Transoesophageal electrophysiology study for children: can we swallow the limitations?

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This editorial refers to ‘Rapid and low-cost method to prove the nature of no documented tachycardia in children and teenagers without pre-excitation syndrome’ by B. Brembilla-Perrot et al., on page 1083

Transoesophageal electrogram registration as a diagnostic tool in humans was suggested at the end of the 1950s. The close anatomic proximity of the oesophagus to the posterior wall of the left atrium prompted investigators to use transoesophageal pacing (TEP) for provocation and termination of supraventricular tachyarrhythmias. Differential diagnostic criteria between reciprocating tachycardias using transoesophageal electrodes were developed later. Transoesophageal pacing uses an intraoesophageal electrode positioned in close proximity to the heart, an ECG recorder and a specialized transoesophageal pulse generator. At the present time, this provides the possibility for both asynchronous and programmed pacing. For successful performance and stable position of the electrode, it should be preferably introduced nasally, however, oral access is also acceptable. Ventricular pacing using transoesophageal access was reported at the end of 1960s. However, to date, despite significant technical improvements, ventricular pacing with acceptable tolerance is only achievable in the minority of patients.

The first issue, which should be considered when this procedure is performed, is related to logistics. Most importantly in small children and infants transoesophageal registration and pacing are usually performed under general anaesthesia in most institutes. It is somewhat of a surprise that Brembilla-Perrot et al. used only light premedication in some patients and later even sedation was abandoned. Furthermore, the procedures were performed in the electrophysiology laboratory, which of course does not decrease the burden of the lab.

One of the advantages of TEP is its simplicity. This technique requires minimum training to insert the electrode and to understand the transoesophageal electrogram. Because it is a relatively non-invasive approach, transoesophageal access has an advantage over standard intravascular access for electrophysiological testing.

This factor reduces the risk for infectious complications and those complications related to vascular access potentially occurring during an invasive study. Rare complications are limited to induction of ventricular tachycardia and ventricular fibrillation. No long-term complications have been reported in most published papers.

Non-invasive TEP is very appealing for patients with a history of frequent or rare palpitations that have not been recorded on ECG. In many cases of non-inducible tachycardias, even with provocative drug administration, or when only atrial fibrillation is inducible, reciprocating supraventricular tachycardias seems very unlikely to be responsible for the symptoms. This observation can reduce the number of intravascular invasive electrophysiological studies.

Theoretically, this latter aspect may have significant influence on the cost of medical care and patient compliance.

Although it is not related strongly to paediatric practice, it should be mentioned that diagnostic capabilities of TEP are not restricted only to induction of supraventricular tachycardias. Sinus node automaticity can easily be assessed using pacing manoeuvres before and after autonomic blockade with atropine and occasionally beta-blockade. Atioventricular (AV) conduction can also be assessed with TEP and is very important in patients in whom single-chamber atrial pacemakers can be implanted. Preserved AV-nodal conduction, proven using ECG monitoring and a TEP study, is a reason for single-chamber pacing. Transoesophageal pacing can be used as an alternative to stress testing for non-invasive assessment of transient myocardial ischaemia with documented or suspected coronary artery disease. This alternative method can be suggested for patients with restricted physical capabilities for treadmill testing.

On the other hand, TEP as a diagnostic tool has some major drawbacks. Virtually all patients experience some chest or back pain and burning sensation during TEP. This is especially important for the fragile paediatric population. In many patients, discomfort is tolerable; however, some patients find it completely insufferable, particularly in cases where a high transoesophageal atrial pacing threshold is present. In some cases patients refuse repeat TEP...
because of severe pain and prefer an invasive electrophysiological study.

One of the most important limitations of TEP is the lack of tolerable ventricular stimulation in the majority of patients and of course the lack of His bundle recording, which has crucial role in the diagnosis of some arrhythmias. Ventricular pacing manoeuvres are very important in the majority of electrophysiology studies and the presence of such a non-invasive possibility is extremely desirable. During TEP studies discrimination of reciprocating tachycardias are based only on ventriculo-atrial conduc-
tion time and frequently will be misdiagnosed. Some types of pre-excitation phenomena are difficult to assess using TEP. We noticed that 25 patients out of 82 were reported as patients without significant findings with TEP. Although at first sight it seems to be a fair number to confirm the potential advantages of this diagnostic tool, after careful reading some concerns can still be raised. Interestingly enough, none of the patients actually was diagnosed with atrial tachycardia. It is very unlikely that from 82 symptomatic patients none of them has this entity. Therefore, we presume that atrial tachycardias are either misdiagnosed or actually based on their different inducibility (i.e. different mechanism) could not be initiated. If this is the case it has increased the number of false-negative results. Equally important ventricular tachycardia induction and discrimination are not a part of typical TEP study, although it would be desirable in certain patients. Indeed, in the study of Brembilla-Perrot et al., there are still a few patients left with unexplained syncope, which suggests the need for the full invasive electrophysiology study. These two latter groups together will probably increase the actual positive findings to the level where finally the majority of the patients should undergo invasive therapeutic or further diagnostic testing questioning the clinical utility of this otherwise elegant technique. Considering hospital admission cost, this extra burden on the organization is not negligible.

Since transoesophageal registration and pacing is performed only in a few countries, there are no generally accepted indications and contraindications for this method. Different important applications of TEP have been published, including tachycardia and conduc-
tion disturbance diagnosis, termination of tachyarrhythmias, treatment of persistent hiccups. In our opinion, the most accepta-
ble applications for TEP are the following: provocation of previously non-registered symptomatic supraventricular tachycardias, which is one of the most frequent indications for this procedure. Risk stratification of asymptomatic manifested pre-excitation phenomenon, including patients with recurrent pre-
excitation after catheter ablation, since the effective refractory period can easily be assessed using TEP. Termination of atrial flut-
ters and atrial tachycardias although atypical atrial flutter sometimes very resistant to fast pacing from the oesophagus.

In conclusion, based on the balance between the above-
mentioned advantages and disadvantages, the use of transoesopha-
geal registration can be considered: (i) when cheaper than an intra-
cardiac study. It can be applied for screening, although with a consequent invasive testing becomes an extra cost. (ii) It can be performed on the ambulatory basis even during consultation. (iii) Most importantly, it can be performed repeatedly for dynamic observation and follow-up if necessary.

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