

Editorial to: Baseline MDCT findings after prosthetic heart valve implantation provide important complementary information to echocardiography for follow-up purposes by Suchá et al

F. E. C. M. Peeters¹ · B. L. J. H. Kietselaer^{1,2}

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Abstract Over the last years a growing number of prosthetic heart valve (PHV) implantation procedures have been performed in sequence with the aging of the population and improving surgical techniques. Currently, echocardiography is the most important tool in the follow-up and evaluation of complications associated with the PHV (pannus, thrombus, endocarditis). However, echocardiographic examination of PHV associated disease may be hampered by poor acoustic window or scatter artefacts caused by the PHV. PHV related disease such as endocarditis is related with a poor prognosis, especially when complications such as periannular abscess formation occurs. Early treatment of PHV associated disease improves prognosis. Therefore, an unmet clinical need for early detection of complications exists. In the evaluation of PHV (dys)function, multidetector-row computed tomography (MDCT) has shown to be of additive value. A necessity for MDCT to be implemented in daily practice is to be able to distinguish between normal and pathological features.

Key Points

- *Early detection of PHV related complications improves prognosis*
- *MDCT has additive value to echocardiography in the evaluation of PHV*

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✉ F. E. C. M. Peeters
frederique.peeters@mumc.nl
B. L. J. H. Kietselaer
b.kietselaer@mumc.nl

¹ Department of Cardiology, Maastricht University Medical Center, P. Debyelaan 25, 6229 HX Maastricht, The Netherlands

² Department of Radiology, Maastricht University Medical Center, Maastricht, The Netherlands

• *RCTs for MDCT evaluation of PHV are required for clinical implementation*

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Editorial

The prevalence of aortic valve stenosis (AS) in the elderly population (75 years and older) is estimated to be 12.4 % worldwide, of which 3.4 % is graded as severe [1]. Currently the only treatment option for severe AS is aortic valve replacement (AVR). In the Netherlands alone, a total of 68,843 valvular surgeries have been executed from 1995 to 2011, 60 % of which concerned the aortic valve [2]. The number of prosthetic heart valve (PHV) implantations has been increasing over the years, not only due to the ongoing ageing of the population, but also due to timing of surgery (earlier intervention in the process of deterioration of the valve) and improving surgical techniques. Although life expectancy increases after AVR, it falls short of restoring it to normal. The main reason for mortality after AVR is the occurrence of complications associated with the PHV [3].

A standard follow-up of the mechanical or biological aortic valve consists of transthoracic echocardiography (TTE), 6 to 12 weeks after surgery. TTE is known to have serious drawbacks in the assessment of PHV. Visualization difficulties and acoustic shadowing caused by the prosthetic valve material can cause unreliable assessment of the valve and its function [4]. Thus, the latest American College of Cardiology (ACC) and European Society of Cardiology (ESC) guidelines have added multidetector-row computed tomography (MDCT) as a potential imaging technique for PHV dysfunction [5–7]. The addition of MDCT in these guidelines was based on multiple studies regarding the evaluation of the PHV [8, 9], where

additional diagnostic value was demonstrated in the detection of PHV dysfunction due to pannus and thrombus [10, 11] and detection of PHV endocarditis [12]. Periannular extension of the inflammatory process increases the six-month mortality rate from 8 to 30 % in PHD endocarditis [13] and requires surgical intervention. MDCT improves detection of periannular abscesses [14] and may, therefore, improve patient survival. A necessity for an imaging technique to be implemented in daily practice is to distinguish between normal and pathological aspects. In this context, the study by Suchá et al. provides us with valuable information. They investigated normal characteristics and incidental findings of pathology on MDCT shortly after PHV implantation and compared this to findings on TTE. They demonstrated that regions of and around the aortic valve can be assessed reliably by MDCT despite the presence of mild to moderate PHV related artefacts. Strikingly, no clinically relevant pathology was found on TTE, although three patients in the study suffered from clinically relevant pathology, as detected by MDCT. Remarkably, MDCT showed induration of periaortic fat tissue in 83 % of cases. Hence, the authors suggest that it is a physiological phenomenon occurring 6 weeks after surgery. As stated, this region is of particular interest when suspicion of valve endocarditis exists.

Newer surgical techniques, such as minimally invasive aortic valve replacement, are making surgical valve replacement feasible for an increasing number of patients. Currently, echocardiography is the cornerstone of evaluating postoperative PHV function. Subgroups of patients such as those with high postoperative transvalvular gradient or postoperative fever may benefit from additional imaging. This study elegantly presents the potential additive value of MDCT for the information of hemodynamics and anatomical structures near the PHV. In addition, these data represent, to our knowledge, the first larger series to demonstrate common and physiological findings in MDCT early after AVR. Thereby, they open doors for larger studies to confirm the value of MDCT as a long-term imaging modality for complications after aortic valve surgery.

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References

- Osnabrugge RL, Mylotte D, Head SJ, Van Mieghem NM, Nkomo VT, LeReum CM et al (2013) Aortic stenosis in the elderly: disease prevalence and number of candidates for transcatheter aortic valve replacement: a meta-analysis and modeling study. *J Am Coll Cardiol* 62:1002–1012
- (2012) thoraxchirurgie Nvv. De Nederlandse dataregistratie hartchirurgie resultaten van samenwerking tussen 16 Nederlandse hartchirurgische centra
- Yacoub MH, Takkenberg JJ (2005) Will heart valve tissue engineering change the world? *Nat Clin Pract Cardiovasc Med* 2:60–61
- Chenot F, Montant P, Goffinet C, Pasquet A, Vancraeynest D, Coche E et al (2010) Evaluation of anatomic valve opening and leaflet morphology in aortic valve bioprosthesis by using multidetector CT: comparison with transthoracic echocardiography. *Radiology* 255:377–385
- Habib G, Hoen B, Tomos P, Thuny F, Prendergast B, Vilacosta I et al (2009) Guidelines on the prevention, diagnosis, and treatment of infective endocarditis (new version 2009): the Task Force on the Prevention, Diagnosis, and Treatment of Infective Endocarditis of the European Society of Cardiology (ESC). Endorsed by the European Society of Clinical Microbiology and Infectious Diseases (ESCMID) and the International Society of Chemotherapy (ISC) for Infection and Cancer. *Eur Heart J* 30: 2369–2413
- Nishimura RA, Otto CM, Bonow RO, Carabello BA, Erwin JP 3rd, Guyton RA et al (2014) 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation* 129:e521–e643
- Taylor AJ, Cerqueira M, Hodgson JM, Mark D, Min J, O’Gara P et al (2010) ACCF/SCCT/ACR/AHA/ASE/ASNC/NASCI/SCAI/SCMR 2010 Appropriate Use Criteria for Cardiac Computed Tomography. A Report of the American College of Cardiology Foundation Appropriate Use Criteria Task Force, the Society of Cardiovascular Computed Tomography, the American College of Radiology, the American Heart Association, the American Society of Echocardiography, the American Society of Nuclear Cardiology, the North American Society for Cardiovascular Imaging, the Society for Cardiovascular Angiography and Interventions, and the Society for Cardiovascular Magnetic Resonance. *Circulation* 122:e525–e555
- Habets J, Mali WP, Budde RP (2012) Multidetector CT angiography in evaluation of prosthetic heart valve dysfunction. *Radiographics* 32:1893–1905
- Habets J, Symersky P, van Herwerden LA, de Mol BA, Spijkerboer AM, Mali WP et al (2011) Prosthetic heart valve assessment with multidetector-row CT: imaging characteristics of 91 valves in 83 patients. *Eur Radiol* 21:1390–1396
- Symersky P, Budde RP, de Mol BA, Prokop M (2009) Comparison of multidetector-row computed tomography to echocardiography and fluoroscopy for evaluation of patients with mechanical prosthetic valve obstruction. *Am J Cardiol* 104:1128–1134
- Tanis W, Habets J, van den Brink RB, Symersky P, Budde RP, Chamuleau SA (2014) Differentiation of thrombus from pannus as the cause of acquired mechanical prosthetic heart valve obstruction by non-invasive imaging: a review of the literature. *Eur Heart J Cardiovasc Imaging* 15:119–129
- Fagman E, Perrotta S, Bech-Hanssen O, Flinck A, Lamm C, Olaison L et al (2012) ECG-gated computed tomography: a new role for patients with suspected aortic prosthetic valve endocarditis. *Eur Radiol* 22:2407–2414
- Hill EE, Herijgers P, Claus P, Vanderschueren S, Peetermans WE, Herregods MC (2007) Abscess in infective endocarditis: the value of transesophageal echocardiography and outcome: a 5-year study. *Am Heart J* 154:923–928
- Habets J, Tanis W, Reitsma JB, van den Brink RB, Mali WP, Chamuleau SA et al (2015) Are novel non-invasive imaging techniques needed in patients with suspected prosthetic heart valve endocarditis? A systematic review and meta-analysis. *Eur Radiol* 25:2125–2133