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Long-Term Survival after Coronary Artery Bypass Grafting versus Percutaneous Coronary Intervention in Patients with Ischemic Cardiomyopathy

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Background

- Ischemic cardiomyopathy (ICM)
  - #1 cause of death globally
  - #1 cause of heart failure (HF) in the developed world
- No head to head comparison of percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) in randomized trials
- International guidelines differ with regards to recommended strategies
- Safety of CABG has improved since the STICH era
- PCI has developed as a contender, with therapeutic potential in ICM

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Objective

- To compare the outcomes of revascularization with PCI and CABG in patients with ICM.

- Definition of ICM:
  - LVEF ≤ 35%, with one of the following:
  - ≥ 50% stenosis in the LM, ≥ 70% in the LAD territory, or ≥ 70% stenosis in ≥ 2 vessels

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Methods

Design: Population-based, retrospective cohort study in Ontario

Inclusion:

- Ontario residents aged 40-85 years
- ICM
- PCI or isolated CABG between October 1 2008 - March 31 2016

Exclusion:

- Hybrid CABG and PCI within the same hospital admission
- Emergent procedure (within 24 hours of acute MI)
- Dialysis dependence, metastatic malignancy

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Methods

Exposure: PCI vs. CABG

Primary Outcome: All-cause mortality

Secondary Outcomes: MI, repeat revascularization, HF hospitalization

Statistical Analysis:

- Mortality assessed through December 31, 2017
  - Mortality rate calculated using the Kaplan-Meier method
  - Multivariable Cox proportional hazard model
- Secondary Outcomes: cause-specific hazard models (death = competing risk)

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Methods

Data Source:

- CorHealth Ontario Clinical Registry
  - Network of 20 hospitals that perform invasive cardiac procedures in Ontario
- Registered Persons Database (RPDB)
  - Vital statistics
- Canadian Institute for Health Information (CIHI)
  - Discharge Abstract Database: hospitalizations, comorbidities
  - Same Day Surgery Database: comorbidities
- Ontario Health Insurance Plan (OHIP)
  - Physician service claims

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Results

- 11,916 patients were included in the study
- Mean follow up time = 4.5±2.5 years

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Table 1. Baseline characteristics in patients who underwent CABG vs. PCI

Variable		PCI N=7,147	CABG N=4,769	P-Value
Age	Mean ± SD	65.6 ± 10.9	65.7 ± 9.7	0.89
Female		1,852 (25.9%)	821 (17.2%)	<.001
Rural Residence		841 (11.8%)	763 (16.0%)	<.001
Income Quintile	1 (Lowest)	1,511 (21.1%)	1,034 (21.7%)	0.99
	2	1,491 (20.9%)	990 (20.8%)	
	3	1,474 (20.6%)	976 (20.5%)	
	4	1,379 (19.3%)	913 (19.1%)	
	5 (Highest)	1,247 (17.4%)	825 (17.3%)	
Morbid Obesity		1,781 (24.9%)	1,504 (31.5%)	<.001
Hypertension		5,672 (79.4%)	4,216 (88.4%)	<.001
MI within 30 days		5,511 (77.1%)	2,927 (61.4%)	<.001
MI within 90 days		5,602 (78.4%)	3,067 (64.3%)	<.001
Previous PCI		1,700 (23.8%)	646 (13.5%)	<.001
[illegible]		[illegible]	[illegible]	[illegible]
HF		3,215 (45.0%)	2,648 (55.5%)	<.001
Atrial Fibrillation		547 (7.7%)	324 (6.8%)	0.078

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Table 1. Baseline characteristics in patients who underwent CABG vs. PCI

Variable		PCI N=7,147	CABG N=4,769	P-Value
CVD		579 (8.1%)	521 (10.9%)	<.001
PVD		721 (10.1%)	736 (15.4%)	<.001
COPD		2,325 (32.5%)	1,576 (33.0%)	0.56
Diabetes		3,252 (45.5%)	2,646 (55.5%)	<.001
Hypothyroidism		128 (1.8%)	97 (2.0%)	0.34
Liver Disease		58 (0.8%)	36 (0.8%)	0.73
Alcohol Abuse		146 (2.0%)	135 (2.8%)	0.005
Anemia		588 (8.2%)	740 (15.5%)	<.001
Renal Disease		217 (3.0%)	184 (3.9%)	0.02
Paraplegia		34 (0.5%)	14 (0.3%)	0.08
Primary Malignancy		340 (4.8%)	240 (5.0%)	0.49
Dementia		39 (0.5%)	19 (0.4%)	0.26
Depression		152 (2.1%)	111 (2.3%)	0.47
Psychosis		19 (0.3%)	22 (0.5%)	0.07
Charlson Index	Mean ± SD	2.4 ± 1.7	2.7 ± 1.7	<.001

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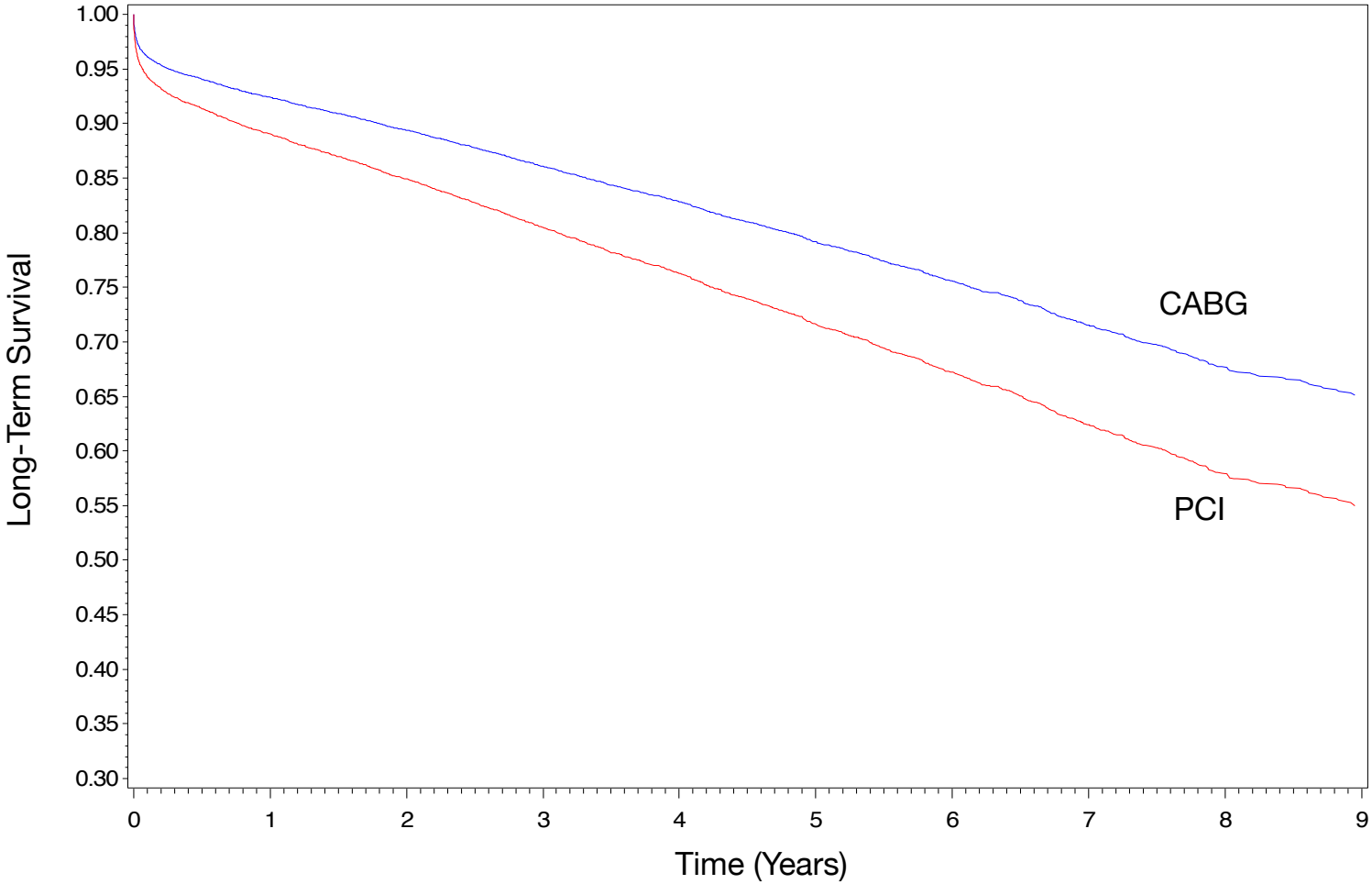
Figure 1. Adjusted Kaplan-Meier survival curves by revascularization strategy



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Results

- 11,916 patients were included in the study
- Mean follow up time = 4.5±2.5 years

Outcome	PCI (N=4,769)	CABG (N=7,147)	Adjusted HR (95% CI) (CABG vs. PCI)
Long-Term Survival	5,101 (71.4%)	3,596 (75.4%)	0.63 (0.58-0.68)
MI	1,404 (19.6%)	292 (6.1%)	0.31 (0.27-0.35)
Revascularization	1,701 (23.8%)	268 (5.6%)	0.28 (0.25-0.31)
HF Hospitalization	1,537 (21.5%)	953 (20.0%)	0.79 (0.72-0.86)

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Conclusion

- In patients with ICM, CABG was associated with a lower adjusted risk of long-term mortality compared to PCI, despite CABG patients having a higher burden of comorbidities.
- Impetus for clinical trial.
- Further research is needed to evaluate the comparative effectiveness of PCI versus CABG in the quality of life in patients with ICM.

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Thank you!

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Table 2. Multivariable predictors of long-term mortality

Variable		HR (95% CI)
CABG vs. PCI		0.63 (0.58-0.68)
Age		
	40-64	Reference
	65-74	1.80 (1.63-1.98)
	75-84	3.06 (2.77-3.37)
Female		0.91 (0.84-1.01)
Rural Residence		1.04 (0.93-1.15)
Income Quintile		
	1 (Lowest)	1.22 (1.08-1.38)
	2	1.12 (0.99-1.27)
	3	1.08 (0.95-1.22)
	4	1.05 (0.93-1.19)
	5 (Highest)	Reference
Morbid Obesity		1.04 (0.95-1.15)
Hypertension		1.08 (0.95-1.23)
MI within 30 days of surgery		1.32 (1.21-1.44)
Remote MI		1.30 (1.19-1.42)

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Table 2. Multivariable predictors of long-term mortality

Variable	HR (95% CI)
Previous PCI	0.85 (0.77-0.95)
Previous CABG	0.96 (0.46-2.02)
CHF	1.99 (1.83-2.17)
Atrial Fibrillation	1.35 (1.21-1.52)
CVD	1.22 (1.09-1.37)
PVD	1.58 (1.43-1.74)
COPD	1.28 (1.18-1.38)
Diabetes	1.35 (1.25-1.46)
Hypothyroidism	0.99 (0.79-1.25)
Liver Disease	1.50 (1.10-2.04)
Alcohol Abuse	1.20 (0.96-1.49)
Anemia	1.37 (1.24-1.52)
Renal Disease	1.58 (1.36-1.84)
Paraplegia	1.30 (0.85-1.98)
Primary Malignancy	1.48 (1.29-1.70)
Dementia	0.86 (0.59-1.25)
Depression	1.21 (0.98-1.50)
Psychosis	1.30 (0.75-2.24)