1. **Heart Failure and regeneration therapy**

In the project of "generation of induced pluripotent stem cells as disease modeling of cardiomyopathy", we established disease models derived from human induced pluripotent stem cells (iPSCs) that manifest cellular disease phenotypes of dilated or hypertrophic cardiomyopathy. The iPSCs are induced to differentiate into cardiac myocytes (CM) and compared with healthy control iPSC-CM.

2. **Atherosclerosis**

Our research interest is cellular and molecular aspects of atherosclerosis, which is a leading cause of death in the world. Current research projects involve the elucidation of a molecular mechanism of dynamic change in extracellular matrix in abdominal aortic aneurysm using mouse models of genetic manipulation and chemical induction, and the development of clinically useful preventive approach of abdominal aortic aneurysm. Clinical research including multicenter trials can be conducted to translate basic findings into therapies and improve patient care of atherosclerotic cardiovascular diseases.

3. Arrhythmia and device therapy (Dr. Morita H)

Arrhythmias: We experienced > 300 catheter ablation cases/year using newly developed mapping systems and a half of the cases are drug-refractory ventricular arrhythmias. We perform clinical and basic researches on prevention of cardiac sudden death, ventricular arrhythmias and atrial fibrillation. We have also developed basic research of regenerative therapy of cardiac pacemaker using ES and iPS cells.

Device therapy: we experienced implantation of cardiac devices in 150 cases/year. We have established a center of remote monitoring system of the implantable devices in the western part of Japan and treat 2500 patients' data. We continue the intervention study on therapy of heart failure using the remote monitoring system.

4. Pulmonary hypertension

We are conducting basic and clinical researches of pulmonary hypertension (PH). We research the pathophysiology of PH and discover the candidate of novel PH drugs using samples (lung tissues, culture cells, blood samples) obtained from patients with PH received lung transplantation. We showed that prostacyclin, imatinib and simvastatin have pro-apoptotic and anti-proliferative effects in pulmonary artery smooth muscle cells. We translationally study the nanotechnology in novel treatment of PH. In clinical research, we study the response to hemodynamics and right ventricular

function by PH-specific drugs. We also study the characteristics of PH patients using database of our hospital.

5. **Adult congenital heart disease**

Okayama University Hospital is the top center of adult congenital heart disease (ACHD) in Japan. Our unit provides multidisciplinary approach including Cardiovascular Surgery, Pediatric Cardiology, GI and Hepatology, OB&GY, Nephrology, etc., especially Fontan or other complex heart disease. More than 200 new ACHD patients visited in our unit all over Japan. We have the highest experience for transcatheter procedure for ASD or PFO (stroke, migraine) in Japan. Research projects expand arrhythmia (catheter ablation), pulmonary hypertension, cardiac imaging (ECHO, CT, MRI), heart failure management. We also keep close relation with International Society for ACHD and Euro GUCH. International research fellowship is always welcome in our unit.

6. **Cardiac imaging**

We conduct clinical research on multimodality imaging such as echocardiography and computed tomography (CT) leading to treatments. The usefulness of imaging for structural heart disease interventions has been reported. We are also developing clinical application of Cardiac Fusion Imaging which is ultrasound image combined CT in real time, and are studying the efficacy for heart diseases including adult congenital heart disease. Additionally, we are attempting to study novel imaging using echocardiography and CT to visualize the properties of myocardium and atherosclerotic plaque. Using innovative technologies, we perform clinical research leading to accurate evaluation and elucidation of disease condition.