Editorial

Right Ventricular Septal Pacing: Has it come of age?

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Prolonged pacing from the right ventricular (RV) apex has been shown to be associated with progressive left ventricular dysfunction as demonstrated by heart failure, atrial fibrillation and an increased morbidity and mortality [1-6]. This has led to an interest in alternate RV pacing sites and in particular the mid RV septum and the RV outflow tract (RVOT) septum [7-11]. These sites are theoretically associated with a more physiological ventricular activation. Despite the perceived advantages of septal pacing, results to date are not confirmatory [12-18]. These studies were generally acute or extended to 6-months and the leads secured to the RVOT and thus were not necessarily septal. On review of the early work of Durrer et al in 1970 [19] the septal regions of the RVOT and mid RV are the first zones of the ventricle to depolarize, suggesting that pacing from these areas on the right side of the septum would achieve as normal a contraction pattern as possible. In contrast, the free wall of the RV is the last zone to be depolarized. When attempting to prove the physiologic and hemodynamic benefits of septal pacing, it seems illogical to choose the RVOT with a mix of both septal and free wall pacing. The potential benefits of septal pacing would possibly be negated by free wall pacing and thus it is not surprising that there has been no consistent benefit over RV apical pacing demonstrated.

These early reported studies involved using a lead stylet shaped with a simple curve which has been shown to position only 61% of leads onto the RV septum with the remainder on the anterior or free walls [8]. Hence we need to design a tool to consistently place the leads onto the RV septum. On review of the anatomy of the RV, the septum lies posteriorly with the free wall in front and separating them is the anterior wall, where the left anterior descending coronary artery lies [9,10,20]. A pacing lead being positioned on the RV septum must therefore pass backwards after traversing the tricuspid valve. Such a stylet directing a pacing lead in this fashion has now been designed and commercially available (Model 4140, St Jude Medical, Sylmar, California) [11]. The RV zones where long term pacing has been successful include the lower portion of the RVOT septum or the mid septum [11]. Clinical results show an extremely low incidence of lead dislodgement [9], excellent long term stimulation thresholds [8] and no perforation, pericarditis or pericardial tamponade. Of particular importance is the recognition of RV septal positioning using the fluoroscopic 40º left anterior oblique view during implantation [9,21].

Now that we have the surgical tools for lead placement onto the RV septum and a simple method of confirmation, it behooves us as physicians to repeat the earlier studies, but this time

confirming septal positioning. One concern, however, is how long the clinical trials should be conducted? As stated earlier, most studies were either acute or lasted about six months. Tse et al [22] compared pacing from the RVOT with RV apex and differences were not significant until 18-months post implant. Lewicka-Nowak et al [23] conducted a small 7-year follow up of 27 patients randomized between RVOT pacing and RV apical pacing. Although once again the cases were not necessarily septal, there was a significant drop in left ventricular ejection fraction with RV apical pacing whilst no drop was noted with RVOT pacing. The NT-pro BNP levels were also significantly higher and there was more tricuspid regurgitation in the RV apical pacing group. These studies suggest that future studies should be conducted for a minimum of two years.

To determine the optimal site for RV pacing, two multicenter randomized trials are currently underway. These are the Right Ventricular Apical and High Septal Pacing to Preserve Left Ventricular Function (Protect Pace), and Right Ventricular Apical versus Septal Pacing (RASP) trials. In Protect Pace, enrollment is almost complete and the mid septum is the pacing site. The RASP study has the inflow septum as the pacing site, The two studies have different study designs and protocols but all will analyze the long term (24 - 36 months) effects of RV pacing on LV performance indices and functional capacity, with changes in LVEF being the primary outcome [24]. Let us hope that these trials will shed more light on the benefits of RV septal pacing. A third trial; the Optimize RV Selective Site Pacing Clinical Trial (Optimize RV) has recently been abandoned.

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