Radiology-Implanted Arm Ports: A Review of the Literature

Brent Burbridge, MD, FRCPC
Grant Stoneham, MD, FRCPC
Medical Imaging Department, College of Medicine, Royal University Hospital, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
Hyun J. Lim, PhD
Clinical Research Support Unit and Department of Community Health and Epidemiology, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada
Chel-Hee Lee, PhD
Clinical Research Support Unit, College of Medicine, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

Abstract

Introduction: *Placement of totally implanted venous access devices, or port systems, in the upper arm is becoming a common practice in interventional radiology. To gain a better understanding of the literature in this area, we performed a search for and analysis of previous publications related to upper arm implantation of these devices by members of interventional radiology departments.*

Methods: *A review of the literature pertaining to upper arm port systems implanted in human beings by members of interventional radiology departments was performed, assessing publications between the years 1992 and 2014. Only English-language publications were assessed.*

Results: *Eighteen publications met selection criteria during the time frame reviewed. None of the studies used a prospective, randomized design; rather, all studies consisted of case−cohort descriptions of outcomes for a single device or for multiple devices. Analysis of the available literature for interventional radiology-inserted arm ports was performed. The technical success rate ranged between 93.7% and 100%, with an average of 98.9%.*

Conclusions: *The high technical success rate of arm port implantation and the elimination of the potential for pneumothorax, hemothorax, catheter pinch-off syndrome, and subclavian and carotid artery injury are strengths of the arm implantation strategy. There was wide variation in the rates of complications detected, in addition to inconsistent study design and study implementation strategies.*

Keywords: *interventional radiology, arm, totally implanted venous access device, port system*

Introduction

Radiology departments have become progressively more involved in the placement and management of venous access devices. Previous authors have identified a general increase in the use of venous access devices coupled with a definite increased role for insertion of these devices by members of interventional radiology departments.[1,2] In particular, there has been an expanded role in radiology departments for the implantation of tunneled catheters, including vein port systems (ie, totally implanted venous access devices [TIVADs]).[2]

Changes in health care delivery related to reduction in access to operating room time for surgeons and expanded outpatient treatment strategies, have led to some of this change in venous access care.[2] Technologic changes related to venous access device design and marketing of these devices specifically for use by interventional radiology teams, as well as improvements in imaging quality for ultrasound and fluoroscopy, have contributed to this shift in patient care. The use of ultrasound guidance for venous access has been shown to reduce the complications encountered during venous access procedures, enhancing the

Table 1. Arm Port Technical Implantation Details

Reference	Venography vs ultrasound for vein access	Port type	Catheter type	Prophylactic antibiotics	Number of ports	Age range of subjects (y)	Technical success rate %	Catheter indwell days (mean)	Total catheter-days
5	Venography	PAS	P	NR	40	30-83	NR	14-212 (106)	4,241
6	Venography	PAS	P	NR	19	NR	100	2-354 (105)	NR
7	Venography	PAS	P	Yes	154	NR	100	NR	NR
8	Venography	PAS	P	Yes	43	26-71	100	10-1,104 (344)	14,797
9	Venography	Cook Vital PAS	S, P	Yes	97	14-78		2-865 (246)	23,842
10	Venography	PAS	P	Yes	52	20-75	100	30-825 (372)	18,357
11/13	Both	PAS	P	Yes	393	17-89		1-694 (247)	97,256
12	Both	5 different ports	P, S	Yes	195	19-85	100	5-573 (169)	33,619
14	Venography	Cook Vital	S	No	125	19-81	100	2-1,278 (265)	33,221
15	Ultrasound	PAS	P	Yes	111	25-83	NR	13-1,093 (258)	28,936
16	Venography	Bard low profile	G, S	No	100	34-88	96	18-671 (168)	NR
17	Venography	Bard low profile	G, S	No	1,000	19-90	93.7	4-699 (256)	NR
18	Both	Bard Cook Vital	S	NR	113	29-82	NR	9-560 (264)	29,886
19	Venography	Bard low profile	S	NR	112	22-77	100	2-840 (241)	NR
20	Venography	Cook Vital	S	Yes	92	28-82	97	NR	25,049
21	Both	Cook Vital	S	NR	25	39-79	NR	30-600 (210)	NR
22	Venography	Cook Vital	S	No	512	19-88	100	1-1,687 (248)	127,750

P = Polyurethane; NR = Not reported; S = Silicone; G = Groshong.

trend to employ the skills of interventional radiologists for venous access.[3]

Arm implantation of these ports for adult patients has evolved into a very common occurrence at our institution since the initiation of a port implantation program in 1995. An assessment of the literature surrounding the implantation of arm ports by members of interventional radiology departments was performed in an attempt to gain enhanced knowledge about this patient group.

Methods

A literature search and a review of the articles gathered was performed for the purpose of discussing the outcomes and complications associated with the implantation of arm TIVADs by members of interventional radiology departments.

A previous review of all port types performed by Goossens et al[4] was the impetus for our interventional radiology-specific arm port review. Goossens et al[4] provided an extensive, broad-ranging reference list from which to initiate our search for appropriate publications. This reference list, and those of all additional eligible articles, were screened to obtain studies appropriate for our review.

Additionally, we supplemented the review of the reference lists of previous publications with a comprehensive search using PubMed, MedLine, Google Scholar, and the Cochrane Library. These sources were searched for relevant studies of human subjects, in English, using the following key words: *central venous*, *catheters* (*indwelling*), *totally implanted venous access device*(*s*), *TIVAD*(*s*), *venous port*(*s*), *implantable port*(*s*), *venous access port*(*s*), *port catheter*(*s*), *radiology*, *interventional radiology*, and *arm*. The search was for publications between January 1992 and December 2014.

Exclusion criteria included published abstracts from conference proceedings, letters to the editor, editorials, and case reports. Also, all publications that discussed ports that were not inserted by members of interventional radiology departments were excluded. Publications discussing chest and forearm port implantation were also excluded.

Subsequently, the inclusion criteria were narrowed to only those articles that pertained to human subjects receiving a