The implantable loop recorder in children: searching for indications

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Assessment of the aetiology of syncope in children can be challenging. In the majority of cases, the cause can be determined from a careful personal and family history, and physical examination. Additional testing such as an ECG, stress test, Holter monitoring and echocardiogram are useful in helping to ferret out the aetiology of syncope. Tilt table testing is also occasionally considered in patients with histories that are consistent with possible neurocardiogenic syncope. An invasive electrophysiological study is indicated when an arrhythmia is suspected, particularly in a patient with structural heart disease. Despite extensive investigations, there are rare cases in which the mechanism of syncope cannot be easily determined.

The implantable loop recorder (ILR) can be used as a diagnostic tool in cases of recurrent syncope in which an aetiological origin cannot be found. It is a device placed in the subcutaneous tissue, usually in the pectoral area, which can monitor heart rhythm continuously. In the case of an event, such as syncope, the rhythm can be automatically or manually stored by applying a hand-held activator over the device. Subsequently, the stored rhythm can be reviewed by the doctor.

Over the past decade, use of the ILR in adult patients has improved our ability to demonstrate symptom–rhythm correlation during infrequent episodes of unexplained syncope. In an international study, Brignole et al demonstrated that 74% of patients with recurrent syncope after ILR implant had documentation of the rhythm at the time of symptoms. Furthermore, treatment initiated based on those findings significantly reduced syncope relapse. Similarly, in a cohort of 201 adults with unexplained syncope randomised to receive either an ILR or routine non-invasive follow-up, the ILR provided higher diagnostic rates with no device-related adverse events.

In contrast to reports of the use of the ILR in adults, studies on its use in paediatric patients are limited. Most of the studies report experience in a small number of patients. Rossano et al reported on 21 young patients with an ILR in whom symptom–rhythm correlation was possible in all the patients who had recurrent syncope (67% of the cohort). Kothari et al described nine children with positive ILR findings that included bradycardia thought to be secondary to neurocardiogenic syncope and also tachyarrhythmias. These investigators commented on problems they observed in the ILR automatic detection algorithm resulting in over-recording of artefact in some cases as well as undersensing of certain ventricular arrhythmias. In these studies, there were no complications related to ILR implantation.

The study by Yeung and McLeod reported in this issue of Heart is the largest report of the use of the ILR for assessment of symptoms in children (see page 888). During a 7-year period, 38 ILRs were implanted in 34 paediatric patients. Syncope, seizures and palpitations were the initial complaints that brought the patients to medical attention. Nineteen of the 34 patients (56%) in whom a device was implanted had symptom recurrence allowing for rhythm analysis during their episodes. Of these recurrent symptomatic patients, 11/19 had normal sinus rhythm documented with 8/19 having a documented arrhythmia associated with symptoms. These arrhythmias included such abnormalities as asystole >3 seconds (4/19), polymorphic ventricular tachycardia (2/19) and single cases of ventricular bigeminy and transient heart block.

Although the ILR proved to be useful in some patients in their study, it raises a number of questions about appropriate patient selection. Perhaps the most unusual aspect of the study is the small number of patients who had undergone less invasive means of evaluating the patients for their symptoms before ILR implantation. Although all 34 patients underwent ECG testing before ILR implantation, only four underwent 24-hour ambulatory ECG monitoring and just six had event recording. Although all these means of testing are fraught with problems, they are, importantly, non-invasive, and their use might have obviated the need for an invasive, surgical approach which, according to the authors, carried a nearly 16% incidence of complications requiring explantation. Perhaps equally troubling, almost half of the patients who underwent ILR implantation had complete symptom resolution after their surgery. One wonders if further non-invasive testing might have “resulted” in similar rates of symptom resolution. Finally, in at least one patient with exercise symptomatology, consideration of stress testing, isoproterenol infusion testing or perhaps even an invasive electrophysiological study might have offered important diagnostic answers without the attendant risks of surgical placement of a foreign body.

There is substantial literature suggesting the benefit of patient-activated “external” cardiac loop recorders or event recorders in the assessment of patients with syncope or palpitations of unclear aetiology. These data suggest that a diagnosis can be made in at least 25% of adult patients in whom a diagnosis is not well established for the mechanism of syncope and in 66–83% of patients with palpitations. Newer autotriggered memory loop devices hold promise to improve upon standard patient-activated cardiac loop recorders and this technology is only recently becoming more commonly available. Importantly, these newer loop recorder devices do not require surgical placement.

Careful review of this recent work by Yeung and McLeod in this issue of Heart suggests that ILRs are used more frequently in Scotland than in the USA. In the past 5 years, 487 Reveal monitors were implanted in patients aged <19 years in the USA (97 devices a year—information obtained from Medtronic, Inc). In the USA, with a population of 80.5 million inhabitants aged <19 years (http://www.census.gov, accessed 7 February 2008), this would suggest an average implantation rate of about 1 device per 800 000 people a year. In the Yeung and McLeod work, 34 patients received an ILR over a period of

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7 years (4.8 devices a year). Considering that there are approximately 1.2 million people under 19 years of age in the entire country of Scotland (http://www.gro-scotland.gov.uk, accessed 7 February 2008), the implantation rate would be about 1 device per 250 000 people a year. These numbers indicate that ILRs are used at least three times more often in Scotland than in the US paediatric population. Furthermore, these data may underestimate actual implantation rates in Scotland since this calculation is based on the assumption that one cardiac centre provides service for the entire country, a fact that may not be accurate.

Despite these reservations, it is quite clear that there is a role for the ILR in both adults and children in the assessment of patients with unclear causes for syncope. In a large adult study by Krah

et al., prolonged monitoring via an ILR was more efficacious than less invasive, traditional means of assessing syncope. Sinus pauses were the most common finding with ILK testing. There appear to be significant data supporting its use in some patients. However, at the present time, there are no firm recommendations for its use in children and the indications for its use are still, admittedly, murky at best.

Though of clear benefit in some patients with unexplained symptomatology, it is likely that the mechanism for symptoms can be identified in the majority of the patients without the use of an ILR. Additionally, there are clearly problems related to ILRs, including oversensing, missed arrhythmias and device-related complications such as infection or malfunctions. Until such problems have been better dealt with, in children, their use should probably be limited to a small subset of patients who have exhausted all other, less invasive, means of assessment.

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REFERENCES


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