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EDITORIAL COMMENT

Catheter ablation of atrioventricular nodal re-entrant tachycardia: Humans versus machines?

Ablação por cateter de taquicardia por re-entrada auriculoventricular nodal: seres humanos *versus* máquinas?

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Following advances in ablation techniques and in cardiac electrophysiology in the late 1980s and early 1990s,[1–3] catheter ablation of one of the pathways involved in the re-entrant mechanism of atrioventricular nodal re-entrant tachycardia (AVNRT) has now become part of modern cardiology. The 2015 American College of Cardiology/American Heart Association/Heart Rhythm Society guideline states that ''catheter ablation of the slow pathway is recommended'' for the ongoing management of AVNRT (class I recommendation, level of evidence B),[4] and the latest European Society of Cardiology recommendations (a joint European and American guideline from 2003) are also clear on the role of ablation for recurrent symptomatic AVNRT, giving it a class I recommendation, level of evidence B.[5]

Slow pathway ablation was adopted worldwide during the 1990s, and due to the high success rate of this procedure (>99% reported by some highly experienced centers), the cardiac electrophysiology community assumed that it was 'case closed' for AVNRT. Subsequently, after the landmark publication by Haïssaguerre et al. in the late 1990s,[6] attention shifted to atrial fibrillation, and AVNRT began to be considered a 'simple arrhythmia', and catheter ablation of the slow pathway a simple procedure.

However, this is by no means a risk-free procedure, and it should made clear to electrophysiology trainees beginning to acquire experience in catheter manipulation that not only must they become expert in interpreting signals and performing the diagnostic maneuvers to confirm a diagnosis of AVNRT, but they must also develop the skill to keep the catheter in a stable position, preventing it from migrating during the ablation part of the procedure, and maintaining sufficient contact force throughout the application to deliver an effective lesion. Also, they need a very quick 'endocavitary-signals-to-brain connection' to immediately abort application in the event of fast junctional rhythm or at the earliest signs of atrioventricular conduction damage. In this procedure, a minor mistake can lead to lifelong consequences (need for permanent pacemaker) in patients who are frequently young. In the hands of highly experienced centers and operators, the incidence of complete atrioventricular block has been reported to be 0.4%,[7] but in the real world the incidence of this complication may in fact be much higher.

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Acknowledging these aspects of the procedure is proof that research in the area is not over. Debate is ongoing regarding the most effective and safest ablation energy (cryoablation or radiofrequency),[7] whether three-dimensional mapping systems should be routinely used[8] (and when they are, whether there is a role for substrate mapping[9–11]), zero-fluoroscopy procedures versus very short screening times,[12] and the potential role of contact force sensing for slow pathway ablation.[13]

However, a different question should be asked: are human beings good enough to manipulate the catheters? Is manual catheter manipulation preferable, or are alternatives like remote magnetic navigation systems (MNS) a better and safer approach?

Further evidence on this subject of the battle between machines and humans is elegantly provided by Parreira and colleagues in this issue of the *Journal*.[14] Unlike previous studies in which comparisons involved very small samples, short follow-up durations and even catheters which are no longer in use, this study performs a careful comparison of two different ablation approaches using current technology in the hands of an experienced operator. Remote magnetic navigation ablation with the Niobe II MNS (Stereotaxis) was compared with manual ablation performed by the same operator in a different setting. The authors should be praised for the number of patients included (over 200) and their long follow-up (over three years on average). The study demonstrates that operator fluoroscopic exposure is clearly lower (mean of five minutes) using MNS, which is expected to lead to clear long-term benefits for the operator.

Remotely controlled ablation proved to be as safe as manual ablation. As there were concerns about lower contact force with the MNS, longer ablation times were observed in the MNS group. Whether or not this contributed to the lower relapse rate observed with MNS remains to be determined. However, the non-significant difference (due to the lack of statistical power) corresponds to an absolute risk difference of 3%, which is important, as it corresponds to 30 patients being referred for MNS ablation to avoid one relapse. This is a considerable number, as it will lead to further admissions to the emergency room, redo procedures, and prescriptions, which is important from the standpoint of health resource use. A cost-effectiveness study taking these points into account may be valuable.

This study's findings are thought-provoking. A future randomized study using contact force sensing (which is currently becoming the standard) that aims to answer these questions is warranted.

Conflicts of interest

The authors have no conflicts of interest to declare.

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