1074 Pacing Technology

Monday, March 30, 1998, 3:00 p.m.–5:00 p.m.
Georgia World Congress Center, West Exhibit Hall Level
Presentation Hour: 4:00 p.m.–5:00 p.m.

1074-161 Atrial Floating Pacing With a Novel Pacing Configuration Using a Conventional Monophasic Impulse – First Acute Results in Patients

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Background: Single lead, dual chamber pacing using floating atrial ring electrodes and a conventional monophasic impulse configuration is limited by unacceptably high atrial capture thresholds. The novel "Overlapping Biphasic" (OLBI) stimulation reduces atrial floating capture thresholds significantly but sophisticated technology is necessary. The purpose of this study was to evaluate the efficiency of a novel pacing configuration where a conventional impulse was applied between three electrodes delivered bidirectionally (*Bi*directional *M*onophasic Impulse or BIMOS) in an acute study in patients. In a previous animal study, we could demonstrate that atrial floating pacing using BIMOS configurations reduces the capture thresholds about 30% in comparison to conventional bipolar configurations and 40% in comparison to conventional unipolar configurations.

Methods: In 28 patients (14 women, 14 men, mean age 56 ± 14 years) a conventional quadripolar catheter (Bard GmbH) was placed after a routine EP-study under fluoroscopy so that the ring electrodes were floating in the high and mid-level of the right atrium. Atrial capture thresholds were measured during floating pacing using BIMOS configurations and compared with capture thresholds during conventional unipolar (UI) and bipolar (BI) pacing configurations at identical pulse durations of 0.6 ms.

Results: The mean atrial capture threshold during floating pacing using the best BIMOS configuration was significant lower (2.3 V) than the best capture threshold during UI (3.8 V, $p < 0.05$) and during the BI configuration (3.5 V, $p < 0.05$).

Conclusion: The novel BIMOS pacing configuration significantly reduces pacing capture thresholds in comparison to UI and BI configuration using atrial floating ring electrodes and may, therefore, be useful in future single-lead DDD pacemakers.

1074-162 The Optimum Distance From Electrode to the Atrial Wall in Pacing the Atrium With Floating Electrode of Single Pass VDD Pacemaker – The Shorter Distance Fails Pacing

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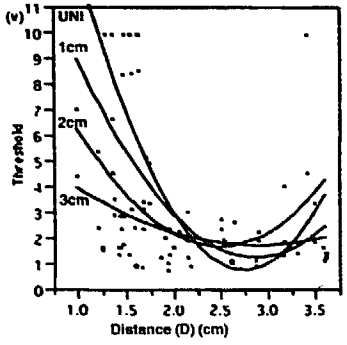
Background: Atrial pacing, using the floating electrode of a single pass pacing lead, has been tried, however, the pacing threshold remaines high and the optimum electrode setting is unclear to realize single pass DDD pacemaker.

Method: We studied the relationship between the atrial pacing threshold and the distance from the electrode to the atrial wall (D), by changing the dipole electrode spacing (Dsp). A Cook (USA) multipolar electrode catheter was inserted into the right atrium of 10 human subjects. The pacing threshold was measured in at least two positions of the right atrium with 1, 2, 3 cm Dsp bipolar and unipolar electrode configurations. D was measured by X ray cinefilm. As a confirmation study of the first step, we then placed a floating unipolar electrode at the three different distances from the right atrial wall, using a formed stylet, during the implantation of a permanent VDD pacemaker (Phymos 3D).



Results: The figure shoews the second degree regression curve fitting of D and pacing threshold. The curve suggests the optimum D as 2.5–3.0 cm, not the closer location, and the 3 cm Dsp of its stability to D. The second step study also supports the results that the threshold improved when D is larger. (Threshold decreased 3.35, 1.7 to 1.15 V, n = 3).

Conclusion: When the 3 cm dipole electrode is placed 3 cm from the atrial wall, single pass DDD pacing will be clinically possible.

1074-163 Miniaturized Transvenous Chronic Pacing With a 2 French Pacing Lead in a Small Rabbit Model

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Background: The utility of transvenous pacing, despite its advantages, has been limited in small subjects, primarily due to relative size of the pacemaker lead and subclavian vein. The purpose of this study was to evaluate the effectiveness of transvenous chronic pacing in a small rabbit model.

Methods: Seven rabbits weighing 4.3 to 5.4 kg (mean 4.8 kg) underwent permanent pacemaker system implantation using a novel, custom, transvenous pacing lead and adapter from Medtronic to connect to a standard pacemaker generator. Rabbits underwent general anesthesia, and a 5 French hemostatic sheath was placed into the right jugular vein via a cut down. Under fluoroscopic guidance, the 2 French lead was placed and fixed at a desired position in the right ventricle through a custom 5 French guider. After documentation of appropriate pacing and sensing thresholds, the sheath and guider were removed, and the pacing electrode was secured to the neck fascia with sutures and a custom tie-down sleeve. The remainder of the lead was subcutaneously tunneled to the back of the neck where the generator was connected and fastened through a second incision. Surgical recovery required 1–2 days. All animals were paced at 340 beats per minute for 25 ± 4 days without pacing complications. Capture was documented weekly by electrocardiographic and/or physical examination.

Conclusions: This technique demonstrates that transvenous pacing can be effectively performed in small animals using a 2 French pacing lead with minimal complications, relatively quick recovery, and appropriate chronic pacing thresholds. This technique avoids unnecessary risks associated with thoracotomy and epicardial lead placement, and may have important clinical implications for pacing in infants and small children.

1074-164 Changing Trends in the Causes of Morbidity and Mortality Related to the Telectronics Accufix Permanent Pacemaker Lead: Lessons Learned From the First Three Years of Device Recall Management

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After recall of the Accufix permanent pacemaker lead, in anticipation of a rush to extract these leads, a registry was established in order to tabulate the number of extraction procedures and associated complications. The registry also tabulated the number of "spontaneous" injuries resulting from protrusion of the J-wire. Every attempt was made to rapidly disseminate up-to-date incidence rates of injury from protrusion of the J-wire and from lead extraction.

Results: Since the recall in Nov. 1994, there have been 3,623 reported intravascular lead extraction procedures with 12 associated deaths. During the same three-year period, there have been 2 deaths attributed to injury resulting from protrusion of the J-wire. The number of lead extraction procedures peaked at 600 per month in March 1995 and rapidly declined after it was announced that the number of fatal complications exceeded the number of fatalities due to J-wire protrusion. Based on a cohort of prospectively followed patients, the injury rate due to the J retention wire is 0.03% per implant year. The corresponding extraction complication rate is 0.99% per implant year.

Conclusions: Careful monitoring with rapid and full disclosure of the facts resulted in: 1) A significant moderation of the number of lead extractions; 2) a low rate of extraction complications, and 3) an extremely low spontaneous J-wire injury rate.

1074-165 Cardiac Pacing in Children With Univentricular Hearts: Unique Characteristics and Concerns

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As longevity and treatment options of children with univentricular hearts (UH) increase, cardiac pacing is more frequently needed in this unique population. Lack of venous access to the ventricle requires epicardial pacing