A randomized comparison of His bundle pacing versus RV pacing: effect on left ventricular function and biomarkers of collagen metabolism

Background:

Right ventricular pacing (RVP) may result in pacing-induced cardiomyopathy (PICM) in some patients. His bundle pacing (HBP) is a method of physiological pacing, which should not lead to PICM. There are some known risk factors, which are, however, not strong enough to reliably predict PICM development. It is unknown whether specific sera biomarkers of collagen metabolism reflect differences between His bundle pacing (HBP) and RVP or predict a decrease in left ventricular function during RVP.

Aims:

To compare the effect of HBP and RVP on the LV ejection fraction (LVEF) and on sera markers of collagen metabolism.

Methods:

Ninety-two high-risk PICM patients were randomized to HBP or RVP. Their clinical characteristics, echocardiography, and sera levels of TGF-β1, MMP-9, ST2, TIMP-1, and Gal-3 were studied before and six months after pacemaker implantation.

Results:

Fifty-three patients were randomized to HBP and 39 patients to RVP. HBP failed in 10 patients, who then crossed over to the RVP group. Both groups had same clinical characteristics at the baseline, but patients with RVP had significantly lower LVEF compared to HBP after six months of pacing (−3 % and −3 % in *as-treated* and *intention-to-treat* analysis, respectively). Levels of TGF-β1 after 6 months were lower in HBP than RVP (mean difference −6 ng/mL, $p = 0.009$). Preimplant Gal-3 and ST2 levels were higher in RVP patients with a decline in the LVEF ≥ 5 % compared to those RVP patients with a decline of < 5 % (mean difference 3 ng/mL and 8 ng/mL, $p = 0.02$ for both)

Conclusion:

In patients at high-risk of PICM, HBP was superior to RVP in providing enhanced physiological ventricular function, as reflected by higher LVEF and lower levels of TGF-β1 in patients with HBP after six months of pacing. Among RVP patients, LVEF declined more in those with higher baseline Gal-3 and ST2 levels than those with lower levels.

Electrical and mechanical interventricular dyssynchrony coupling in bradycardia patients; a UHF-ECG validation trial

Background:

Permanent cardiac pacing may cause various types of ventricular dyssynchrony. Ultra-high-frequency ECG (UHF-ECG) is a diagnostic tool for non-invasive visualization of the ventricular activation sequence. It has never been compared to other methods assessing mechanical dyssynchrony.

Aims:

To compare UHF-ECG electrical interventricular dyssynchrony (interventricular e-DYS) and echocardiographic interventricular mechanical delay (IVMD) in bradycardia patients with right ventricular pacing (RVP) or conductive system pacing (CSP).

Methods:

53 patients with advanced AV conduction disease, no structural heart disease, and preserved left ventricular systolic function were prospectively randomized to RVP (n=32) or CSP (n=21). IVMD was measured as a difference between LV and RV pre-ejection periods by two examinators. Interventricular e-DYS was calculated automatically and manually as a time difference between activation in V7 and V1 chest electrodes using UHF-ECG.

Results:

The median patients age was 75 years, and both groups had similar clinical characteristics. After one year of pacing, the patients with CSP preserved similar levels of both IVMD (mean change −2 ± 5 ms, $p = 0.74$) and interventricular e-DYS (mean change 0 ± 4 ms, $p = 0.95$) compared to a spontaneous rhythm before pacemaker implantation. By contrast, in the RVP group, both IVMD interventricular e-DYS increased (IVMD by 27 ± 5 ms and interventricular e-DYS by 24 ± 5 ms; $p < 0.0001$ for both compared to the baseline. There was a moderate overall correlation between IVMD and interventricular e-DYS in all studied ventricular rhythms ($R = 0.73$).

Conclusion:

UHF-ECG expresses interventricular dyssynchrony noninvasively by measuring the activation difference between V7-V1 chest leads. RVP increases interventricular dyssynchrony, while CSP preserves synchronous ventricular activation.