

Experience and training in temporary transvenous pacing

ABSTRACT—Competence in temporary transvenous cardiac pacing is an important part of general professional training. A questionnaire survey from district general hospitals in the North West Region suggests junior medical staff have little experience in this procedure and require a formal teaching programme.

Competence in temporary transvenous pacing is an essential part of the training of junior physicians. Temporary pacing is often required as an emergency procedure and is usually performed by senior house officers (SHOs) and registrars. The incidence of complications from this procedure has been increasing and may be due to poor training and lack of consultant supervision [1]. Like Winner and Boon [2], we have observed complications related to temporary pacing in patients referred to our cardiac unit for permanent pacemaker implantation with temporary leads *in situ*. We thus sought to assess the level of technical skill, experience and radiation practices as related to temporary pacemaker insertion of all doctors (SHOs and registrars in general and elderly medicine) who may be called upon to insert temporary pacemakers in our referring district general hospitals. The management of basic complications and the need for further training were also determined.

Methods

This survey was performed in July 1995. Junior medical staff were visited by one of the authors to explain the purpose of the survey. They were then asked to complete an anonymous questionnaire aimed at assessing doctors' experience in central venous cannulation and temporary pacing-lead positioning, as well as their individual radiation practices. The management of complications and the need for further training were also investigated. The full questionnaire is shown in Table 1.

Results

Eleven registrars and 33 SHOs working in district general hospitals (DGHs) in Lancashire took part in this survey. The mean number of years worked since qualification was 3 for SHOs and 8.5 for registrars; 3 (9%) SHOs and 10 (90%) registrars had passed the

Membership examination of the Royal College of Physicians. All doctors had learned to perform central venous cannulation and to insert temporary pacing leads by observing colleagues (registrars and SHOs) and only three had had some consultant teaching. Thirty-three doctors (75%) had inserted less than five temporary pacemakers during their career, no doctor had inserted at least five temporary pacing leads in the preceding 12 months and 74% did not know how to perform post-implant pacing threshold measurements. Most doctors were able to perform subclavian vein cannulation and 32 (72%) used this route routinely (Table 2). However, 48% could not perform internal jugular venous cannulation and 60% often needed help for successful central venous access, whichever route was attempted.

The estimated average duration for a temporary pacing procedure was 25 minutes, with 60% of doctors having previously had to call a colleague for assistance with the procedure. Thirty per cent frequently had difficulty in positioning temporary pacing leads while 50% had 'failed to position a lead' at least once in the preceding 12 months. The same number had had to reposition/replace pacing leads for pacing malfunction or infection, yet 44% of doctors would not consider removing a pacing lead if infection developed. Half the doctors did not know whether their X-ray screening times were recorded and a similar number did not wear a radiation monitoring badge. Forty-three per cent had not attended an approved radiation protection training course. All doctors felt that they would benefit from further training in temporary pacing practices and would welcome most teaching methods.

Discussion

Many reasons have been put forward to account for the high rate of complications associated with temporary transvenous pacing. Our study shows that physicians lack the necessary experience and feel inadequately prepared to perform the procedure. They had difficulties both with central venous access and with positioning the lead. The Medical Practice Committee and Council of the British Cardiac Society [3] recommend that the internal jugular approach should be used for venous access for most patients requiring temporary pacing. This route, however, is not commonly used as first preference and is unfamiliar to many of the junior physicians interviewed. They also know little about the necessary post-implantation checks and care of the temporary pacing system, and are reluctant to remove and resite a pacing electrode if

G K DAVIS, MRCP, Research Registrar, Regional Cardiac Centre, Blackpool Victoria Hospital

D H ROBERTS, MD, MRCP, Consultant Cardiologist, Regional Cardiac Centre, Blackpool Victoria Hospital

Table 1. Questionnaire on training and experience in temporary pacing

Year of primary medical qualification?	
Postgraduate degree or diploma in Medicine YES/NO:	MRCP/Other
How long have you been in post?	<6 months/6–12 months/12–24 months/ >24 months
Temporary pacing procedures (last 12 months)?	<5, 5–10, 10–15, 15–20, >20
How many procedures have you ever done?	>5, 5–10, 10–15, 15–20, >20, >50, >100
What route of venous access do you normally use?	subclavian/jugular/femoral/antecubital/other
Which routes of venous access can you do?	subclavian/jugular/femoral/antecubital
How often do you need help with	
(a) venous access?	never/occasionally/frequently
(b) wire positioning?	never/occasionally/frequently
Who would you ask for help with wire insertion or venous access?	on call medical registrar/on call anaesthetist/consultant/other
How did you train to perform central venous access?	observation (Cons, SR, Reg, SHO), books, video, other
How did you train to position temporary pacing wires?	observation (Cons, SR, Reg, SHO), books, video, other
In the last twelve months	
a Have you ever failed to obtain venous access?	YES/NO
b Have you ever failed to obtain satisfactory pacing lead position?	YES/NO
c Had a pneumothorax as a complication?	YES/NO
d Had to reposition a pacing lead?	YES/NO
e Had to abandon the temporary pacing procedure?	YES/NO reason
Where is the pacing procedure usually performed?	CCU/Ward/A&E Dept/Theatre/x-Ray Dept/Other
Estimated duration of your procedure in minutes?	
Who is present with you during the procedure?	nurse/house officer/registrar/senior colleague/radiographer/ECG technician
Is a record kept in your hospital of your screening times?	YES/NO
Do you routinely wear a radiation badge during the procedure?	YES/NO
Have you attended a radiation protection course?	YES/NO
Have you ever had to call in a second colleague resident	
outside the hospital?	YES/NO
within the hospital?	YES/NO
Have you ever had to send the patient to another hospital for temporary pacing?	YES/NO
What threshold (volts) do you aim for at wire insertion and how often (%) do you achieve your aim?	
Does your unit routinely perform threshold checks on the day(s) after the procedure?	YES/NO
Who does these checks?	doctor/nurse/technician/senior colleague
Can you personally perform post-implant threshold checks?	YES/NO
How would you manage a patient with a raised temperature and a temporary pacing wire?	
Would you remove the lead?	YES/NO
Would you like training in temporary pacemaker techniques?	YES/NO
Venous Access:	subclavian/int jug/antecubital/lead positioning
What format would you prefer?	video/lecture/interactive group discussion/manual

Table 2. Junior doctors' ability and preference for selected routes of central venous cannulation in temporary pacing procedures

Route of venous access	Able to perform (%)	Preferred route of access (%)
Subclavian	96	71
Internal Jugular	52	23
Femoral	34	0
Antecubital	45	6

infection develops systemically and/or at the insertion site.

The use of fluoroscopy is governed by a European Community directive [4], but a surprisingly large number of physicians had not attended a radiation protection course. This adds to the concerns of Partridge [5] who suggests that 'many cardiology trainees have a poor appreciation of X-ray technology'.

This survey reveals that junior medical staff in district general hospitals have little experience in temporary pacing and require a formal teaching programme as part of their general professional training [6]. We recommend that this be supported by district health authority purchasers of local cardiac services. Important aspects of internal jugular venous cannulation and the temporary pacing procedure are presented in boxes 1 and 2 respectively.

Acknowledgement

We thank the doctors and their associated hospitals for participating in this study.

References

- Murphy JJ, Frain JPJ, Stephenson CJ. Training and supervision of temporary transvenous pacemaker insertion. *Br J Clin Pract* 1995;49:126-8.
- Winner S, Boon N. Clinical problems with temporary pacemakers prior to permanent pacing. *J R Coll Physicians Lond* 1989; 23:161-3.
- Parker J, Cleland JGF. British Cardiac Society Newsletter. *Br Heart J* 1993;70:294-6.
- European Economic Community. Ionising radiation regulations 1988. Brussels: EEC, 1988.
- Partridge JB. Training in cardiology: The future. Letter to the editor. *Br Heart J* 1995;74:571.
- Murphy JJ. Guidelines for specialist training in cardiology. Letter to the editor. *Br Heart J* 1995;74:571-4.
- Daily EK, Tilkian A. Venous access. In: *Cardiovascular procedures—diagnostic techniques and therapeutic procedures*. 1st edn. USA: Mosby, Missouri, 1986:32-65.
- Fitzpatrick A, Sutton R. A guide to temporary pacing. *Br Med J* 1992;304:365-9.

Box 1. Internal jugular vein cannulation [7]

Low central approach using Seldinger technique

Patient preparation

- Patient in a supine or head down position
- Head turned to the opposite side
- Aseptic technique, clean and drape the neck and clavicular region

Anatomy

- Palpate the lower neck for the apex of a triangle formed by the sternal and clavicular attachments of the sternomastoid muscle and the medial aspect of the clavicle

Technique

- Anaesthetise the apex of the triangle
- Introduce the Seldinger needle at a 30° angle to the frontal plane
- Aspirate while advancing the needle in the direction of the ipsilateral nipple
- Enter the vein and remove the syringe
- Advance a guide wire through the needle
- Remove the needle and advance a sheath/introducer unit over the guide wire into the vein
- Remove the guide wire and introducer leaving the sheath present

Box 2. Pacing lead positioning [8]

- Insert lead (usually 6F bipolar) via a sheath placed in a central vein
- Direct the lead across the tricuspid valve
- Alternatively, loop it against the right atrial wall and rotate it across the tricuspid valve
- Advance towards the right ventricular apex

Threshold measurement

- Initiate pacing at a rate above the patient's intrinsic rate
- Decrease output voltage in 0.1 volt (V) increments until loss of ventricular capture
- A value < 1 V after insertion is optimal
- Set pacing box to Demand mode with a pulse amplitude of 3 V (or 2 V greater than the threshold)
- Check threshold daily

Radiation points

- Keep exposure time to a minimum by screening only when it aids lead positioning
- Wear a protective fastened lead/rubber apron
- Wear a radiation badge under the protective apron
- Take necessary advice from a radiographer, who should be present

Address for correspondence: Dr G K Davis, Regional Cardiac Centre, Blackpool Victoria Hospital, Blackpool FY3 8NR.