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| **Supplementary Material 5. Study outcomes of external devices on cardiac function in HF patients** |
| **Study** | **Subjects,**  | **Study Design** | **Population** | **primary endpoint** | **Clinical outcome** | **SAE** |
| MIRACLE (25) | 453 | Effect of cardiac resynchronization therapy (CRT) versus no CRT | NYHA class III or IV heart failure, QRS of at least 130 ms (mean 165 ms), and LV systolic dysfunction with an LVEF ≤35% | Minnesota Living with Heart Failure Questionnaire Quality of Life (QOL) Measure and HF improvement | CRT improved New York Heart Association (NYHA) class by at least one class, quality of life (-18.0 vs. -9.0 points, p=0.001), and ejection fraction, Need for hospital admission and intravenous medication were lower | No SAE from therapy  |
| Flaherty et al. (2) | 230 | Retrospective study of LVAD-supported patients vs LVAD unsupported patients | Patients undergoing high-risk PCI with ejection fraction ≤35% | incidence of in-hospital AKI | Significant reduction in AKI incidence and postprocedural hemodialysis. Same reduction seen in patient presenting with CKD | Long term SAE not reported |
| Welp et al (3) | 20 | Prospective study of non-pulsatile vs Pulsatile LVAD  | Patients undergoing LVAD implantation | Plasma Renin level  | Plasma renin activity and plasma aldosterone levels was elevated in non-pulsatile left ventricular support  | NA |
| Bazoukis et al (26) | 6208 | Systemic review investigating the effect of baseline renal function on all-cause mortality in patients who underwent CRT | CKD presentation in CRT patients | all-cause mortality or unplanned hospitalization | Baseline renal dysfunction has an adverse effect on-all cause mortality  | NA |
| COMPANION (27)  | 1520 | Protocol-mandated (OPT) alone vs OPT + CRT or OPT+ CRT-D device. | NYHA class III or IV HF due to ischemic or non ischemic cardiomyopathy in association with a LVEF of ≤0.35 and a QRS interval of ≥120 ms | time to death or hospitalization from any cause | CRT candidates with baseline renal dysfunction had significantly higher risk of sudden cardiac death. CRT-D device was associated with a 55% reduction in sudden death risk  | NA  |
| MADIT-CRT (28) | 1820 | Prospective study. Where patients received CRT plus an implantable cardioverter-defibrillator (ICD) or an ICD alone. | HF (NYHA I or II, ischemic or non-ischemic cardiomyopathy, LVEF≤30%, QRS ≥130 msec) | death from any cause or a nonfatal heart-failure event | CRT was associated with a significant reduction in left ventricular volumes and improvement in the ejection fraction.  | Infrequent between each group  |

COMPANION, Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure; MADIT-CRT, Multicenter Automatic Defibrillator Implantation Trial with Cardiac Resynchronization Therapy; MIRACLE, Multicenter InSync Randomized Clinical Evaluation; CHF, congestive heart failure; CKD, chronic kidney disease; Cr, creatinine; CRT, cardiac resynchronization therapy; EF, ejection fraction; GFR, glomerular filtration rate; HF, heart failure; HFrEF, heart failure with reduced ejection fraction; LVAD, Left Ventricular Assistance device; MRA, mineralocorticoid receptor antagonist; NA, not applicable; RCT, randomized controlled trial.

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