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Incidence and Quality Implications of Deep Venous Thrombosis after Peripherally Inserted Central Venous Catheter

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Incidence and Quality Implications of Deep Venous Thrombosis after Peripherally Inserted Central Venous Catheter

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Background

The Problem

- PICCs are becoming increasingly commonplace
- Known to be associated with upper extremity (UE) deep venous thrombosis (DVT)
 - Previous studies small
 - Limited data for role of anti-coagulation
 - Quoted rate of DVT with PICC ~2%
 - Up to 10% of all DVTs in UE
 - Up to 36% associated with pulmonary embolus

Why do we care?

- DVT/post-phlebotic syndrome a national health issue since Surgeon General's 2008 "Call to Action to Prevent Deep Vein Thrombosis and Pulmonary Embolism"
- Hand, plastic, and vascular surgeons often consulted acutely for pain/edema or for post-phlebotic syndrome
- AHRQ estimates incremental cost of each DVT to be \$10,000 and each PE to be \$20,000

What do we do?

- Nurse-run PICC team
- History of DVT or current DVT referred to Interventional Radiology (IR)

Patients and Methods

Retrospective review of all patients with PICC and DVT/PE (inpatient and outpatient) between Jan. 2006 and Dec. 2011 Age < 18 excluded.

Study Variables:

- Age, comorbidities, admitting diagnosis, history of prior thrombus, thrombotic risk factors
- PICC days, size/type of catheter, location of catheter tip, site of insertion
- Presence of symptoms, dose/type of prophylaxis

Results / Discussion

- 21,641 catheters placed over 6-year period
 - 231,480 PICC days (mean 10.7 days)
 - 497 with thrombus
 - 292 with DVT
- Mean age: 66.6 years (SD 17.8)
- Median number of PICC days: 8 (IQR 8)
- Overall thrombus rate 2.3% (n = 497)
- DVT Rate 1.3% (n = 292 / 95% CI: 1.20-1.51)
- 1.26 per 1000 PICC days (95% CI: 1.121.41)

*Rate is consistent throughout study period

Implications for PICC	n (%)
IV Antibiotics	172 (58.9)
Medications	94 (32.2)
TPN	76 (26)
Frequent Labs	3 (1)
Blood Products	1 (0.3)
IV Access / MD request	28 (9.6)

Co- Morbidities		
HTN	0	12 (4.1)
CV Neuro/Psych	1	34 (11.6)
GI DM	2	36 (12.3)
MSK Heme	3	50 (17.1)
Pulm	4	48 (16.4)
Endo CKD	5+	112 (38.4)

- IV antibiotics most common indication
- 11% placed with little or no identifiable indication other than access for fluids
- Hypertension most common co-morbidity
- Majority (69.7%) had some identifiable risk factor
 - Cancer most frequently cited
- More than two-thirds (73.0%) without prior history of thrombus

Risk Factors	n (%)
Cancer	91 (31.2)
Tobacco Use	71 (24.3)
Post-op	29 (9.9)
Multi-trauma	21 (7.2)
Non-ambulatory	19 (6.5)
Hematologic Condition	8 (2.7)
Exogenous Estrogen	2 (0.7)

History of Thrombus	Freq.	Percent	Median PICC days
No prior thrombus	213	73.0%	8
Prior thrombus	79	27.1%	10
Total	292	100	

Results / Discussion

Location	Total	
Midline	13 (4.5)	
L Subclav	4 (1.4)	
R Subclav	8 (2.7)	
LIJ	2 (0.7)	
LI	12 (4.1)	
RI	2 (0.7)	
LI-SVC	4 (1.4)	
RI/SVC	1 (0.3)	
SVC	218 (74.7)	
SVC/RA	21 (7.2)	
RA	7 (2.4)	
TOTAL	292 (100)	

Location	Freq.	Percent	Median PICC days
Non-ideal	33	11.3	8
Midline	13	4.45	4
RA	7	2.4	4
Ideal	239	81.85	8
TOTAL	292	100	

Catheter Size	Freq.	Percent	Median PICC days
4 Fr	73	25.09	8
5 Fr	213	73.2	8

- Ideal placement achieved in 81.85% of cases
- Majority of DVTs observed with 5 Fr catheters (73.2%)
- No significant difference in number of days until thrombus based on ideal placement or size of catheter placed

Anticoagulation Type	Freq.	Percent	Median PICC days
Low MW Heparin	51	17.47	8
Heparin SQ	87	29.79	8
Heparin GTT	15	5.14	6
Coumadin	18	6.16	7.5
Other	3	1.03	8
None	118	40.41	8
TOTAL	292	100	8

- Chemoprophylaxis or full anti-coagulation utilized in only 59.6% of patients later identified with DVT
- 80.5% of patients on prophylaxis were compliant
 - Did not vary significantly by agent
 - No significant difference in number of days until thrombus based on compliance

		Compliant		Total	
		No	Yes	Iotai	
	Low MW Heparin	8 (17.4)	38 (82.6)	46 (100)	
Anticoagulation	Heparin	19 (22.1)	67 (77.9)	86 (100)	
Type	Coumadin	2 (14.3)	12 (85.7)	14 (100)	
	Other	0 (0)	3 (100)	3 (100)	
	TOTAL	29 (19.5)	120 (80.5)	149 (100)	

Conclusions

- Our 1.3% rate of DVT is slightly lower than previously reported values
- Cancer has a high association with DVT in PICC patients
- 11% of DVTs potentially preventable because PICCs were placed for little or no indications
- Overall thrombus rate 2.3% (n = 497)
- Compliant usage of prophylaxis with PICC is roughly 44.9%

Future Directions

- Adherence to strict indication/guidelines for placement of PICC
- Screening tool (i.e. Caprini) modified/used to determine if patient high risk for DVT
- Education for DVT prophylaxis, including outpatients particularly those at high risk for bleed/thrombosis
- Required evaluation of anti-coagulation status and compliance during PICC therapy

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