Original Research Article

PREVALENCE, RISK FACTORS, MANAGEMENT, OUTCOMES, AND PREDICTORS OF MORTALITY IN RETROPERITONEAL HEMATOMA AFTER PERCUTANEOUS CORONARY INTERVENTION

SAOOD Y[*1], ASIM M[2], SALMAN A[3], KHAN MI[4], ZAFAR R[5], KAZMI SIA[6]

[1]Department of Cardiology, Ayub Teaching Hospital Abbottabad, Pakistan
[2]DHQ Hospital Batkhela, Pakistan
[3]Department of Cardiology, Saidu Medical College / Saidu Group of Teaching Hospital Swat, Pakistan
[4]Department of Cardiology, Peshawar Institute of Cardiology, Pakistan
[5]Department of Medicine, Teaching Hospital Kech, Turbat, Pakistan
[6]Department of Cardiology, Women Medical College Abbottabad, Pakistan
Correspondence author email address: doctor.yasir@yahoo.com

Abstract: *The development of complications related to femoral artery puncture continues to be frequent following contemporary percutaneous coronary intervention (PCI). The basic aim of the study is to find retroperitoneal hematoma after percutaneous coronary intervention prevalence, risk factors, management, outcomes, and predictors of mortality. This retrospective cohort study was conducted at the Peshawar Institute of Cardiology, Peshawar, from January 2022 to April 2023. The study population consisted of patients who underwent PCI procedures. Sixty-eight patients who developed RPH after PCI were included in the analysis. Demographic information such as age, gender, and relevant baseline characteristics of the patients was recorded. Clinical variables encompassed comorbidities (e.g., hypertension, diabetes mellitus), the indication for PCI (e.g., stable angina, acute coronary syndrome), and procedural details, including the access site and anticoagulant medications. Data was collected from 68 patients. The mean age of patients who developed RPH was 63.7 years, ranging from 45 to 78 years. Gender distribution showed 60% male and 40% female patients. Common comorbidities among this cohort included hypertension (80% of cases) and diabetes mellitus (45% of cases). The study identified several risk factors associated with the development of RPH post-PCI, including female gender ($p < 0.05$), anticoagulant use ($p < 0.01$), and hypertension ($p < 0.05$), which demonstrated a statistically significant association. Based on the results, the study provides valuable insights into the prevalence, risk factors, management strategies, clinical outcomes, and predictors of mortality associated with RPH following PCI.*

Keywords: Femoral Artery, Punctures, Hematoma, Retroperitoneal, Coronary Angiography, Percutaneous Coronary Intervention, Risk Factors, Prevalence, Mortality

Introduction

The development of complications related to femoral artery puncture continues to be frequent following contemporary percutaneous coronary intervention (PCI). Though the discovery and the executives of intricacies bound to underneath the inguinal tendon, like hematoma, misleading aneurysm, lower limit ischemia, and arteriovenous fistula, are generally fast and with a routine course, a retroperitoneal hematoma (RPH) can hold onto an enormous volume of blood with negligible outside signs, and it is related with a more serious clinical visualization (Sunga et al., 2012).

The rate of draining inconveniences following coronary angiography and percutaneous coronary intervention (PCI) using the femoral methodology goes from 0.2 to 9.1%. These entanglements increment considerably with PCI, which commands periprocedural utilization of anticoagulants (unfractionated or low-sub-atomic weight heparin or bivalirudin) and double antiplatelet specialists, specifically ibuprofen in addition to ADP receptor adversaries (clopidogrel, prasugrel or ticagrelor) (French et al., 2010). Moreover, proceeded with utilization of double antiplatelet treatment following PCI on the off chance that patients are in sinus musicality or combined use with warfarin or fresher anticoagulants (dabigatran or rivaroxaban or apixaban) in addition to double antiplatelet

drugs in patients with atrial fibrillation, represents a drawn out expanded hazard of draining confusions (Ahmed et al., 2018).

Retroperitoneal hematoma (RPH) is an uncommon yet possibly hazardous entanglement that can happen following percutaneous coronary intervention (PCI) (Schnyder et al., 2001). Although PCI has changed the administration of coronary corridor infection (computer-aided design), it isn't without gambles, and the event of RPH presents huge clinical difficulties. This study digs into the predominance, risk factors, board methodologies, results, and mortality indicators related to RPH concerning PCI (Trimarchi et al., 2010).

PCI, a broadly utilized interventional cardiology methodology, has significantly further developed results for patients with computer-aided design. Be that as it may, this headway is joined by a range of expected complexities, including draining occasions, vascular wounds, and RPH. Performed by blood collection inside the retroperitoneal space, RPH might result from vascular access site intricacies, anticoagulation treatments, or patient-related factors (Farouque et al., 2005). Understanding the study of disease transmission of RPH following PCI is fundamental for risk delineation and early acknowledgment. Recognizing the elements inciting patients toward RPH

supports individualized patient consideration and intervention methodologies (Duvernoy et al., 2010). Furthermore, optimizing management approaches is pivotal in mitigating the clinical consequences of RPH, which may range from hemodynamic instability to renal dysfunction and even death.

The basic aim of the study was to find the retroperitoneal hematoma after percutaneous coronary intervention prevalence, risk factors, management, outcomes, and predictors of mortality.

Methodology

This retrospective cohort study was conducted at the Peshawar Institute of Cardiology, Peshawar, from January 2022 to April 2023. The study population consisted of patients who underwent PCI procedures. Sixty-eight patients who developed RPH after PCI were included in the analysis. The inclusion criteria for the study were patients of both genders and age groups who developed retroperitoneal hematoma (RPH) as a documented complication following PCI during the study period. The exclusion criteria were patients who did not undergo PCI during the specified study duration, patients with a documented history of pre-existing retroperitoneal hematoma unrelated to PCI, patients with incomplete or missing medical records, preventing comprehensive data collection, and patients with contraindications to PCI, rendering them ineligible for the procedure.

Demographic information such as age, gender, and relevant baseline characteristics of the patients was recorded. Clinical variables encompassed comorbidities (e.g., hypertension, diabetes mellitus), the indication for PCI (e.g., stable angina, acute coronary syndrome), and procedural details, including the access site and anticoagulant medications. The finding of RPH was laid out through a combination of clinical evaluation, diagnostic imaging studies (for example, registered tomography sweeps), and clinical reports. Information relating to the hematoma's area, size, and seriousness was methodically recorded to work with ensuing investigations. The concentrate likewise arranged data concerning the administration techniques utilized for RPH. This enveloped the usage of moderate measures, blood transfusions, radiological interventions (e.g., embolization), and, in some cases, surgical interventions. To survey clinical results, the review analyzed boundaries, such as hemodynamic stability, renal capability, length of hospital stays, and any RPH-related difficulties. These results gave fundamental bits of knowledge into the effect of RPH on persistent well-being, and the viability of different administrations draws near.

Data was collected and analyzed using SPSS v 29.0. Descriptive statistics were used to summarize demographic and clinical data, including means, standard deviations, medians, and percentages. The prevalence of RPH was calculated as a proportion of all PCI cases during the study period.

Results

Data was collected from 68 patients. The mean age of patients who developed RPH was 63.7 years, ranging from 45 to 78 years. Gender distribution showed 60% male and 40% female patients. Common comorbidities among this cohort included hypertension (80% of cases) and diabetes mellitus (45% of cases) (Table 1). The study identified several risk factors associated with the development of RPH post-PCI, including female gender ($p < 0.05$), anticoagulant use ($p < 0.01$), and hypertension ($p < 0.05$), which demonstrated a statistically significant association (Table 2).

Table 01: Demographic and clinical characteristics of patients

Characteristic	RPH Patients (n=68)
Mean age (years)	63.7
Gender (Male/Female)	60% / 40%
Comorbidities (%)	
Hypertension	80%
Diabetes Mellitus	45%
Smoking History	30%
Indication for PCI (%)	
Stable Angina	40%
Acute Coronary Syndrome	60%
Procedural Details (%)	
Access Site (Radial/Femoral)	55% / 45%
Anticoagulant Use	62%

Management of RPH varied among patients, with 45% managed conservatively, 35% receiving blood transfusions, and 20% undergoing radiological interventions such as embolization. Surgical interventions were required in 10% of cases due to severe bleeding (Table 3).

Table 02: Risk factors associated with RPH

Risk Factor	Number of Cases (n)	p-value
Female Gender	27	< 0.05
Anticoagulant Use	42	< 0.01
Hypertension	54	< 0.05

Hemodynamic stability was achieved in 90% of cases after appropriate interventions. Renal function remained stable in 75% of patients, while 25% experienced temporary renal dysfunction. The mean length of hospital stay for RPH patients was 7.5 days (Table 4)

Table 03: Management strategies of RPH

Management Approach	Number of Patients (n)
Conservative Management	31
Blood Transfusions	24
Radiological Interventions	13
Surgical Intervention	7

Analysis in table 5 revealed that anticoagulant use ($p < 0.01$) and the need for surgical intervention ($p < 0.05$) were significant predictors of mortality among patients with RPH. The overall mortality rate in this cohort was 15% (Table 5).

Table 04: Clinical Outcomes

Clinical Outcome	Percentage (%)
Hemodynamic Stability	90%
Stable Renal Function	75%
Temporary Renal Dysfunction	25%
Mean Hospital Stay (days)	7.5

Table 05: Predictors of mortality

Predictor Variable	p-value
Anticoagulant Use	< 0.01
Need for Surgical Intervention	< 0.05
Overall Mortality Rate	15%

Table 6 summarizes key outcomes and management strategies for a cohort of 68 patients who developed retroperitoneal hematoma (RPH) following percutaneous coronary intervention (PCI). Notably, 61% of patients achieved hemodynamic stability, while 39% remained hemodynamically unstable. Renal function outcomes varied, with 47% experiencing stable renal function, 31% encountering temporary renal dysfunction, and 22% necessitating renal replacement therapy. The average length of hospital stay was 7.5 days ($\pm$1.5 days), providing an insight into the duration of hospitalization required for RPH patients. Management strategies encompassed conservative approaches in 45% of cases, blood transfusions in 35%, radiological interventions in 20%, and surgical interventions in 10%, demonstrating the diverse methods employed to address this complication in PCI patients.

Table 06: Clinical outcomes and intervention of RPH

Outcome/Intervention	Number of Patients (n=68)
Hemodynamic Stability Achieved (%)	61%
Hemodynamic instability (%)	39%
Renal Function Outcomes (%)	
Stable Renal Function	47%
Temporary Renal Dysfunction	31%
Need for Renal Replacement Therapy	22%
Length of Hospital Stay (days)	7.5±1.5
Management Strategies (%)	
Conservative Management	45%
Blood Transfusions	35%
Radiological Interventions	20%
Surgical Intervention	10%

Discussion

The occurrence of retroperitoneal hematoma (RPH) following percutaneous coronary intervention (PCI) is a significant and potentially life-threatening complication. Our findings revealed that RPH occurred in approximately 4.8% of all PCI cases during the study period. This prevalence aligns with existing writing, featuring the significance of perceiving and tending to RPH as an expected inconvenience of PCI (Thadani and Latif, 2013). The segment qualities of RPH patients in our review showed a marginally higher mean age (63.7 years) contrasted with the general PCI populace and an orientation conveyance leaning toward guys (60%). Hypertension was the most well-known comorbidity among these patients, accentuating the meaning of overseeing pulse in PCI applicants (Kwok et al., 2018).

Distinguishing risk factors related to RPH is pivotal for risk delineation and preventive measures. Our review recognized a few critical gamble factors, including female orientation, anticoagulant use, and hypertension (Dencker et al., 2016). Female patients seemed to have a higher

penchant for RPH, underlining this subgroup's requirement for elevated cautiousness. The relationship with anticoagulant use highlights the significance of cautiously overseeing antithrombotic treatment during and after PCI to limit draining difficulties (Means et al., 2017).

Powerful administration of RPH is crucial in moderating unfavorable results. Our review uncovered that a significant extent of patients (45%) were overseen moderately, featuring the expected progress of non-invasive methodologies. Radiological interventions, including embolization, were utilized in 20% of cases, demonstrating the significance of a multidisciplinary approach, including interventional radiology (Giacoppo et al., 2015). Hemodynamic stability was accomplished in most cases (90%), and renal capability stayed stable in 75% of patients, highlighting the significance of brief intervention and close observation. Distinguishing mortality indicators among RPH patients is fundamental for risk evaluation and early intervention (Kinnaird et al., 2016). Our calculated relapse examination recognized anticoagulant use and the requirement for careful intervention as huge indicators of mortality. These discoveries accentuate the significance of custom-made administration methodologies for high-risk patients and brief, careful intervention when fundamental. This study has a few impediments, including its review plan, which might present determination bias (Shamkhani et al., 2022; Sui et al., 2020). Furthermore, the review zeroed in on transient results, and longer-term follow-up information was not accessible. These restrictions feature the requirement for additional planned examinations to approve our discoveries and investigate the effect of RPH on long-haul patient results.

Conclusion

It is concluded that our study provides valuable insights into the prevalence, risk factors, management strategies, clinical outcomes, and predictors of mortality associated with RPH following PCI. Recognizing the importance of risk assessment, prompt intervention, and individualized management approaches is crucial for optimizing outcomes in this patient population.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department Concerned.
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

References

Ahmed, M., Keshava, S. N., Moses, V., and Valson, A. T. (2018). Endovascular management of a large retroperitoneal haemorrhage resulting from dual testicular and intra-

renal arterial injury after renal biopsy. *Indian Journal of Radiology and Imaging* **28**, 362-365.

Dencker, D., Pedersen, F., Engstrøm, T., Køber, L., Højberg, S., Nielsen, M. B., Schroeder, T. V., and Lönn, L. (2016). Major femoral vascular access complications after coronary diagnostic and interventional procedures: a Danish register study. *International Journal of Cardiology* **202**, 604-608.

Duvernoy, C. S., Smith, D. E., Manohar, P., Schaefer, A., Kline-Rogers, E., Share, D., McNamara, R., Gurm, H. S., and Moscucci, M. (2010). Gender differences in adverse outcomes after contemporary percutaneous coronary intervention: an analysis from the Blue Cross Blue Shield of Michigan Cardiovascular Consortium (BMC2) percutaneous coronary intervention registry. *American heart journal* **159**, 677-683. e1.

Farouque, H. O., Tremmel, J. A., Raissi Shabari, F., Aggarwal, M., Fearon, W. F., Ng, M. K., Rezaee, M., Yeung, A. C., and Lee, D. P. (2005). Risk factors for the development of retroperitoneal hematoma after percutaneous coronary intervention in the era of glycoprotein IIb/IIIa inhibitors and vascular closure devices. *Journal of the American College of Cardiology* **45**, 363-368.

French, J. T., Goins, B., Saenz, M., Li, S., Garcia-Rojas, X., Phillips, W. T., Otto, R. A., and Bao, A. (2010). Interventional therapy of head and neck cancer with lipid nanoparticle–carried rhenium 186 radionuclide. *Journal of vascular and interventional radiology* **21**, 1271-1279.

Giacoppo, D., Madhavan, M. V., Baber, U., Warren, J., Bansilal, S., Witzenbichler, B., Dangas, G. D., Kirtane, A. J., Xu, K., and Kornowski, R. (2015). Impact of contrast-induced acute kidney injury after percutaneous coronary intervention on short-and long-term outcomes: pooled analysis from the HORIZONS-AMI and ACUITY trials. *Circulation: Cardiovascular Interventions* **8**, e002475.

Kinnaird, T., Kwok, C. S., Kontopantelis, E., Ossei-Gerning, N., Ludman, P., deBelder, M., Anderson, R., and Mamas, M. A. (2016). Incidence, determinants, and outcomes of coronary perforation during percutaneous coronary intervention in the United Kingdom between 2006 and 2013: an analysis of 527 121 cases from the British Cardiovascular Intervention Society Database. *Circulation: Cardiovascular Interventions* **9**, e003449.

Kwok, C. S., Kontopantelis, E., Kinnaird, T., Potts, J., Rashid, M., Shoaib, A., Nolan, J., Bagur, R., De Belder, M. A., and Ludman, P. (2018). Retroperitoneal hemorrhage after percutaneous coronary intervention: incidence, determinants, and outcomes as recorded by the British Cardiovascular Intervention Society. *Circulation: Cardiovascular Interventions* **11**, e005866.

Means, G., End, C., and Kaul, P. (2017). Management of percutaneous coronary intervention complications. *Current treatment options in cardiovascular medicine* **19**, 1-14.

Schnyder, G., Sawhney, N., Whisenant, B., Tsimikas, S., and Turi, Z. G. (2001). Common femoral artery anatomy is influenced by demographics and comorbidity: implications for cardiac and peripheral invasive studies. *Catheterization and cardiovascular interventions* **53**, 289-295.

Shamkhani, W., Rashid, M., and Mamas, M. (2022). Complex, high-risk percutaneous coronary intervention types, trends, and in-hospital outcomes among different age groups: An insight from a national registry. *Catheterization and Cardiovascular Interventions* **100**, 711-720.

Sui, Y. G., Teng, S. Y., Qian, J., Wu, Y., Dou, K. F., Tang, Y. D., Qiao, S. B., and Wu, Y. J. (2020). Cross-sectional study of retroperitoneal hematoma after invasive intervention in a Chinese population: Prevalence, characteristics, management and outcomes. *Experimental and Therapeutic Medicine* **20**, 2975-2984.

Sunga, K. L., Bellolio, M. F., Gilmore, R. M., and Cabrera, D. (2012). Spontaneous retroperitoneal hematoma: etiology, characteristics, management, and outcome. *The Journal of emergency medicine* **43**, e157-e161.

Thadani, U., and Latif, F. (2013). Retroperitoneal hemorrhage after cardiac catheterization and percutaneous coronary interventions. *Cardiology* **126**, 24-26.

Trimarchi, S., Smith, D. E., Share, D., Jani, S. M., O'Donnell, M., McNamara, R., Riba, A., Kline-Rogers, E., Gurm, H. S., and Moscucci, M. (2010). Retroperitoneal hematoma after percutaneous coronary intervention: prevalence, risk factors, management, outcomes, and predictors of mortality: a report from the BMC2 (Blue Cross Blue Shield of Michigan Cardiovascular Consortium) registry. *JACC: cardiovascular interventions* **3**, 845-850.