

New Onset Significant Paravalvular Leakage in a Patient with Mechanical Prosthetic Aortic Valve after Exposure to Magnetic Resonance Imaging. Is There Any Relevance?

Arash Hashemi¹, Azin Alizadehasl^{2,*}

¹ Cardiology Department, Lorestan University of Medical Science, Khorramabad, IR Iran

² Cardiology Department, Tabriz University of Medical Sciences, Tabriz, IR Iran

*Corresponding author: Azin Alizadehasl, MD, Cardiology Department, Tabriz University of Medical Sciences, Tabriz, IR Iran. Tel: +98-4113363880, Fax: +98-4113363880, E-mail: alizadeasl@yahoo.com.

Received: March 01, 2013; **Revised:** May 19, 2013; **Accepted:** Jun 08, 2013

Keywords: Magnetic Resonance Imaging; Heart Valve Prostheses

Dear Editor,

Many studies have evaluated heart valve prostheses and annuloplasty rings for Magnetic Resonance (MR) issues, particularly with regard to the magnetic field interactions associated with MR systems operating at field strength more than 4-Tesla. Many of these studies showed relatively minor magnetic field interactions, and according to their conclusion, MR procedure is not considered to be so hazardous for a patient with any prosthetic valve or annuloplasty ring. However, there has been everlasting debate over the effect of Magnetic Resonance Imaging (MRI) on mechanical prosthetic valves and annuloplasty rings. This issue is specially attributed to magnetic fields exceeding 4-Tesla; many of the previous studies have shown minimal effect on these prosthetic structures and the common consensus shows that MRI studies are not hazardous for a patient with prosthetic mechanical valve or ring annuloplasty, especially especially when under evaluation field is not related to heart and the field is not too strong (1). Nonetheless, there are some studies suggesting that the LENZ effect should be considered. LENZ effect theoretically suggests that any metal moving through a magnetic field can develop an opposing magnetic field by its own. So there could be opposing pressures on a mechanical prosthetic valve and cause some degree of malfunction (1, 2). Effects of this force on the macrostructure of the prosthetic valve or whether these forces could cause undesirable movement or dehiscence in it, has not yet been studied. According to the previous

studies, this effect is proportional to the magnetic field strength used and the risk is higher in powers exceeding 1.5 Tesla (1-3), but interestingly Edwards et al. demonstrated that elderly patients with degenerative valvular disease are unlikely to be at risk while exposing to less than or equal to 4.7 Tesla (4). Though the different results of these studies suggest that there may be potential forces with some damaging effects on mechanical prosthetic valves in mitral position even with low-strength field equal to 1.5 Tesla. The aforementioned effect is related to the field strength linearly. This issue points that we should be alarmed to study these patients before including them in MRI study and perhaps excluding them from this experience. (1, 2, 5). We reported a 75 year old gentlemen with history of severe aortic stenosis and aortic valve replacement by ST Jude Medical prosthesis three years ago. He referred to our clinic due to the new onset dyspnea on exertion with New York Heart Association (NYHA) function class III after a thoracic MRI study for the evaluation of thoraco-lumbar discopathy that had been done by Siemens machine with the main static magnetic field strength (B₀) of 1.58 Tesla and maximum average body weight of specific absorption rate (SAR) equal to 800 J/kg. The MRI scanning had been taken for 13 minutes and the patient location was feet first in the MR system bore entrance. This patient was well and had no cardiac complaints during three years passing his surgery until his MRI study. His functional capacity was acceptable prior to this visit. He had undergone two transthoracic (TTE) evaluations after his surgery as a part of routine proto-

col in our center just after his surgery and again four weeks later showed no complications. Also he even had undergone TTE with transesophageal echocardiographic (TEE) study, three months earlier for more evaluation of his sudden, short-term and anxious dyspnea, and no abnormalities were reported. In the evaluation of his new onset and progressive dyspnea which occurred after his recent MRI study and was not associated with any other condition, we found a 2/6 diastolic murmur at right parasternal border and our evaluation by echocardiography (both TTE and TEE studies) showed Bilateral moderate paravalvular leakage. We haven't found any other logical explanation for this new onset and sudden bilateral paravalvular leakage except for the MRI study which was done few days before onset of his symptoms. Regarding this new finding in our case and other similar reports, it deserved to suggest more studies on patients with heart valve prostheses undergoing MRI studies.

Financial Disclosure

There is no conflict of interest.

Funding Support

There is no funding support.

References

1. Condon B, Hadley DM. Potential MR hazard to patients with metallic heart valves: the Lenz effect. *J Magn Reson Imaging*. 2000;**12**(1):171-6.
2. Levine GN, Gomes AS, Arai AE, Bluemke DA, Flamm SD, Kanal E, et al. Safety of magnetic resonance imaging in patients with cardiovascular devices: an American Heart Association scientific statement from the Committee on Diagnostic and Interventional Cardiac Catheterization, Council on Clinical Cardiology, and the Council on Cardiovascular Radiology and Intervention: endorsed by the American College of Cardiology Foundation, the North American Society for Cardiac Imaging, and the Society for Cardiovascular Magnetic Resonance. *Circulation*. 2007;**116**(24):2878-91.
3. Pruefer D, Kalden P, Schreiber W, Dahm M, Buerke M, Thelen M, et al. In vitro investigation of prosthetic heart valves in magnetic resonance imaging: evaluation of potential hazards. *J Heart Valve Dis*. 2001;**10**(3):410-4.
4. Edwards MB, Draper ER, Hand JW, Taylor KM, Young IR. Mechanical testing of human cardiac tissue: some implications for MRI safety. *J Cardiovasc Magn Reson*. 2005;**7**(5):835-40.
5. Shellock FG, Morisoli SM. Ex vivo evaluation of ferromagnetism, heating, and artifacts produced by heart valve prostheses exposed to a 1.5-T MR system. *J Magn Reson Imaging*. 1994;**4**(5):756-8.

Please cite this paper as: Hashemi A, Sadeghpour A, Alizadehasl A. New Onset Significant Paravalvular Leakage in a Patient with Mechanical Prosthetic Aortic Valve after Exposure to Magnetic Resonance Imaging. Is There Any Relevance? *Arch Cardiovasc Imaging*. 2013;1(1): 38-9.