New multipoint pacing technology for heart failure patients

Future Cardiology Interview

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“There are a lot of exciting areas in device treatment for heart failure ... hopefully all of these can be integrated so they can work together ... to really help heart failure patients to respond.”

Tim Betts speaks to Caroline Telfer, Assistant Commissioning Editor. Tim Betts is currently a consultant cardiologist and electrophysiologist at the Oxford Heart Centre, John Radcliffe Hospital (Oxford, UK). Dr Betts gained his MB ChB from Birmingham Medical School (Birmingham, UK) in 1991, and his MD on the relationship between atrial anatomy and electrophysiology was awarded by Southampton University (UK) in June 2003. Dr Betts' special interests include diagnosis, investigation and treatment of heart rhythm disorders, including blackouts, palpitations and risk assessment for sudden cardiac death. He performs diagnostic electrophysiology and catheter ablation. He also specializes in cardiac devices including pacemakers, defibrillators and cardiac resynchronization therapy (biventricular pacing).

■ **What attracted you to a career in cardiology?**

It seemed intellectually challenging and I liked the aspect of doing procedures and operations. It has practical and manual skills, as well as the cerebral diagnostic side of things.

■ **Can you tell us a little bit about your career background?**

I graduated from Birmingham Medicine School (UK) and I did most of my cardiology training in Southampton (UK) and the south coast, but I also went to Chicago (USA) for 18 months to do a fellowship in cardiac electrophysiology, both in an adult's hospital and a pediatric children's hospital.

■ **What position do you hold at the moment?**

I am a consultant cardiologist at the Oxford Heart Centre (UK).

■ **Which of your achievements in your career are you most proud of to date?**

I am very pleased to have ended up in Oxford, which is a fantastic place and has a great reputation, so I'm very honoured to work there. I got a postgraduate degree in cardiac electrophysiology, which was awarded by Southampton University – that was a big career milestone as well. Outside of work, carrying the Olympic Torch last summer was a major highlight!

■ **Can you explain a little bit about the theory behind cardiac resynchronization therapy for the treatment of heart failure?**

There are many people out there with heart failure, which means the heart ventricles, primarily the left ventricle, does not pump strongly enough to meet the body's demands, so they become breathless, fatigued and tired. Sometimes, things are made worse by the fact that the muscle is poorly coordinated; when it tries to beat, it is quite wobbly because the natural conduction system in the ventricles does not work very well and, in quite a few heart failure patients, that wobbly unsynchronized heartbeat makes their heart failure symptoms worse. Cardiac resynchronization therapy is a pacemaker-based therapy that tries to correct that desynchronized heartbeat. Most people who have pacemakers have them because their heart rates are too slow, but with cardiac resynchronization therapy, it's a matter of getting the two different sides of the left ventricle to pump at the same time to be more efficient. That's achieved by putting one wire into the right ventricle and then feeding another pacemaker wire around the coronary veins to the outside of the left ventricle to try and find the best place to stimulate that side, and thus turn a wobbly, weak heart into a coordinated weak heart. Hopefully, that not only makes the person feel better and able to do more, but may make the heart healthier and possibly increases their lifespan.

■ **Why was there a demand for an improvement in the technology for performing cardiac resynchronization therapy?**

Probably the greatest challenge is that, despite putting these resynchronization pacemakers in,

depending on how you measure it, on average, only two-thirds/three-quarters of people really notice an improvement, by means of walking further or feeling better. There are lots of different reasons why that may be the case. There's been a lot of research and a big drive to try and make the treatment more effective; ideally, we want everyone who has one of these devices put in to feel better, although we realize this may be too much to hope for, but to try and get 80–90% of patients feeling a lot better would be great. The goal is to try to get people to do more, feel better and get a great response to cardiac resynchronization therapy (CRT). To do so, we need to overcome some of the anatomical challenges we face when trying to get the wires into the right position.

■ **Recently, St Jude Medical (MN, USA) announced that their new multipoint pacing device received a CE mark approval. Can you explain a little about the design & function of this device?**

The Quadra Assura MP™ (St Jude Medical, MN, USA) CRT defibrillator (FIGURE 1) is based on the platform of having a quadripolar lead. Up until recently, every wire we insert into the coronary veins has one or two electrodes on the tip and stimulates just one spot on the heart muscle, and that has meant that there have been challenges in

trying to get the right spot for the greatest benefit, while simultaneously avoiding structures that we don't want to stimulate, such as the phrenic nerve. Developing a quadripolar lead with four poles has overcome a lot of those challenges, making it easier and safer to deliver the lead. By having four poles, the wire offers other advantages as well. Multipoint pacing goes one step further and uses additional software within the generator to stimulate one or more poles on the lead at different timing intervals to try and better coordinate the pumping action of the heart. Up until now, we have only been able to change the timings between the right and left ventricles, but with multipoint pacing, you can also change the timings in which the heart is stimulated between the two different sites in the left ventricle where the lead lies, so it gives more flexibility and more programming, and the idea is that this will translate into a greater magnitude of response to CRT.

■ **So the differences from previous technologies are basically the number of poles & points that you stimulate?**

It's the number of poles, and also the ability to choose when each pole is stimulated and when.

■ **How has this new device been trialed?**

At the moment, it is being trialed in a number of single-center or small multicenter studies, and there are quite a few abstract presentations that have been coming out in the past 12 months. I'm sure there are plans for there to be a large multicenter trial. There are a lot of emerging data, but no large trials as far as I'm aware.

■ **What were the entry criteria for these preliminary studies?**

What they are trying to do is choose people who are suitable for CRT, and the early studies have used multipoint pacing rather than standard pacing, so those who have been entered are candidates for CRT according to national and international guidelines. Certainly, some of the preliminary results have suggested that after 3 months, almost 90% of those with multipoint pacing have been classed as responders, a greater proportion than previous conventional studies. As I've mentioned, compared with standard CRT, where the number is closer to 60–70%, it looks like multipoint pacing in your standard CRT-indicated patients delivers a much greater chance of being a responder and having a measurable improvement in heart function. This is something that can be tried in those who have already had a standard device put in and haven't been a responder, and

Figure 1. Quadra Assura MP™ (St Jude Medical, MN, USA) cardiac resynchronization therapy defibrillator.

then had a further attempt in CRT using the new lead with the new multipoint pacing software, and a proportion of those people have gone from being nonresponders to responders.

■ **You have explained the results from the preliminary trials; did these exceed expectations?**

There is a small study in which 89% of patients with multipoint pacing were responders. To hit this percentage is fantastic and is a great goal, and something to aspire to. It is certainly better than anything else that has been achieved to date. I'm personally really impressed by that – I would love to get 90% of my patients to be classed as responders. It's great to see that in a small trial, which hopefully will also manifest in a much bigger trial, as well as in day-to-day practice in hospitals.

■ **What end points were they looking at in these preliminary trials?**

It can vary. There are different ways of measuring how well people respond. One way would be a functional response; for example, how far a patient can walk or how they measure their quality of life in a questionnaire. Another way, which is less subjective, is to do echocardiograms and ultrasound scans of the heart to measure the size and the pumping action before you carry out the treatment, and then again 3 months later, because that is something that you can measure and do robust statistical calculations on. Functional measures are more subjective and, depending on what trial you use, different measures are used for response, and sometimes it can be a combination, so a lot depends on which study you are looking at. For me personally, the most important thing is how the patient feels; if they feel better, can walk further and have more energy, then I feel it has done them a good job.

■ **What do you think are the next steps for this treatment strategy in terms of trials & development?**

I think the next step is to move forward and do a larger multicenter trial compared with standard biventricular CRT to see if the early information, which is being found in the small single-center studies, can be translated into wider practice. We need to know the best and most efficient way of using multipoint pacing technology because one of the things about having many more programmable options is that you need to know the best way to work through those options and find which setting the patient needs.

■ **What other options are available or are in development at the moment for the treatment of heart failure? Which do you think holds the greatest promise?**

There's a few within the CRT arena. Multipoint pacing is a big step forward, quite a big change. Within pacing there will eventually be leadless pacing, very small devices that you put in through a vein through the leg, screwed into the inside of the heart and left there with their own power supply and no need to be connected to a generator. Leadless pacing is on its way, but for heart failure treatment, it could be as far as 5–10 years; I know for standard bradycardia pacing, it is almost ready to go now. Then there are other technologies outside of pacing such as vagus nerve stimulation devices, which are on the horizon, but also invasive, continuous pressure monitoring; little devices which can go into the pulmonary artery to record the pressures inside the heart and allow patients to control their own medication levels. There are a lot of exciting areas in device treatment for heart failure, which are on the horizon, and hopefully all of these can be integrated so they can work together as a package to really help heart failure patients to respond.

■ **You mentioned all of these different devices that are currently in development. How do you see the treatment of heart failure progressing in the next 5 years?**

Hopefully, it will get a lot better because it is a major problem, which is becoming a bigger and bigger burden each year as patients live longer, and demands on health services will be much greater. Having cost-effective treatments that prevent hospital admissions and give people a greater quality of life is going to be very important.

Disclaimer

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