The aim of this research project is to understand how radiation therapy, a method commonly used in cancer treatment, modifies heart rhythm. In the past, doctors tried to avoid the heart during tumor irradiation because this could lead to several heart problems, including arrhythmias. Among arrhythmias, the condition known as ventricular tachycardia, where the heart beats too fast, is the most dangerous and can lead to sudden cardiac arrest, a major cause of death. Unexpectedly, in recent years it turned out that radiotherapy might be also used to treat arrhythmias. It can therefore be seen as a double-edged weapon that works differently depending on the clinical situation. This new perspective could completely change how we understand and treat cancer and heart arrhythmias.

The idea behind the project is both innovative and potentially transformative. It challenges the traditional belief that radiation therapy works by changing the structure of heart tissues making it more thicken. Instead, we propose that radiotherapy alters the way heart cells handle electrical signals and that this effect is more rapid than previously thought.

The research plan is carefully designed to uncover these potential changes. Initially, we will study human heart tissues in the laboratory, examining how radiation affects the way these tissues function at a very small scale, right down to their cells and molecules. We will very a novel model of living myocardial slice which is the very thin section of living heart tissue. By using this model, we can investigate the heart's natural, complex structure and the way its cells are organized and connected, just as they are in a healthy heart. We will look closely at changes in the way the heart's cells handle electrical signals and their overall health. Understanding these changes is crucial for developing new treatments.

Then, the project moves into a more practical phase. Here, we will use heart samples from patients who have previously received radiation therapy because of ventricular tachycardia. This step is vital for seeing if the laboratory findings hold true in real-life situations. If successful, this research could lead to a more effective way to treat this heart problem and avoid it in cancer patients, potentially saving many lives.

But the impact of this project goes beyond just treating and preventing arrhythmias. The findings could also improve our understanding of radiation therapy's role in other medical treatments, like cancer. Furthermore, the insights gained could help in developing new medications, especially those targeting changes caused by radiation in cells.

In essence, this project is not just about addressing a heart; it's about exploring new frontiers in medical science. Its success could open new pathways for treating various health issues, making it a beacon of hope for many patients and a significant step forward in medical research.