Novel diagnostic procedure

Warfarin improved CT values of the coronary artery atherosclerotic plaque: evaluation by 64-MDCTA

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Correspondence to Dr Hidekazu Takeuchi, takeuchi-h@clin.med.tokushima-u.ac.jp**Summary**

64-multidetector CT angiography (MDCTA) can identify plaques and assess different plaque components (lipid, fibrous tissue and calcifications). The first patient was a 75-year-old-man with atrial fibrillation (AF). Axial 64-MDCTA image of a coronary artery atherosclerotic plaque was obtained, which included the plaque on the outer vessel wall. The authors measured the five points of CT values around the vague center of the plaque with almost equal interval, which was shown in figure 1. Max was 80 Hounsfield unit (HU), and min was 28 HU. After 3 months warfarin therapy (1.5 mg id), max increased to 100 HU, and min increased to 69 HU. The second patient was a 74-year-old-male with hypertension and AF. Max was 61 HU, and min was 37 HU. After 3 months warfarin therapy (2.5 mg id), max increased to 70 HU, and min increased to 50 HU. Warfarin increased CT values of the atherosclerotic plaques in two patients with AF.

BACKGROUND

Cardiovascular disease is one of the major causes of morbidity and mortality. Understanding the underlying basic biologic principles and prognostic risk factors is crucial to identify the most appropriate therapeutic strategies.

Rupture of a coronary artery atherosclerotic plaque is considered to cause acute myocardial infarction (AMI), which often results from rupture of the vulnerable plaque. And many of vulnerable plaques are just moderately stenosed and not visible by conventional angiography. About 70% patients with AMI were reported to be stenosed less than 50% by plaque.¹ The plaque vulnerability to rupture is associated with the component of the plaque, and a large and soft lipid core and a thin fibrous cap are highly thrombogenic.

64-slice multidetector CT angiography (64-MDCTA) can identify plaques and assess different plaque components (lipid (<60 Hounsfield unit (HU)), fibrous tissue (60–130 HU) and calcifications (130 HU<)). Additionally, 64-MDCT was shown to be an option to detect the left atrial appendage (LAA) thrombi of the patients with atrial fibrillation (AF), and showed the LAA thrombi completely.² For the patients with AF, 64-MDCT scan demonstrate both LAA thrombi and the coronary artery atherosclerotic plaque at the same time.

Definition of CT value of the plaque

Axial 64-MDCTA image of a coronary artery atherosclerotic plaque was obtained, which included the region of interest on the outer vessel wall. We measured CT values of the five points (HU values) around the vague center of the plaque with almost equal interval, which was shown in figure 1. Because the border between the plaque and lumen or outer tissue were obscure, it was very difficult to describe borderline of the plaque clearly, so we used this method.

And we defined min as the minimum value of the five CT values and max as the maximum value of the five CT values.

CASE PRESENTATION

The first patient was a 75-year-old-man, and had AF. He was referred to our hospital for the evaluation of the LAA thrombi. No previous medication had been performed. Axial 64-MDCTA image of a coronary artery atherosclerotic plaque was obtained, which included the atherosclerotic plaque on the outer vessel wall. We measured CT values of the five points (Hounsfield unit (HU) values) around the vague centre of the plaque with almost equal interval, which was shown in figure 1. Max was 80 HU, and min was 28 HU. After 3 months warfarin therapy (1.5 mg id), max increased to 100 HU, and min increased to 69 HU.

The second patient was a 74-year-old-man, and had hypertension and AF. He was referred to our hospital for the evaluation of LAA thrombi, too. He was treated with aspirin (100 mg id) and amlodipine besilate (5 mg id). No previous treatment with warfarin had been performed. 64-MDCTA demonstrated a coronary artery atherosclerotic plaque. Max was 61 HU, and min was 37 HU. After 3 months warfarin therapy (2.5 mg id), max increased to 70 HU, and min increased to 50 HU. Aspirin (100 mg id) was immediately stopped after starting the warfarin therapy.

TREATMENT

Both patients were newly treated with warfarin, and in the second patient aspirin (100 mg id) was immediately stopped after starting the warfarin therapy. No other medication had been changed.

DISCUSSION

It is important to assess the grade of coronary artery atherosclerotic plaque to understand the underlying basic

Figure 1 Because the border between the plaque and lumen or outer tissue are obscure, it was very difficult to describe borderline of the plaque clearly, so we measured the five points of CT values (Hounsfield unit (HU) values) around the vague center of the plaque (1+ to 5+) with almost equal intervals.

biologic principles, to predict the prognosis and to identify the accurate therapeutic strategies.

Dysfunction of the vascular endothelium, fatty streak formation and fibrous cap formation are processes in the formation of atherosclerotic plaque that are regulated by the action of T cells, macrophages, cytokines and lipid metabolites. Several studies have demonstrated that supplementation with eicosapentaenoic acid and docosahexaenoic acid from fish oil attenuates the exaggerated platelet activation, which is induced by various stimuli, and attenuates the action of growth factors and cytokines.

The results of the present study showed that warfarin increased CT values of the plaque, which may represent that warfarin alleviated atherosclerosis via attenuating the exaggerated platelet activation.

For over 50 years, patients with AF have been primary treated with warfarin to prevent thromboembolic events. Although warfarin has clinical efficacy, warfarin has many limitations such as necessity of adjusting dose by regular blood monitoring. More recently, we have other options such as rivaroxaban, dabigatran³ and apixaban,⁴ which have a possibility to have superior effects than warfarin on the coronary artery atherosclerotic plaques as well as LAA thrombi. Mega *et al* reported low-dose rivaroxaban might decrease the occurrence of death from cardiovascular causes, myocardial infarction or stroke in patients with a recent acute coronary syndrome from the point of thrombosis.⁵ However, according to the results of the present study, we may need to evaluate the effects of rivaroxaban on coronary artery atherosclerotic plaque.

The images of the LAA thrombi identified by 64-MDCT play an important role clinically,² and CT values of the

coronary artery atherosclerotic plaque assessed by 64-MDCTA play a crucial role. Both of the images of the LAA thrombi and CT values of the coronary artery atherosclerotic plaque may be useful indicator to compare the effects of above four medications.

Although we have an option such as integrated backscatter – intravascular ultrasound to estimate the coronary artery atherosclerotic plaque, 64-MDCTA examines the plaque more easily and safely with low costs and, in the case of the patients with AF, we can get the data of the LAA thrombi at the same time.

Learning points

- ▶ The CT values of the present study was additionally obtained when 64-MDCT was exerted to examine the LAA thrombi of the two patients with AF simultaneously.
- ▶ Warfarin increased the CT values of the coronary artery atherosclerotic plaques in two patients with AF, which may mean warfarin ameliorated coronary artery atherosclerosis.
- ▶ It may be an option to use 64-MDCTA to evaluate the coronary artery atherosclerotic plaque.
- ▶ 64-MDCTA may be useful to diagnose the coronary artery atherosclerotic plaque and to compare the effects of rivaroxaban, dabigatran, apixaban and warfarin on the coronary artery atherosclerotic plaque.

Competing interests None.

Patient consent Obtained.

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