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Personalized Risk Stratification of Sudden Cardiac Death in Dilated Cardiomyopathy Patients

Stanford researchers have developed a personalized arrhythmia risk prediction tool for dilated cardiomyopathy (DCM) patients using patient-derived induced pluripotent stem cells (iPSCs) to replicate heart biology and accurately predict arrhythmia risk, enabling timely interventions for high-risk patients.

Sudden cardiac death (SCD) is a leading cause of death in patients with dilated cardiomyopathy (DCM), caused by life-threatening arrhythmias. Current methods to assess risk rely on contraction impairment, which is unreliable and leave clinicians unable to identify high-risk patients accurately. This results in preventable deaths or unnecessary invasive defibrillator placements. The lack of a reliable, personalized risk stratification tool leaves clinicians without clear guidance on who should receive preventive interventions.

To address this unmet need, Stanford researchers have developed a personalized risk prediction tool for DCM patients using patient-derived induced pluripotent stem cells (iPSCs). By differentiating iPSCs into cardiomyocytes (iPSC-CMs), this tool replicates a patient's unique cardiac biology to assess arrhythmia risk with high precision. Advanced techniques like multi-electrode array, patch-clamp recordings, and calcium imaging detected arrhythmic activity with 86% sensitivity and 92% specificity. Overall, this approach allows clinicians to accurately stratify arrhythmia risk, ensuring timely interventions for high-risk patients.

Stage of Development:
Research – in vitro. Future steps include clinical trial testing in a clinical cohort.

Applications

- Prognostic tool for personalized arrhythmia risk stratification for DCM patients
- Serves complimentary to existing clinical data
- Platform for diagnostic testing in hospitals and laboratories
- Research model for studying patient-specific arrhythmic mechanisms

Advantages

- Provides a personalized platform to quantify individual risk of arrhythmia
- Outperforms existing methods in sensitivity and specificity
- Enables targeted preventive interventions for improved patient outcomes.
- Personalized predictions tailored to each patient's unique cardiac biology
- Prevents unnecessary ICD placements

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