Retroperitoneal Hemorrhage following Cardiac Catheterization Procedures: Predictors, Outcomes and Healthcare costs

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Background

* Retroperitoneal hemorrhage (RPH) is an infrequent, but potentially dangerous complication of invasive cardiac procedures

* Reported incidence is 0.5-3% of all cases, and leads to increased length of hospital stay, and healthcare costs

* Previous reports had conflicting associations of RPH with vascular closure device use

* We sought to assess the predictors, outcomes, and healthcare costs of retroperitoneal hemorrhage following cardiac catheterization and percutaneous coronary intervention (PCI), and to clarify the relationship of vascular closure device use with the development of RPH

Methods

* We studied all consecutive patients undergoing diagnostic cardiac catheterization or PCI at the Brigham and Women's Hospital, Boston from 1/1/02-12/31/05

* Cases complicated by RPH during in-patient hospital stay were identified through the cardiac catheterization laboratory database registry, based on the ACC-NCDR data definitions

* Diagnosis of RPH confirmed by CT imaging for all cases

* Detailed demographic, clinical, procedural, and cost data were extracted.

* In addition, angiographic review of femoral angiograms carried out for 1,272 consecutive PCI patients from 1/1/05-10/30/05, which included 10 patients with post-procedural RPH

Table1. Univariate Predictors of the Risk of Retroperitoneal Hemorrhage

Variables	Controls (n=14,760)	RPH (n=44)	P value	OR (95%C.I)
Age > 75 (years)	23%	34%	0.09	1.69 (0.90-3.15)
Gender (female)	34%	57%	0.001*	2.56 (1.41-4.66)
BMI (kg/m²)	28.3 ± 7.4	27.5 ± 6.2	0.40	0.98 (0.93-1.03)
Diabetes	26%	25%	0.88	0.95 (0.48-1.88)
Hypertension	73%	82%	0.18	1.68 (0.78-3.61)
PVD	10%	14%	0.4	1.39 (0.59-3.31)
Acute MI	22%	32%	0.07	1.77 (0.94-3.34)
Cardiogenic shock	1%	7%	0.002*	5.16 (1.58-16.82)
PCI	49%	86%	<0.001*	6.61 (2.79-15.65)
Elective procedure	52%	34%	0.02*	0.47 (0.25-0.90)
Venous Sheath	42%	59%	0.02*	2.01 (1.1-3.66)
Arterial sheath > 6Fr	5%	10%	0.21	1.9 (0.67-5.34)
BIvalirudin	6%	7%	0.8	1.14 (0.33-3.7)
Glycoprotein IIb/IIIa inhibitor	22%	48%	<0.001	3.3 (1.82- 5.97)
Vascular closure device	72%	84%	0.07	2.07 (0.92-4.65)

Table2. Femoral Angiographic Analysis of 1,272 patients undergoing PCI

Variables	Controls (n=1,1262)	RPH (n=10)	p value	OR (95% C.I)
Puncture site (above FH)	1.9%	20.0%	<0.001*	12.9 (2.60-63.9)
Puncture site (upper 1/3 of FH)	9.7%	30.0%	0.03*	3.96 (1.01-15.5)
High Stick (above middle 1/3 of FH)	11.6%	50.0%	<0.001*	7.58 (2.16-26.5)
Punctured artery- CFA	86.8%	60.0%	0.01	
Punctured artery- Profunda femoris	3.3%	0.0%	0.50	
Punctured artery- SFA	6.9%	0.0%	0.40	
Punctured artery- External iliac	2.7%	40%	<0.001*	24.07 (6.49-82.5)
Diameter of artery punctured (mm)	5.9 ± 1.57	2.46	0.20	
Arterial Sheath diameter (mm)	2.05 ± 0.21	2.00 ± 0.14	0.35	
Peripheral Vascular Disease (PVD)	10.3%	20.0%	0.30	
PVD in CFA	4.8%	10.0%	0.60	
PVD in Profunda femoris	5.1%	10.0%	0.60	
PVD in SFA	4.4%	10.0%	0.60	
PVD in External iliac artery	2%	20.0%	0.001*	10.63 (2.16-52.26)
Vascular closure device	85.2%	70.0%	0.20	

PVD= peripheral vascular disease, AMI= acute myocardial infarction, FH= femoral head, CFA= common femoral artery, SFA= superficial femoral artery

Results

* 14,804 patients were studied, of which 7,457 (51%) underwent diagnostic catheterization and 7,257 (49%) underwent PCI

* Vascular closure devices were used in 10,639 (72%) cases

* 44 patients out of 14,804 developed RPH, the overall incidence being 0.3%

* Patients undergoing PCI had significantly higher incidence of RPH compared to diagnostic catheterization (0.52% vs 0.08%, p < 0.001*)

* Univariate analyses showed statistically significant association of retroperitoneal hemorrhage with female gender, presence of cardiogenic shock at presentation, PCI, venous sheath, and the use of glycoprotein IIb/IIIa inhibitors (Table 1)

* In addition, angiographic variables showed significantly increased risk of RPH with high femoral puncture (above the middle1/3 of femoral head), OR 7.6, 95% C.I 2.16 to 26.5, p<0.001*, and presence of peripheral vascular disease in the external iliac artery, OR 10.63, 95% C.I 2.16 to 52.26, p=0.001* (Table 2)

* Vascular closure device use was associated with a trend towards higher risk of RPH (p=0.07). However, after adjustment for angiographic findings (access site location and presence of peripheral vascular disease in the ilio-femoral system), vascular closure device use was no longer independently associated with the development of RPH (OR 0.40, 95% C.I 0.10 to 1.58, p=0.2)

* The median cost of hospital admission for PCI patients developing RPH exceeded the median cost of controls by $6,698

* The incidence of death in patients who had RPH was 1 in 44 (2.27%) and surgical intervention occured in 4 patients (9.09%)

Conclusions

* Retroperitoneal hemorrhage is an infrequent, but serious vascular access site complication of invasive cardiac procedures, leading to increased hospital costs, rarely risk of surgical repair, and rarely death

* High femoral arterial puncture, and presence of peripheral vascular disease in the external iliac artery are powerful predictors of the risk of retroperitoneal hemorrhage

* Vascular closure device use does not appear to predispose to RPH