Case report

Successful reimplantation of a phrenic nerve stimulator after traumatic exteriorisation

Françoise Le Pimpec-Barthes a,1, Jean-Pierre Hubsch b, Stéphane Payelleveille c, Thomas Similowski d,*

a Department of Thoracic Surgery; Hôpital Européen Georges Pompidou, Assistance Publique-Hôpitaux de Paris, Paris, France
b Department of Anaesthesiology; Hôpital Européen Georges Pompidou, Assistance Publique-Hôpitaux de Paris, Paris, France
c Private practice, Bruay La Bussière, France
d Department of Respiratory and Intensive Care Medicine, Groupe Hospitalier Pitié-Salpêtrière, Assistance Publique-Hôpitaux de Paris, 47-83 Bd de l’Hôpital, 75651 Paris Cedex 13, France

Received 10 August 2005; received in revised form 15 October 2005; accepted 17 October 2005; Available online 6 December 2005

Abstract

A quadriplegic patient experienced post-traumatic exteriorisation of the subcutaneous receiver of a phrenic pacemaker. In the absence of infection and stimulation dysfunction in the patient, the device was reimplanted with full success at 1 year. This strategy can, exceptionally, be considered if removal and subsequent implantation is impossible or refused.

© 2005 Elsevier B.V. All rights reserved.

Keywords: Diaphragm pacing; Reimplantation; Infection; Quadriplegia; Ventilator-dependency

1. Introduction

In patients who are ventilator-dependent because of high cervical cord injury, diaphragm pacing allows full separation from an external mechanical ventilator [1—3]. Bi- or quadrripolar electrodes are implanted around the phrenic nerves and connected to subcutaneous receivers placed on the chest wall. Stimulation parameters and energy are sent transcutaneously by radiofrequency transmission. Infection at the implant site, albeit rare, is a major complication [4]. The standard therapeutic approach consists of implant removal. The subsequent implantation of a new device is technically possible, but at an increased risk of phrenic nerve injury and with an economical cost that is not always compatible with available resources. We report the successful reimplantation of a phrenic pacing receiver after its traumatic exteriorisation.

2. Case report

A 47-year-old C2 quadriplegic patient with successful diaphragm pacing for the past 17 years (Avery-Dobelle stimulator, New York, USA) suffered traumatic skin ulceration immediately above the right receiver (left, Fig. 1). Microbiological assessment was negative. A month later, the device became fully exteriorised (middle, Fig. 1), but diaphragm pacing remained efficient with unchanged parameters. Phrenic nerve conduction times were normal (right 7 ms and left 8 ms). There was no fever, a normal blood polymorphonuclear count and no increase in C-reactive protein. After complete information of the patient about the risks and costs of a removal—reimplantation approach and those of a simple reimplantation, a decision was made in favour of the latter. In the operating room, a sample of necrotic tissue around the receiver was cut off and an intravenous injection of cefazolin (2 g) was administered. The skin around the receiver and the receiver itself were impregnated with povidone iodine for 30 min. The sides of the wound were economically resected and a flap of skin with subcutaneous tissue was positioned above the receiver. The entire operative field was impregnated again with povidone iodine for 30 min before closing on the two subcutaneous small drains. Postoperatively, intravenous methicillin (3 g daily) and gentamicin (240 mg daily) were started, methicillin being replaced at day 3 by vancomycin upon identification of a methicillin-resistant strain of Staphylococcus aureus. The patient was discharged on the seventh postoperative day. Daily subcutaneous injections of teicoplanin were administered for 80 days. Healing was perfect (right, Fig. 1). One year after the intervention, the patient was in stable condition, had experienced neither
fever nor hyperleukocytosis, and the efficiency of phrenic pacing on the operated side was unchanged. The same held true after 18 months.

3. Discussion

The late total exteriorisation of a phrenic pacemaker receiver is uncommon, not mentioned in a large survey of the complications of the technique [4]. The most straightforward attitude in such a case is probably to remove the exteriorised device, and to reimplant another one at a later stage. However, the reimplantation of a phrenic pacemaker is not as simple as the replacement of a subcutaneous intravenous injection chamber or of a cardiac pacemaker. In our patient, phrenic pacing remained adequate and the absence of any sign of infection other than locally made reimplantation was considered. The reluctance of the patient to accept any risk of subsequent stimulation failure made this strategy to prevail. Indeed, patients with diaphragm pacing generally insist that they would not welcome a step back to the dependency from an external ventilator.

Although conservative approaches of similar nature have been reported for the management of pocket infections during cardiac pacing of left ventricular assistance [5,6], it should be stressed that the attitude described here should not be extrapolated to devices connected to intravenous leads, because of the threat of ascendant bacterial migration and subsequent septicemia or endocarditis. Of note, in the present observation, extreme precautions were taken against infection both during the intervention and during the post-interventional management. It is likely that the duration of iodine impregnation used (50 min) and the duration of antibiotic therapy were largely excessive, but there is no helpful information in the literature to ascertain what would minimal durations be.

The complication of phrenic pacing described here can probably be prevented. Receivers should be implanted in a deep enough subcutaneous pocket just above a muscle plane. This pocket should not be too lateral. Pacing should not start before all surgical scars are totally wounded. Later on, caregivers should be careful to avoid local traumatisms.

In conclusion, this report is not intended to suggest that reimplantation should be a generalised management strategy for phrenic pacemakers exteriorisations. It just indicates that it is a possible option. In addition, this approach can be helpful in situations where funding is an issue.

References