Excessive loops of intracardiac leads — what must pay attention to in the transthoracic echocardiogram in a patient with a pacemaker?

Nadmierne pętle elektrod w sercu — na co należy zwrócić uwagę podczas badania echokardiograficznego u pacjenta ze stymulatorem?

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Abstract

A young patient with dual chamber pacemaker has transthoracic echocardiogram performed, in which potentially dangerous abnormalities were found — excessive loops of intracardiac leads and an additional mass connected to the atrial lead. An important fact is that the patient was referred for the examination for different reasons than assessment of the pacemaker. The assessment of intracardiac leads in transthoracic echocardiogram is difficult, however, neglection of some abnormalities may have fatal effects. So far no recommendations have been made for the management of asymptomatic patients with additional masses found on the intracardiac lead.

Key words: transthoracic echocardiography, lead-dependent endocarditis, pacemaker

Case report

We present a case of 37-year-old male who was admitted to the hospital with a suspicion of obstructive sleep apnoea (OSA) in order to perform polysomnography examination. The patient at the age of 23 had a dual-chamber pacemaker (DDD) implanted due to sick sinus syndrome, and at the age of 32 undergone an elective replacement of pulse generator because of battery depletion. At admission patient claimed that he had good exercise tolerance, denied syncope and pre-syncopal symptoms, chest pain, dyspnoea, palpitations or infections. A screening transthoracic echocardiogram (TTE) was performed because of OSA suspicion. An atypical position of atrial lead was detected — an excessive loop of atrial lead was placed low in the right atrium, entering the right ventricle during relaxation and moving back to right atrium pushed by tricuspid valve leaflets (Figure 1A). Surprisingly, the anomaly did not provoke significant tricuspid valve regurgitation or stenosis. Moreover, a loop of ventricular lead was detected, with a thickening on its surface (Figure 1B). In modified projection one additional, strand-like mass connected to the atrial lead was noticed (Figure 2). The unexpected findings in TTE had to be explained. Description of previous TTE did not mention any abnormality of intracardiac leads. A chest X-ray picture showed two separate loops of leads — atrial
and ventricular (Figure 3), unfortunately previous chest X-ray pictures were not available, making it impossible to establish since when patient had this suboptimal course of leads. The interrogation of DDD pacemaker showed that patient was pacemaker-dependent.

The presence of an additional mass seen during TTE raised a concern of infectious process, even though the patient was otherwise asymptomatic. The blood culture (three sets) were negative. Additionally CRP, procalcitonin and white blood cell count were within normal limits. Assessed thromboembolic risk of the patient was low. The patient was referred for transoesophageal echocardiogram (TEE). Due to technical limitations (artefacts from excessive lead loops) no additional mass in relation with the leads could be visualised, despite it was seen in TTE. SPECT-CT investigation (single photon emission computed tomography-computed tomography) with radionuclide labelled leukocytes was performed, definitely excluding lead-dependent infective endocarditis (LDIE). The patient was discharged with a recommendation of careful ambulatory follow-up of the device.

Discussion

Because of long life expectancy, pacemaker-dependency, presence of lead-associated mass, and collision of a lead with the tricuspid valve which poses potential risk of LDIE development or valve dysfunction in future, a procedure of transvenous lead extraction may be worth consideration. However, so far no recommendations have been made for the management of asymptomatic patients with additional masses found on the intracardiac lead. Additionally, in the European Society of Cardiology (ESC) Guidelines on the prevention, diagnosis, and treatment of infective endocarditis from 2009 and ESC Guidelines for the management of infective endocarditis from 2015, there is no information how to interpret the presence of a thickened fragment of the electrode on echocardiography [1–3]. Downey et al. analysed 177 TEEs of 153 patients with endocardial leads. A visible mass on a device lead was observed in
25 TEEs, in 13 of which they formed lead strands. 17 patients were adjudicated to have endocarditis, of which only 8 had a lead-related mass seen during TEE. In TEEs performed for indications other than to rule out endocarditis, lead masses were seen in 13 of 136 studies (10%). The authors conclude, that lead-related masses should be interpreted in the overall clinical context and, in the absence of concomitant evidence of endocarditis, should not mandate device and lead removal [4]. On the other hand, it is established, that from the time of implantation, the leads undergo a process of wear. The intensive lead bending during heart contraction predispose to insulation damage, which may give material background for further infectious process [3]. Unfortunately, the Heart Rhythm Society Expert Consensus on Transvenous Lead Extraction from 2009 does not form clear recommendation in that issue, as long as infection is not confirmed [5]. In the light of absence of guidelines covering this issue, it is still an open question how to deal with a patient with lead-related masses accidentally found in diagnostic imaging and to which extend conduct diagnostic procedures to rule out LDIE. Proposed diagnostic scheme based on the own experience is shown in Figure 4.

Lead-dependent tricuspid dysfunction (LDTD) is an increasing problem. Rydlewska et al. [6] analysed 100 patients with CIED and found severe tricuspid regurgitation in 28% of them. Both insufficient and excessive lead length in the radiological picture were independent risk factors of severe tricuspid regurgitation in multivariate analysis, however insufficient lead length is a factor of more importance (odds ratio [OR] = 3.914; p = 0.003 vs OR = 2.595; p = 0.017, respectively) [6]. Although severe LDTD is a dangerous condition, the management of patients still remains controversial.

**Conclusion**

The assessment of intracardiac leads in transthoracic echocardiogram is difficult, however, neglecting of some abnormalities may have fatal effects. So far no recommendations have been made for the management of asymptomatic patients with additional masses found on the intracardiac lead. Assessment of endocardial leads of...
A cardiac implantable electronic device is an important part of TTE even if a patient is asymptomatic or is referred to perform TTE from different reasons.

**Conflicts of interest(s)**

There are no conflicts of interest.

**References**


