Reel Syndrome: A Variant Form of Twiddler’s Syndrome

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Reel syndrome is a variant form of twiddler’s syndrome. We describe a 53 years old woman who was referred to our hospital because of symptomatic sinus bradycardia. Subsequently she underwent dual chamber pacemaker implantation and was sent back to the previous hospital on the following day. She was referred again because of sudden syncope due to low heart rate 2 weeks following implantation. Chest X-ray revealed leads had pulled out of the heart and coiled up around the pacemaker generator; a diagnosis of reel syndrome was made. The difference between the two syndromes, risk factors and preventive measures were discussed.

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Key words: Reel syndrome, Pacemaker implantation, Coiling lead, Complication

Introduction

Twiddler’s syndrome is a rare complication of pacemaker implantation. This syndrome is characterized by coiling of the pacemaker lead due to rotation of the pacemaker generator on its long axis. The first description was reported by Bayliss et al in 1968.1 The syndrome occurs more often among elderly, obese, dementia and mental disorder patients.2–4 Previous reports have noted a tendency of increased complications in women with twiddler’s syndrome, suggesting lax subcutaneous tissue along the pendulous breast that may potentially form a large loose pocket.5,6 Reel syndrome is another variant of twiddler’s syndrome. It occurs due to the rotation of the pacemaker generator on its transverse axis with subsequent coiling of the pacemaker leads around the pacemaker generator. The first report by Carnero-Varo in 1999 described a 70 year old man in whom this complication occurred 1 month after implantation of a single chamber pacemaker to treat atrial fibrillation with slow ventricular response.7 Some literature still use the term twiddler’s syndrome, although the clinical manifestation confirm that it is actually reel syndrome.3,8–10 Most of the reported cases of reel syndrome describe lead dislodgement without damage to the lead.3,7,9,11,12 On the other hand, twiddler’s syndrome is frequently associated with lead dislodgement, either with lead fracture or insulation leakage.13,14

In this report, we describe a patient with a dual chamber pacemaker who presented with sudden onset of syncope after 2 weeks of implantation and was subsequently diagnosed as having reel syndrome.
Case report

A 53 year old woman (body height 156 cm, body weight 60 kg) was referred to our hospital because of severe bradycardia on 24th February 2010. She has been treated for ischemic stroke in the previous hospital for 2 weeks. The presenting symptoms were hemiparesis of her right extremities, and cranial nerve paresis including facial, hypoglossal and cognitive impairment. The resting electrocardiogram (ECG) demonstrated sinus node disease (Figure 1A).

A dual chamber pacemaker was implanted via the right subclavian vein. A screw-in ventricular lead was placed at the high right ventricular septum and another screw-in atrial lead was placed at the right atrial appendage. Fixation of both leads was done in the standard fashion by suturing on lead sleeve with silk suture. The pacemaker generator was then connected to both leads and placed into a subcutaneous tissue pocket. Both redundant leads were put under the pacemaker generator. The wound was closed using absorbable suture. The day after surgery, her ECG, as shown in Figure 1B, confirmed that pacemaker function was good. Her chest X-ray also confirmed that the pacemaker generator and its leads were in proper position (Figure 2). The patient was sent back to her previous hospital for stroke management.

On 11th March 2010, the patient was reported to have experienced dizziness and near syncope. Her ECG showed both atrial and ventricular spikes uncaptured and her own rhythm back to marked sinus bradycardia and junctional escape beat. All ECGs were recorded at speed of 25 mm/second.

Figure 1
A. ECG showed sinus bradycardia (1st, 2nd and 3rd P wave) and sinus arrest (between 3rd and 4th P wave) with junctional escape beat (4th QRS complex). B. One day after implantation showed tall spike followed by P wave and normal QRS complex without spike indicating unipolar atrial lead setting and long AV delay of normal dual chamber pacemaker function. C. There were 2 types of spikes. Tall spike (black arrow) indicating unipolar lead from atrium and small spike (white arrow) indicating bipolar lead (from right ventricle). Both were not captured and sensing. The rhythm was marked sinus bradycardia and junctional escape beat. All ECGs were recorded at speed of 25 mm/second.

Figure 2
Chest X-ray was taken 1 day following pacemaker implantation. Pacemaker generator and its leads were in proper position. The path of the leads was clearly through the subclavian venipuncture (white arrow). Tip of the atrial lead was not clearly seen, but the right ventricular lead was placed at the high right ventricular septum (black arrow).
sinus bradycardia with junctional escape beat or rhythm (Figure 1C).

She was referred again to our hospital for further investigation. We brought the patient to the catheterization room for fluoroscopy which revealed that both leads had been dislodged. Leads were coiling several times around the generator (Figure 3A) and the diagnosis of reel syndrome was made. The patient denied having manipulated the pacemaker, and we suspected that the generator was unintentionally turned because her left arm was active and some scratch mark on the skin at the pacemaker implantation area was clearly seen.

We performed a second operation to reposition the leads. The leads were found to wrap the pacemaker generator without any signs of insulation leakage and conduction damage. The right ventricular lead was repositioned and placed at the middle right ventricular septum and the right atrial lead was placed at the right atrial appendage. Both leads were fixed with nonabsorbable suture on its sleeve with surrounding fascia and muscles. To confirm good fixation, the leads were pulled with adequate strength. Additional sutures using non-absorbable material were added to obtain good fixation of the pacemaker generator. The pocket was made within the subpectoral muscle for adequate fixation (Figure 3B). After subsequent follow up, the patient was well, the pacemaker function was good and no complications have been noticed.

Discussion

Twiddler’s and reel syndrome both have similar etiologies. Female gender, large pocket, obesity, children, older people and dementia can be listed as contributing factors. Even though the etiologies are quite similar, the mechanisms may differ. In reel syndrome, a ratchet mechanism was probably responsible for this syndrome.15,16) Therefore reel syndrome is characterized by rotation of the permanent pacemaker on its transverse axis and rolling of the electrode around the generator. Due to lead or leads rolling around the pacemaker generator, most of the time reel syndrome is manifested without any damage the the lead or leads. A chest X-ray is the most important and simplest method for diagnosis.

Pacemaker programming is a second possibility. We also have to know whether there is any lead insulation leakage or fracture. Repositioning of the leads into proper position within the heart is a simple procedure without the need for lead replacement. Most cases of reel syndrome occur within a month of implantation, whereas twiddler’s syndrome can occur later, up to one year from implantation (Table 1). In our case, this complication occurred within 2 weeks after implantation. Although we performed lead fixation in the standard manner, unsecure fixation may remain unrecognized. Confirmation of secure fixation of the lead or leads by

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**Figure 3A**
Dislodgement of the right atrial and ventricular lead with both tips was at the superior cava vein. Both leads wrapped around the pacemaker generator.

**Figure 3B**
Just after reposition procedure. Both right atrial and ventricular leads were already placed in proper position. There was no difference in X-ray appearance between Figure 2 and Figure 3B in terms of the pacemaker generator and the leads around it. The difference was in its procedure (see text).
pulling each lead with adequate strength may help. Cooper proposed that leads can spontaneously retract during normal arm movement, without any conscious or unconscious device manipulation by the patient. Hence, leads must be firmly secured in the device pocket via their suture sleeves in order to minimize the risk of retraction, regardless of mechanism.17

Reel syndrome can occur in either pacemaker, cardiac resynchronization therapy device or in implantable cardioverter defibrillator (ICD) patients.18,19 It may lead to a series of complications such as syncopal attack and lethal cardiac arrhythmias, especially in pacemaker-dependent patients, as well as catastrophic consequences when the ICD is involved.

Preventive measures such as patient education and use of a smaller pocket will reduce the risk of developing the syndrome. Suturing the pacemaker generator into surrounding tissue, as well as placing the generator into the pectoral muscle may also prevent the syndrome. Other preventive measures include using a compression band around the upper chest and shoulder, and tightening of the patient’s arm for at least five to seven days.11 The use of a Dacron patch would stabilize the pulse generator by promoting tissue in-growth. The necessity for careful follow-up, especially in the first few months after surgery, needs to be underscored. The use of a Dacron pouch and adequate fixation of the device header should be strongly considered for patients at risk.20,21

References
15) Wollmann CG: Reel syndrome—the ratchet mecha-

Table 1  The difference between twiddler’s and reel syndrome

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<thead>
<tr>
<th></th>
<th>Twiddler’s syndrome</th>
<th>Reel syndrome</th>
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<tr>
<td>Mechanism</td>
<td>Rotation of the pacemaker generator on its long axis</td>
<td>Rotation of the pacemaker generator on its transverse axis (ratchet mechanism)</td>
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<td>X ray</td>
<td>Tangling of lead or leads around pacemaker generator</td>
<td>Lead or leads rolling around pacemaker generator</td>
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<tr>
<td>Consequences on lead</td>
<td>Lead damage can occur, either lead fracture or insulation leakage Sometimes with depleted battery</td>
<td>No damage of the leads</td>
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<td>Procedure of treatment</td>
<td>Replace with a new lead and maybe pacemaker generator</td>
<td>Reposition of the lead</td>
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<tr>
<td>Occurrence</td>
<td>Possibly within a year</td>
<td>Within a month</td>
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