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ISSN 2377-164X Open Journal http://dx.doi.org/10.17140/HROJ-2-113

Case Report

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Volume 2 : Issue 2
Article Ref. #: 1000HROJ2113

Article History
Received: May 19th, 2015
Accepted: May 28th, 2015
Published: May 29th, 2015

Citation
Yoho DJR, Firstenberg MS. The sequelae of silence: catheter entrapment as a preventable morbidity resulting from communication failure. *Heart Res Open J*. 2015; 2(2): 82-84. doi: 10.17140/HROJ-2-113

The Sequelae of Silence: Catheter Entrapment as a Preventable Morbidity Resulting from Communication Failure

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ABSTRACT

Medical errors follow a well-established association with communication failure. Seemingly benign interventions such as central venous catheterization can have far reaching consequences. A 72-year-old male required reoperative mitral valve replacement surgery for culture negative endocarditis. Intraoperatively, a central venous catheter was placed without communication between the surgical and anesthesia teams. Despite a seemingly uneventful operative and post-operative course, prior to discharge, the catheter was unable to be removed and necessitated surgical removal. Bidirectional communication during cardiovascular surgery is key to achieving optimum outcomes. Fortunately, it often requires many errors to lead to unnecessary morbidity, however sometimes it takes but one.

KEYWORDS: Central venous catheter; Central line; Catheter; Entrapment; Suture; Cardiothoracic; Cardiac surgery; Anesthesia; Stuck catheter; Stuck line; Communication; Safety; Interdisciplinary; Swiss cheese; Morbidity; Reoperation.

INTRODUCTION

Complications associated with central venous catheters are predominately mechanical (associated with initial placement) or infectious (associated with catheter care).[1] Pulmonary artery catheter entrapment is a well described complication of cardiac surgery[2] however suture entrapment of previously placed central venous catheters is an incredibly rare complication with only a few previously described reports.[3-6] Its rarity leads to under-recognition and highlights the importance of team communication in order to prevent potentially severe complications.

Medical errors follow a well-established association with communication failures, even when they are the consequence of good intentions or simple omission. The high stress environment of the operating room is a prime location for failures of communication to result in potentially devastating errors. Herein, we present an unusual case of central line entrapment after cardiac surgery despite intra-operative maneuvers and communication to prevent it. The singular breakdown in communication between the cardiac anesthesia and surgical teams led to increased morbidity that could easily have been prevented. This case emphasizes the importance of strong bi-directional communication at all levels in reducing operative complications and improving outcomes.

CASE

The patient is a 72 year/old male with prior aortic valve replacement who presented for mitral valve replacement. He was in heart failure with severe mitral regurgitation presumed secondary to culture negative native valve endocarditis. His prosthetic aortic valve appeared unremarkable on preoperative echocardiography.

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At the time of surgery, the anesthesia team placed an 8-French introducer for the Pulmonary Artery (PA) catheter, which is routine preoperative cardiac care at the institution in which this operation was performed. However, unbeknownst to the surgical team in anticipation of potentially significant blood loss due to the re-operative nature of the procedure, the anesthesia team also placed a long large bore central venous catheter *via* the right internal jugular vein.

Re-sternotomy was performed without difficulty and venous drainage was achieved with superior and inferior vena cava cannulation to facilitate exposure to the mitral valve. Retrograde cardioplegia was delivered through a cannula inserted into the coronary sinus. The mitral valve was replaced through an incision made in the left atrium without difficulty.

The patient was weaned from cardiopulmonary bypass and decannulated without difficulty. All cannulation sites were re-enforced with additional sutures and felt pledgets to limit surgical site bleeding. Prior to closing the chest, free mobility of the PA catheter was confirmed by anesthesia to avoid entrapment.

Post-operative care was uncomplicated and followed our routine cardiac surgery pathways. The PA catheter and introducer sheath were removed without difficulty on post-operative day number two. Prior to discharge, on post-operative day number 4, the nursing staff reported difficulty in attempting to remove the central venous line, reporting pulsatile "tugging" with attempts at removal. Due to the concern of catheter entrapment, he was returned to the operating room for surgical management. While gently pulling on the catheter, it appeared to have been entrapped by a cannulation stitch in the superior vena cava. The chest was re-opened and the stitch was cut and the catheter was then removed without resistance (Figure 1AB). The chest was closed and the remainder of his post-operative course was unremarkable.

DISCUSSION

Entrapment of the pulmonary artery catheter is a well-described complication of cardiac surgery[5] and typically occurs when a stitch, placed to secure cannulas during cardiopulmonary bypass, is inadvertently passed through the pulmonary artery catheter. Following weaning from bypass and decannulation, these stitches are then tied to secure the vascular cannulation sites. The most common site of entrapment is the cannulation stitch placed to secure the cannula in the superior vena cava.[7] Treatment, although simple when recognized, unfortunately requires re-operation with concomitant added morbidity. Once the offending stitch is identified, it can be cut and the catheter is then removed under direct visualization. Failure to recognize entrapment post-operatively with the use of excessive force to remove the catheter can result in suture disruption and potentially catastrophic hemorrhage. Prevention requires the Anesthesiologist confirming free mobility of the catheter prior to chest closure. This simple intra-operative maneuver clearly illustrates the importance of team communication.

The seemingly benign, and potentially beneficial, step of placing an additional central venous catheter at the time of anesthesia induction introduced the additional risk of suture-associated catheter entrapment. Since the catheter was placed without the knowledge of the surgical team, free mobility was not confirmed prior to chest closure. The complication was not recognized until several days post-operatively during attempted removal. The length of the catheter placed the distal portion in the superior vena cava, at risk for entrapment. Presumably, had the surgical team been aware of the placement of this additional catheter, free mobility could have been confirmed during the first operation, and an early re-operation could have been avoided.

It has been well established that good team communication is critical to optimal outcomes; especially during complex medical/surgical procedures, such as cardiovascular surgery.[8] Breakdowns in communication have been associated with adverse events of varying magnitudes of impact including preventable deaths. Improved communication protocols, including checklists and handoffs, have been clearly shown to reduce medical errors and clinical complications.[9] Furthermore, incorporating comprehensive algorithms targeted at specific complications, such as early re-operation for post-operative bleeding, can also be extremely effective in improving outcomes.[10] Nevertheless, potentially preventable complications and communication breakdowns still occur.

Typically, severe complications (such as deaths or early re-operations) have been associated with systematic communication breakdowns at multiple levels. This so-called "Swiss

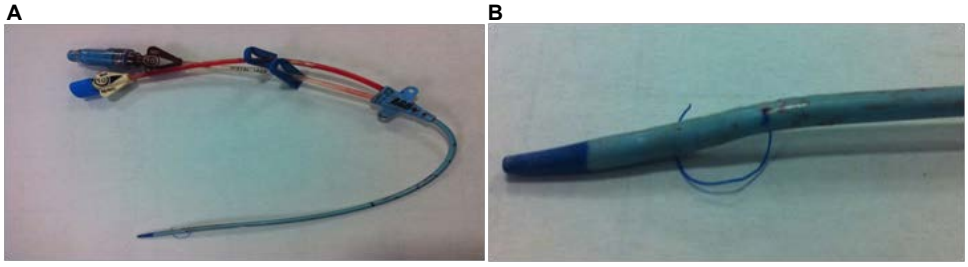

Figure 1: (A) shows double-lumen central venous catheter with a close-up (B) of the distal end showing the remnant of the monofilament superior vena cava cannulation site that caused the entrapment.

Cheese" effect is conceptually related to multiple holes, or breakdowns, at different levels (i.e. slices of cheese) in which an error can pass and ultimately result in a severe complication.[11,12] However, as our case illustrates, even a single lapse in communication can have a potentially catastrophic effect.

DISCLOSURES

In the context of this study and manuscript none of the authors have any disclosures or conflicts of interest - nor do we have any acknowledgments or relevant funding sources. No, informed consent was obtained from the patient.

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