Transcoronary pacing in a porcine model - impact of guidewire insulation


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Aims:

Bradyarrhythmia complicating percutaneous coronary intervention (PCI) can require temporary pacing. A transcoronary approach using the guidewire in the coronary artery may be a useful alternative to transvenous pacing. This method avoids an additional venous puncture and right ventricular pacing wire use, both of which are associated with complications and additional procedural time.

The purpose of the present study was to compare the efficacy of two different coronary guidewires in transcoronary pacing in a porcine model: a novel guidewire (VisionWire®, Biotronik, Germany) which has a coating to electrically insulate the shaft, thereby maximizing current delivery through the intracoronary section, compared to a standard guidewire (without insulation) and a standard guidewire/balloon combination.

Methods:

Unipolar transcoronary pacing was applied in 15 pigs under general anaesthesia in an animal cathlab. The new VisionWire was compared to a bare standard floppy guidewire and to a bare floppy guidewire with additional insulation by an angioplasty balloon serving as the cathode (figure 1). Relying on the coating of the VisionWire this guidewire was not tested with additional balloon insulation.

After exclusion of coronary stenosis and anomalies by angiography of both coronary arteries the guidewire was placed into the distal coronary artery serving as a different cathode. As the indifferent anode, skin patch electrodes located on the anterior and posterior thoracic wall were used. Both electrodes were connected to an external pacemaker. We examined the effect of different electrode combinations on transcoronary pacing as assessed by threshold and impedance data and the magnitude of the epicardial ECG. Statistical analyses were performed on a mixed model with fixed effects.

Results:

Transcoronary pacing with the bare standard guidewire was effective in 77% against the anterior patch and 87% against the posterior patch electrode at pacing thresholds at 6.7±2.9 V and 4.1±3.0 V respectively (table 1). Insulation of the guidewire by an angioplasty-balloon increased the pacing efficacy to 100% at significantly lower pacing thresholds with 2.4±1.6 V with the anterior patch and 1.6±1.3 V with the posterior patch electrode in use (p<0.001). The bare VisionWire yielded the lowest pacing thresholds at 1.6±0.7 V and 1.0±0.6 V respectively with a 100% pacing efficacy (p<0.001). Within the indifferent cutaneous patch-electrodes, the pacing thresholds obtained for the posterior chest wall were significantly lower as compared to the anterior skin patch electrode for each of the cathodal guidewire-settings (figure 2).

We did not observe any adverse effects of coronary pacing. Skeletal muscle contraction was only generated at high output levels.

Conclusion:

Transcoronary pacing in the animal model is an effective technique. The bare VisionWire performed better than the standard guidewire, even if additionally insulated by an angioplasty-balloon. This transcoronary pacing technique can substitute the transvenous approach during PCI particularly in the emergency situation of unexpected bradycardias and especially when using transradial access without a suitable venous access in the sterile puncture area.

Disclosure Statement

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