Inappropriate Shock Because of Triple Counting in a Patient With a Subcutaneous Implantable Cardioverter Defibrillator Corrected by Initiation of Dual Site Left Ventricular Pacing

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Case Report
A 50-year-old male underwent a mechanical tricuspid and mitral valve replacement after ventricular septum rupture because of an inferior wall infarction, followed by implantation of a dual chamber pacemaker (Medtronic Adapta ADDRL1; Medtronic Inc, Minneapolis, MN) for complete heart block. Because of the mechanical tricuspid valve ventricular pacing was accomplished by a Medtronic 4194 lead placed in a posterior branch of the coronary sinus (CS). An implantable cardioverter defibrillator (ICD) implantation was scheduled because of an ejection fraction of 29% after a previous myocardial infarction, The New York Heart Association class III, and development of nonsustained ventricular arrhythmias. Owing to the presence of the mechanical tricuspid valve, we preferred to implant a subcutaneous ICD (S-ICD; Boston Scientific, St Paul, MN). The subcutaneous parasternal shock lead of this device has also 2 additional electrodes for ventricular sensing. Shortly after implant, the patient experienced an inappropriate ICD shock caused by persisting triple counting initiated by double sensing of the QRS complex and T-wave oversensing (Figure, top). The paced QRS width was 269 ms (Figure, bottom A). As definitive solution, we choose to implant an additional quadripolar CS lead (Boston Scientific, Acuity X4 Spiral L4678) in the anterior branch of the CS, widely spaced from the existing CS lead. Stimulation from the third electrode of this lead resulted in left ventricular pacing with of 183 ms. (Figure, bottom B). Both CS leads were connected to an SJM Allura Quadra CRT-P (St. Jude Medical, St Paul, MN). Simultaneous pacing from both left ventricular leads further reduced the QRS width to 172 ms. (Figure, bottom C). The resulting ECG fitted in the S-ICD template check showing normal single R-wave detection in the primary vector and a significant reduction of the T-wave amplitude without oversensing. Besides 1 inappropriate shock shortly after implant because of loss of capture in the anterior CS lead, the patient remained free of symptoms for >6 months.

Discussion
This is the first report of triple counting caused by a wide-paced QRS complex with double R-wave counting and additional T-wave sensing in a patient with an S-ICD. Triple counting has previously only been observed in transvenous ICDs during broad complex ventricular tachycardia or a wide fragmented QRS associated with cardiogenic shock or hyperkalemia.1,2 Triple counting was prevented by simultaneous pacing from a second CS pacing lead implanted with a wide separation from the existing lead. This reduced the QRS width and double R-wave counting was abolished. Simultaneous pacing from opposite sites also cancelled out the large T-wave amplitude (Figure, bottom A and B). The use of a quadripolar CS lead added the opportunity to select an optimal stimulation configuration to avoid oversensing.

Conclusions
To the best of our knowledge, this is the first report on triple counting caused by double R-wave sensing and T-wave oversensing in an S-ICD, corrected by implantation of a second CS lead and bifocal pacing.

Disclosures
Dr van Gelder provides training and education for Medtronic Trading NL B.V., and St. Jude Medical Nederland B.V., The Netherlands and is Clinical advisor for RadiWire pressure systems, a SJM company. The other authors report no conflicts.

References

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Figure. Episode showing triple counting (top) in the stored electrogram, which was followed by an inappropriate shock. Bottom A, Left ventricular (LV) pacing from the posterior cardiac vein (QRS, 269 ms), (B) LV pacing from the anterior vein (QRS, 183 ms), and (C) bifocal LV pacing (QRS, 172 ms).
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