

# Transient changes in QRS morphology during a narrow complex tachycardia: What is the mechanism?

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## 1 | EP ROUNDS

A 22-year-old man with recurrent episodes of tachycardia in the absence of structural heart disease underwent an electrophysiological evaluation. A narrow complex tachycardia (NCT) was induced by programmed by ventricular pacing. A transient change in QRS morphology and H-V interval in the middle of the tracing was noted during ongoing tachycardia (Figure 1). What are the possible mechanisms of tachycardia and changes in QRS morphology?

## 2 | DISCUSSION

The differential diagnosis of NCT with V-A dissociation includes atrioventricular nodal reentrant tachycardia (AVNRT) with block in the upper common pathway (UCP), orthodromic nodo-fascicular (NF)/nodo-ventricular (NV) re-entry (NFRT/NVRT) and a focal tachycardia from the proximal or distal His-Purkinje system.<sup>1-6</sup> Orthodromic AVRT was easily excluded because more ventricular than atrial activations are present.<sup>5-7</sup> The spontaneous changes in H-H (His-His) intervals preceded and predicted changes in subsequent V-V (ventricular-ventricular) interval, confirming anterograde activation of the HPS and node-dependent tachycardias and resetting the tachycardia (Figure 1).<sup>8-10</sup> Even in an irregular atrial tachycardia (AT), the H-H interval does not predict the succeeding A-A (atrial-atrial) interval, and the H-A timing will

not be constant.<sup>2</sup> These features leave AVNRT with UCP block, and the much less commonly observed NFRT/NVRT.<sup>1,3,10</sup> However, the differentiation between the AVNRT with UCP block, and orthodromic NFRT/NVRT is a particularly challenging NCT to diagnose,<sup>1,11</sup> particularly in the presence of VA block or dissociation.<sup>1,2,10-12</sup>

The bystander pathways may show intermittent or varying degrees of pre-excitation, and some patients may have both bundle branch aberrancy and a bystander pathway or multiple pathways, giving rise to varying degrees of QRS fusion. In current tracing, the HV shortening with slightly different QRSs in Figure 1 make sometimes complicated to differentiate from the AVNRT with UCP block than NFRT/NVRT.<sup>3,13</sup> It is also difficult to exclude the coincidental occurrence of the premature ventricular complexes, close to but possibly proximal to the right bundle (RB) exit or left bundle exit. Despite it is impossible to know what is happening in the AV node, that is, whether it is all NF or in part AVNRT; we considered that these transient HV and QRS changes might have been caused by the transition from an orthodromic NVRT to an atypical AVNRT with UCP and bystander participation of NV superior septal capture. When we examine the last six cycles of the tracing, the H-H remains constant until the incomplete RB branch block occurs while the H-V prolongs and the next H-H arrives a little later, i.e. the incomplete RB branch block resets the circuit. This would suggest that the RB was in the circuit and would prove that one was dealing with NFRT/NVRT at least in part.<sup>14</sup> The tachycardia was eliminated by the continued radiofrequency application despite VA block during junctional rhythm from slow pathway ablation from the anterior side of coronary ostium<sup>15,16</sup>



**FIGURE 1** A narrow QRS tachycardia with mild QRS and HV interval changes in the middle of the tracing is seen

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