Piercing the left lung with a pacemaker lead, an uncommon complication

A.A. Hassan, J. Widdershoven, M.A. Molenaar, J. Winter

Although percutaneous insertion of pacemaker leads is a simple and safe method, it remains a procedure with a relatively high complication rate. We describe an uncommon and avoidable complication of this technique: piercing the lung with a pacemaker lead in an obese patient after direct puncture of the subclavian vein. (*Neth Heart J* 2004;12:537-9.)

Key words: haemothorax, pacemaker complication, pneumothorax, subclavian vein puncture

Since the first pacemaker implantation in 1958, cardiac pacing has continued to grow with about 400,000 pacemakers implanted worldwide each year.[1] Although percutaneous insertion of pacemaker leads is a simple and safe method, it remains a procedure with a relatively high complication rate. We report an unusual, and more important, avoidable complication of this technique.

Case report

A 79-year-old lady, known to have complete right bundle branch block, was admitted to our hospital after a collapse. Physical examination revealed a high blood pressure of 200/100 mmHg and a slow heart rate below 50 beats/min. She was obese, with a body weight of 90 kg and a length of 1.67 m. The electrocardiogram showed a complete atrioventricular block with an escape rhythm of 47 beats/min with right bundle branch block and normal sinus node activity. She was scheduled for implantation of a VDD pacemaker (single lead, sensing and pacing in the right ventricle and sensing in the right atrium).

Before the procedure, the area of the left clavicle was covered with a film wound dressing to straighten the skin. An attempt to direct puncture the left subclavian vein was made. A single pacing electrode was positioned in the apex of the right ventricle. At the end of the procedure the patient complained of pain in the left scapula region; fluoroscopy showed no signs of pneumothorax. However, a routine follow-up chest X-ray revealed a haemothorax on the left side, and even more important, the pacemaker lead was positioned below the second rib (figure 1). A CT scan showed a pneumothorax, haematothorax and a pacemaker lead through the apex of the left upper lung lobe, eventually entering the innominate vein (figure 2). In a second procedure, the pacemaker lead was removed and another lead was successfully inserted via the left subclavian vein (figure 3). The recovery of the patient was uneventful.

Discussion

Pacemaker implantation is a routine procedure in modern cardiology. Although it is a safe procedure, one should not underestimate the possibility of complications. These can be divided into early complications, in the six-week period following implantation, and late complications.[2,3] Complications due to the pacemaker lead insertion fall within the early group. The present case underscores that in obese patients, blind puncturing of the subclavian vein should be performed with extreme care and caution.

The subclavian vein is the most common venous access site. In general, there are two common approaches to obtain that access: venous cutdown of the cephalic vein and blind puncture of the vein.[4] Cutdown of the cephalic vein was the standard procedure in the late 1960s. The advantage of this method is that it provides a safe access to the subclavian vein. However, it is somewhat difficult to perform in obese patients when the landmarks are more obscure. It is also more time consuming than blind subclavian vein puncture in which the vein is approached in its intrathoracic segment.[3,4]

A.A. Hassan
J. Widdershoven
M.A. Molenaar
J. Winter
Department of Cardiology and Department of Radiology, TweeSteden Hospital, Tilburg

Correspondence to: A.A. Hassan
Department of Cardiology, TweeSteden Hospital,
Dr. Deelenlaan 5, 5042 AD Tilburg
E-mail: Ahmed70nl@hotmail.com

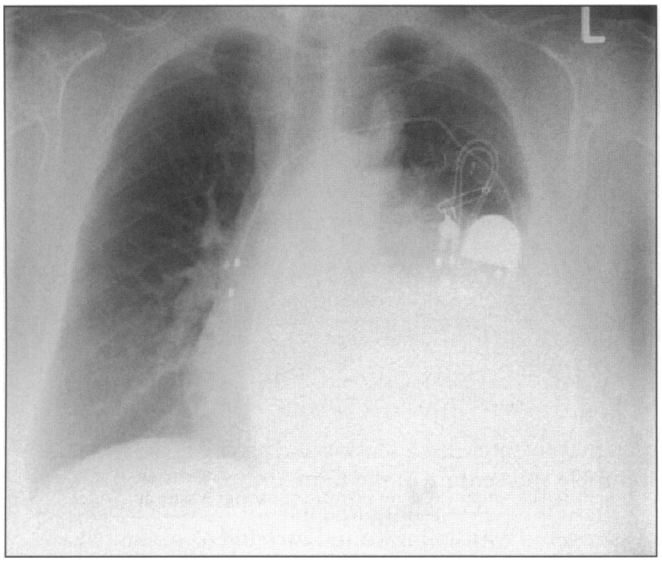

Figure 1. The pacemaker electrode at the level of the second rib with haemothorax on the left side.

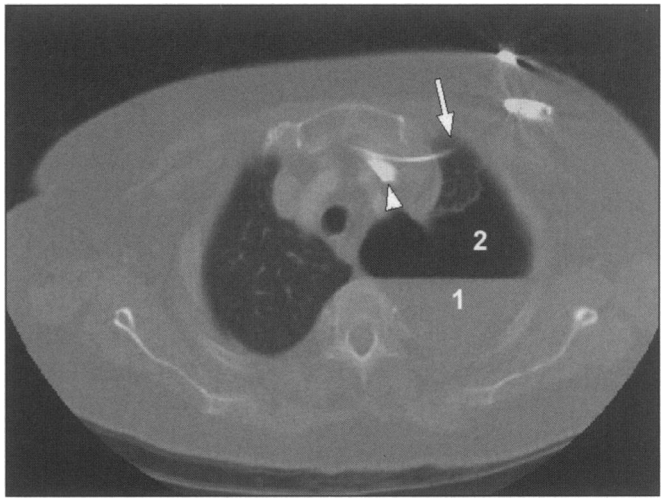

Figure 2. CT-scan with contrast showing the pacemaker electrode (arrow) passing through the left lung into the innominate vein (arrow head). The haematothorax (1) and pneumothorax (2) are also visible.

Since its introduction by Littleford et al., blind subclavian vein puncture has gained more popularity amongst physicians and is the most frequently practiced approach for pacemaker lead insertion.[5] This is due to its simplicity and suitability for multiple-lead placement. In addition, many implanters favour subclavian puncture because they feel that it speeds up the procedure. However, the debate about the safety and efficacy of this method is not yet settled, since this approach imposes a higher risk, especially when performed in patients with obscure body landmarks and in the hands of less experienced physicians.[3-6] Parsonnet et al. and Furman compared the complication rates between the percutaneous approach and cephalic cutdown.[7-9] They studied 632 cases performed by 29 physicians over a period of five years. There were 37 perioperative complications. The complication rate would drop from 5.7% to an acceptable 3.5% if the complications related to blind subclavian vein puncture were excluded. They also found that physicians performing less than 12 pacemakers per year have a higher incidence of complications. Parsonnet et al. have even recommended that this approach to be reserved as a second choice should the venous cutdown fail. Chauhan et al. have also associated a higher complication rate with the subclavian approach when compared with the cephalic approach.[2]

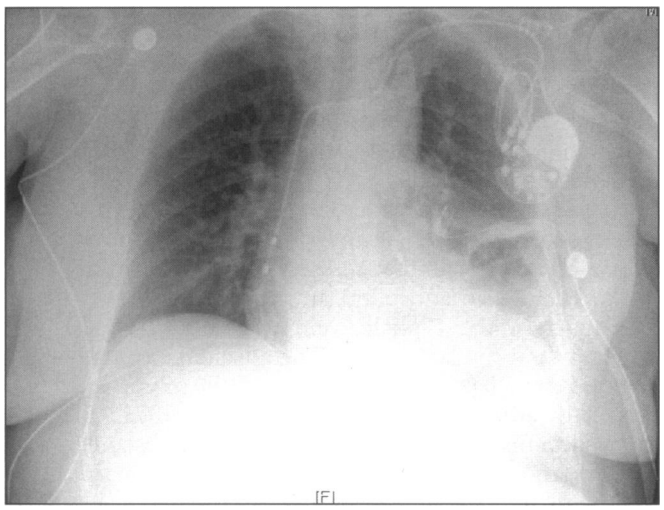

Figure 3. Pacemaker electrode after correction.

These findings highlighted the risks of the blind subclavian venous puncture technique and they encouraged the search for a better alternative to this approach. The extrathoracic subclavian venous puncture could be an alternative because the vein can be approached in its extrathoracic segment.[10] Magney and colleagues have introduced this method. It is performed by identifying bony landmarks on the skin that define the entry and target points. The former is located at the junction of the middle and lateral thirds of a line drawn between the middle of the sternal angle and the coracoid process of the scapula. The target point, which represents the ideal place to puncture the vein, could be identified at the junction of the medial and middle thirds of the clavicle. With this method, Gardini and Benedini studied the success and complication rate in 250 patients undergoing pacemaker lead implantation. In five patients (2%), the vein could not be found. In particular subsets of patients, for example obese patients (as in our case), those with a large build or when the clavicles are bowed anteriorly, the procedure was more difficult

and in some cases two or more attempts were needed. Eventually the implantation via this technique was successful in 245 (98%). In five (2%) of the cases the subclavian artery was punctured. There were no complications related to the venous approach and no major complications are observed. The overall complication rate was 2.9%, seven cases (two subclavian vein thromboses, five lead dislodgments in four patients and one pocket haematoma). This method could prove to be a suitable alternative to the classical blind intrathoracic subclavian venous puncture combining the advantages of that method and the safety of approaching the vein outside the thorax.

Conclusion

The present case underscores that in obese patients, blind puncture of the subclavian vein should be performed with extreme care and caution. In our obese patient, covering the skin with film wound dressing obscured the anatomical landmarks, leading to a low skin incision and subsequent puncture of the apex of the left lung and the innominate vein.

In our opinion, cutdown of the cephalic vein is the first-choice approach, if this approach fails the classical direct blind puncturing of the subclavian vein or the extrathoracic subclavicular venous puncture are alternatives. Nevertheless, the debate about the best technique will and should go on. ■

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