

Introduction

Infective endocarditis (IE) is a disease with mortality rates that have remained in the range of 15 to 20% over the past 25 years despite advances in diagnosis and therapeutics¹. Heart failure, systemic embolism and recurrent and resistant infections remain the main indications for surgery. Some controversy exists as to the optimal timing.

Injection drug use (IDU) is a major risk factor for the development of IE and is the most important risk factor in young people². Advances in medical and surgical therapy of IE fail to address the complex social barriers that arise from managing patients with IDU as a comorbid illness. Surgical outcomes and complications of IE pertaining to IDU are not well understood.

Long term mortality data post surgery among injection drug users (IDUs) is sparse. To our knowledge, only one study has addressed this and it suggests that IDU is an independent risk factor for mortality³. IDU generally reflects a younger population with less risk factors for perioperative complications. Logically, this should *reduce* the number of immediate post-operative complications and death among IDUs.

In order to investigate this further, we conducted this study to evaluate the short and long term outcomes post valve surgery for IE at our institution, with a focus on IDU.

Methods

We conducted a single-centre prospective cohort study at the University of Ottawa Heart Institute in Ottawa, Ontario between January 1st 2003 and July 1st 2012. We included all consecutive adults aged 18 to 75 with a diagnosis of infective endocarditis by modified Duke Criteria who underwent their first valve replacement or repair surgery for this indication. Patients were considered IDUs only by self admission. Surgical data and demographic data were collected and entered into a database. Immediate outcomes included length of post operative hospital stay in the intensive care unit and hospital ward, and need for hemodialysis. Outcomes were retrospectively collected through chart review and included mortality, re-admission, re-operation, and re-infection at our institution.

Participant characteristics were compared between IDU and non-IDU using a paired t-test for continuous variables and the chi-square test for categorical data. For the secondary analysis of mortality, re-infection, re-admission and re-operation, survival analysis using cox regression procedures was used.

Results

Table 1 Baseline and Operative Characteristics

Characteristic*	IDU (n=24)	Non-IDU (n=171)	p value
Demographics			
Mean (SD) age, years	39.4 (2.1)	59.1 (1.03)	<0.0001
Female	7 (29.2)	44 (25.7)	0.72
Body Mass Index (SD), kg/m ²	23.6 (4.0)	26.6 (5.7)	0.007
Diabetes mellitus	1 (4.2)	30 (17.5)	0.09
Hypertension	1 (4.2)	82 (50.0)	<0.0001
Coronary artery disease	1 (4.2)	40 (23.4)	0.03
Prosthetic valve endocarditis	4 (22.2)	38 (22.2)	0.79
Left ventricular ejection fraction			
>60%	20 (90.9)	111 (77.1)	0.40
40-60%	2 (9.1)	18 (12.5)	
20-40%	0	14 (9.7)	
<20%	0	1 (0.7)	
Mean (SD) serum creatinine, μmol/L	95.4 (6.4)	124.1 (5.4)	0.05
Mean (SD) serum haemoglobin, g/L	106.9 (4.8)	105.0 (1.5)	0.67
Microorganism			
Staphylococcus aureus	8 (33.3)	42 (24.6)	0.37
Other staphylococci	0 (0)	8 (4.7)	0.28
Viridans group streptococci	6 (25.0)	51 (29.8)	0.63
Other streptococci	2 (8.3)	15 (8.8)	0.94
Enterococcus faecalis	4 (16.7)	17 (9.9)	0.32
Fungal	2 (8.3)	1 (0.6)	0.004
Other	1 (4.2)	19 (11.1)	0.29
Culture negative	1 (4.2)	18 (10.5)	0.33
Valve characteristics			
Mitral	12 (50.0)	77 (45.0)	0.64
Aortic	11 (45.8)	111 (64.9)	0.07
Tricuspid	9 (37.5)	21 (12.3)	0.001
Pulmonic	2 (8.3)	2 (1.2)	0.02
Operative characteristics			
Prosthesis type			
Mechanical	2 (8.3)	38 (22.2)	0.01
Tissue	8 (33.3)	85 (49.7)	
Repair	14 (58.3)	48 (28.1)	
Concurrent coronary artery bypass grafting	1 (4.2)	27 (15.9)	0.13
Aortic root replacement	3 (12.5)	18 (10.5)	0.77
Re-do sternotomy	3 (12.5)	35 (20.5)	0.36
Multi-valve replacement or repair	7 (29.1)	38 (22.2)	0.45
Operation Status			
Elective	4 (16.7)	54 (31.6)	0.30
Urgent	16 (66.7)	89 (52.0)	
Emergent	4 (16.7)	28 (16.4)	

*Data are presented as a number (%) unless otherwise indicated

Table 2 Outcomes in the immediate post-operative period

Outcome*	IDU	Non-IDU	p value
Mean length of stay in intensive care unit (SD), days	6.3 (2.0)	8.1 (1.0)	0.53
Mean length of stay in surgical ward (SD), days	15.1 (2.0)	13.5 (1.1)	0.59
Mean total length of hospital stay (SD), days	21.3 (3.1)	21.6 (1.7)	0.95
Post operative need for dialysis	2 (8.3)	24 (14.0)	0.40

*Data are presented as a number (%) unless otherwise indicated

A total of 195 patients met the inclusion criteria, of which 24 were identified as IDUs (Table 1). The mean age of the IDUs and the non-IDUs was 39.4 years and 59.1 years respectively. IDUs had a lower mean body mass index when compared to non-IDUs. IDUs were also less likely to have hypertension (4.2% vs. 50.0%) and coronary artery disease (4.2% versus 23.4%). A fungal cause of endocarditis was more frequently identified in IDUs when compared to non-IDUs (8.3% vs. 0.6%). There was no other significant difference in the microbiological cause between the two groups. IDUs were more likely to have right sided valve involvement including the tricuspid (37.5% vs. 12.3%) and pulmonic valve (8.3% vs. 1.2%).

Figure 1 Cox regression analysis survival curve

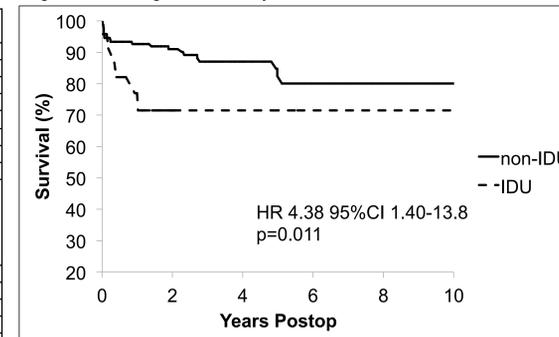


Figure 2 Proportion of patients remaining infection free

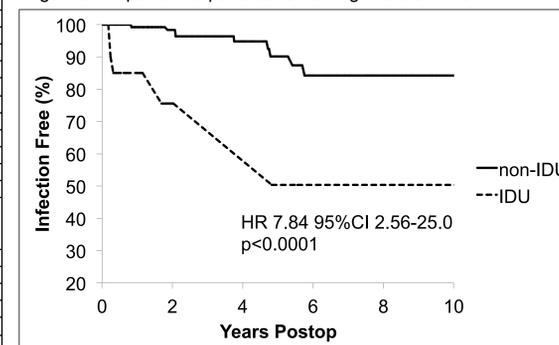
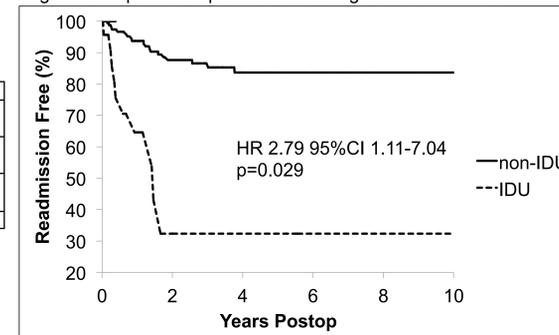


Figure 3 Proportion of patients remaining readmission free



Results

In terms of length of hospital stay or need for dialysis, no difference was observed between the 2 groups (Table 2). At the end of the study period, survival was 71.5% among the IDUs and 80.0% among non-IDUs. Cox regression survival analysis are presented in the figures. IDU was associated with a higher rate of mortality (Figure 1), re-infection (Figure 2) and re-admission (Figure 3). Although not statistically significant, there was a trend toward a higher rate of re-operation (figure not shown, HR 1.88 CI 0.77 to 4.58; p=0.17).

Upon adjustment for hypertension, coronary artery disease, age and body mass index, IDU was still associated with a higher rate of mortality (HR 4.38 95% CI 1.40 to 13.8, p=0.011).

Discussion

IDU is associated with worse long term outcomes. Mortality rates are higher among IDUs despite the fact that there were no differences in immediate post operative complications. In our cohort, IDU was also associated with much higher rates of infection and hospital readmission. Presumably this is due to ongoing IDU, which puts this population at higher risk of reinfecting their surgically operated valve.

Unlike previous studies, we were able to clearly show the similarities between IDU and non-IDU in the immediate post-operative period. We were also able to find that rates of reinfection and readmission were also higher among IDUs. This suggests the reason for increased mortality is at least partially related to ongoing IDU, which is a major risk factor for reinfecting the valve.

At our institution, there is no process to address the complex social issues that accompany IDUs who have IE that require cardiac surgery. Often, IDUs are kept in the hospital for weeks prior to the surgery for the fear that if discharged, they will use their peripherally inserted central catheter (PICC) for ongoing drug use. This time should be spent implementing strategies to reduce rates of re-infection. Improving long term outcomes in this population requires a focus on prevention through multi-disciplinary interventions.

References

- Murdoch DR, Corey GR, Hoen B et al. Clinical presentation, etiology, and outcome of infective endocarditis in the 21st century: the International Collaboration on Endocarditis-Prospective Cohort Study. Arch Intern Med 2009;169(5):463-473.
- Prendergast BD. The changing face of infective endocarditis. Heart 2006;92(7):879-885.
- Rabinov D, Mokadam NA, Miller DM, Coetz RR, Verrier ED, Aldea CS. Long-term outcome for the surgical treatment of infective endocarditis with a focus on intravenous drug users. Ann Thorac Surg 2012;93(1):51-57.