: Pulmonary veins, Left ventricular hypertrophy

Recent years, there were enormous amounts of experimental and clinical research into role of the pulmonary vein (PV) in atrial fibrillation (AF). Advanced imaging techniques have confirmed the findings of PV dilatation earlier post mortem studies. Many investigations suggest that the PVs may play role in both the initiation and maintenance of AF.

Hypertensive heart disease, characterized with left ventricular hypertrophy (LVH), which is usually accompanied with left ventricular dysfunction, is prevalent in the community. Tsang et al.[1] shown that abnormal relaxation appeared to increase the predisposition for non valvular AF. The gradient of risk appeared to be related to the severity of diastolic dysfunction. Abnormal relaxation lead to a reduced of passive left atrial (LA) emptying, and may result in a larger LA volume at the onset of atrial systole as a compensatory mechanism.[2] Overtime, the LA and pulmonary vein dilate.

We investigated the relationship between LVH and pulmonary vein dilatation in patients with normal sinus rhythm.

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Methods

Subjects

Multislices Cardiac Computed Tomography was performed at the National Cardiovascular Center Harapan Kita in 46 consecutive sinus rhythm subjects. The subjects were divided into two groups, 23 subjects with LVH and the rest with non LVH. Any valves diseases and PV anomalies were ruled out.

CT imaging

All subjects were underwent a single detector of CT scan of the chest with 0.75 mm and rapid administration of intravenous contrast material.[3] The CT dataset was transferred to three-dimensional (3-D) workstation, where 3-D reconstruction of LA was performed to define the PV anatomy, diameter of ostia, and vein orientation at the junction of LA (**Figure 1**). Because PVs frequently do not make a 90° angle with the atrium but rather have funnel-shaped distal segments, the ostial diameter were measured at the point of the smallest angle with the atrial wall.

Measurement of PVs was taken at the largest diameter (**Figure 2**). LVH is defined by thickening of interventricular septum wall more than 12 mm, and is determined by measuring axial plane of LV by CT scan at the level of papillary muscle.[4] All measurements were performed by the same radiographer who was blinded to the patient history.

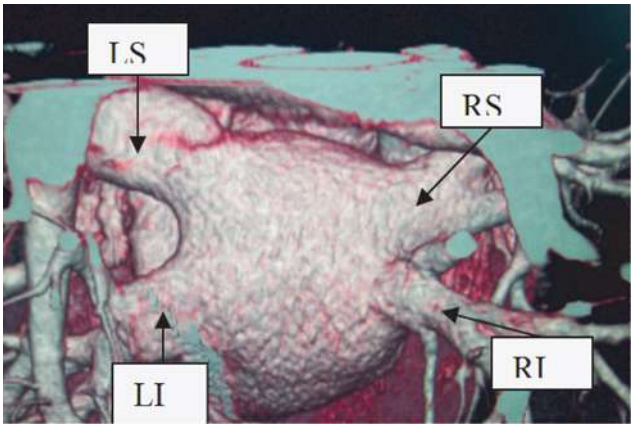

Figure 1. Evaluation of PVs by multisliced CT-scan (RS: right superior PV ; RI: right inferior PV; LS: left superior PV; LI: left inferior PV)

Statistical methods

Variables are expressed as mean ± 1 SEM. Categorical variables were compared by t test. $P < 0.05$ was considered statistically significant. Statistical analyses were performed using SPSS version 13.0 for windows.

Results

Table 1 shows the characteristics and ostial diameter in patients with sinus rhythm. LVH was found related to age (p 0.05). The ostial diameter of right superior (RS), right inferior (RI) and left superior (LS) PVs in the patients with LVH were increased compared with non LVH ($p<0.05$). Left inferior PV diameter did not show any significant difference in both groups.

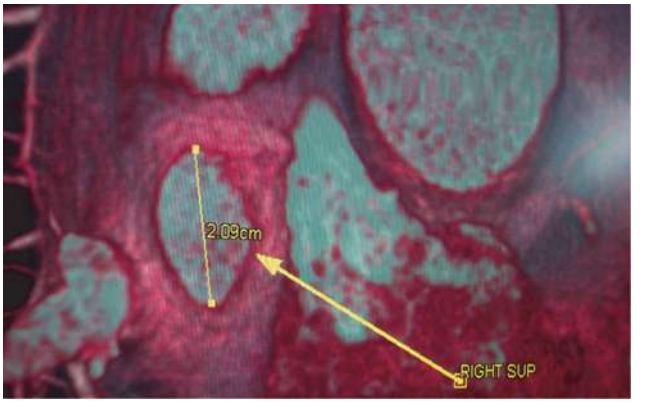

Figure 2. Ostial diameter measurement in the axial plane

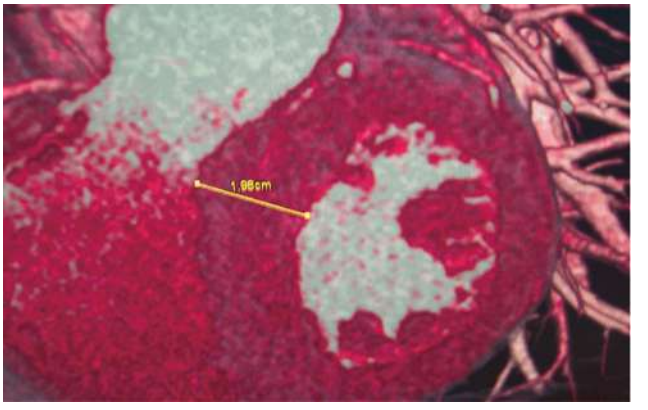

Figure 3. LVH measurement

Table 1. Clinical characteristics and results

	LVH (-) (N=23) Mean±SEM	LVH (+) (N=23) Mean±SEM	P value
Age (years)	54.83±2.31	58.13±1.6	0.05
RS	1.869±0.057	1.9039±0.063	0.03
RI	1.032±0.086	1.787±0.07	0.02
LS	1.6517±0.05	1.7883±0.06	0.02
LI	1.5926±0.05	1.5665±0.03	0.87

RS: right superior PV ; RI: right inferior PV; LS: left superior PV; LI: left inferior PV

Discussion

Our study demonstrated that older age was correlated with LVH. Previous report by Redfield et al.[5] showed of marked LVH and diastolic dysfunction in older adult populations. We have proven that ostial RS, RI and LS PVs diameter were significantly larger in the LVH group. Tsang et al.[2] in a prospective study demonstrated that increased left atrium volume correlated with the presence and severity of diastolic dysfunction. Herweg et al.[6] proved that all ostial PVs diameter were enlarged in patients with hypertensive heart disease and particularly in AF. The presence of greater PV diameter in the setting of LVH supports the mechanistic process stemming from diastolic dysfunction. Earlier reports revealed marked dilatation in PVs diameter in patients with AF compared to non AF controls.[7,8]

Conclusion

Our study demonstrated that older age was correlated with LVH. The diameter of ostial RS, RI and LS PVs in patients with LVH was increased. The limitation of the present study is its relatively small size samples. However, this study support the theories that subjects with LVH had dilatation of PVs.

Acknowledgment

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