
DETERMINATION OF THE DEGREE OF AORTIC REGURGITATION USING PULSED DOPPLER ECHOCARDIOGRAPHY WITH RESPECT TO RETROGRADE DIASTOLIC ABDOMINAL AORTIC FLOW

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In this study, the relationship between retrograde diastolic abdominal aortic flow and the degree of aortic regurgitation (AR) have been investigated by pulsed Doppler echocardiography. 20 patients with AR, and 10 patients without AR according to cineangiographic evaluation were included. In all patients abdominal aortic flow sample was documented by pulsed Doppler echocardiography. It has been observed first 1/3 diastolic retrograde flow in 10 patients without AR and in 10 patients with 1°-2° AR. On the other hand, one out of five patients with 3° AR had diastolic retrograde flow in first half of diastole while remaining four showed holodiastolic retrograde flow sample. In all five patients with 4° AR, holodiastolic retrograde flow has been found. As a result, by using pulsed Doppler echocardiography, it has been found that first 1/3 diastolic retrograde flow in abdominal aorta correlated with 1°-2° AR, while holodiastolic retrograde flow indicated 3°-4° AR.

Key words: Aortic regurgitation, pulsed Doppler echocardiography, retrograde diastolic abdominal aortic flow

It is mentioned first in 1956 by Warner and Toroto, that in normal adults, there is a minimum diastolic retrograde flow. The retrograde flow increases with aortic insufficiency (AI), and this retrograde flow is dependent on the regurgitant vol-

ume.¹ Existence of retrograde flow in aortic insufficiency was discovered by Braunwald and Morrow with use of dye-dilution technique.

Proceeding from the fact that, in AI, retrograde flow occurs, different Doppler echocardiographic methods have been used for the determination of aortic regurgitation (AR). These are mapping of the regurgitant jet in the left ventricle, the forward and backward ratio of aortic flow, and search for diastolic retrograde flow at various levels of the ascending-arcus-descending aorta. Takenaka and his friends have indicated that the degree of AR can be determined with pulsed Doppler echocardiography using samples of retrograde diastolic flow in the abdominal aorta⁵.

In our study, pulsed Doppler echocardiography was used to evaluate the correlation between retrograde diastolic flow and the degree of AR determined with cineangiography.

Materials and Methods

This study was conducted on 30 patients at the Koşuyolu Heart and Research Hospital. Ten patients (7 female, 3 male, mean age 43, ± 10), who had aortic root cineangiography and proved not to have AI were included with 20 other patients (16 male, 4 female, mean age 40, ± 10) with AI. These patients were subgrouped with regard to the degree of AI, each group with 5 patients. In 7 patients pure AI had been diagnosed, 1 patient had paravalvular leak, and 12 patients had coexisting aortic stenosis, mitral stenosis and mitral insufficiency.

The aortic cineangiography was performed on the General Electric cineangiographic device by giving 40-60 cc Urographin into the aortic root, with the Medrax automatic pump, in the 50° left anterior oblique position, with the speed of 15 cc/sec., via 7 Fr. catheters. After injection into the aortic root, the degree of AI was evaluated from 1 to 4, depending on the visualization of the opaque substance in the left ventricle during diastolic phase.

One day after aortic cineangiography, pulsed Doppler echocardiography was performed. General Electric echocardiography device used. The patients lied flat on their back at an angle of

30° with horizontal. The long axis view of the abdominal aorta in subcostal region was achieved. By tilting the transducer, the nonperpendicularity of the long axis of aorta and ultrasound beam was ensured. The Pulsed Doppler sample volume was placed into the abdominal aorta. The abdominal aortic flow sample was recorded.

The degree of AR determined cineangiographically was compared with the abdominal aortic pulsed Doppler flow samples.

Results

Among the patients who had 1°-2° AR or no AR at all, retrograde flow in the abdominal aorta was observed in the first 1/3 of diastolic phase. In one of the 5 patients with 3° AI filling half of the diastol, in the other 4, holodiastolic retrograde aortic flow was noticed.

In the patients with 4° AI, retrograde holodiastolic flow was experienced in the abdominal aorta.

Discussion

Different Doppler echocardiographic methods have been used for the determination of AR. These are; the regurgitant jet mapping in the left ventricle², the calculation of forward and backward aortic flow ratios³, and the indication of the existence of diastolic flow at different levels in the ascending-arcus-descending aorta. These methods are complicated procedures and they are technically hard to perform.

The only report that we could find in our survey of the literature, the Takenakas report on Pulsed Doppler echocardiography of abdominal aortic flow sample in AR, holodiastolic retrograde flow was determined in the patients with 3°-4° AR, but the retrograde diastolic flow in the patients having 1°-2° AR was not determined.⁵

In our study, using the pulsed Doppler echocardiography, retrograde diastolic flow was determined in the patients who had no or 1°-2° AR in the first 1/3 of the diastolic phase and in the

patients with 3°-4° AR in covering diastolic phase completely. In a patient having AR, the degree of AR was 1°-2°, if the diastolic retrograde flow takes place in the first 1/3 of diastolic phase in the abdominal aorta, and it is 3°-4°, if the flow was holodiastolic. The difference of 1°-2° and 3°-4° can be observed easily, because at 1°-2° AR, retrograde flow does occur in the first 1/3 of diastolic phase and at 3°-4° AR, retrograde flow is holodiastolic. Therefore, the degree of AR can be determined by this technically easy method.

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