CASE REPORT

Sinus Arrest and Asystole Caused by a Peripherally Inserted Central Catheter

Allison Nazinitsky, M.D., Melody Covington, M.D., and Laszlo Littmann, M.D., Ph.D.

From the Department of Internal Medicine, Carolinas Medical Center, Charlotte, North Carolina, USA

Background: Transient bradycardia in the critical care setting is frequently caused by hypoxemia or oropharyngeal manipulation. Central lines have been associated with a variety of cardiac arrhythmias, but sinus arrest and asystole have not been previously reported.

Methods: A 38-year-old woman with multisystem organ failure had several episodes of prolonged sinus arrest, slow junctional escape rhythm, and periods of asystole lasting over 6 seconds. The cause of the repetitive bradyarrhythmia was evaluated by clinical observation including the response to parasympatholytic agents, by detailed analysis of rhythm strips, and review of cardiac imaging studies.

Results: The episodes of bradycardia did not coincide with orotracheal manipulation, were not prevented by escalating doses of glycopyrrolate, and were not accompanied by AV conduction disturbance as is frequently seen during a transient increase in vagal tone. Review of the patient's chest X-ray and chest CT revealed that the tip of a peripherally inserted central catheter migrated to the vicinity of the sinoatrial node. Removal of the catheter resulted in prompt resolution of the episodes of sinus arrest.

Conclusions: This case demonstrates that migration of a peripherally inserted central catheter to the sinoatrial node can provoke prolonged sinus bradycardia, sinus arrest and asystole.

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intensive care unit; peripherally inserted central catheter; catheter migration; sinus arrest; asystole

Several types of arrhythmias have been documented in association with central line placement including premature atrial contractions, premature ventricular contractions, repetitive ectopic atrial tachycardia, atrial fibrillation, paroxysmal supraventricular tachycardia, and ventricular tachycardia.^{1–7} These arrhythmias usually occur during insertion of the venous catheters when the guide wire or the catheter itself pops into one of the cardiac chambers resulting in irritation of the right atrium or the right ventricle.^{6,7} Withdrawal or removal of the catheter usually results in resolution of the tachyarrhythmia. Transient sinus deceleration and sinus arrest, however, an otherwise frequent occurrence in the intensive care unit, have not been previously associated with the presence of a central line. In this report, we present a case where prolonged

sinus arrest and episodes of asystole were caused by mechanical irritation of the sinoatrial (SA) node by the tip of a peripherally inserted central catheter (PICC) line.

CASE PRESENTATION

A 38-year-old woman with no cardiac history has been hospitalized for 3 months for multisystem organ failure caused by intraabdominal abscesses and fungemia. She was extremely debilitated and ventilator dependent, ventilated through a tracheostomy. A left basilic vein PICC line had been placed with ultrasound guidance by radiology for administration of intravenous antibiotics. At the time of the line insertion, chest X-ray confirmed the appropriate position of the PICC line. The PICC line was sutured in place.

Address for correspondence: Laszlo Littmann, M.D., Department of Internal Medicine, Carolinas Medical Center, P. O. Box 32861, Charlotte, NC 28232, USA. Fax: 704-355-7626; E-mail: Laszlo.Littmann@carolinashhealthcare.org

Figure 1. Panel A: 24-hour heart rate trend curve demonstrating a relatively regular rhythm interrupted by several episodes of abrupt but transient decelerations. Panel B: representative continuous 30-second rhythm strip during one of the bradycardic episodes. Note that the fifth P wave (P) is slightly delayed; this is followed by a 20.5-second period during which there are no P waves recorded (red). There is a slow junctional escape rhythm (E) resulting in profound bradycardia including a 6-second episode of asystole. Also note that all PR intervals are short and there is no PR prolongation or AV block either at the onset or at the termination of the bradycardia.

Figure 2. Chest X-ray (left) and chest CT (right) demonstrate that the tip of the central line is at the superior vena cava and right atrial junction (arrows).

Approximately 10 days following placement of the PICC line, the patient was noted to have multiple daily episodes of abrupt sinus deceleration resulting in profound bradycardia and episodes of asystole. Except for these paroxysms, the sinus rate

was normal at about 80–100/min. Initially it was assumed that the bradycardic episodes were due to vagal stimulation from tracheostomy suctioning, but later it was noted that the episodes occurred even without manipulation of the tracheostomy

site and without movement of the patient's head and neck. Glycopyrrolate was administered at 2 mg every 8 hours as a vagal blocking agent, but it had no effect on the episodes of bradycardia.

Figure 1 is a representative example of an episode of abrupt and profound bradycardia. Panel A illustrates a 24-hour heart rate trend curve. Panel B is a continuous 30-second telemetry rhythm strip recorded during one of the spells. It starts with normal sinus rhythm with short PR intervals. There is a very brief period of sinus deceleration followed by complete sinus arrest lasting for 20.5 seconds: the first sinus P wave does not appear until the second half of the bottom strip. During sinus arrest, there is a slow junctional escape rhythm with periods of asystole lasting up to 6 seconds. Note that neither at the onset or at the resolution of sinus arrest is there any associated PR prolongation or AV block. The apparent rapid electrical activity at the end of the recording is artifact probably related to muscle jerking.

The patient's episodes of sinus arrest were consistent with transient direct irritation of the SA node. Upon repeat chest X-ray and chest CT it was revealed that the tip of the PICC line had migrated to the junction of the superior vena cava and the high right atrium (Fig. 2). After removal of the PICC line, the patient was monitored for an additional 10 days. There were no further episode of sinus arrest and asystole.

DISCUSSION

In the intensive care unit setting, episodes of sudden bradycardia usually occur in association with vagal stimulation or with abrupt hypoxemia. Oropharyngeal suctioning and dislodgement or movement of a tracheostomy tube are typical causes.⁸⁻¹² Our study indicates that mechanical irritation of the SA node by a central line can also result in profound sinus deceleration, sinus arrest, and asystole.

It has been previously demonstrated that central lines can trigger a variety of atrial and ventricular tachyarrhythmias including atrial fibrillation and ventricular tachycardia.¹⁻⁷ In addition, right heart catheters, including Swan-Ganz balloon flotation catheters, can cause transient right bundle branch block by direct stimulation.^{13,14} In patients with preexisting left bundle branch block, this can result in transient complete AV block and cardiac

arrest.^{15,16} It is not surprising, therefore, that stimulation of the SA node by a central line can result in transient sinus arrest.

In addition to direct observation of the patient, a thorough analysis of telemetry recordings can also raise awareness of a possible mechanical rather than a parasympathomimetic cause of sinus arrest. With vagal stimulation such as cough or suctioning, sinus deceleration is almost always accompanied by PR prolongation or AV block.¹⁷ Sinus arrest occurring in isolation, as in our case, suggests direct irritation of the SA node. If transient bradycardia or asystole occurs in an intensive care unit patient who has a central line, we recommend careful review of telemetry, radiology and vagal stimulation activities. The definitive proof in regard to direct stimulation of the SA node is in demonstrating termination of the bradycardic episodes after adjusting or removing of the central line; this also results in the solution to the problem.

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