

CABG – Challenging Cases in Apollo Hospitals Dhaka, A Decade of Experience

Zahangir NM¹, Ahmed ST², Ahmed F³, Kabir M⁴, Rayhan MN⁵, Ahmed N⁶, Ahmed S⁷, Haider MZ⁸

Abstract

Objective: To show outcome of challenging cases of Coronary Artery Bypass Graft (CABG) **Methods:** A retrospective study, done in Apollo Hospitals Dhaka from 02-05-2005 to 13.12.2014. Total 1892 CABG cases were reviewed- Emergency: 22 cases, Off-pump: 1257 cases, Arrested heart: 554 cases, On-pump beating heart: 81 cases, MIDCAB: 2 cases. Female - 213 (11.25%), male -1679 (88.74%). Associated co-morbidities: peripheral vascular disease: 19 cases, COPD: 78 cases, on dialysis: 17 cases, ventricular septal ruptures :10 cases, carotid occlusive disease: 88 cases, old stroke: 58 cases, permanent pacemaker: 4 cases, preoperative ventilator: 29 cases, left ventricular aneurysm: 58 cases, severe mitral regurgitation: 5 cases, EF: 31-50% =260 cases, 21-30% =147 cases, 15- 20% = 8 cases. Associated procedures - left ventricular aneurysm repair: 42 cases, mitral valve replacement: 30 cases, aortic valve replacement: 25 cases ,double valve replacement: 3 cases , RA myxoma removal: 1 case , LV aneurysm repair with mitral valve procedure: 5 cases , LV aneurysm repair with ventricular septal rupture repair: 5 cases , ventricular septal rupture repair: 10 cases , aorto-femoral bypass: 3 cases, ileo femoral bypass: 1 case, left aorto-axillary bypass: 1 case , Bentall procedure with Brachio-cephalic artery re-implantation: 1 case, Aorto-bifemoral bipopliteal bypass: 1 case , redo CABG-7, IABP preoperatively: 12 cases. **Results:** Overall mortality rate 2.12% (39 cases), emergency 9.09 % (2 cases) mortality, routine mortality 1.97% (37 cases). **Conclusion:** Challenging cases of CABG can be done with acceptable morbidity and mortality with good long term outcome.

Key Words

Ventricular Septal Rupture, Aorto-bifemoral bipopliteal bypass, Left Ventricular Aneurysm

Introduction

CABG with other comorbidities, associated with other procedures make the CABG procedure challenging. Mortality and morbidity challenge

in such cases. But a good set up, with the combined effort of different disciplines-make the challenge easier with good outcome.

1. Specialist, Dept. of Cardiovascular and Thoracic Surgery, Apollo Hospitals Dhaka, 2. Registrar, Dept. of Cardiovascular and Thoracic Surgery, Apollo Hospitals Dhaka 3. Registrar, Dept. of Cardiovascular and Thoracic Surgery, Apollo Hospitals Dhaka 4. Registrar, Dept. of Cardiovascular and Thoracic Surgery, Apollo Hospitals Dhaka 5. Medical Officer, Dept. of Cardiovascular and thoracic Surgery, Apollo Hospitals Dhaka 6. Consultant, Dept. of Cardiothoracic Anesthesia, Apollo Hospitals Dhaka 7. Consultant, Dept. of Cardiovascular and thoracic Surgery, Apollo Hospitals Dhaka 8. Consultant, Dept. of Cardiovascular and thoracic Surgery, Apollo Hospitals Dhaka

Methods

This is a retrospective study, done in Apollo Hospitals Dhaka from 2nd May, 2005 to 13th December, 2014. Total 1892 CABG cases were reviewed. 565 (30.34%) cases were challenging in our series. CABG with associated co-morbidities and additional surgical procedures were included in this study.

Off-pump: 1257 cases, arrested heart: 554 cases, on-pump beating heart: 81 cases. Female - 213 (11.25%), male -1679 (88.74%). Age range in years: 27 years = 1 patient (0.052%), 30-40 year = 401 patients (21.21%), 50-60 years = 690 (36.50%) patients, 60-65 years = 367 patients (19.39%), 66-70 years = 132 patients (6.97%), 71-75 years = 68 patients (3.59%), 76-80 years = 13 patients (0.68%), 81-85 years = 6 patients (0.47%), 86 year = 1 patient (0.052%).

Emergency CABG was done in 22 patients. Indication was evolving myocardial ischemia refractory to optimal medical therapy, presence of left main stenosis and/or 3-vessel disease, ongoing ischemia despite successful or failed PCI, complicated PCI, or cardiogenic

shock. In unstable emergency situation only venous conduits were used in 10 cases. Female = 2. IABP was used in 6 emergency cases.

There were 78 cases of Chronic Obstructive Pulmonary Disease. Pulmonary function test was done in all patients. Injection Hydrocortisone was needed in 30 patients who suffered from Chronic Obstructive Pulmonary Disease (COPD) with FEV1 less than 50% and FEV1/FVC 0.7 or less; during their immediate postoperative period. Nebulization with salbutamol, ipratropium bromide, budesonide; propped up position, oxygen inhalation, steroids, xanthine, frusemide and sometimes positive pressure ventilation was applied for management of COPD.

CABG with operation for peripheral vascular disease was done in 19 cases. Aorto-femoral bypass was done for 3 patients, ileo-femoral bypass in 1 patient, left axillo-femoral bypass in 4 patients, aorto-axillary bypass in 1 patient (Fig. 1), aorto-bifemoral bipopliteal bypass-1, femoro-popliteal bypass in 8 patients, repair of injury to right Subclavian artery and vein was done under Total Circulatory Arrest (TCA) in 1 case.



Fig. 1: CABG proximal grafts, proximal end of aorto-axillary bypass

Surgical correction of Ebstein anomaly with CABG was done in 1 case- severe Tricuspid Regurgitation with associated atrialization of RV.

Bentall procedure with Brachio-cephalic artery reimplantation was in 1 patient where aortic dissection involved coronary artery ostia and brachio-cephalic artery origin (Fig. 2).

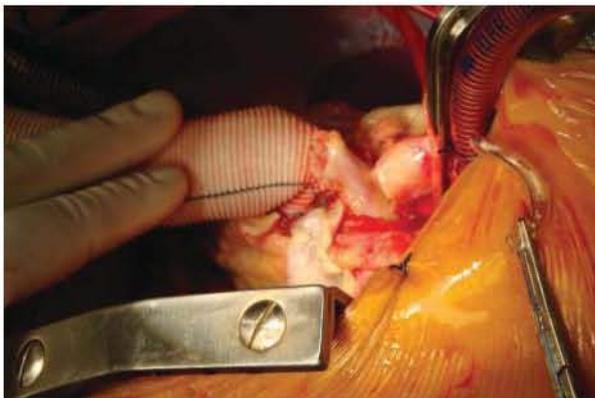


Fig. 2: Bentall procedure—coronary artery implanted

Total arterial CABG-Left Internal Mammary Artery (LIMA) to Left Anterior Descending Artery and Right Internal Mammary Artery (RIMA) to Posterior Descending artery, 1st and 2nd Obtuse Marginal arteries with Aorto-bifemoral biopltel bypass was done in 1 patient.

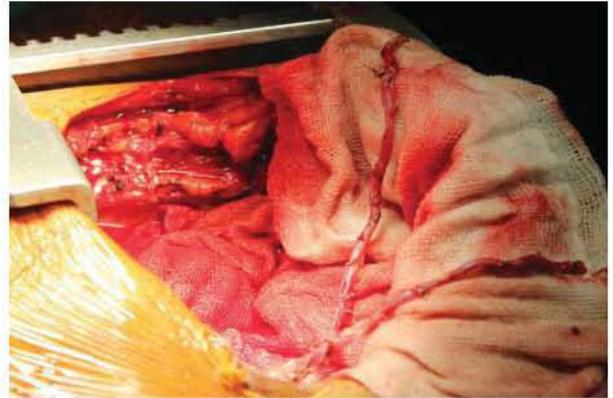


Fig. 3: Total arterial CABG- Left Internal Mammary Artery (LIMA), Right Internal Mammary Artery (RIMA) Y graft

Ejection fraction (EF) was 31-50% in 260 patients, 21-30% in 147 patients and 15-20% in 8 patients. Patients with low ejection fraction needed a few days to be fit for the surgery.

17 patients were on dialysis preoperatively. Routinely, we advised dialysis the day before the operation and at the night or next morning. 43 of non-dialysis dependent patients needed postoperative dialysis due to Acute Renal Failure. Ultrafiltration was done by perfusionist preoperatively in all patients with renal impairment.

Aneurysm of coronary artery, placcation was done in 4 cases. Direct purse-string suture taken by 8/0 proline around aneurysm, large aneurysms were plicated, other smaller aneurysms were left as they were.

There were 10 cases of ventricular septal ruptures (Fig. 4), 2 patients were operated as acute cases, 24-48 hours of incidence. 2 patients developed cardiogenic shock with multi-organ failure. There were 9 anterior and 1 posterior rupture. The repair of ventricular septal rupture was done using the infarction exclusion with endocardial patch repair technique. 10 patients were operated, mean age was 56 years. Time of

heart attack was 10.75 days (mean) before operation. 4 patients had renal failure. Coronary angiogram was done in all patients. Coronary Artery Bypass Grafting was done in all patients, aneurysmorrhaphy was needed in 5 cases, delayed sternal closure was done in all cases.

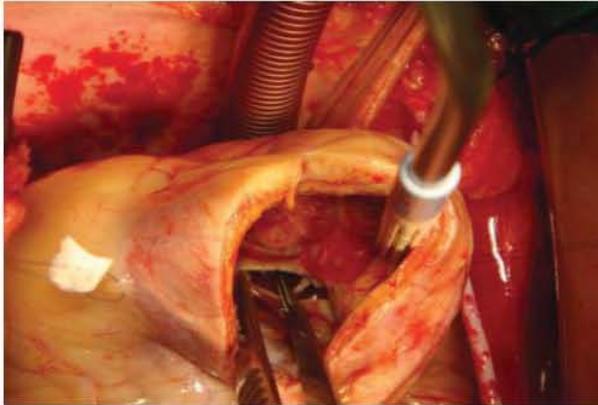


Fig. 4: Ventricular septal rupture is shown

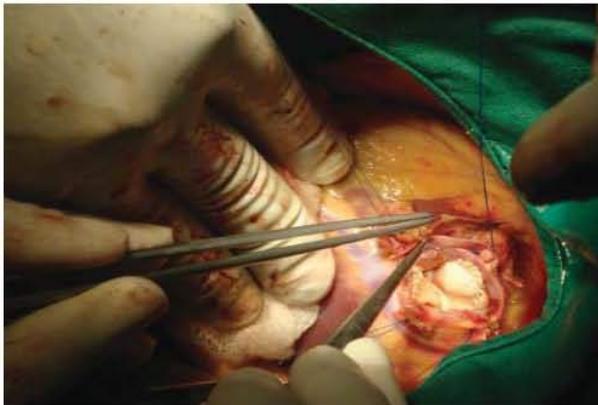


Fig. 5: The patch is then sewn beyond the area of infarction

There were 88 Carotid occlusive disease cases, 58 cases with history of old stroke. 5 patients suffered from acute stroke with hemiparesis 10-20 days prior to CABG. All other CABGs were operated at least 3 months after stroke.

Permanent pacemaker was present in 4 patients. Battery was checked in all patients with the support of catheterization lab.

Preoperative ventilator was needed in 29 patients. Of them, 11 needed Cardio Pulmonary

Resuscitation (CPR). During angiogram, 6 patients became unstable and needed ventilator support with IABP insertion. Due to ongoing ECG change we went for CABG. 2 of these patients (33.33%) died. 23 patients needed preoperative ventilator. They were extubated and stabilized. Angiogram was done as a routine case. They were operated with good post operative course. One of these patients needed CPR on roadside. Our emergency team reached there, continued CPR, intubated on site with ambu bag ventilation. He was put under a ventilator in emergency room, IABP inserted and then removed after 3 days. He was extubated after four days; routine angiogram was done which was followed by CABG.

There were 58 cases of left ventricular aneurysm and 5 cases of severe mitral regurgitation. 42 cases of left ventricular aneurysm repair were done, LV aneurysm repair 5 cases with mitral valve procedure, LV aneurysm repair with ventricular septal rupture repair was carried out in 5 patients. Endoventricular patch repair (Dor procedure) was done in 35 cases. Colley's linear repair in 6 cases. Batista procedure in 1 case. 41 patients underwent concomitant CABG, Mitral valve ring annuloplasty was done in 4 cases, chordal shortening in 1 case and one patient underwent mitral valve replacement.

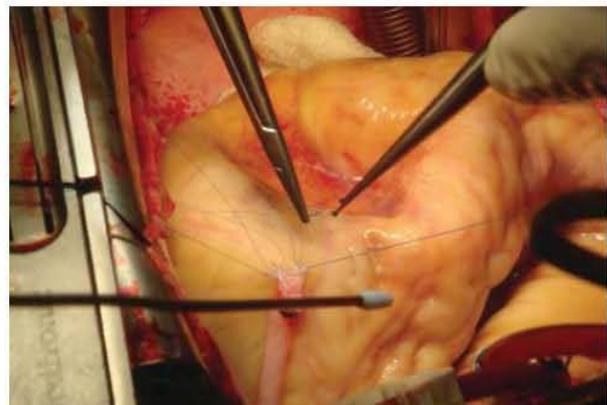


Fig. 6: Dimpling in aneurysmal part of LV

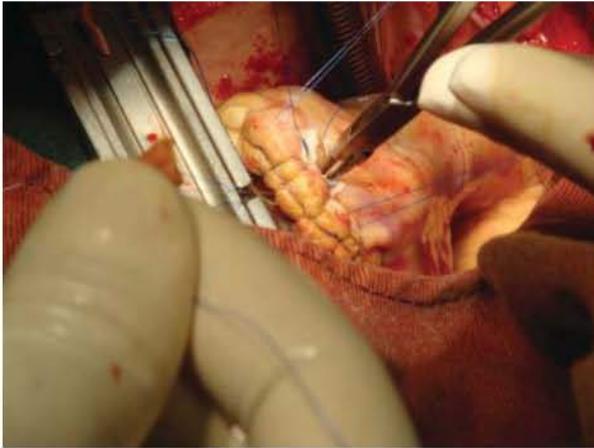


Fig. 7: Aneurysmorrhaphy

Mitral valve replacement was needed in 30 cases with CABG, 16 cases needed tissue valve, 14 cases needed mechanical valve, severe Mitral Stenosis in 8 cases, severe MR (grade 3 and 4) in 22 patients, aortic valve replacement in 25 cases, Double valve replacement was in 3 cases. Coronary artery fistula was repaired in 4 cases with CABG.

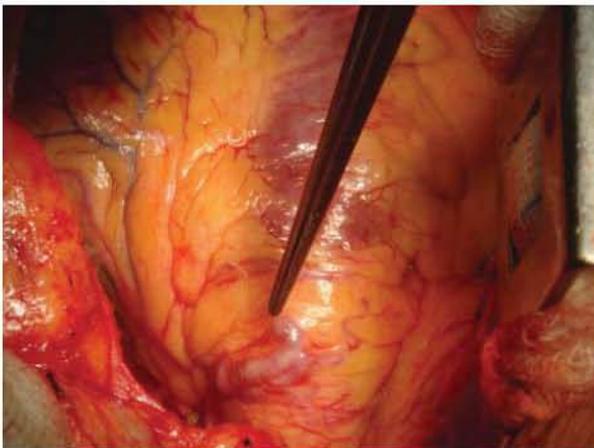


Fig. 8: Engorged fistulous tract on Main Pulmonary Artery from Left Anterior Descending Artery

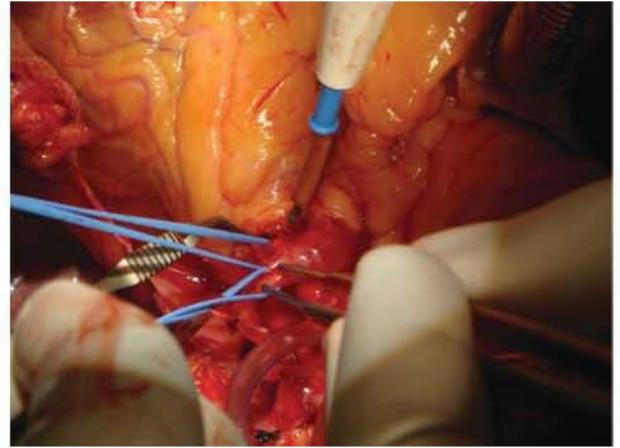


Fig. 9: Vessel loop applied to distinguish origin and insertion of fistulous tract, Bulldog applied at origin before going to CPB—thrill disappear

3 arose from Left Anterior Descending Artery, 1 from Left Circumflex Artery. Right Atrial myxoma removal with CABG in 1 case, redo CABG in 7 cases. IABP preoperatively used in 12 cases, postoperatively in 35 cases.



Fig. 10: Femoro-femoral bypass

Results

Overall mortality rate was 2.12% (39 cases), mortality in emergency cases = 9.09 % (2 cases), mortality in routine cases = 1.97% (37 cases) .

Table I: Result

| Mortality | Percentage | Number |
|-----------|------------|--------|
| Overall | 2.12% | 39 |
| Emergency | 9.09% | 2 |
| Routine | 1.97% | 37 |

In our series of 22 cases of emergency cases 6 cases were in cardiogenic shock-needed high inotropes with IABP support. There were 2 mortalities (33.33%).

All patients with LV aneurysm repair were evaluated pre and post-operatively by clinical examination and echocardiographic assessment. Mortality in this series was 3 (7.14%). 2 patients suffered from arrhythmia, 4 patients suffered from mild degree of heart failure, 33 patients had event free survival.

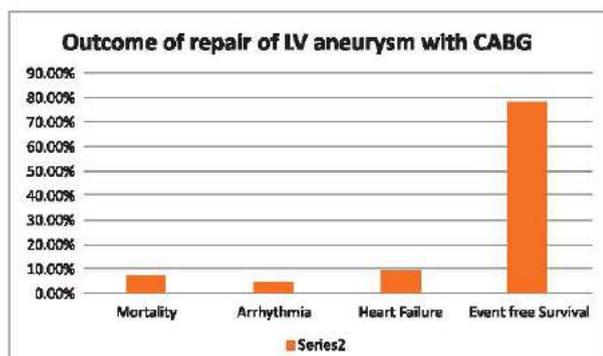


Fig. 11: Outcome of repair if LV aneurysm with CABG

Of the 10 cases of ventricular septal rupture, intra-aortic balloon pump was used in all for 1-4 days (mean 2.8 days). Total hospital stay was 2 to 17 days (mean 10.85 days). ICU stay was 4 to 11 days (mean 5.25 days) . Postoperative hospital stay was 2 to 14 days (mean 9.14 days). There was 1 mortality on 2nd post-operative day, another on 9th post-operative day . Hospital mortality was 20%. Postoperative

infection with MRSA +ve was in 2 cases . Ventricular septal rupture was detected from 1st day to 22nd day of acute MI, (mean 5.71 days after MI), mean ventilation time was 3.5 days postoperatively. Postoperative residual ventricular septal rupture was detected in 1 case which was conservatively managed, this patient developed pleural effusion and needed intra thoracic tube drainage.

Table II: VSR with CABG

| Stay | Mean | Range |
|-----------------------------|------------|-----------|
| Total Hospital Stay | 10.85 days | 2-17 days |
| ICU Stay | 5.25 days | 4-11 days |
| Postoperative Hospital Stay | 9.14 days | 2-14 days |

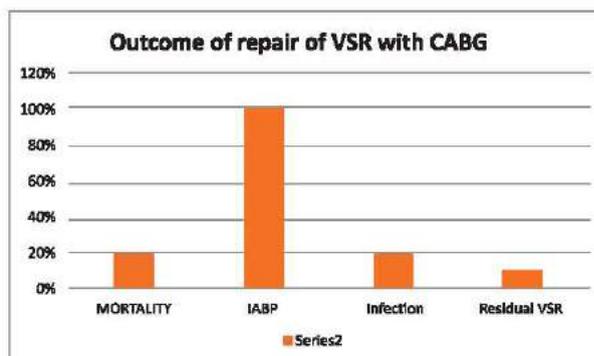


Fig. 12: Outcome of repair of VSR with CABG

Preoperative dialysis dependent patients had good outcome. All of them (17 in total) recovered with zero mortality. But the patients who needed dialysis for Acute Renal Failure postoperatively, the outcome was worse. There were 5 mortalities (11.62%) among these 43 patients. Among Permanent pacemaker of 4 patients, 1 patient expired due to malfunction of battery of pacemaker. Readmission needed in 3 patients among EF: 15-20% patients group . 2 patients (25%) did not survive in this group due to heart failure. Prolong stay was associated in this EF

group. AICD was needed for 5 patients in this group. There were 6 mortalities (7.7%) among severe COPD patients in our series. 10 patients developed stroke, 3 of them died within 10 years of follow up. Among MVR overall mortality in 10 years is 6.66%, Aortic Valve Replacement (AVR) is 4%, Double Valve Replacement (DVR) is 33.33%. 1 patient (14.28%) in Redo CABG of 7 cases.

Table III: CABG with Valve replacement-overall 10 years follow up

| | Mortality |
|--------------------------|------------------|
| Mitral Valve replacement | 6.66% |
| Aortic Valve replacement | 4% |
| Double Valve replacement | 33.33% |

Discussion

The management of combined Coronary Artery Disease and Peripheral Vascular Disease is a challenge and brings with it numerous clinical dilemmas. Aorto-bifemoral biopltelial bypass with total arterial coronary artery bypass is a rare combined single sitting operation. Computed Tomographic(CT) Angiography appears consistent and accurate in the assessment of patients with peripheral arterial occlusive disease¹. Synchronous procedure, minimizing surgical aggression, could be effective in selected high risk patients.²

Surgical ventricular restoration (SVR) is safe and effective in improving pump function and clinical status. Left ventricular aneurysm repair can be performed with reliable good results. Surgical treatment gives good survival benefit. Surgical ventricular restoration (SVR) is an emerging technique aiming to restore left ventricular

geometry and function in LV aneurysm patient.

Ventricular septal rupture is a lethal complication of myocardial infarction. To avoid the high morbidity and mortality associated with this disorder, patients should undergo emergency surgery.

Mortality was more associated with renal failure, more duration of cross clamp time, preoperative cardiogenic shock and preoperative use of ventilator. Coronary artery bypass was done in all our cases in our report. Coronary artery bypass surgery was performed in 52% patients in University Hospital Zürich, Zürich, Switzerland in their series of 52 cases of ventricular septal rupture repair. A residual septal shunt was found in 18% in their series³, in our study it was 14%. Skillington et al⁴ reported postoperative residual or recurrent ventricular septal rupture in 22 of 101 patients, and a repeat operation was necessary in eight cases. Current guidelines of the American College of Cardiology– American Heart Association for the treatment of patients with acute myocardial infarction recommend immediate operative intervention in patients with septal rupture, regardless of their clinical status.⁵ The immediate preoperative hemodynamic status is a major determinant of the postoperative outcome.⁶ 2 patients came to our hospital with cardiogenic shock with history of recent myocardial infarction. Intra-aortic balloon pump was introduced. After initial stabilization, coronary angiogram was done and operation was done on the day of admission. But these 2 patients died after 31 hours and 9 days postoperatively. Same reports were given by Daggett WM et al. If cardiogenic shock is present, intra-aortic balloon

pumping is instituted promptly; cardiac catheterization, left ventriculography, and coronary angiography are performed within 6 hours thereafter. Ventricular septal repair is carried out within the next 12 hours, even if intra-aortic balloon pumping had produced apparent hemodynamic stability, because this stability is usually temporary.⁷ Miyajima et al. described infarction, cardiogenic shock, and inferior ventricular septal rupture as predictors of mortality.⁸ Doppler echocardiography is generally diagnostic.⁹ In-hospital mortality rate of approximately 45 percent among surgically treated patients and 90 percent among those treated medically.¹⁰ In our study, it was 20%. Post-infarction ventricular septal rupture remains a serious and challenging complication of acute myocardial infarction in the modern surgical era. Surgical repair is associated with an operative mortality of 39.5%. Overall survival at 10 years is 44.4% ± 8.4%.¹¹ Overall 10 years in our series was 60%.

Emergency cases who suffered from cardiogenic shock revealed a benefit of early revascularization strategies and also CABG was superior to PCI. However, hospital mortality of CABG procedures in a trial done by Hochman JS et al was 39.6%.¹² In our series it was 33.33%.

Coronary artery disease and COPD are both related to smoking and therefore frequently coexist. Many COPD patients die of coronary artery disease. Of particular interest is the increased incidence of atrial fibrillation in the COPD patients. Annual incidence of mortality in patients with COPD undergoing CABG is 7.2% per year. Medalion et al¹³ studied only 37

patients for 8.6 years of follow-up with an annual incidence of death of 4%. In our series it was 7.7%.

Conclusion

Challenging cases of CABG can be done with acceptable morbidity and mortality with good long term outcome. Particularly in challenging cases outcome improved with experience and combined team effort of different specialties.

References

1. Catalano CI, Fraioli F, Laghi A, et al. Infrarenal aortic and lower-extremity arterial disease: diagnostic performance of multi-detector row CT angiography. *Radiology*. 2004; 231(2):555-63.
2. Alexandrescu V, Bergeron P, Perrin R, Combined minimally invasive surgery for coronary bypass and abdominal aortic occlusion, 2000 Oct; 8(6):507-9.
3. René Prêtre, Qing Ye, Jurg Grünenfelder, et al. Operative results of "repair" of ventricular septal rupture after acute myocardial infarction. *The American Journal of Cardiology*, 1999; 84(7): 785-788
4. Skillington PD, Davies RH, Luff AJ, et al. Surgical treatment for infarct-related ventricular septal defects. Improved early results combined with analysis of late functional status. *J Thorac Cardiovasc Surg* 1990; 99(5): 798-808.
5. Ryan TJ, Antman EM, Brooks NH, et al. 1999 Update : ACC/AHA guidelines for the management of patients with acute myocardial infarction: a report of the American College of Cardiology / American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). *J Am Coll Cardiol* 1999; 34:890-911.
6. Edwards BS, Edwards WD, Edwards JE. Ventricular septal rupture complicating acute myocardial infarction : identification of simple and complex types in 53 autopsied hearts'. *Am J Cardiol*, 1984; 54:1201-1205.
7. Daggett WM, Guyton RA, Mundth ED, et al. Surgery for post myocardial infarct ventricular septal defect. *Ann Surg*. 1977 Sep;186(3):260-71

8. Masahiro Miyajima, Toshiya Kawashima, Tatsuya Saito, et al. 'Delayed Closure of Postinfarction Ventricular Septal Rupture *Ann Thorac Cardiovasc Surg*, 2010; 16(2): 128-30
9. JH, Sutherland GR, Geuskens R, Dawkins K, et al. Doppler color flow mapping in the diagnosis of ventricular septal rupture and acute mitral regurgitation after myocardial infarction'. *J Am Coll Cardiol* 1990;15:1449-1455.
10. Davies RH, Dawkins KD, Skillington PD, et al. Late functional results after surgical closure of acquired ventricular septal defect. *J Thorac Cardiovasc Surg* 1993;106:592-598.
11. Philip YK , Yoong KS, Chong H L, et al. Outcome and survival analysis of surgical repair of post-infarction ventricular septal rupture. *J Cardiothorac Surg*. 2013; 8: 44.
12. Hochman JS, Buller CE, Sleeper LA, et al. Cardiogenic shock complicated acute myocardial infarction – etiologies, management and outcome: A report from the shock trial registry. *J Am Coll Cardiol*. 2000; 36 (Suppl A): 1163–70
13. Medalion B, Katz MG, Cohen AJ, Hauptman E, Sasson L, Schachner A. Long-term beneficial effect of Coronary Artery Bypass Grafting in patients with COPD. *Chest*. 2004; 125: 56–62.