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Postoperative Outcomes in Patients with Chronic Renal Failure Undergoing Coronary Artery Bypass Grafting in Madani Heart Center: 2000-2010

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ABSTRACT

Introduction: Renal failure predisposes patients to adverse outcome after coronary artery bypass grafting (CABG). Renal dysfunction is a predictor of increased morbidity and mortality after CABG, whether it is dialysis-dependent or not. **Methods**: In a retrospective study from April 2000 to December 2010, seventy-six patients (60 male and 16 female with the mean age of 58.57±7.93 years) with different categories of chronic renal failure undergoing CABG in Shahid Madani Hospital, were studied. The cardiac disease leading to the operation was coronary artery disease (CAD) in all patients. Patients demographic, surgical and laboratory data were gathered from hospital records. Data were then analyzed. **Results**: Mean hospital stay was 10.16±7.16 days. The preoperative mortality rate was 10.5% (15% in non dialysis and 5.6% in dialysis dependant patients with no significant difference). Morbidity rate was 28.9% (respectively 30% and 27.8% in dialysis and non dialysis patients with no significant difference) including in-hospital myocardial infarction (MI) (10.5%), in-hospital stroke (2.6%), in-hospital bleeding (21.1%) and in-hospital infection, pneumonia, (5.3%). Mean creatinine and blood urea nitrogen (BUN) levels were significantly increased after surgery ($p<0.001$). Postoperative hemodialysis rate was 33.3%. **Conclusion**: Chronic renal failure whether dialysis-dependant or not increases in-hospital mortality and morbidity in patients undergoing CABG. For CRF patients not on dialysis with a creatinine 2.5 gm/dL, there is a strong likelihood of postoperative dialysis.

Introduction

Renal failure predisposes patients to adverse outcome after coronary artery bypass surgery. Moderate to end stage renal dysfunction is known to be an important predictor of morbidity and mortality after coronary artery bypass grafting (CABG) and in this group a 5-year survival of less than 50% has been observed.[1] A number of studies have identified indicators of preoperative impaired renal function as risk factors for mortality[2-6] and morbidity[5-9] with CABG. Patients with chronic renal failure (CRF) have other risk factors for cardiovascular mortality like hypertension, left ventricular hypertrophy, myocardial dysfunction, abnormal lipid metabolism, anemia and increased plasma homocysteine levels.[10,11] CABG indications in these patients are the same as patients without renal failure having coronary artery disease. CABG in comparison to standard medical treatments has better survival rate.[10]

It should be noted that patients with chronic renal failure clearly differ in several aspects from other patients who undergo surgical coronary revascularization. Patients with end stage renal disease (ESRD) often have multiple

comorbid disorders, including hypertension and diabetes mellitus, each with its own complications and associated impact on both short- and long-term survival.[12] In addition, infection and sepsis have been identified as significant causes of morbidity and mortality in patients with ESRD undergoing cardiac surgical procedures. As a result of these factors and others such as perioperative volume and electrolyte disturbances, patients with chronic renal failure are at increased risk for complications after CABG.[12]

Early after revascularization, patients may expect relief from coronary symptoms with coincident improvement in overall functional status. However, long-term survival remains relatively limited in this patient population, suggesting a need for further investigations to establish the relative costs and benefits of revascularization in patients with dialysis-dependent ESRD.[10] Current survey studies postoperative outcomes in patients with chronic renal failure undergoing coronary artery bypass grafting in Madani Educational center in years 2000-2010.

Materials and methods

We retrospectively analyzed the charts of 76 patients (16 women and 60 men with a mean age of 58.57±7.93 years [±standard deviation]) with different categories of chronic renal failure who undergone CABG from April 2000 to December 2010 in Shahid Madani Hospital, Tabriz. Forty (52.6%) patients had dialysis previously. The cardiac disease leading to the operation was coronary artery disease (CAD) in all patients. Those with laboratory test taken at least 2 weeks before surgery were included. Patients with history of non cardiac surgery were excluded. The study protocol was approved by the institutional ethics review board. All data were gathered from hospital records. Patients were managed by Helsinki agreement. The preoperative patient data are summarized in Table 1.

Table 1. Preoperative status and demographic findings of patients

operation	
Elective	22 (28.9%)
Emergent	54 (71.1%)
Cardiac risk factors	
Hypertension	72 (94.7%)
Hyperlipidemia	28 (36.8%)
Diabetes mellitus	45 (59.2%)
Obesity	34 (44.7%)
History of smoking	16 (21.1%)
Familial history	22 (28.9%)
Previous MI	22 (28.9%)
Comorbidity	
Peripheral arterial vascular disease	0
Chronic obstructive pulmonary disease	8 (10.5%)
Neurologic disease	14 (18.4%)
Infection (including endocarditis)	0

Statistical analysis

Continuous data with normal distribution are given as mean±standard deviation, otherwise as median, student t test for testing the significance of mean for independent continuous scale data, Chi-square or Fisher exact test for testing the significance of percentages. A *p* value of 0.05 or less was considered significant.

Results

Twenty-eight patients (36.8%) had history of previous cardiac surgery. Forty (52.6%) patients were on dialysis. Table 2 demonstrates major adverse cardiac events (MACE) among CRF patients. The most common complication was bleeding (21.1%). Ventilation more than 48 hours was needed in 8 (10.5%) patients. Mean hospital stay was 10.16±7.16 days. Mean creatinine levels before surgery was 4.34±2.61 and 5.21±2.80 after surgery. Significant differences existed between creatinine levels before and after CABG (p=0.001). Also, there was significant differences between blood urea nitrogen (BUN) levels before (53.58±30.48) and after CABG (66.80±25.29) (p=0.001). MACE incidence in CRF patients with and without dialysis was 12 (30%) and 10 (27.8%) respectively; the difference was not significant.

Table 2. Major adverse cardiac events (MACE) among CRF patients

MACE	22 (28.9%)
In-hospital death	8 (10.5%)
MI in hospital	8 (10.5%)
Need for In-hospital resurgery	0
In-hospital stroke	2 (2.6%)
In-hospital bleeding	16 (21.1%)
Bleeding type (Major)	9 (56.2%)
Bleeding type (Minor)	7 (43.8%)
In-hospital infection	4 (5.3%)*

*All patients had pneumonia

Discussion

Renal failure predisposes patients to adverse outcome after coronary artery bypass surgery. Renal dysfunction is a predictor of increased morbidity and mortality after CABG, whether it is dialysis-dependent or not.[1-9] CABG indications in these patients are the same as patients without renal failure having coronary artery disease. CABG in comparison to standard medical treatments has better survival rate.[10] Whether CABG can be performed safely in renal failure patients, and how, have remained questions of great concern in recent years. Fluid overload and pulmonary congestion related to cardiopulmonary bypass, anemia, and the bleeding tendency in these patients are sources of worry for most surgeons.[5,6]

The proportion of patients with non-dialysis-dependent mild renal insufficiency who require coronary

revascularization is much higher than that with dialysis-dependent renal failure, but it is less well known whether mild renal insufficiency influences the clinical outcome after heart surgery.[13-15]

Rao *et al*. have shown that patients with non-dialysis-dependent mild renal insufficiency are elderly and diabetic, with a higher prevalence of hypertension, peripheral vascular disease, and left ventricular dysfunction in comparison with the routine population undergoing CABG.[14] Patients in their study group also had a significant difference in body mass index. A majority of patients undergoing CABG are male. At the same age, weight, and level of serum creatinine women have a lower eGFR while there may be a different qualitative relationship between renal function and risk of future cardiovascular disease in women.[16] In this study seventy six patients with CRF (52.6% on dialysis before surgery) were studied. Patients' mean age was 58.57±7.93 years and most (78.9%) were male. In Samuels et al. study most patients were male (81.8%), with a mean age of 71 years.[13]

Although gender distribution is likely the same, patients were older in Samuels et al. study. The increase in morbidity and mortality associated with dialysis-dependent renal disease is widely recognized.[14,17,18]

An increased morbidity has also been shown in association with moderately elevated serum creatinine levels in patients with non-dialysis-dependent renal insufficiency.[14] In this study MACE occurred in 28.9% of patients. Its incidence among dialysis and non dialysis patients was 30% and 27.8%, respectively. However, MACE incidence between patients with renal failure dialysis or not-dialysis dependant was not significant. Reported postoperative complications incidence is 48% in dialysis-dependent renal failure,[17] which is much higher than our results. Previous studies have shown that the morbidity and mortality of patients with dialysis-non-dependent renal insufficiency ranges from 25% to 81% and from 5% to 19%, respectively.[13-15]

The reported mortality rates in patients with non-dialysis-dependent renal dysfunction were between 5.3% and 19.3%.[6,15,19] Thus, these strongly suggest that patients with mild renal insufficiency, despite the absence of dialysis, remain at risk for adverse outcomes. Samuels *et al*. suggested that patients over the age of 70 years with chronic renal failure are at a substantial risk of hospital death and major morbid event after CABG.[13]

A recent report described a serum creatinine level greater than 1.6 mg/dl as the most important predictor of in-hospital mortality after coronary reoperation in patients aged 70 and over.[20] Therefore, the therapeutic strategy should be chosen carefully in elderly patients with elevated serum creatinine. Preoperative mortality incidence among our patients was 10.5%. In-hospital mortality was 15% in dialysis dependant patients and 5.6% in non dialysis CRF patients which was not significant. The same results were observed in Nakayama and coworkers's study.

In their study, hospital mortality was 11% in non dialysis and 5.9% in dialysis dependant patients with no significant difference; however unlike our findings mortality rate was higher in patients with no dialysis.[21] Similar to our findings, in-hospital mortality between dialysis-dependent renal failure patients in Liu *et al.*[22] study was 12.2% and 13.8% in Horst and coworkers.[23]

Samuels *et al*. reported hospital mortality rate of (23%) with 4 (31%) hospital deaths in patients on dialysis and 6 (19%) in patients with no dialysis[13]; as is seen, the highest mortality rate even in dialysis nor in non dialysis CRF patients was reported by Samuels et al, which is considerably high in dialysis patients.

Other complications observed in our study were myocardial infarction (MI) in 10.5%, in-hospital stroke in 2.6%, in-hospital bleeding in 21.1% consisting of 11.8% major but not in need of re-exploration and 9.3% minor bleeding and in-hospital infection in 5.3%, all having hospital acquired pneumonia. In non-dialysis-dependant renal failure patients, reported postoperative recovery was longer, which is associated with a more frequent occurrence of major complications (28.8%) and mortalities (6.8%). Postoperative stroke and mediastinitis were both 3.4%, also postoperative hemodialysis was 13.6% and long term mechanical ventilation was 10.2%. Postoperative MI was not seen in any cases.[24]

Prevalence of acute renal failure requiring dialysis has been reported to range from 0.5 to 1.1% of patients undergoing cardiac surgery.[25] In this study, mean creatinine and BUN levels were significantly increased after surgery, considering the need for dialysis in patients with CRF not on dialysis. Postoperative hemodialysis rate was 33.3%. Hayashida et al reported 11% need for postoperative dialysis.[26]

In Samuels *et al*. study, in non-dialysis patients there were 8 (26%) patients who required permanent postoperative dialysis.[13] The high prevalence of postoperative dialysis in our patients could be due to high preoperative creatinine levels (over 3 mg/dl) in CRF patients but not on dialysis. It is suggested that for CRF patients not on dialysis with a creatinine 2.5 gm/dL, there is a strong likelihood of permanent postoperative dialysis.[13]

Conclusion

In conclusion, results of present study showed that chronic renal failure whether dialysis-dependant or not increases in-hospital mortality and morbidity in patients undergoing CABG. For CRF patients not on dialysis with a creatinine 2.5 gm/dL, there is a strong likelihood of postoperative dialysis.

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References

1. Dacey LJ, Liu JY, Braxton JH, Weintraub RM, DeSimone J, Charlesworth DC, et al. Long-term survival of dialysis patients after coronary bypass grafting. ***Ann Thorac Surg*** 2002; 74: 458- 462.
2. O'Connor GT, Plume SK, Olmstead EM, Coffin LH, Morton JR, Maloney CT, et al. Multivariate prediction of in-hospital mortality associated with coronary bypass surgery. ***Circulation*** 1992; 85: 2110-2118.
3. Hannan EL, Kilburn H Jr, O'Donnell JF, Lukacik G, Shields EP. Adult open heart surgery in New York State: an analysis of risk factors and hospital mortality rates. ***JAMA*** 1990; 264:2768-2774.
4. Grover FL, Hammermeister KE, Burchfiel C. Initial report of the Veterans Administration pre-operative risk assessment study for cardiac surgery. ***Ann Thorac Surg*** 1990; 50:12-28.
5. Higgins TL, Estafanous FG, Loop FD, Beck GJ, Blum JM, Paranandi L. Stratification of morbidity and mortality outcome by pre-operative risk factors in coronary artery bypass patients: a clinical severity score. ***JAMA*** 1992; 267: 2344-2348.
6. Anderson RJ, O'brien M, MaWhinney S, VillaNueva CB, Moritz TE, Sethi GK, et al. Renal failure predisposes patients to adverse outcome after coronary artery bypass surgery: VA Cooperative Study #5. ***Kidney Int*** 1999; 55:1057-1062.
7. Hammermeister KE, Burchfiel C, Johnson R, Grover FL. Identification of patients at greatest risk for developing major complications at cardiac surgery. ***Circulation*** 1990;82: IV380-9.
8. Kurki TS, Kataja M. Pre-operative prediction of postoperative morbidity in coronary artery bypass grafting. ***Ann Thorac Surg*** 1996; 61:1740-1745.
9. John R, Choudhri AF, Weinberg AD, Ting W, Rose EA, Smith CR, et al. Multicenter review of preoperative risk factors for stroke after coronary artery bypass grafting. ***Ann Thorac Surg*** 2000; 69:30-36.
10. Eagle KA, Guyton RA, Davidoff R, Edwards FH, Ewy GA, Gardner TJ, et al. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: Summary article: A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery). ***J Am Coll Cardiol*** 2004; 44: e213-310.
11. Levin A. Clinical epidemiology of cardiovascular disease in chronic kidney disease prior to dialysis. ***Semin Dial*** 2003; 16:101-105.
12. Batiuk TD, Kurtz SB, Oh JK, Orszulak TA. Coronary artery bypass operation in dialysis patients. ***Mayo Clin Proc*** 1991; 66:45-53.
13. Samuels LE, Sharma S, Morris RJ, Kuretu ML, Grunewald KE, Strong MD, et al. Coronary artery bypass grafting in patients with chronic renal failure: A reappraisal. ***J Card Surg*** 1996; 11:128-33.
14. Rao V, Weisel RD, Buth KJ, Cohen G, Borger MA, Shiono N, et al. Coronary artery bypass grafting in patients with non-dialysis-dependent renal insufficiency. ***Circulation*** 1997; 96: II-38-43.
15. Durmaz I, Büket S, Atay Y, Yağdi T, Ozbaran M, Boğa M, et al. Cardiac surgery with cardiopulmonary bypass in patients with chronic renal failure. ***J Thorac Cardiovasc Surg*** 1999; 118:306-315.
16. Holzmann MJ, Hammar N, Ahnve S, Nordqvist T, Pehrsson K, Ivert T. Renal insufficiency and long-term mortality and incidence of myocardial infarction in patients undergoing coronary artery bypass grafting. ***Eur Heart J*** 2007; 28: 865-871.
17. Owen CH, Cummings RG, Sell TL, Schwab SJ, Jones RH, Glower DD. Coronary artery bypass grafting in patients with dialysis-dependent renal failure. ***Ann Thorac Surg*** 1994; 58: 1729-1733.
18. Ashraf SS, Shaukat N, Kamaly ID, Durrani A, Doran B, Grotte GJ, et al. Determinants of early and late mortality in patients with end-stage renal disease undergoing cardiac surgery. ***Scand J Thorac Cardiovasc Surg*** 1995; 29:187-93.
19. Chikwe J, Castillo JG, Rahmanian PB, Akujuo A, Adams DH, Filsoufi F. The impact of moderate-to-end-stage renal failure on outcomes after coronary artery bypass graft surgery. ***J Cardiothorac Vasc Anesth*** 2010; 24:574-579.
20. Yamamuro M, Lytle BW, Sapp SK, Cosgrove DM, Loop FD, McCarthy PM. Risk factors and outcome after coronary reoperation in 739 elderly patients. ***Ann Thorac Surg*** 2000; 69: 464-474.
21. Nakayama Y, Sakata R, Ura M, Itoh T. Long-term results of coronary artery bypass grafting in patients with renal insufficiency. ***Ann Thorac Surg*** 2003; 75:496-500.
22. Liu JY, Birkmeyer NJ, Sanders JH, Morton JR, Henriques HF, Lahey SJ, et al. Risks of Morbidity and Mortality in Dialysis Patients Undergoing Coronary Artery Bypass Surgery. ***Circulation*** 2000;102: 2973-2977.
23. Horst M, Mehlhorn U, Hoerstrup SP, Suedkamp M, de Vivie ER. Cardiac Surgery in Patients with End-Stage Renal Disease: 10-Year Experience. ***Ann Thorac Surg*** 2000; 69:96-101.
24. Hirose H, Amanob A, Takahashia A, Nagano N. Coronary artery bypass grafting for patients with non-dialysis-dependent renal dysfunction (serum creatinine ≥2.0 mg/dl). ***Eur J Cardiothorac Surg*** 2001; 20: 565-572.
25. Chertow GM, Lazarus JM, Christiansen CL, Cook EF, Hammermeister KE, Grover F, et al. Preoperative renal risk stratification. ***Circulation*** 1997; 95: 878-884.
26. Hayashida N, Chihara S, Tayama E, Takaseya T, Yokose S, Hiratsuka R, et al. Coronary artery bypass grafting in patients with mild renal insufficiency. ***Jpn Circ J*** 2001; 65: 28-32.