Effectiveness of the EMPOWER* Modular Pacing System and EMBLEM* Subcutaneous ICD to Communicate Antitachycardia Pacing

Published: 25-05-2021
Last updated: 19-08-2024

To demonstrate the safety, performance and effectiveness of the EMPOWER* Modular Pacing System (MPS), as well as the EMPOWER and EMBLEM* Subcutaneous ICD Coordinated System. Additionally, data from this study may be used to support pre-market and...

Ethical review	Approved WMO
Status	Recruiting
Health condition type	Cardiac arrhythmias
Study type	Interventional

Summary

ID

NL-OMON54281

Source
ToetsingOnline

Brief title
MODULAR ATP

Condition

- Cardiac arrhythmias
- Cardiac therapeutic procedures

Synonym
ventricular arrhythmias; irregular heart rhythm

Research involving
Human

Sponsors and support

Primary sponsor: Boston Scientific
Source(s) of monetary or material Support: Boston Scientific

Intervention

Keyword: Anti-bradycardia Pacing, Anti-tachycardia Pacing, Defibrillation, Subcutaneous ICD

Outcome measures

Primary outcome

Safety Endpoint 1: Major EMPOWER MPS System- and Procedure-related

Complication-Free Rate from Implant through 6 Months Post-Implant

Primary Effectiveness Endpoint:

1. Communication Success between the S-ICD and EMPOWER PG at the 6 Month Visit

2. Proportion of subjects with adequate Pacing Capture Threshold (PCT) (defined

as <= 2 V@0.4 ms) at the 6 Month Visit

Secondary outcome

Safety Endpoint 2: Major EMPOWER MPS System- and Procedure-related

Complication-Free Rate from implant through 12 Months Post-Implant

Safety Endpoint 3: All-Cause Survival from Implant through 2 Years Post-Implant

Secondary Effectiveness Endpoint: Mean Metabolic-Chronotropic Relation (MCR)

slope from the Kay-Wilkoff model at the 3 Month Visit

Study description

Background summary

Despite technological advances in pacing and defibrillation, the overwhelming majority of acute and chronic complications are related to incisional access for device pockets connected to indwelling transvenous leads. Over 600,000 patients implanted yearly worldwide are faced2 with adverse events due to the pulse generator (e.g., hematoma, skin erosion, pocket infections) or transvenous lead placement (e.g., pneumothorax, cardiac perforation, lead dislodgement)3.
Advancements in electronic circuitry and battery technology enable manufacturers to develop pacemakers that can be completely implanted inside the right ventricle of the patient*s heart while keeping battery durability and longevity with communication to an entirely extravascular (subcutaneous) defibrillation system.
The EMPOWER* Modular Pacing System (EMPOWER MPS, comprised of the EMPOWER pacemaker and delivery catheter) and EMPOWER MPS accessories used for delivery and retrieval of the EMPOWER pacemaker build on Boston Scientific*s (BSC*s) decades of experience designing and manufacturing conventional transvenous pacemakers, as well as new key technologies within the rhythm management industry, such as circuit miniaturization, catheter technology, and new materials (e.g., innovative alloys). The EMPOWER pacemaker is placed directly into the right ventricle using a newly designed steerable, atraumatic delivery catheter system that enters the vasculature via the femoral vein. Leadless cardiac therapy eliminates the need for a transvenous pacing lead, as well as the subcutaneous pocket required for a conventional pulse generator; thereby, eliminating a larger proportion of complications common to transvenous pacemaker systems.
The potential hazards and risks associated with the EMPOWER System throughout the product life cycle were identified by means of an exhaustive risk assessment. These risks were then compared to those of existing transvenous single-chamber pacemakers. The assessment and comparison identified many similarities between conventional transvenous single-chamber pacemakers and the EMPOWER pacemaker; however, the EMPOWER pacemaker decreases or eliminates several risks associated with transvenous pacemakers mainly due to the lack of a device pocket and/or use of a transvenous lead. While there are limited novel risks associated with the use of the EMPOWER System, the outcomes of the pre-clinical testing validate that the benefits of the EMPOWER System likely outweigh the possible risks. It is therefore considered safe and justified to continue evaluating the EMPOWER pacemaker by implanting it in human subjects.
The subcutaneous implantable cardioverter defibrillator system (S-ICD System) was developed in part to address complications associated with traditional transvenous implantable cardioverter defibrillator (TV-ICD) leads. The nature of the transvenous system with the need for leads to be permanently dwelling in the venous circulation and cardiac chambers for very long term, increases the

likelihood of certain types of lead failure like conductor fracture, insulation break and dislodgement that can compromise the system*s performance. Furthermore, when a system infection occurs, it usually represents a severe complication and requires lead extraction with its own risks. Analyses of multiple large patient claims databases have evaluated transvenous device and lead complications. , , When TV-ICD leads are specifically considered, it is noted that the mechanical complication rate is 5% by 3 years post implant and continues to rise to 23.9% for those patients who reach 10 years of follow-up7. Therefore, these complications have substantial implications for patient outcomes and health care system costs. According to an analysis of U.S. claims data6, these complications will affect 1 in 6 patients by 3 years, which has substantial implications for patient outcomes and health care system costs.
The S-ICD System does not require a lead to be placed either in (endocardium) or on (epicardium) the heart, which may be advantageous in reducing:
• Implant-associated risks related to central venous access or endocardial lead positioning and fixation.
• Exposure of the lead to stresses induced by repeated cardiac pulsations
• Serious infections with a direct pathway to the blood stream and endocardium
• Complications related to lead extraction
Because the S-ICD System lacks a transvenous lead in the heart, it has no ability to provide bradycardia pacing or antitachycardia pacing (ATP). This limitation restricts the ICD-indicated patient population that can benefit from the S-ICD system. The approved indication for the S-ICD System reflects this restriction by specifically identifying S-ICD candidates as ICD-indicated patients who do not have symptomatic bradycardia, incessant ventricular tachycardia, or spontaneous, frequently recurring ventricular tachycardia that is reliably terminated with anti-tachycardia pacing.
These restrictions limit the patients who receive an S-ICD based on their initial indication and the clinical likelihood of requiring the therapies not provided by this system in the future. However, some S-ICD candidates have or eventually develop symptomatic bradycardia or ventricular tachycardias that can be terminated with ATP. For S-ICD patients who develop bradycardia, published reports indicate that a concomitant pacemaker may be implanted without adversely affecting the S-ICD function. , , , Unlike these S-ICD patients, those who need ATP do not currently have a concomitant device option as the implanted pacemaker and the S-ICD perform as individual systems and don*t communicate to one another. Options for patients who develop incessant or frequently recurring ventricular tachycardia (VT) include VT ablation or replacement of the S-ICD with a TV-ICD.
The MODULAR ATP Clinical Study will evaluate another option for patients who may benefit from ATP: the investigational mCRM Modular Therapy System. The mCRM Modular Therapy System combines an S-ICD System with a specially designed leadless pacemaker (EMPOWER PG)) that can receive communication signals from the S-ICD System to provide ATP prior to (or as an alternative to) an S-ICD shock. The intended indication for the mCRM Modular Therapy System will be to provide defibrillation therapy and anti-tachycardia pacing (ATP) therapy for the treatment of life threatening ventricular tachyarrhythmias. The EMPOWER PG

can also be programmed to provide bradycardia backup pacing when required. For the purpose of the MODULAR ATP Clinical Study, the devices included in the mCRM Modular Therapy System (S-ICD System and the EMPOWER PG) will be called the mCRM Coordinated System.
Boston Scientific conducted extensive testing to determine that the EMPOWER MPS System and the coordination of the EMBLEM S-ICD System and EMPOWER MPS System elements of the mCRM System functions safely and effectively per the design intent. Boston Scientific performed safety risk management, nonclinical bench testing, and animal studies to support the project. These activities were performed in accordance with established national and international industry standards, Good Laboratory Practices (GLPs), product specifications, and internal Boston Scientific procedures. All testing demonstrated that the investigational EMPOWER MPS System and the coordination of the EMBLEM S-ICD System and EMPOWER MPS System elements of the mCRM System performed as intended and met all electrical and mechanical performance specifications.

Study objective

To demonstrate the safety, performance and effectiveness of the EMPOWER* Modular Pacing System (MPS), as well as the EMPOWER and EMBLEM* Subcutaneous ICD Coordinated System. Additionally, data from this study may be used to support pre-market and post-market approval requirements for the EMPOWER MPS.

Study design

A prospective, non-randomized, multi-study site, single-arm, global study utilizing performance goals to demonstrate safety, performance, and effectiveness of the EMPOWER System and mCRM Modular Therapy System.

Intervention

Subjects who do not already have a compatible S-ICD PG, Model A209 or A219, will undergo two implant procedures: one for the EMPOWER PG and one for the S-ICD System.
For those subjects, it is recommended to implant the EMPOWER PG first and the S-ICD System second. The implant procedures may, but are not required, to occur on the same day; however, it is strongly recommended that both implant procedures be complete within 30 days of enrollment.

Study burden and risks

Risk to Benefit Rationale:
The implantation of an S-ICD has proven to be a successful/effective therapy to reduce sudden cardiac death without the complications associated with having leads in the vasculature and the heart. As such, it may be the only option for patients at high risk of sudden cardiac death with challenging or no venous

access or complex congenital heart disease. For patients at risk of sudden cardiac death who do not require pacing or cardiac resynchronization therapy and are at high risk of infection, or have inadequate vascular access, implantation of an S-ICD is a Class I or Class IIb recommendation based on 2017 AHA/ACC/HRS and 2015 ESC guidelines, respectively. Furthermore, contemporary guidelines suggest that the advantages of the system compared to TV-ICDs make S-ICD implant beneficial in the broad population of patients at risk for sudden cardiac arrest if they do not have an indication for pacing or cardiac resynchronization therapy (Class I recommendation in the 2017 AHA/ACC/HRS guidelines, Class IIa recommendation in the 2015 ESC guidelines). According to the published data of the 2-year results from a pooled analysis of the S-ICD IDE Study and the EFFORTLESS registry , the S-ICD terminated spontaneous ventricular tachyarrhythmias in 90.1% of events with the first shock and in 98.2% of events within the 5 available shocks. Data from the UNTOUCHED Study revealed first shock conversion rate is 92.2%, and final shock conversion rate is 98.4% . The addition of the EMPOWER PG, which can communicate with the S-ICD (Coordinated System), will provide the option of delivering ATP, which may reduce the number of unnecessary shocks and improve patients* quality of life and device longevity . The incremental benefits related with providing ATP through the communication between S-ICD and the EMPOWER PG are expected to be greater than the risks related to implanting both systems. The benefit might be significantly greater for those patients who are not candidates to receive a TV-ICD for the reasons outlined above.

Anticipated Benefits

Anticipated benefits of the Coordinated System include the potential avoidance of shocks for monomorphic ventricular tachycardias that can be safely terminated with ATP. This could also positively impact the overall number of shocks that a given patient will receive during the device*s life and their associated morbidity. As with the traditional transvenous ICD, the Coordinated System provides ATP and shock therapy while limiting the exposure to the risks frequently associated with long-term intravascular lead implantation. This is of particular importance for patients with challenging vascular access or high risk of infection who might not be candidates for transvenous ICD and whose arrhythmias might be successfully converted by ATP.

An additional anticipated benefit of the Coordinated System is the option to implant a leadless pacemaker in a patient with an existing S-ICD System who has developed a new indication for single-chamber right ventricular pacing. The alternative to this option would be the explant or inactivation of the S-ICD System and the implantation of a traditional transvenous ICD system, which would expose the patients to the risks frequently associated with long-term intravascular lead implantation.

Contacts

Public
Boston Scientific

Lambroekstraat (Green Square) 5D
Diegem 1831
BE
Scientific
Boston Scientific

Lambroekstraat (Green Square) 5D
Diegem 1831
BE

Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

• Patient who meets Class I, IIa, or IIb guideline ICD indications, or who has an existing TV-ICD or S-ICD
• Patient who is deemed to be at risk for MVT based on at least ONE of the following:
o History of Non-Sustained MVT with LVEF <= 50%
o History of sustained VT/VF (secondary prevention) with LVEF <= 50% or significant cardiac scar
o History of syncope deemed to be arrhythmic in origin
o History of ischemic cardiomyopathy with LVEF <=35%
o History of non-ischemic cardiomyopathy with LVEF <=35% and significant scar
• Patient is willing and capable of providing informed consent (which is not to

include the use of a legally authorized representative (LAR) for documentation of informed consent) and participating in all testing associated with this investigation at an approved study site and at the intervals defined by this protocol
• Patient is age 18 years or above, or of legal age to give informed consent specific to state and national law

Exclusion criteria

• Patient with an ongoing complication due to Cardiac Implantable Electronic Device (CIED) infection or CIED explant
• Transvenous lead remnants within the heart from a previously implanted CIED (Note: transvenous lead remnants outside the heart (e.g., in the SVC) are allowed)
• Patient with a known LA thrombus
• Patient with a ventricular arrhythmia due to a reversible cause
• Patient indicated for implantation of a dual chamber pacemaker or cardiac resynchronization therapy (CRT)
• Patient with another implanted medical device that could interfere with implant of the leadless pacemaker, such as an implanted inferior vena cava filter or mechanical tricuspid heart valve
• Patient requires rate-responsive pacing therapy
• Patient is entirely pacemaker-dependent (defined as escape rhythm <= 30 bpm)
• Patient with Acute Coronary Syndrome (i.e. Acute Myocardial Infarction, Unstable Angina) within 40 days
• Inability to access femoral vein with a 21-French or larger inner diameter introducer sheath due to known anatomy condition, recent surgery, and/ or other relevant condition
• Patient who has an active implanted electronic medical device intended for chronic use concomitantly with the study system, such as a left ventricular assist device (LVAD). Note that a temporary pacing wire is allowed.
• Patient with known or suspected sensitivity to Dexamethasone Acetate (DXA)
• Patient with a known cardiovascular anatomy that precludes implant in the right ventricle
• Patient with a known allergy to any system components
• Patient with a known or suspected intolerance to S-ICD conversion testing, based on physician discretion
• Patient is not likely to have meaningful survival for at least 12 months (documented or per investigator*s discretion)
• Patient is enrolled in any other concurrent study. Co-enrollment into other studies such as observational studies/registries needs prior written approval by BSC. Local mandatory governmental registries are accepted for co-enrollment without approval by BSC
• Patient who is a woman of childbearing potential who is known to be pregnant at the time of study enrollment (method of assessment upon investigator*s

discretion)

Study design

Design

Study type: Interventional

Masking:	Open (masking not used)
Control:	Uncontrolled
Primary purpose:	Treatment

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	02-12-2021
Enrollment:	60
Type:	Actual

Medical products/devices used

Generic name:	(EMBLEM/ EMBLEM MRI) S-ICD Pulse Generator + S-ICD Subcutaneous Electrode (both CE mark); EMPOWER MP
Registration:	No

Ethics review

Approved WMO Date:	25-05-2021
Application type:	First submission
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)

Approved WMO Date:	11-06-2021
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)

Approved WMO Date:	12-04-2022
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)
Approved WMO Date:	21-07-2022
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)
Approved WMO Date:	07-11-2022
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)
Approved WMO Date:	03-05-2023
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)
Approved WMO Date:	24-07-2024
Application type:	Amendment
Review commission:	MEC-U: Medical Research Ethics Committees United (Nieuwegein)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
ClinicalTrials.gov	NCT04798768
CCMO	NL77017.100.21