Supplemental Appendix

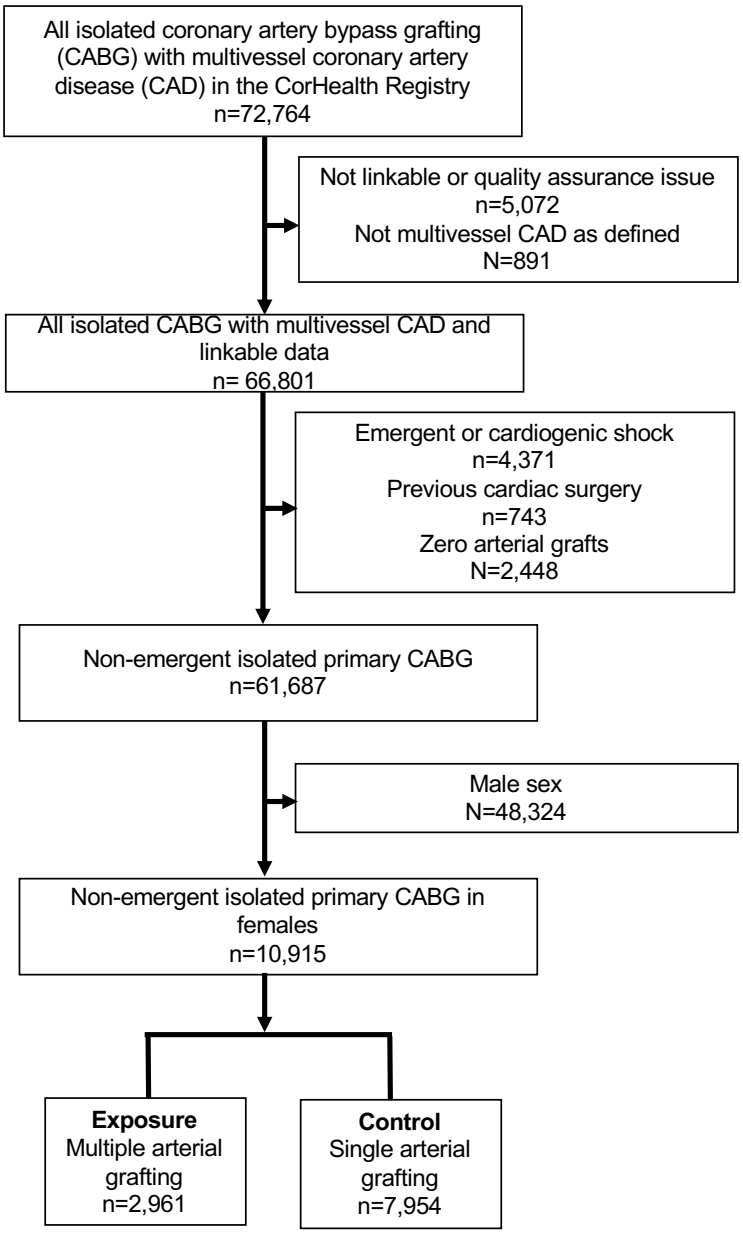
Variables entered into propensity score

1. Age
2. Body Mass Index
3. Hospital Frailty Risk Score
4. Income Quintile
5. Hypertension
6. Diabetes
7. History of smoking
8. CCS Class
9. NY Heart Association
10. Left ventricular function
11. History of CHF
12. History of MI
13. Recent MI
14. PVD
15. CVD
16. COPD
17. Creatinine Group
18. Dialysis
19. Urgency Status
20. Extent of coronary artery disease
21. Off Pump

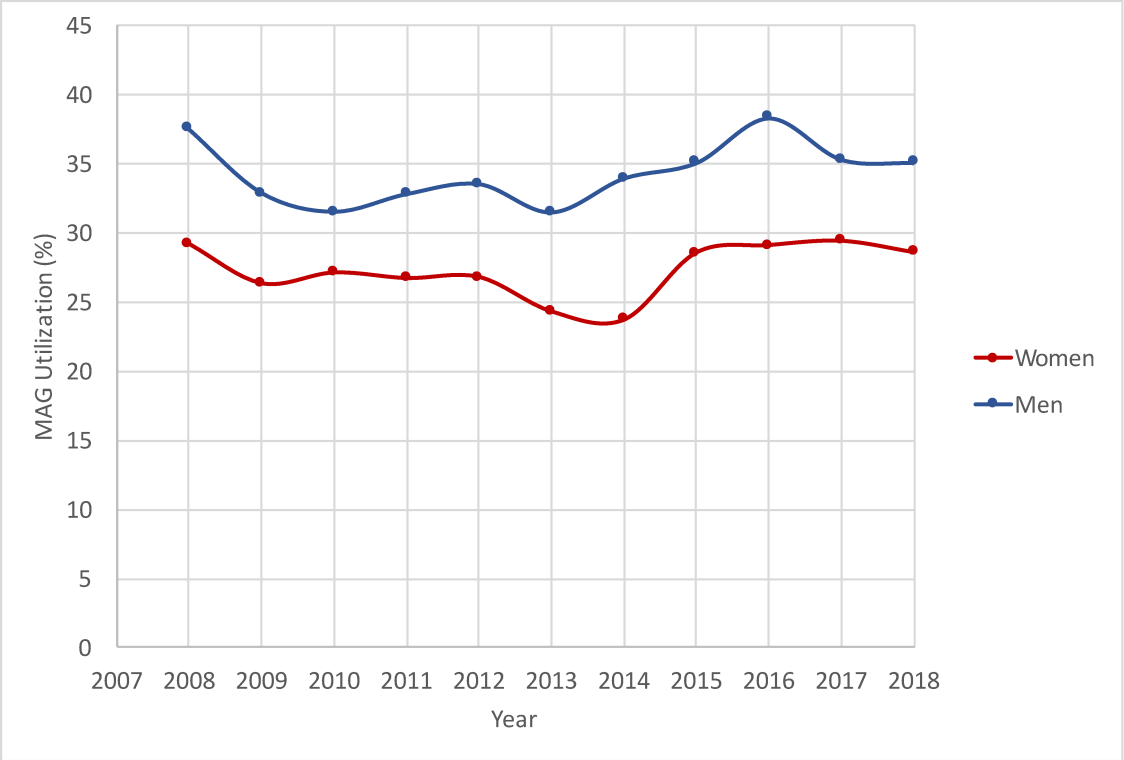
Codes for outcome ascertainment

	Database	Codes
Outcomes		
ICU length of stay	OHIP	Number of days that the following OHIP codes are continuously billed following index procedure: G400, G405 OR G557 (first day); G401, G406 OR G558 (days 2-30); G402, G407 OR G559 (after 31 days).
Hospital length of stay	CIHI-DAD	Number of days between index procedure and discharge date, subtracting the number of ALC days (ALC LOS). Discharge is defined as discharge/transfer to any non-hospital/non-acute care facility (DISCHDISP = 2, 3, 4, 5, 6, 7, 12).
Any stroke	CIHI-DAD	**ICD-10** I60.x I61.x I62.x I63.x, I64.x, H34.1 (excluding I63.6)
Acute myocardial infarction	CIHI-DAD	**ICD-10** I21.x, I22.x
Sternal complications	CIHI-DAD	**CCI:** 1SK.73, 1SK74, 1SK80, 1SK87, 1SY80LAXXG
Coronary revascularization	CIHI-DAD	**CCI** 1IJ50x, 1IJ54x, 1IJ57GQ, 1IJ76x
- Percutaneous coronary intervention	CIHI-DAD	CCI codes: 1IJ50, 1IJ54, 1IJ57GQ
- Coronary artery bypass graft surgery	CIHI-DAD	CCI code 1IJ76

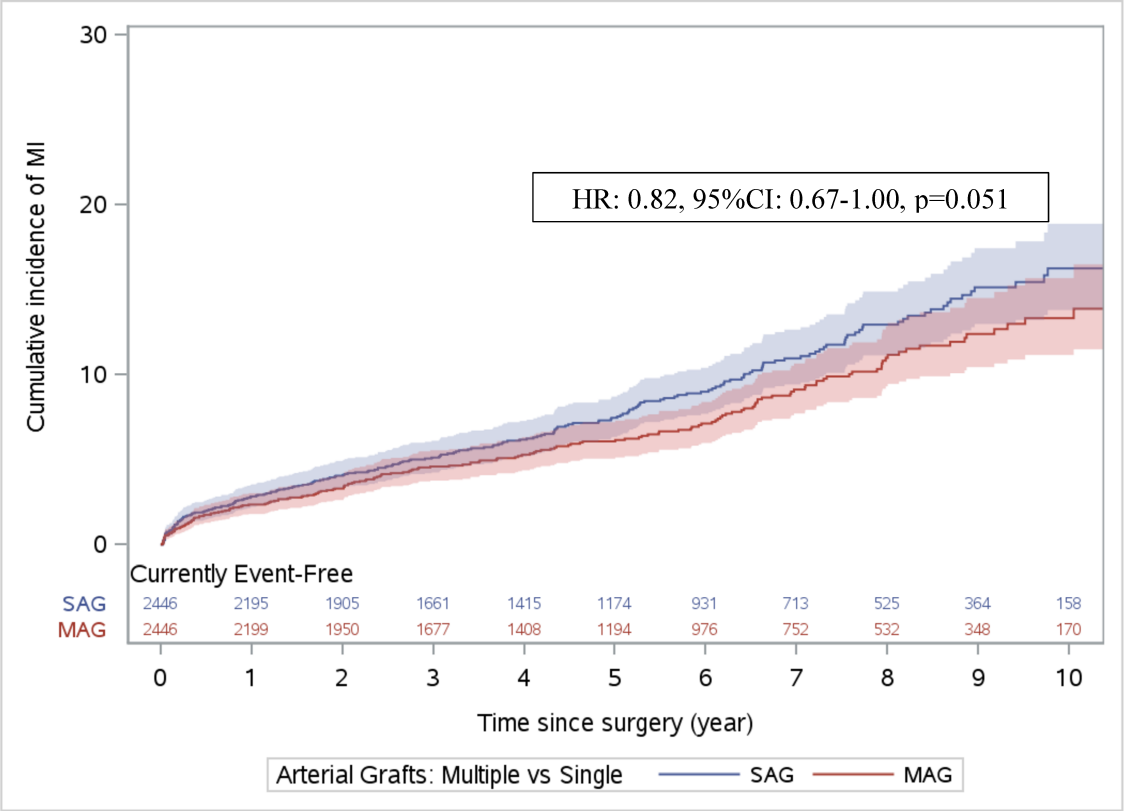
Supplemental Figures



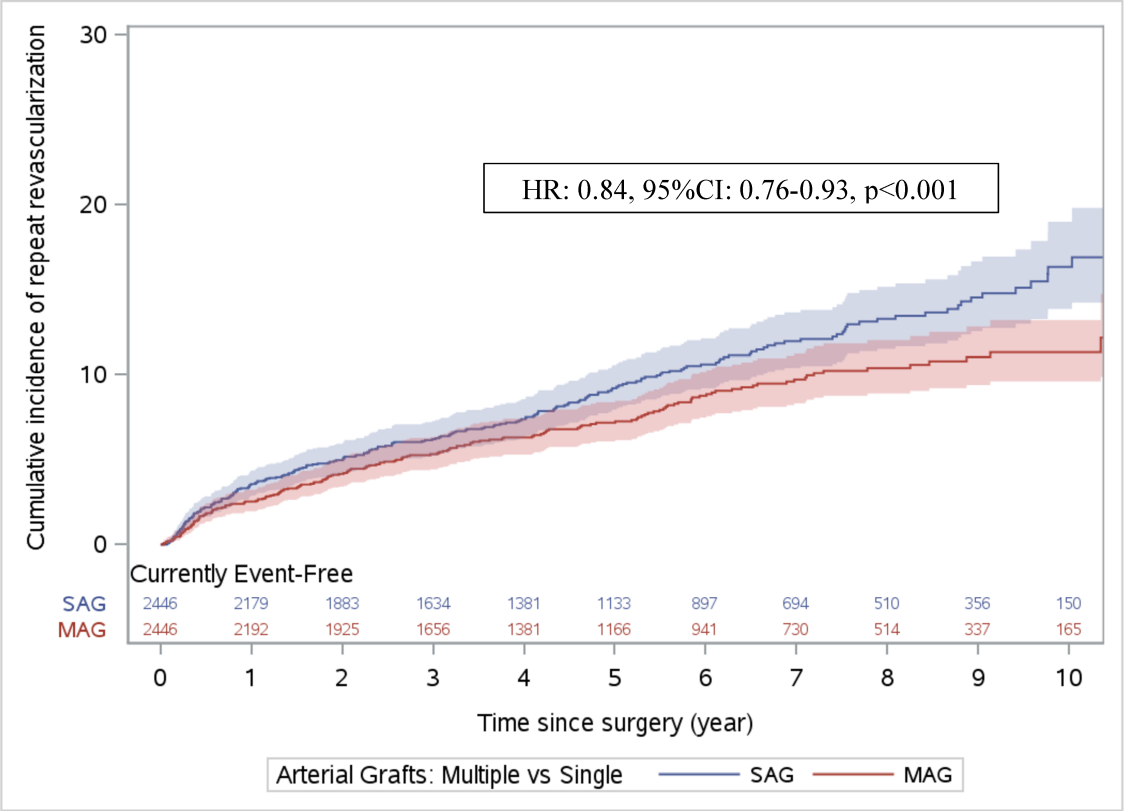
Supplemental Figure 1. Patient flow diagram for cohort derivation.



Supplemental Figure 2. Time trend for multiple arterial grafting (MAG) utilization in women (red) and men (blue) with multivessel coronary artery disease. Linear regression of MAG utilization by year of procedure was not significant in women (p=0.47) or men (p=0.35) although the utilization was higher in men compared to women (34% vs 28%, p<0.001) over the entire study period.

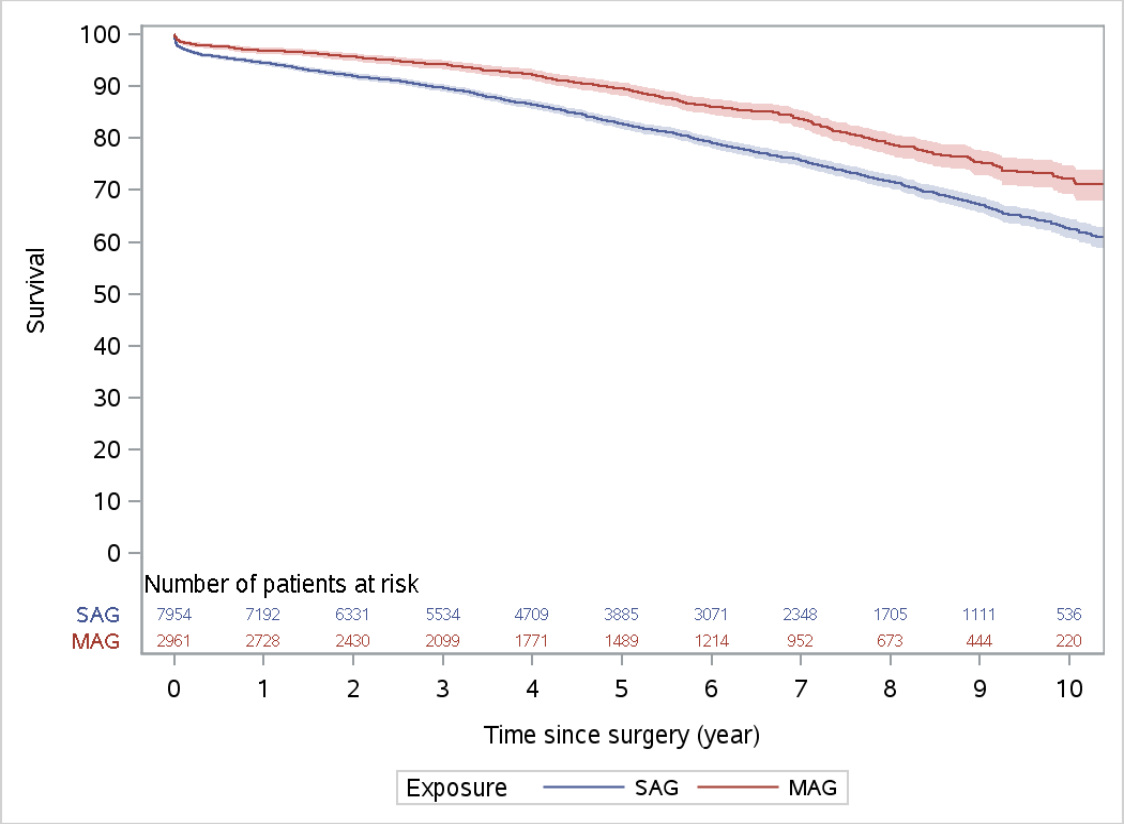


Supplemental Figure 3. Cumulative incidence curves for acute myocardial infarction was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) after propensity score matching in patients multivessel coronary artery disease and adjusting for death as a competing risk. The shaded region around the curve represents the 95% confidence interval.

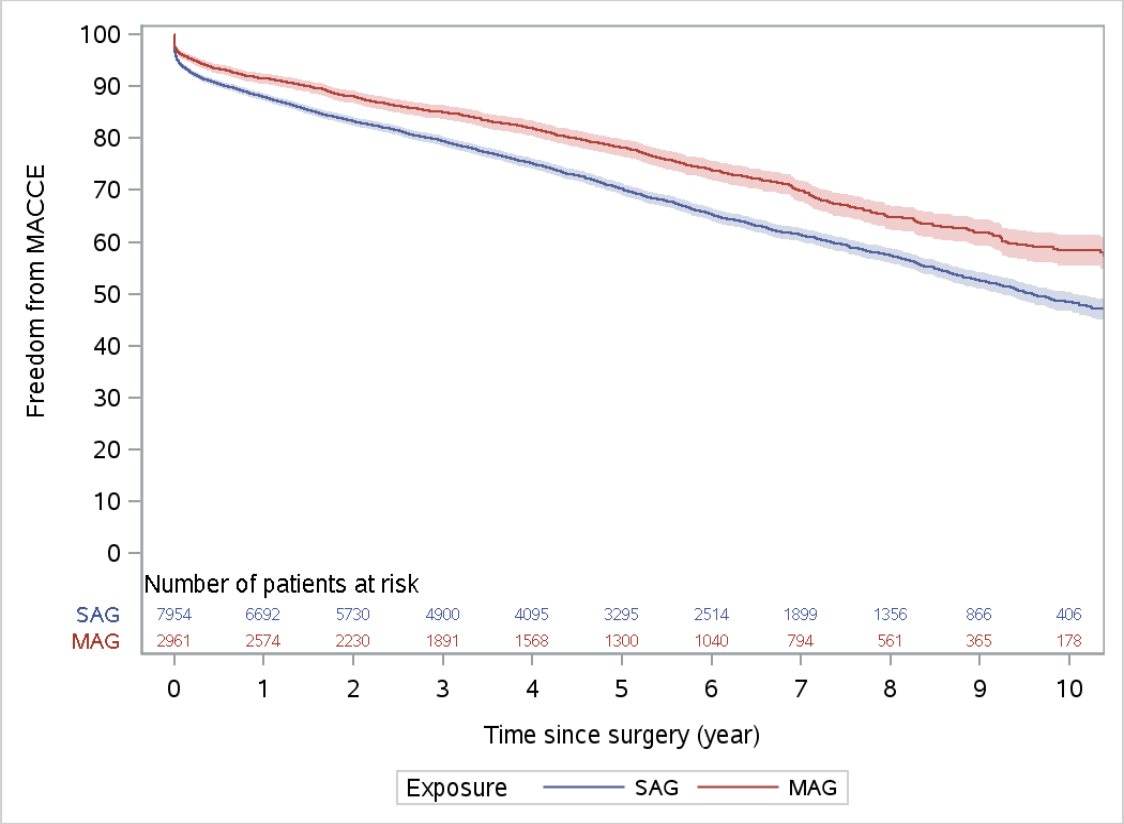


Supplemental Figure 4. Cumulative incidence curves for repeat revascularization was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) after propensity score matching in patients multivessel coronary artery disease and adjusting for death as a competing risk. The shaded region around the curve represents the 95% confidence interval.

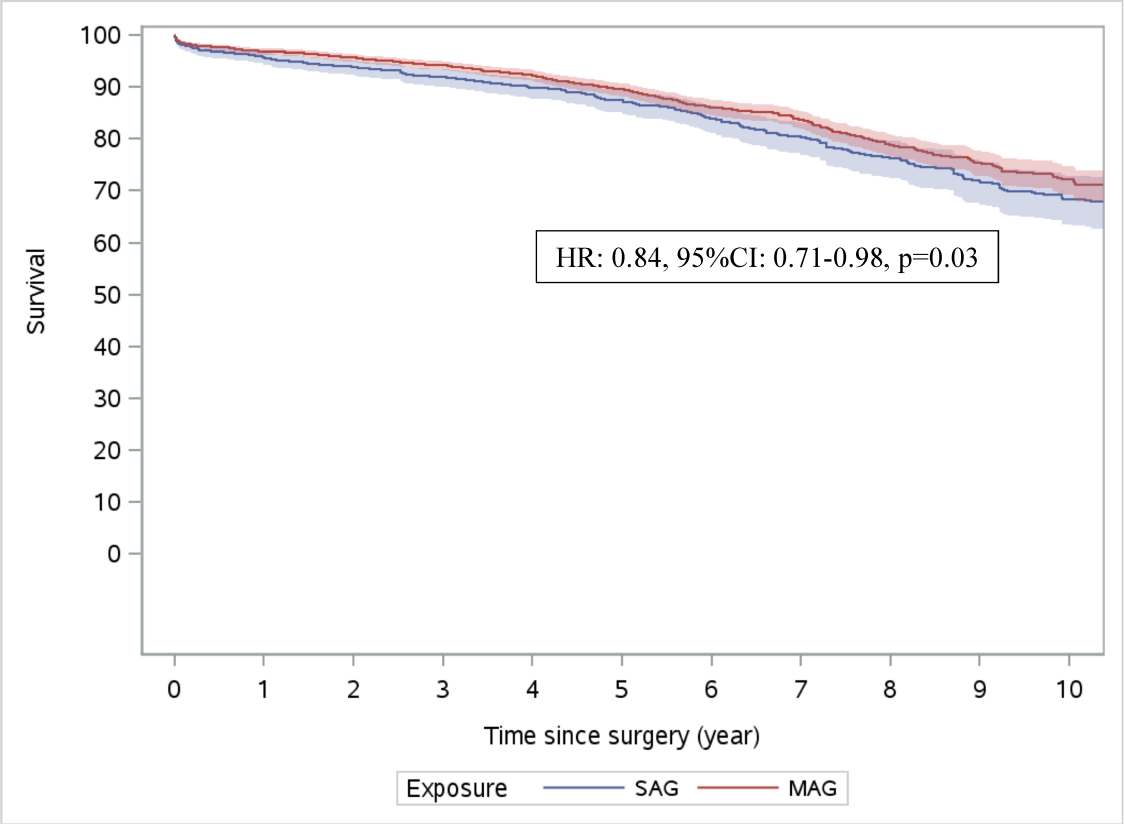
Supplemental Figure 5. Cumulative incidence curves stroke was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) after propensity score matching in patients multivessel coronary artery disease and adjusting for death as a competing risk. The shaded region around the curve represents the 95% confidence interval.



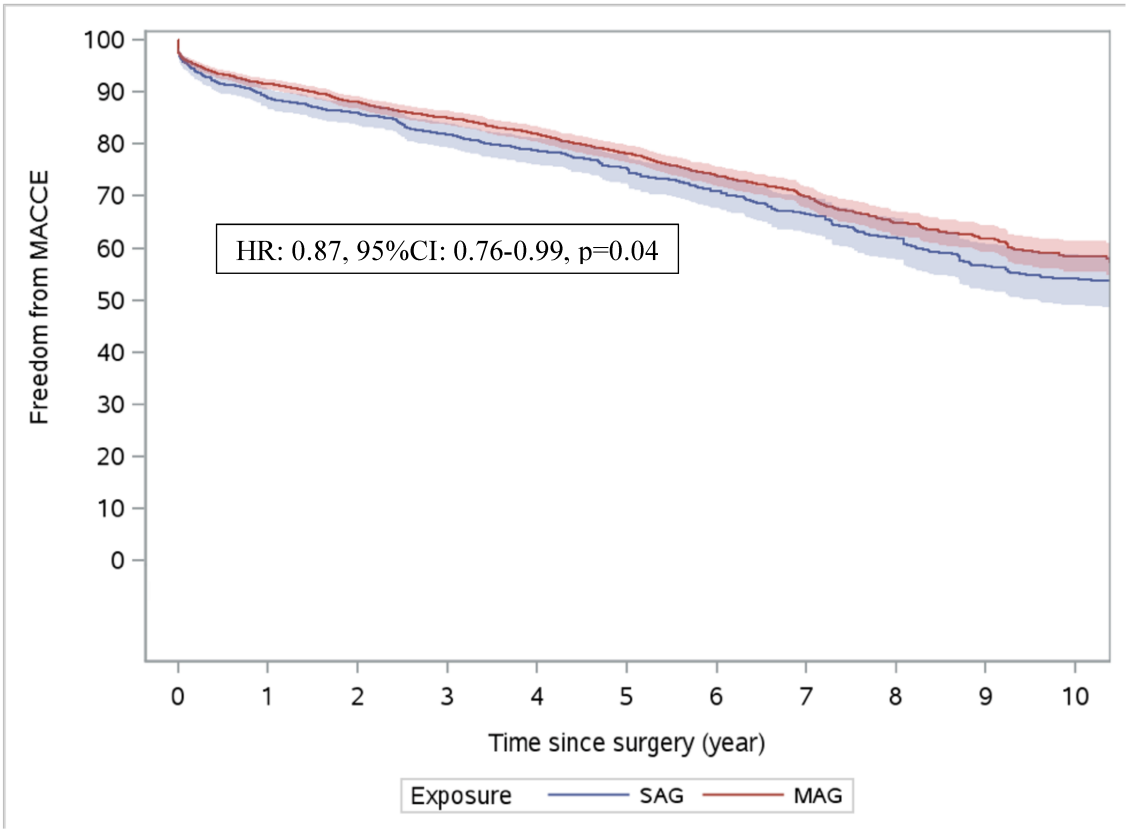
Supplemental Figure 6. Kaplan-Meier curves for survival. Survival was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) before propensity score matching in patients multivessel coronary artery disease. The shaded region around the curve represents the 95% confidence interval.



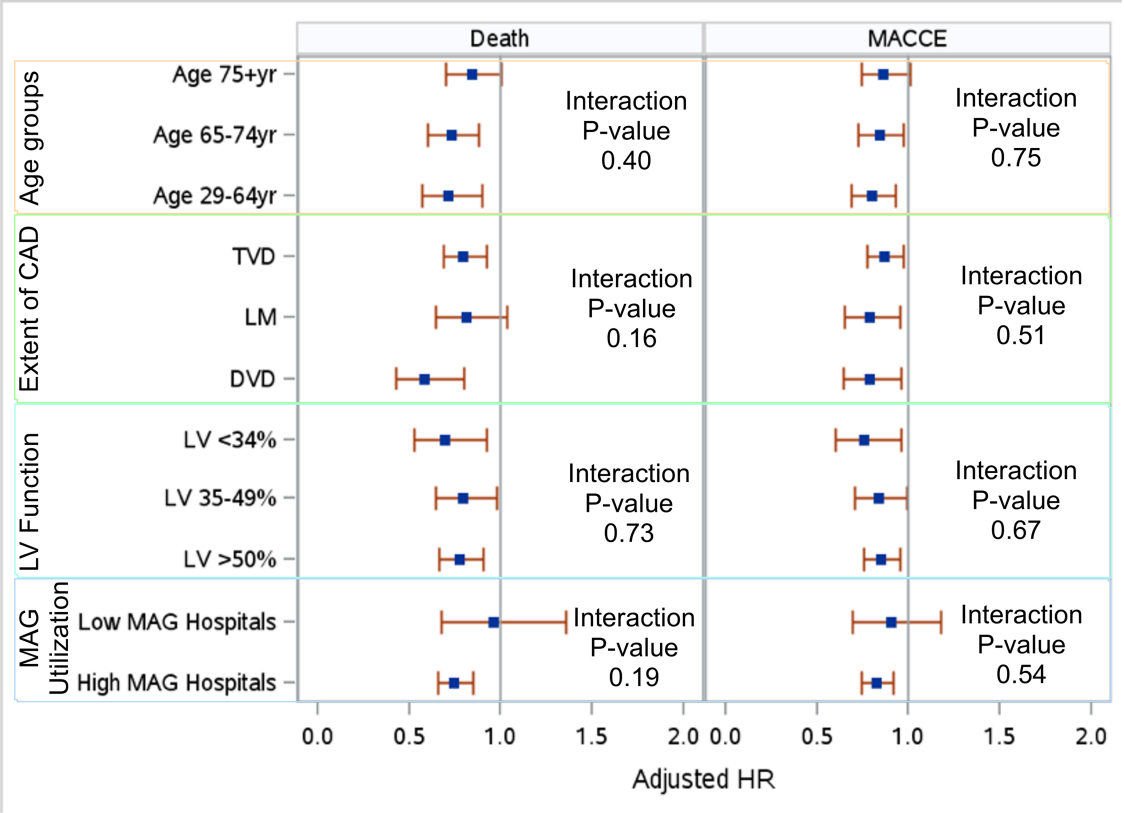
Supplemental Figure 7. Kaplan-Meier curves for freedom from major adverse cardiac and cerebrovascular events (MACCE). Freedom from MACCE was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) before propensity score matching in patients multivessel coronary artery disease. The shaded region around the curve represents the 95% confidence interval.



Supplemental Figure 8. Weighted Kaplan-Meier curves for survival. Survival was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) after inverse-probability of treatment weighting in patients multivessel coronary artery disease. The shaded region around the curve represents the 95% confidence interval.



Supplemental Figure 9. Weighted Kaplan-Meier curves for freedom from major adverse cardiac and cerebrovascular events (MACCE). Freedom from MACCE was compared between multiple arterial grafting (MAG) versus single arterial grafting (SAG) after inverse-probability of treatment weighting in patients multivessel coronary artery disease. The shaded region around the curve represents the 95% confidence interval.



Supplemental Figure 10. Subgroup analysis comparing multiple arterial grafting (MAG) versus single arterial grafting (SAG) for the primary outcome of death and the secondary outcome of major adverse cardiac and cerebrovascular events (MACCE) in a multivariable Cox-proportional hazards model. The adjusted hazard ratio (HR) is presented with >1.0 indicating harm with MAG and <1.0 indicating benefit for MAG. CAD, coronary artery disease, LV, left ventricular

Supplemental Tables

Supplemental Table 1. Baseline characteristics of propensity score (PS) matched patients and patients that were not matched

Variable	PS Matched	Not Matched	Overall	SMD	P-value
	N=4,892	N=6,023	N=10,915		
Age	66.7 (9.8)	69.3 (9.1)	68.1 (9.6)	0.27	<.0001
Body Mass Index	29.4 (5.9)	29.3 (6.1)	29.3 (6.0)	0	0.88
Hospital Frailty Risk Score	3.3 (4.1)	3.9 (4.7)	3.6 (4.4)	0.15	<.0001
Income Quintile					<.0001
Lowest 1	1,174 (24.0%)	1,479 (24.6%)	2,653 (24.3%)	0.01	
2	1,060 (21.7%)	1,271 (21.1%)	2,331 (21.4%)	0.01	
3	958 (19.6%)	1,262 (21.0%)	2,220 (20.3%)	0.03	
4	874 (17.9%)	1,089 (18.1%)	1,963 (18.0%)	0.01	
Highest 5	826 (16.9%)	922 (15.3%)	1,748 (16.0%)	0.04	
Hypertension	3,929 (80.3%)	5,099 (84.7%)	9,028 (82.7%)	0.11	<.0001
Diabetes	2,280 (46.6%)	2,905 (48.2%)	5,185 (47.5%)	0.03	0.0909
History of smoking					<.0001
Current	1,042 (21.3%)	1,102 (18.3%)	2,144 (19.6%)	0.08	
Former	1,126 (23.0%)	1,577 (26.2%)	2,703 (24.8%)	0.07	
Never	2,724 (55.7%)	3,344 (55.5%)	6,068 (55.6%)	0	
CCS Class					<.0001
0	225 (4.6%)	291 (4.8%)	516 (4.7%)	0.01	
1	313 (6.4%)	372 (6.2%)	685 (6.3%)	0.01	

2	795 (16.3%)	887 (14.7%)	1,682 (15.4%)	0.04	
3	981 (20.1%)	1,066 (17.7%)	2,047 (18.8%)	0.06	
4	202 (4.1%)	328 (5.4%)	530 (4.9%)	0.06	
ACS High Risk	186 (3.8%)	414 (6.9%)	600 (5.5%)	0.14	
ACS Intermediate Risk	1,033 (21.1%)	1,162 (19.3%)	2,195 (20.1%)	0.05	
ACS Low Risk	1,157 (23.7%)	1,503 (25.0%)	2,660 (24.4%)	0.03	
NY Heart Association					<.0001
I	3,725 (76.1%)	3,810 (63.3%)	7,535 (69.0%)	0.28	
II	63 (1.3%)	126 (2.1%)	189 (1.7%)	0.06	
III	271 (5.5%)	379 (6.3%)	650 (6.0%)	0.03	
IV	405 (8.3%)	521 (8.7%)	926 (8.5%)	0.01	
Unknown	428 (8.7%)	1,187 (19.7%)	1,615 (14.8%)	0.32	
Left ventricular function					0.6283
20% - 34 %	379 (7.7%)	463 (7.7%)	842 (7.7%)	0	
35% - 49%	1,005 (20.5%)	1,234 (20.5%)	2,239 (20.5%)	0	
<20%	57 (1.2%)	55 (0.9%)	112 (1.0%)	0.02	
>=50%	3,451 (70.5%)	4,271 (70.9%)	7,722 (70.7%)	0.01	<.0001
History of CHF	453 (9.3%)	782 (13.0%)	1,235 (11.3%)	0.12	0.04
History of MI	923 (18.9%)	1,231 (20.4%)	2,154 (19.7%)	0.04	0.0012
Recent MI	1,744 (35.7%)	2,329 (38.7%)	4,073 (37.3%)	0.06	0.0059

PVD	529 (10.8%)	754 (12.5%)	1,283 (11.8%)	0.05	0.0005
CVD	440 (9.0%)	663 (11.0%)	1,103 (10.1%)	0.07	<.0001
COPD	418 (8.5%)	684 (11.4%)	1,102 (10.1%)	0.09	<.0001
Creatinine Group					<.0001
0-120	4,523 (92.5%)	5,335 (88.6%)	9,858 (90.3%)	0.13	
121-180	282 (5.8%)	420 (7.0%)	702 (6.4%)	0.05	
>180	87 (1.8%)	268 (4.4%)	355 (3.3%)	0.15	
Dialysis	45 (0.9%)	146 (2.4%)	191 (1.7%)	0.12	<.0001
Urgency Status					<.0001
Elective	2,103 (43.0%)	2,300 (38.2%)	4,403 (40.3%)	0.1	
SemiUrgent	1,451 (29.7%)	2,011 (33.4%)	3,462 (31.7%)	0.08	
Urgent	1,338 (27.4%)	1,712 (28.4%)	3,050 (27.9%)	0.02	
Extent of coronary artery disease					0.11
DVD with proximal LAD	696 (14.2%)	892 (14.8%)	1,588 (14.5%)	0.02	
DVD without proximal LAD	408 (8.3%)	459 (7.6%)	867 (7.9%)	0.03	
LM ± SVD/DVD	948 (19.4%)	1,437 (23.9%)	2,385 (21.9%)	0.11	
LM with TVD	578 (11.8%)	698 (11.6%)	1,276 (11.7%)	0.01	
TVD without LM	2,262 (46.2%)	2,537 (42.1%)	4,799 (44.0%)	0.08	
Off Pump	1,391 (28.4%)	692 (11.5%)	2,083 (19.1%)	0.43	<.0001

ACS, acute coronary syndrome, CCS, Canadian Cardiovascular Society, CHF, congestive heart failure, COPD, chronic obstructive pulmonary disorder, CVD, cerebrovascular disease, DVD, double vessel disease, LAD, left anterior descending artery, LM, left main, MI, myocardial

infarction, PVD, peripheral vascular disease, SVD, single vessel disease, TVD, triple vessel disease

Supplemental Table 2. Long-term outcomes before and after propensity score matching

	Year	MAG	SAG
Survival	1	96.9% (95%CI: 96.2%-97.4%)	94.5% (95%CI: 94%-95%)
	5	89.5% (95%CI: 88.2%-90.7%)	82.8% (95%CI: 81.8%-83.7%)
	10	72.1% (95%CI: 69.2%-74.8%)	62.5% (95%CI: 60.6%-64.4%)
	Overall	HR: 0.65, 95%CI: (0.59 - 0.73)	
Freedom from MACCE	1	91.4% (95%CI: 90.4%-92.4%)	87.9% (95%CI: 87.2%-88.6%)
	5	78.2% (95%CI: 76.4%-79.8%)	70.2% (95%CI: 69.1%-71.3%)
	10	58.4% (95%CI: 55.5%-61.3%)	48.5% (95%CI: 46.7%-50.4%)
	Overall	HR: 0.73, 95%CI: (0.67 - 0.79)	
Acute MI	1	2.3% (95%CI: 1.8%-2.8%)	3.1% (95%CI: 2.8%-3.5%)
	5	6% (95%CI: 5.1%-7%)	8.2% (95%CI: 7.5%-8.9%)
	10	12.6% (95%CI: 10.7%-14.8%)	17% (95%CI: 15.5%-18.6%)
	Overall	HR: 0.74, 95%CI: (0.63 - 0.87)	
Repeat Revascularization	1	2.4% (95%CI: 1.9%-3%)	2.9% (95%CI: 2.6%-3.3%)
	5	7.1% (95%CI: 6.1%-8.2%)	8% (95%CI: 7.3%-8.7%)
	10	11.5% (95%CI: 9.9%-13.3%)	13.6% (95%CI: 12.3%-14.9%)
	Overall	HR: 0.92, 95%CI: (0.79 - 1.07)	
Stroke	1	0.7% (95%CI: 0.4%-1%)	0.8% (95%CI: 0.6%-1%)
	5	3.2% (95%CI: 2.5%-4%)	3.9% (95%CI: 3.4%-4.4%)
	10	6.5% (95%CI: 5.1%-8.3%)	8.4% (95%CI: 7.3%-9.6%)
	Overall	HR: 0.79, 95%CI: (0.63 - 0.99)	

MACCE, major cardiac and cerebrovascular events (composite of time to first event for death, acute MI, repeat revascularization, or stroke). MAG, multiple arterial grafting, MI, myocardial infarction, SAG, single arterial grafting

For survival and freedom from MACCE, Kaplan-Meier estimates are shown. For Acute MI, repeat revascularization, and stroke, the cumulative incidence estimate are shown.

Supplemental Table 3. Long-term outcomes after propensity score matching

	Year	MAG	SAG
Survival	1	96.6% (95%CI: 95.8%-97.3%)	95.5% (95%CI: 94.6%-96.3%)
	5	88.8% (95%CI: 87.3%-90.2%)	86.2% (95%CI: 84.6%-87.7%)
	10	70.7% (95%CI: 67.5%-73.7%)	67.3% (95%CI: 64%-70.4%)
	Overall	HR: 0.85, 95%CI: (0.75 - 0.98)	
Freedom from MACCE	1	90.8% (95%CI: 89.6%-91.9%)	88.8% (95%CI: 87.5%-90%)
	5	77.2% (95%CI: 75.2%-79%)	73.1% (95%CI: 71.1%-75%)
	10	57% (95%CI: 53.8%-60.1%)	50.6% (95%CI: 47.3%-53.8%)
	Overall	HR: 0.85, 95%CI: (0.76 - 0.93)	
Acute MI	1	2.5% (95%CI: 2%-3.2%)	3.6% (95%CI: 2.9%-4.4%)
	5	7.2% (95%CI: 6.1%-8.4%)	9.2% (95%CI: 7.9%-10.6%)
	10	11.3% (95%CI: 9.6%-13.2%)	16.3% (95%CI: 13.9%-19%)
	Overall	HR: 0.82, 95%CI: (0.67 – 1.00)	
Repeat Revascularization	1	2.4% (95%CI: 1.8%-3%)	2.8% (95%CI: 2.2%-3.6%)
	5	6.1% (95%CI: 5.1%-7.2%)	7.5% (95%CI: 6.3%-8.7%)
	10	13.3% (95%CI: 11.2%-15.7%)	16.2% (95%CI: 13.8%-18.9%)
	Overall	HR: 0.79, 95%CI: (0.65 - 0.94)	
Stroke	1	0.7% (95%CI: 0.4%-1.1%)	0.6% (95%CI: 0.4%-1%)
	5	3.4% (95%CI: 2.6%-4.3%)	3.4% (95%CI: 2.6%-4.3%)
	10	6.7% (95%CI: 5.1%-8.6%)	6.9% (95%CI: 5.3%-8.9%)

	Overall	HR: 1.03, 95%CI: (0.76 - 1.38)

MACCE, major cardiac and cerebrovascular events (composite of time to first event for death, acute MI, repeat revascularization, or stroke). MAG, multiple arterial grafting, MI, myocardial infarction, SAG, single arterial grafting

For survival and freedom from MACCE, Kaplan-Meier estimates are shown. For Acute MI, repeat revascularization, and stroke, the cumulative incidence estimate are shown.

Supplemental Table 4. Baseline characteristics before and after inverse probability of treatment weighting (IPTW)

	Before IPTW			After IPTW		
Variable	**MAG**	**SAG**	**SMD**	**MAG**	**SAG**	**SMD**
Age	66.0	68.9	0.30	66.0	65.5	0.050
Body Mass Index	29.2	29.4	0.020	29.2	29.3	0.010
Hospital Frailty Risk Score	3.2	3.8	0.150	3.2	3.3	0.030
Income Quintile						
Lowest 1	22.5%	25.0%	0.060	22.5%	24.0%	0.030
2	21.1%	21.4%	0.010	21.1%	21.1%	
3	20.5%	20.3%	0.010	20.5%	20.7%	0.000
4	18.5%	17.8%	0.020	18.5%	17.8%	0.020
Highest 5	17.3%	15.5%	0.050	17.3%	16.5%	0.020
Hypertension	79.2%	84.0%	0.12	79.2%	78.2%	0.020
Diabetes	46.4%	47.9%	0.030	46.4%	47.3%	0.020
History of smoking						
Current	20.2%	19.4%	0.020	20.2%	20.4%	0.000
Former	22.1%	25.8%	0.090	22.1%	23.7%	0.040
Never	57.8%	54.8%	0.060	57.8%	55.9%	0.040
CCS Class						
0	5.0%	4.6%	0.020	5.0%	5.4%	0.020
1	5.8%	6.4%	0.020	5.8%	6.3%	0.020
2	17.0%	14.8%	0.060	17.0%	17.5%	0.010
3	20.1%	18.3%	0.050	20.1%	21.2%	0.030
4	3.8%	5.3%	0.070	3.8%	3.5%	0.010
ACS High Risk	3.3%	6.3%	0.14	3.3%	3.8%	0.020

ACS Intermediate Risk	21.1%	19.7%	0.040	21.1%	18.5%	0.070
ACS Low Risk	23.8%	24.6%	0.020	23.8%	23.9%	0.0010
NY Heart Association						
I	79.3%	65.2%	0.32	79.3%	77.9%	0.030
II	1.1%	2.0%	0.070	1.1%	1.0%	0.010
III	4.9%	6.3%	0.060	4.9%	5.8%	0.040
IV	7.1%	9.0%	0.070	7.1%	7.8%	0.030
Unknown	7.6%	17.5%	0.30	7.6%	7.5%	0.000
Left ventricular function						
20% - 34 %	7.5%	7.8%	0.010	7.5%	8.5%	0.040
35% - 49%	20.4%	20.5%		20.4%	19.8%	0.020
<20%	1.3%	0.9%	0.040	1.3%	1.3%	0.000
>=50%	70.8%	70.7%		70.8%	70.4%	0.010
History of CHF	8.3%	12.4%	0.14	8.3%	9.2%	0.030
History of MI	17.7%	20.5%	0.070	17.7%	17.9%	0.010
Recent MI	35.0%	38.2%	0.070	35.0%	33.2%	0.040
PVD	10.1%	12.4%	0.070	10.1%	11.2%	0.030
CVD	9.0%	10.5%	0.050	9.0%	8.6%	0.010
COPD	8.0%	10.9%	0.10	8.0%	8.2%	0.010
Creatinine Group						0.000
0-120	93.0%	89.3%	0.13	93.0%	92.9%	0.010
121-180	5.6%	6.7%	0.050	5.6%	5.5%	0.000
>180	1.4%	4.0%	0.16	1.4%	1.6%	0.020
Dialysis	0.7%	2.1%	0.12	0.7%	0.8%	0.000
Urgency Status						

Elective	45.2%	38.5%	0.14	45.2%	47.0%	0.040
SemiUrgent	28.5%	32.9%	0.090	28.5%	28.3%	0.010
Urgent	26.3%	28.6%	0.050	26.3%	24.7%	0.040
Extent of coronary artery disease						
DVD with proximal LAD	13.8%	14.8%	0.030	13.8%	13.2%	0.020
DVD without proximal LAD	8.6%	7.7%	0.030	8.6%	8.8%	0.010
LM ± SVD/DVD	16.9%	23.7%	0.17	16.9%	18.2%	0.030
LM with TVD	11.2%	11.9%	0.020	11.2%	10.6%	0.020
TVD without LM	49.5%	41.9%	0.15	49.5%	49.2%	0.010
Off Pump	40.2%	11.2%	0.70	40.2%	37.8%	0.050

ACS, acute coronary syndrome, CCS, Canadian Cardiovascular Society, CHF, congestive heart failure, COPD, chronic obstructive pulmonary disorder, CVD, cerebrovascular disease, DVD, double vessel disease, LAD, left anterior descending artery, LM, left main, MI, myocardial infarction, PVD, peripheral vascular disease, SVD, single vessel disease, TVD, triple vessel disease