A novel approach to detect phrenic nerve stimulation in cardiac resynchronization therapy

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We report on a novel approach to detect phrenic nerve stimulation (PNS) in a case series of five patients by analysing the endocardial acceleration sensor (EAS) signal recorded with cardiac resynchronization therapy (CRT) devices which showed typical vibrations between the first and second heart sound while the patients were complaining about PNS.

A 79-year-old man was complaining about phrenic nerve stimulation (PNS), a frequent complication after implantation of cardiac resynchronization therapy (CRT) devices for cardiomyopathy.[1] After electronic respositioning by changing the stimulation vector from left ventricular (LV) tip to LV ring (T → R) to LV ring to right ventricular coil (R → C) the patient was asymptomatic. Remarkably, we were able to record two different endocardial acceleration sensor (EAS) signals with a micro-accelerator (SonRtip™, Sorin, Clamart, France) located on the tip of the right atrial lead and used for CRT optimization. In *Figure 1A*, there were vibrations in the EAS signal after the first heart sound (S1) with the T → R pacing configuration resulting from the contraction of the diaphragm due to PNS. In contrast, these vibrations could not be detected after changing the stimulation vector to R → C in *Figure 1B*. Furthermore, we were able to document

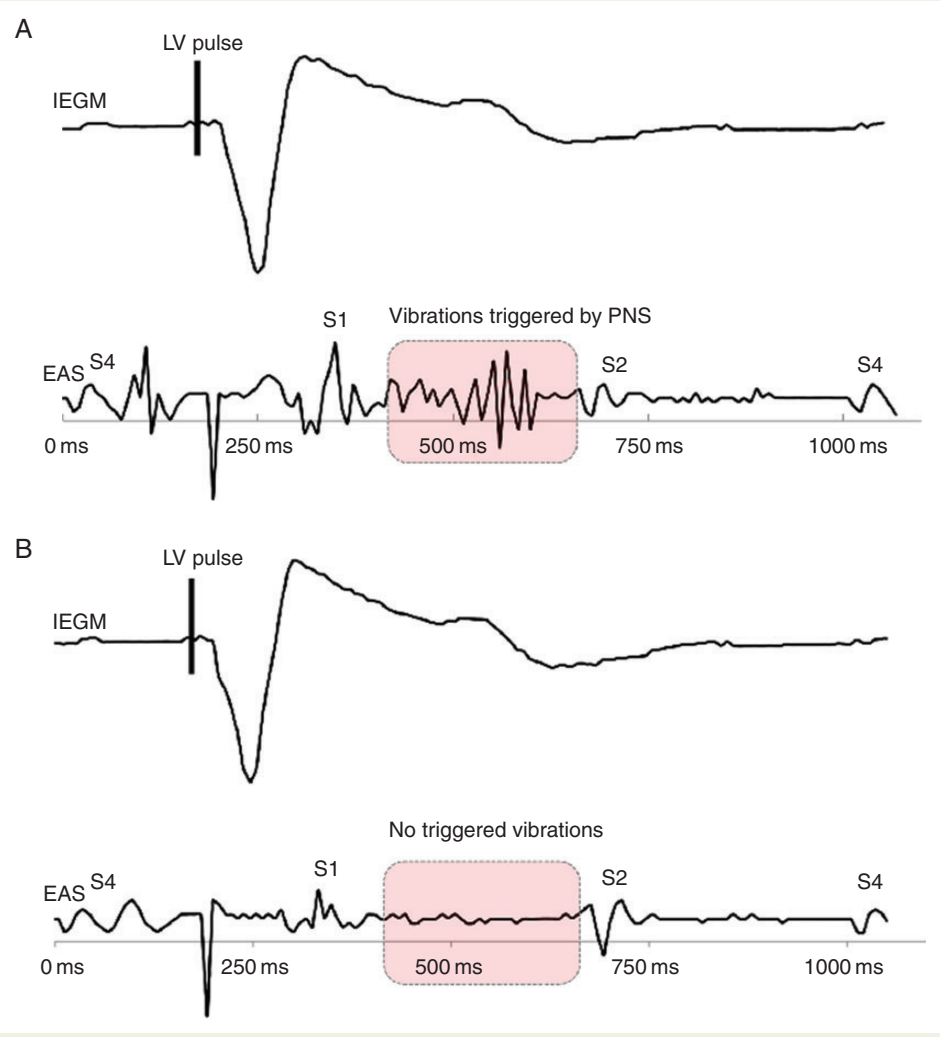

Figure 1 (*A* and *B*).

these typical vibrations in the EAS signal between the first and second heart sound in another four patients with PNS. The wavelet analyses of these vibrations in the EAS signals demonstrated that the main frequencies were in the range between 15 and 35 Hz. PNS causes relevant discomfort in 22% of patients undergoing CRT.[3] Although new quadripolar LV leads allow to switch between multiple stimulation vectors, it is still not possible to detect PNS by the device itself. Reviewing the management of PNS, Biffi *et al.* suggested that an automatic detection algorithm of diaphragmatic contraction might prove useful to provide an automatic switch of the pacing configuration to avoid PNS.[3] This case series demonstrates that detection of PNS with a CRT device incorporating an EAS is possible. Further research is needed to prove that an automatic detection algorithm which changes the stimulation vector and/or reduces the LV lead output can avoid PNS.

References

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