most cases of coronary heart disease (CHD) are caused by atherosclerotic change in the coronary arteries, as are other artery diseases (ADs) such as atherosclerosis obliterans or carotid AD (CaAD). Not surprisingly, CHD and AD share common risk factors such as hypertension, smoking and diabetes mellitus. Thus, it is quite plausible that there would be a large overlap among patients with CHD and those with AD. Patients with concomitant CHD and AD are said to have polyvascular disease (polyVD). Partly because diseases of different arterial beds are treated by physicians in different fields, the prevalence of polyVD, its predictors and its outcome in Japanese CHD patients are not well understood.

In the study by Miura et al in this issue of the Journal, among patients who underwent successful percutaneous coronary intervention (PCI) at a single center, approximately 28% also had other arterial vascular diseases such as lower extremity AD (LEAD), CaAD, renal AD or abdominal aortic aneurysm. They also show that, although the prevalence of some atherosclerosis risk factors such as greater age, hypertension and current smoking were higher in the polyVD group, that of dyslipidemia was lower and that of diabetes mellitus did not differ, although insulin use was significantly higher in the polyVD group. As for predictive factors, greater age, hypertension, current smoking, previous coronary artery bypass grafting, previous stroke, chronic kidney disease (CKD) and use of insulin were all significantly predictive of polyVD. As for outcomes, polyVD was significantly associated with higher risk of major cardiovascular events, cardiovascular death and stroke, although it did not significantly increase the risk of myocardial infarction.

One of the notable points of this study is that polyVD diagnosis was based primarily on the ankle-brachial index (ABI) for LEAD, and ultrasonography for other ADs. The underdiagnosis of peripheral AD is well-recognized, and numbers of polyVD patients are typically much lower when diagnosis is based only on symptoms or history of interventional procedures. Thus, it is likely that most patients with polyVD in this study were asymptomatic for their particular combination of vascular diseases, although information regarding symptom complexity or history of interventional procedures is not provided. Regardless, the existence of polyVD significantly increased the risk of cardiovascular events, suggesting that polyVD should be given serious attention.

Although the definition of polyVD differs among studies, most of the results of this study are compatible with those of previous reports from outside Japan. One of the largest reports on systemic atherothrombosis, the REACH registry, which enrolled patients with established CHD, cerebrovascular disease or peripheral AD or with at least 3 atherothrombotic risk factors, showed that the risks of mortality and of major cardiovascular events were higher in patients with polyVD than in those with 1 vascular disease and that these risks rose as the number of arterial beds affected increased. Another analysis of a registry of acute coronary syndrome patients showed that significant predictors of polyVD included age, diabetes mellitus, hypertension and renal failure. Predictors that were shown to be significantly related to 1-year mortality included polyVD, ST-elevation myocardial infarction, prior coronary AD and renal failure.

Thus, it can be concluded that patients with more atherosclerosis risks are prone to polyVD and that having polyVD correlates with worse cardiovascular outcomes.

The next question that arises is how we can best identify patients with polyVD and what measures we should take to prevent cardiovascular events in polyVD patients?

Unfortunately, most of the significant predictors that were identified in this study were risk factors for CHD itself or were previous cardiovascular events; the exceptions were CKD and the use of insulin. It is worth investigating whether a certain number of these factors or certain combinations of these factors can serve as more specific markers for polyVD. Aside from the study of risk factors, performing screening tests for polyVD in CHD patients is also useful. In the clinical setting, however, extensive ultrasound screening of all patients with CHD may not be feasible; as an alternative, measuring ABI could be a good first step in identifying those with vascular diseases in other arterial beds. In fact, ABI may be used conversely to identify patients with high CHD risk among asymptomatic diabetic women.

With regard to the management of patients with polyVD, it should first be noted that, although atherosclerosis is the common underlying condition in these diseases, each artery bed does have different properties. The prevalence of subclavian stenosis, for example, is reported to be higher in women. In contrast to CHD mortality and CHD risk, no clear association
has been established between stroke mortality or stroke risk and elevated low-density lipoprotein and total cholesterol, and although meta-analysis results do show that the use of statins decreases the risk of first stroke, the evidence level is not as strong as that for CHD. As for blood pressure, there are many reports of the J-curve phenomenon in CHD patients, although it is generally believed that the lower the better holds true for stroke patients. It was recently shown that intensively lowering both blood pressure and low-density lipoprotein cholesterol in hypertensive, hyperlipidemic CHD patients did not improve cardiovascular outcomes, suggesting that simply treating each risk factor intensively will not always result in better outcomes for polyVD patients. Thus, a careful assessment of polyVD in each patient is needed and individualized care should be applied, although sufficient scientific evidence to justify such individualized care is lacking.

The study by Miura et al showed that there is a substantial number of patients with polyVD who have undergone PCI, and that such patients have worse cardiovascular outcomes. Considering the burden of polyVD, further studies addressing the questions above should be planned and conducted in the future.

References
1. Miura T, Soga Y, Doijiri T, Aihara H, Yokoi H, Iwabuchi M, et al. Prevalence and clinical outcome of polyvascular atherosclerotic disease in patients undergoing coronary intervention. *Circ J* 2013; 77: 89–95.
2. Simmons A, Steffen K, Sanders S. Medical therapy for peripheral arterial disease. *Curr Opin Cardiol* 2012; 27: 592–597.
3. Steg PG, Bhatt DL, Wilson PW, D’Agostino R Sr, Ohman EM, Rother J, et al. One-year cardiovascular event rates in outpatients with atherothrombosis. *JAMA* 2007; 297: 1197–1206.
4. Al Thaní H, El-Menyar A, Alhabib KF, Al-Motarreb A, Hersi A, Alfaleh H, et al. Polyvascular disease in patients presenting with acute coronary syndrome: Its predictors and outcomes. *Sci World J* 2012; 2012: 284851.
5. Igarashi Y, Chikamori T, Hida S, Tanaka H, Shibahara C, Usui Y, et al. Importance of the ankle-brachial pressure index in the diagnosis of coronary artery disease in women with diabetes without anginal pain. *Circ J* 2011; 75: 2206–2212.
6. Aboynas V, Kamineni A, Allison MA, McDermott MM, Crouse JR, Ni H, et al. The epidemiology of subclavian stenosis and its association with markers of subclinical atherosclerosis: The Multi-Ethnic Study of Atherosclerosis (MESA). *Atherosclerosis* 2010; 211: 266–270.
7. Lewington S, Whitlock G, Clarke R, Sherliker P, Emberson J, Halsey N, et al. Blood cholesterol and vascular mortality by age, sex, and blood pressure: A meta-analysis of individual data from 55,000 vascular deaths. *Lancet* 2007; 370: 1829–1839.
8. Amarenco P, Labreuche J. Lipid management in the prevention of stroke: Review and updated meta-analysis of statins for stroke prevention. *Lancet Neurol* 2009; 8: 453–463.
9. Bangalore S, Messerli FH, Wun CC, Zuckerman AL, DeMicco D, Kostis JB, et al. J-curve revisited: An analysis of blood pressure and cardiovascular events in the Treating to New Targets (TNT) Trial. *Eur Heart J* 2010; 31: 2897–2908.
10. Messerli FH, Mancia G, Conti CR, Hewkin AC, Kupfer S, Champion A, et al. Dogma disputed: Can aggressively lowering blood pressure in hypertensive patients with coronary artery disease be dangerous? *Ann Intern Med* 2006; 144: 884–893.
11. Cruickshank JM, Thorp JM, Zacharias FJ. Benefits and potential harm of lowering high blood pressure. *Lancet* 1987; 1: 581–584.
12. Kohro T, Yamazaki T, Izumi T, Daida H, Kurabayashi M, Miyayachi K, et al. Intensively lowering both low-density lipoprotein cholesterol and blood pressure does not reduce cardiovascular risk in Japanese coronary artery disease patients. *Circ J* 2011; 75: 2062–2070.