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The Morbidity and Mortality Risks following Percutaneous Coronary Interventions in Cirrhosis

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Abstract

Background: The prevalence of coronary artery disease in cirrhotic population is estimated to be low and the risk of bleeding in those who had percutaneous catheterization interventions (PCI) is not well studied yet. Our aim in this study is to determine the morbidity and mortality risks in cirrhotic patient undergoing PCI.

Methods: We performed a retrospective analysis using the National Inpatient Sample (NIS) database for 2010. The NIS is the largest publicly available inpatient health care database in the United States. It contains data from more than 7 million hospital stays each year. People with Percutaneous coronary intervention (PCI) related admissions and a history of cirrhosis diagnosis were placed in the case group. Equivalent number of people with PCI related admissions and no history of cirrhosis were identified randomly and Case-Control (PCI with cirrhosis vs. PCI without cirrhosis) design is used. All genders, race was with age of 18-year-old and above was included. A binary multivariate Logistic regression statistical test was used to examine the probability difference adjusted odd ratio. IBM SPSS Statistics for Windows was used to execute the analysis. A confidence interval (CI) of 95% and P value less than 0.05 were determined to define significance.

Results: A total of 1218 of PCI related admissions were identified. 609 PCI related admissions with cirrhosis (Cases group) and equivalent number of 609 admissions with PCI and no cirrhosis (Control group) were randomly selected. 83.5% of the cohort represented by white race followed by Hispanic and African-American percentages of 10% and 6.5% respectively. The mean age of the cohort was 60 years, 54% represented by male race. The mean length of stay was 1.06 in the non-cirrhosis group compared to the 1.65 days in the cirrhosis group. Tables 1 and 2 (0.3%) out of 609 PCI related admission and no history of cirrhosis group had an Upper Gastrointestinal bleeding (UGIB) Vs. 11 (1.8%) in the PCI related admission with history of cirrhosis group. Inpatient mortality in the PCI+ non Cirrhosis group was 0.3% vs. 1.8% in the PCI and Cirrhosis group.

The probability of dying during hospitalization for PCI related admission and have history of cirrhosis is 5 times higher than having a PCI without history of Cirrhosis with an adjusted odd ratio of 5.5(P-Value 0.026).

Conclusion: There is a significantly higher risk of gastrointestinal bleeding and mortality in cirrhotic patients compared to the non-cirrhotic patients who underwent PCI.

Keywords: Cirrhosis; Percutaneous coronary intervention; Gastrointestinal bleeding; Liver transplant; Mortality

Introduction

Percutaneous coronary intervention (PCI) is a non-surgical intervention used to diagnose and treat coronary artery stenosis using contrast to visualize the arterial supply under fluoroscopy. PCI reduces morbidity and mortality in patients with coronary artery disease when used in combination with duel antiplatelet therapy. Although modern advances in PCI have led to a high success rate with few complications, periprocedural and postprocedural bleeding has been shown to have an adverse impact on prognosis.

Gastrointestinal bleeding (GIB) in patients undergoing PCI has been shown to cause a large health care burden leading to a significant increase in morbidity and mortality. Previous studies have shown that the incidence of GIB after PCI ranges from 0.6% to 2.3% in the general population with very limited data in patients with cirrhosis [1]. Due to portal hypertension and bleeding disorders, patients with cirrhosis are at increased risk for severe GIBs compared to the general population [2,3].

We postulate that because of this increased tendency to bleed in the cirrhotic population, the risk of bleeding post-PCI will be significantly increased. The purpose of our study is to perform a retrospective analysis and to expose the significant impact that patients with cirrhosis exhibit gastrointestinal bleeding following PCI to quickly characterize those at high-risk to provide them appropriate prevention

measures to decrease the degree of morbidity and mortality and to subsequently decrease the economic burden.

Methods

We performed a retrospective analysis using the National Inpatient Sample (NIS) database for 2010. The NIS is a database and software tool developed for the Healthcare Cost and Utilization Project (HCUP). The NIS is the largest publicly available inpatient health care database in the United States. It contains data from more than 7 million hospital stays each year. Weighted, it estimates more than 35 million hospitalizations nationally. Admissions for the 2010 NIS totaled over 7 million. The variables included in this study were identified using ICD-9 codes for 2010. People who had percutaneous coronary intervention related admissions were identified using the ICD-9 codes. Then people with Percutaneous coronary intervention (PCI) related admission and history of cirrhosis diagnosis were placed in the case group. Equivalent number of people with PCI related admissions and no history of cirrhosis were identified randomly from the 7 million patients who doesn't have a diagnosis of cirrhosis. The procedure used in SPSS for selecting control group is called arbitrary random equivalent number. Case-Control (PCI with cirrhosis vs. PCI without cirrhosis) design is used. All genders, race with age of 18-year-old and above were included. A binary Logistic regression statistical test was used to examine the mortality and adjusted odd ratio. IBM SPSS Statistics for Windows Version 24, was used to execute the analysis. A confidence interval (CI) of 95% and P value less than 0.05 were determined to define significance.

Results

In our study, we identified a total of 1218 of PCI related admission in the NIS data. 609 PCI related admissions with a history of cirrhosis (Cases group) were found and an equivalent number of 609 admissions with PCI and no history of cirrhosis (Control group) were randomly selected to match the case group. The demographics of this cohort included 398 white (76.8%), 35 black (6.5%), 52 Hispanic (10%), 13 Asians (2.5%), 5 Native American (1%) and others 2.9%. As seen, most patients included in this study were white followed by African-Americans with no clear difference in outcomes between the two racial groups. Also, there was slightly a male predominance with 58% being male and 42% being female with a mean age of 60 (S.D ± 16) years (Table 1).

The main endpoints of our study include the rate of upper gastrointestinal bleeding as well as the morality between these two groups. 11(1.8%) out of 609 patients with cirrhosis had a gastrointestinal bleed. In the non-cirrhotic group, we found that 2 (0.3%) out of 609 PCI related admission with no history of cirrhosis group had an upper gastrointestinal bleed. Comparing the two groups, the risk of upper gastrointestinal bleeding is 5 times higher in the cirrhotic group than the non-cirrhotic group. In regards to the inpatient mortality, the probability of dying during hospitalization for PCI related admission with a history of cirrhosis was also 5 times higher than having a PCI without history of Cirrhosis (Adjusted odd ratio is 5.5) (Table 2).

One important factor which dictates the financial aspect of this study is the mean length of hospital stay. The mean length of stay was 1.06 compared to 1.65 days respectively between the patients without cirrhosis and patients with cirrhosis respectively demonstrating a clear financial burden for patients with cirrhosis undergoing PCI.

Demographic	**(%)**
Mean age	60.16
Sex	
Male	58%
Female	42%
Race	
White	83.50%
African-American	4.90%
Hispanic	6.30%
Asian	2.00%
Others	3.30%

Table 1: Cirrhosis among different race.

	No cirrhosis + PCI	**Cirrhosis + PCI**	**P value**	
UGIB	2(0.3%)	11(1.8%)	5.5	0.026
No UGIB	607(99.7)	598(98.2)	0.5	0.026
Died during hospitalization (mortality)	2(0.3%)	11(1.8%)	5.5	0.026

Table 2: PCI with and without cirrhosis.

Discussion

The prevalence of coronary heart disease in the general population in U.S. is estimated to be 6.0% with the greatest percentage being aged ≥ 65 years (19.8%) based on CDC's report from 2010 [4]. In the past, it was estimated that the prevalence of coronary artery disease in cirrhosis patients is less than 1% based on autopsies and a small number of liver transplant studies [5,6]. Recent literatures suggested that the prevalence was higher than previously reported being estimated between 2.7%-30% with the highest percentage being seen in patients evaluated for liver transplant [7- 10].

Per the 2005 guidelines of the American College of Cardiology/American Heart Association/Society for Cardiovascular Angiography and Interventions, dual antiplatelet therapy with low-dose aspirin and thienopyridine derivatives, such as clopidogrel, should be used in patients following successful PCI for at least 12 months [11]. A serious complication of dual antiplatelet therapy is bleeding, most of which arise from the gastrointestinal (GI) tract [12,13]. The proposed

pathogenesis is that the irreversible inhibition of COX-1 by aspirin leads to the inhibition of mucus and bicarbonate secretion as well as reduced mucosal blood flow from vasoconstriction, making the GI mucosa prone to injury [14]. Studies have shown that each aspirin dose significantly reduced gastric, duodenal, and rectal mucosal prostaglandin levels, some to approximately 40% of the baseline value [15]. Multiple double-blind, placebo-controlled clinical trials have estimated this affects between 1-4% of patients undergoing PCI [16-18]. Major risk factors for adverse GI bleeding following PCI include advanced age, history of peptic ulcer disease, NSAIDS, and anticoagulation. While there is limited data and guidelines on the prevention of GI bleeding post-PCI, the current recommendations include adjunctive proton pump inhibitor therapy in patients with history of PUD and eradication of H. pylori infection if present [19]. Managing GI bleeding in a patient who has undergone recent PCI requires balancing the risk of stent thrombosis against further life-threatening bleeding. One subset of patients at significant risk for catastrophic bleeding following PCI are those with cirrhosis. Gastroesophageal varices are present in approximately half of patients with cirrhosis and data suggests that they develop in about 8% of cirrhotic patients without varices per year [20]. This manifestation of cirrhosis is due to blood stasis in the portal veins, which induces markedly higher pressure within the portal veins, and subsequently results in extrahepatic portosystemic shunts and varices [21]. Also, secondary to the decline of hepatic synthetic function, alterations in vasoreactive substances contribute significantly to the pathophysiology of portal hypertension characterized by increased intrahepatic vascular resistance and hyperdynamic circulation [22].

Azarbal et al., conducted a retrospective study on a small cohort consist of 16 patients with cirrhosis with associated CAD and underwent PCI. PCI successful rate was 94% with no difference in inpatient 30-day mortality as well as no procedural bleeding. He also showed that PCI was safe in his small group of patients. On the contrary, our study has a larger number of patients as the cohort group studied 1218 admissions. It was clearly demonstrated that PCI has unfavourable outcomes in people with liver cirrhosis as those who underwent PCI with a history of cirrhosis had an increased risk of death during their hospitalization five times more than non-cirrhotic patients. It also portrayed that people with cirrhosis had a higher chance of GI bleeding with increased blood transfusion requirements. UGIB composed about 73% of the GI bleeding cases with a higher mortality rate compared to those who had a lower GI bleed (27%).

In conclusion, our data indicates that there is a higher morbidity and mortality risks in the cirrhotic population who is undergoing PCI when compared to the non-cirrhotic patients. We hope that portraying this data we can advocate for the need to identify high-risk patients and correctly start them on preventative therapy such as proton pump inhibitors as well as analysing the risk and benefit ratio to starting such patients on dual vs. single antiplatelet therapy.

Our study had certain limitations in that the NIS is a retrospective database using administrative ICD-9 codes, thus questioning the accuracy of coding procedures. NIS is unable to display readmission rates; therefore, the mortality rate could be underestimated in the given patient population. NIS data is unable to identify the main cause of death as it includes only general inpatient mortality. Our data does not include the outpatient encounters, which could introduce selection bias. Also this data lacks the information about the degree of cirrhosis and doesn't include MELD score or other score that usually used to determine the severity of the disease. Finally, there could be also a clerical error involved as the database is taken from charts completed by humans, with human error, as well as completion of charts from many different institutions across the United States. While several limitations may exist, we believe these are counterbalanced by the large sample size and absence of reporting bias as in some publications from specialized centres or those with a financial interest.

References

1. Singh M, Rihal C, Gersh B, Lennon RJ, Prasad A, et al. (2007) Twenty-five-year trends in in-hospital and long-term outcome after percutaneous coronary intervention: a single-institution experience. Circulation 115: 2835-2841.
2. Rao S, Eikelboom J, Granger C, Harrington RA, Califf RM, et al. (2007) Bleeding and blood transfusion issues in patients with non-ST-segment elevation acute coronary syndromes. Eur Heart J 28: 1193-1204.
3. Jiang Z, Wu H, Duan Z, Wang Z, Hu K, et al. (2013) Proton-pump inhibitors can decrease gastrointestinal bleeding after percutaneous coronary intervention. Clin Res Hepatol Gastroenterol 37: 636-641.
4. Prevalence of Coronary Heart Disease, United States (2011) MMWR. Centers for Disease control and Prevention 60: 1377-1381.
5. Garcia-Tsao G, Sanyal AJ, Grace ND, Carey W (2007) Practice Guidelines Committee of AASLD; Practice Parameters Committee of the ACG. Prevention and management of gastroesophageal varices and variceal hemorrhage in cirrhosis. Hepatology 46: 922-938.
6. Cholongitas E, Papatheodoridis GV, Vangeli M, Terreni N, Patch D, et al. (2005) Systematic review: the model for end-stage liver disease - should it replace Child-Pugh's classification for assessing prognosis in cirrhosis? Aliment Pharmacol Ther 22: 1079-1089.
7. Cichoz-Lach H, Celiński K, Słomka M, Kasztelan-Szczerbińska B (2008) Pathophysiology of portal hypertension. J Physiol Pharmacol 59: 231-238.
8. Fede G, Privitera G, Tomaselli T, Spadaro L, Purrello F (2015) Cardiovascular dysfunction in patients with liver cirrhosis. Ann Gastroenterol 28: 31-40.
9. Creed D, Baird W, Fisher E (1955) The severity of aortic arteriosclerosis in certain diseases; a necropsy study. Am J Med Sci 230: 385-391.
10. An J, Shim JH, Kim SO, Lee D, Kim KM, et al. (2015) Prevalence and prediction of coronary artery disease in patients with liver cirrhosis: a registry-based matched case-control study. Circulation 130: 1353-1362.
11. King SB 3rd, Smith SC Jr, Hirshfeld JW Jr, Jacobs AK, Morrison DA, et al. (2008) focused update of the ACC/AHA/SCAI 2005 guideline update for percutaneous coronary intervention: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. J Am Coll Cardiol 51:172-209.
12. Tanigawa T, Watanabe T, Nadatani Y, Otani K, Machida H, et al. (2011) Gastrointestinal bleeding after percutaneous coronary intervention. Digestion 83: 153-160
13. Kauffman G (1989) Aspirin-induced gastric mucosal injury: lessons learned from animal models. Gastroenterology 96: 606-614.
14. Cryer B, Feldman M (1999) Effects of very low dose daily, long-term aspirin therapy on gastric, duodenal, and rectal prostaglandin levels and on mucosal injury in healthy humans. Gastroenterology 117: 17-25.
15. Hallas J, Dall M, Andries A, Andersen BS, Aalykke C, et al. (2006) Use of single and combined antithrombotic therapy and risk of serious upper gastrointestinal bleeding: population based case-control study. BMJ 333: 726.
16. Nikolsky E, Stone GW, Kirtane AJ, Dangas GD, Lansky AJ, et al. (2009) Gastrointestinal bleeding in patients with acute coronary syndromes: Incidence, predictors, and clinical implications: analysis from the ACUITY (Acute Catheterization and Urgent Intervention Triage Strategy) trial. J Am Coll Cardiol 54: 1293-1302.
17. Abbas AE, Brodie B, Dixon S, Marsalese D, Brewington S, et al. (2005) Incidence and prognostic impact of gastrointestinal bleeding after percutaneous coronary intervention for acute myocardial infarction. Am J Cardiol 96:173-176.

18. Dai X, Makaryus AN, Makaryus JN, Jauhar R (2009) Significant gastrointestinal bleeding in patients at risk of coronary stent thrombosis. Rev Cardiovasc Med 10: 14-24.
19. Tan VP, Yan BP, Kiernan TJ, Ajani AE (2009) Risk and management of upper gastrointestinal bleeding associated with prolonged dual-antiplatelet therapy after percutaneous coronary intervention. Cardiovasc Revasc Med 10: 36-44.
20. Kalaitzakis E, Rosengren A, Skommevik T, Bjornsson E (2010) Coronary artery disease in patients with liver cirrhosis. Dig Dis Sci 55: 467-475.
21. Keeffe, BG, Valantine H, Keeffe EB (2001) Detection and treatment of coronary artery disease in liver transplant candidates. Liver Transpl 7: 755-761.
22. Azarbal B, Poommipanit P, Arbit B, Hage A, Patel J, et al. (2011) Feasibility and safety of percutaneous coronary intervention in patients with end-stage liver disease referred for liver transplantation. Liver Transpl 17: 809-813.