Usefulness of cardiac echocardiography in the diagnosis and treatment of non-acute phase lead perforation following pacemaker implantation.

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**Introduction**: Though cardiac perforation is an uncommon complication of pacemaker (PM) therapy, it could be lethal with cardiac tamponade. Computed tomography (CT) is now becoming a gold standard for diagnosing lead perforation. We examined the usefulness of cardiac echocardiography (UCG) for diagnosis of cardiac perforation due to active fixation lead and determination of the treatment strategy.

**Methods**: From July 2004 to June 2019, 2549 PMs were implanted in Saiseikai Kumamoto Hospital and the data were retrospectively studied.

**Result**: Pericardial effusion, which was caused by lead perforation, occurred in 9/2549 cases (0.3%). Acute phase perforation within 24 hours of PM implantation occurred in 3 cases and two of them needed open chest surgery for repair of cardiac perforation. Non-acute phase perforation occurred in the other 6 cases, and could be treated without surgical procedures. In all of these 6 cases, it was difficult to diagnose lead perforation by chest CT. The detailed examination of UCG, however, showed remarkable findings of lead perforation, including the tenting of the right ventricular free wall at the local site of ventricular lead tip and, and thrombus or fibrin tissue on the surface of ventricular epicardium. Accordingly, in 5/6 cases, we diagnosed as a minor perforation due to the helical penetration of the ventricular lead. After the drainage of pericardial effusion, it was possible to remove and reposition the ventricular lead only with a cardiac surgery backup in these 5 cases. In the other one case, pericardial effusion was improved with correction of Warfarin overdose. All six cases had no recurrence of pericardial effusion.

**Conclusion**: In the non-acute phase perforation cases, UCG was useful for the diagnosis of cardiac perforation due to the helical ventricular lead. UCG can provide a key finding in selecting the optimal therapy for lead revision.