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## ASSESSMENT OF THE ABILITY OF INTRAVENOUS MYOCARDIAL CONTRAST ECHOCARDIOGRAPHY TO IDENTIFY PERFUSION ABNORMALITIES IN PATIENTS WITH KAWASAKI DISEASE

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Patients (pts) with Kawasaki disease (KD) who develop myocardial infarction are usually asymptomatic before the event; thus, it is crucial that pts at risk be identified. The aim of our study was to assess the ability of myocardial contrast echocardiography (MCE) with harmonic power Doppler imaging (HPDI) to identify perfusion abnormalities in patients with KD at rest and during pharmacological stress imaging with dipyridamole. Results were compared with those of  $^{99m}\text{Tc}$ -tetrofosmin single-photon emission computed tomography (SPECT) imaging as the clinical reference standard. MCE with HPDI was performed on 20 pts with a history of KD. Images were obtained at baseline and during dipyridamole infusion (0.56mg/kg) in the apical two- and four-chamber views. Myocardial opacification suitable for the analysis was obtained in all pts (100%). Nine pts with stenotic lesions had a reversible defect after dipyridamole infusion detected by both MCE with HPDI and SPECT, and 3 pts with a history of myocardial infarction had a partially or completely irreversible defect detected by both 2 methods. Three pts. with coronary aneurysm without stenotic lesion, 4 pts with regressed coronary aneurysm, and 2 pts with normal coronary artery in acute phase also had normal perfusion at rest and after pharmacological stress by the 2 methods. A 96% concordance ( $\kappa = 0.87$ ) was obtained when comparing the respective segmental perfusion scores using the two methods at baseline, and an 86% concordance ( $\kappa = 0.81$ ) was obtained at postdipyridamole infusion. After combining baseline and postdipyridamole images, each segment was labeled as having either normal perfusion, irreversible defects, or reversible defects. Using these classifications, concordance for the two methods was 92% ( $\kappa = 0.87$ ). MCE with HPDI is a safe and feasible method by which to detect asymptomatic ischemia due to severe stenotic lesion as a complication of KD.

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## ECHOCARDIOGRAPHIC VIDEO DENSITY INDEX OF THE CORONARY ARTERIES IN KAWASAKI DISEASE: A PREDICTOR FOR SUBSEQUENT CORONARY ARTERY ABNORMALITY

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Even IVIG was established as a standard of care for patients with Kawasaki disease, there are still significant numbers of patients who developed coronary artery abnormality (CAA) or were resistant to therapy. Inflammation at the walls of these arteries has been demonstrated earlier during the acute phase. Direct analysis on these sites may reflect the ongoing pathological process. The purpose of our study was to quantitatively analyze the videodensity (VD) of the coronary arterial walls indexed to that of myocardium (videodensity index-VDI). The VDI was evaluated as a potential predictor for subsequent CAA. Patients who fulfilled the diagnostic criteria, ranging in age from 2 months to 9 years, were studied. All the patients were treated with IVIG 1-2 gm/kg. An HP Sonos 4500 echocardiographic system was used to acquire images of the coronary arteries. Optimal images of the major branches of the coronary arteries including the right ventricular free wall myocardium were digitally captured and analyzed for VD using the NIH Image software. The echocardiographic studies were performed at the time of diagnosis, 2 months, and 6 months later. Sixty-two of 72 patients (86%) had adequate echocardiographic images for analysis. Eleven patients developed small (6), medium (2), and giant (3) coronary artery aneurysms. The VDIs in acute phase ranged from 0.50 to 2.49. The ROC curve analysis using SPSS identified an optimal VDI cut-off at 1.32 with sensitivity of 82% and specificity of 78% for predicting the CAA. The mean interobserver variability of the measurement was 5%. In conclusion, echocardiographic videodensity index of the coronary arterial wall may predict for the subsequent occurrence of coronary artery abnormality in patients with Kawasaki disease.

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MYOCARDIAL SCINTIGRAPHY WITH  $^{99m}\text{Tc}$ -SESTAMIBI IN PATIENTS WITH KAWASAKI DISEASE

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To verify the usefulness of a semi-invasive assessment of myocardial perfusion, rest and dipyridamole  $^{99m}\text{Tc}$ -Sestamibi scintigraphy were performed on 62 patients (19 females and 43 males) with Kawasaki disease. Their ages at the onset of Kawasaki disease ranged from 3 months to 10 years. The nuclear medicine study was performed at the age of 3.5 months to 18 years ( $6.5 \pm 5.3$  years); they were 0.5 month to 17 years after the onset of illness. Among them, coronary arterial dilatation had been detected by two-dimensional echocardiography in 9 patients. Four of them were also demonstrated by cardiac catheterization. Seven of them with coronary arterial lesions showed  $^{99m}\text{Tc}$ -Sestamibi scintigraphic abnormalities. Perfusion defects were also detected in 18 of 53 patients (false positive rate 34.0%) with normal coronary arteries on echocardiography or cineangiography. The sensitivity, specificity, positive and negative predictive value of  $^{99m}\text{Tc}$ -Sestamibi scintigraphy for detection of myocardial dysfunction which may indicate coronary arterial lesions were 77.8% (7/9), 66.0% (35/53), 28% (7/25) and 94.6% (35/37). The higher negative predictive value (94.6%) and sensitivity (77.8%) suggest that rest and dipyridamole  $^{99m}\text{Tc}$ -Sestamibi scintigraphy is a useful and semi-invasive method for detecting coronary arterial insufficiency and long-term follow-up study of patients with Kawasaki disease.

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## EFFICACY OF MAGNETIC RESONANCE CORONARY ANGIOGRAPHY FOR EVALUATION OF CORONARY ARTERIAL LESION IN INFANT TO ADULT PATIENTS WITH KAWASAKI DISEASE

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**{Background and Objective}** Coronary angiography (CAG) has been validated as the standard method for the follow-up of the coronary arterial lesions (CAL) due to Kawasaki disease, which start with aneurysms and progress to stenotic lesions frequently. However, patients with CAL need to be studied repeatedly throughout the life, and CAG is associated with substantial amount of risk, especially in small infants. This study examined the validity of magnetic resonance coronary angiography (MRCA) in evaluation of the morphology of CAL due to Kawasaki disease. **{Patients and Method}** Seventeen patients of Kawasaki disease (age:12288;4 months-24 years; mean:9 years) underwent MRCA examinations. Methods used to visualize CAL; induced 3D true FISP in 10 patients, 3D-FLASH in 9, and 3D FLASH-IR in 2, and MRCA under free respiration using navigator echo 3D-FLASH was done in 6 children who could not hold their breath. Three infants were sedated with Tricloril (1mg/Kg) during the examination. MRCA findings were compared with those of 2D echocardiography in 9 patients and with CAG findings in 8 patients. **{Results}** Twelve of 13 aneurysms (92%) were demonstrated by MRCA, however it failed to detect a slightly dilated lesion. Four stenotic lesions of more than 50% were all clearly visualized, and CABG patency in 2 patients (100%) and 34 out of 36 of normal coronary arterial branches (94%) (seg.1-4, 5-7 & 11) were also documented. An aneurysm which could not be shown by 2D echo was readily demonstrated by MRCA. **{Conclusion}** Feasibility of noninvasive demonstration of CAL of Kawasaki disease was confirmed including in young infants. It was suggested that MRCA could reduce the number of CAG in follow-up of Kawasaki disease patients. Its potential to screen premature arteriosclerotic changes in Kawasaki disease patients was also suggested.

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## ATTEMPT TO EVALUATE CORONARY ARTERIES BY ELECTRON BEAM COMPUTED TOMOGRAPHY IN PATIENTS WITH A HISTORY OF KAWASAKI DISEASE

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Introduction Coronary arteries of patients with a history of Kawasaki disease have generally been evaluated by echocardiography and coronary angiography. However, when pediatric patients get older, the echo window gets gradually narrower, and thus echocardiographic evaluation becomes difficult. Moreover, since coronary angiography is invasive, this method is not appropriate for ambulatory follow-up. Electron beam computed tomography (EBT) allows to scan in 50 msec at the shortest without cardiac motion artifact or the influence of lungs or bones. The usefulness of EBT in the field of cardiovascular medicine has been reported. Purpose To evaluate coronary arteries by EBT in patients with a history of Kawasaki disease. Subjects Subjects were 12 patients aged 5 - 25 years old with a history of Kawasaki disease (5 males and 7 females). At the time of examination, 2 cases had coronary aneurysm, 5 had regressed coronary arterial lesion and other 5 had no coronary arterial lesion from the acute stage. Materials and Methods IMATRON C-150XP (Imatron, US) was used for EBT, and Accu View Work Station (AcclImage, US) for image processing. As a contrast medium, iopromide 370 (2 ml/kg) was injected into a peripheral vein. Imaging was performed electrocardiography triggered and breath-holding under the conditions of 3 mm slice, 2 mm feed and 0.1 sec/scan. Results In all cases, coronary arteries including aneurysm were visualized by image construction. Calcification of coronary arteries was suspected in 1 case of the patients with coronary aneurysm and 1 case of the patients with regressed coronary arterial lesion. Discussion In comparison with echocardiography, EBT shows fewer artifacts caused by lungs or bones. This method is much less invasive than coronary arteriography and useful for long-term follow-up of patients with a history of Kawasaki disease.

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## QUANTITATIVE EVALUATION OF SEVERITY OF LEFT VENTRICULAR MYOCARDIAL ABNORMALITIES IN KAWASAKI DISEASE: THE TISSUE CHARACTERIZATION STUDY

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**Background** The cyclic variation (CV) of ultrasound integrated backscatter (IBS) from myocardium is a method of tissue characterization. The aims of this study are to evaluate severity of myocardial abnormalities quantitatively using IBS and to assess rate of resolution of myocardial abnormalities after intravenous immune globulin (IVIG). **Methods** The 43 KD patients comprised 2 groups: Group 1 consisted of 30 patients with responded to initial IVIG. Group 2 consisted of 13 patients with IVIG resistant KD. The CV of myocardium was measured in LV posterior wall using a specialized IBS signal processor (Sonos 5500, Agilent Tec. Inc). **Results** Before IVIG in KD patients, the CV of myocardium was lower than age-matched control patients (Group 1:  $4.8 \pm 2.6$ , Group 2:  $6.8 \pm 2.8$ , vs. control  $9.2 \pm 2.1$  dB,  $p < 0.05$ ). In Group 1, the CV of myocardium increased at 48 hours after IVIG ( $8.8 \pm 4.8$  dB) and no difference was found between group 1 and control. However, in Group 2, the CV of myocardium at 48 hours after IVIG did not increase ( $7.0 \pm 2.2$  dB), and that value still lower than the value in control ( $p < 0.05$ ). In Group 2, the CV of myocardium at 14 days of illness is still lower than value in control ( $7.1 \pm 2.1$  dB,  $p < 0.05$ ). The CV of myocardium in 3 patients in Group 2 still persisted lower value compared with that in controls at 1 month after KD onset. **Conclusion** The changes of the CV in myocardium correlated with clinical effects to IVIG. The abnormality of myocardium as assessed by IBS is typical at presentation for KD and that recovery is accelerated by IVIG in acute phase. In patients with IVIG resistant KD, however, the abnormalities of myocardium persist in convalescent phase. The long-term follow up is needed for not only coronary artery lesions but also abnormalities of LV myocardium in KD patients.