A way to a woman's heart might be through her bones

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ABSTRACT
The presence of calcified deposits in arterial walls is an important feature in atheromatous plaques and it is informative of subsequent risk of atherosclerotic cardiovascular disease (ASCVD). Estimating the coronary artery calcium is indicative of atherosclerotic burden and it has been suggested as a screening tool for assessing ASCVD risk. However, there are biological and clinical links between vascular and bone health. Since bone testing forms part of the screening for osteoporosis in women, a team of investigators used this clinical measure to predict the future risk of ASCVD and have shown that bone mineral density (BMD) in women could be used as a screening tool to assess and manage ASCVD risk. Since bone densitometry is relatively affordable and radiation exposure is low, the findings raise the possibility of using BMD as an alternative way to screen for ASCVD risk in a relatively low-risk population such as in women.

As foam-cell and lipid-pool accumulates over time, the arterial intimal layer thickens and atheromatous plaques eventually develops, which can potentially lead to tissue ischaemia.[1] The progression of atherogenesis can affect the circulation of the heart or the brain, with myocardial infarction and ischaemic stroke among the debilitating consequences. In advanced atherosclerosis, the presence of calcified deposits is an important feature in these atheromatous plaques and it is informative of subsequent risk of atherosclerotic cardiovascular disease (ASCVD). Various modalities have been used to detect vascular calcification, and the coronary artery calcium (CAC) is a widely used indicator of atherosclerotic burden, thereby, a predictor of future risk of ASCVD.[2] Although debate exists regarding the use of CAC as a screening tool to assess and manage ASCVD risk,[3] several clinical guidelines have suggested the utility of CAC score to improve risk stratification and guide clinical management,

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particularly for those who are at low or intermediate risk of ASCVD.[4 5] Nevertheless, the cost of assessing CAC is not negligible, and exposure to radiation when assessing CAC using CT scan might be an issue for some.

Interestingly, calcification of the arterial tissue has long been recognised to be an active process regulated by mechanisms akin to bone mineralisation.[6] A plausible link has been suggested between cardiovascular and bone health, in particular, an association between arterial calcification and low bone mineral density (BMD) or osteoporosis.[7 8] These conditions are suggested to share similar patient age demographic, risk factors, histopathological features, and underlying mechanisms. Since bone densitometry forms part of screening for osteoporosis particularly in middle-aged and older women, it is therefore a tantalising idea if the same assessment could also be used to assess ASCVD risk. It is in this context that Park et al have investigated whether or not low BMD could be used to predict ACVD in women, as reported in this issue.[9] They retrospectively identified 12681 women aged 50 to 80 years who underwent dual-energy X-ray absorptiometry (DXA) to estimate BMD for defining osteoporosis and identified 468 women who developed ASCVD during follow-up (median=9.2 years). Women with low BMD were observed to have an increased risk of ASCVD, independently of other clinical risk factors. The relationship was continuous but the risk was substantially increased with BMD T-scores indicative of osteoporosis. For example, osteoporosis in the femur, neck or hips was associated with hazard ratios of 2.27 (95% CI 1.66 to 3.11) and 2.95 (95% CI 2.18 to 3.98) for incident ASCVD, respectively, and 2.93 (95% CI 1.85 to 4.65) and 4.90 (95% CI 3.17 to 7.56) for ASCVD death, respectively. The discrimination and reclassification performance of a model that included clinical risk factors of ASCVD significantly improved with the addition of low BMD into the model. These findings suggest that BMD could be used as a prognostication tool for ASCVD risk.

Findings of this study are important for a number of reasons. Tools for assessing ASCVD risk tend to underestimate the risk

in women. Thus, this study population fits the category of low or intermediate risk of ASCVD for whom clinical guidelines have indicated CAC assessment could be useful.[4 5] Depending on available facilities, DXA measurements are generally low cost and involve radiation exposures that are substantially lower than that from CT scan. The study also provides an interesting insight as to how we might reconfigure health services to adapt to the challenge brought about by an increasing trend towards more patients presenting with multimorbidity. There may be appropriate clinical scenarios when integrating assessment tools is appropriate such that a particular clinical screening tool can serve multiple purposes.

Although these ideas seem interesting, a number of considerations have to be made. In this study, the data were based on a retrospective review of hospital records. However, the selection bias may play a minor impact since healthcare coverage is comprehensive for the target population and access to regular assessment for BMD is within the provision of their healthcare. The study highlights differences in predictive performance of BMD in different anatomical sites, with hip BMD showing better performance than the BMD of other sites. Although using DXA is ideal for screening for osteoporosis, it may not be readily available in other practice settings. It remains unclear if alternative, simpler methods of estimating bone density are as predictive as DXA-derived assessments. Further investigations are needed to evaluate economic costs in specific healthcare settings as well as possible harms. Replicating this study in other healthcare settings and populations as well as among men would be very useful.

The cross-talk between bones and atherosclerosis is an interesting area of research, yet it is hardly novel. In a lecture given in 1858, Dr Rudolf Virchow referred to atherosclerotic lesions as 'ossification'.[10] Perhaps it is high time to establish how bone health affects vasculature and understand the underlying pathophysiology that links osteoporotic and atherosclerotic conditions. In doing so, we might just discover new ways to improve the treatment of, and care for, the hearts and minds of women, as well as of men.

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