Evolving Atherectomy Use for Treating Calcified Coronary Lesions: A Single Center 10-year Real World Experience

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Background

- PCI for severely calcified coronary lesions is associated with lower procedural success and more complications.
- Atherectomy prior to stenting is an important adjunct for treatment of these lesions.
- Outcome data directly comparing available atherectomy devices is limited.
- Trans-radial (TR) access when compared to transfemoral (TF) access has lower rates of major vascular complications and bleeding with higher rates of patient satisfaction.

Objective

- The aim of our study was to evaluate the evolving use of OA and RA over a ten-year period in or institution and to compare the outcomes with each modality over this period as well as feasibility and safety from different access sites.

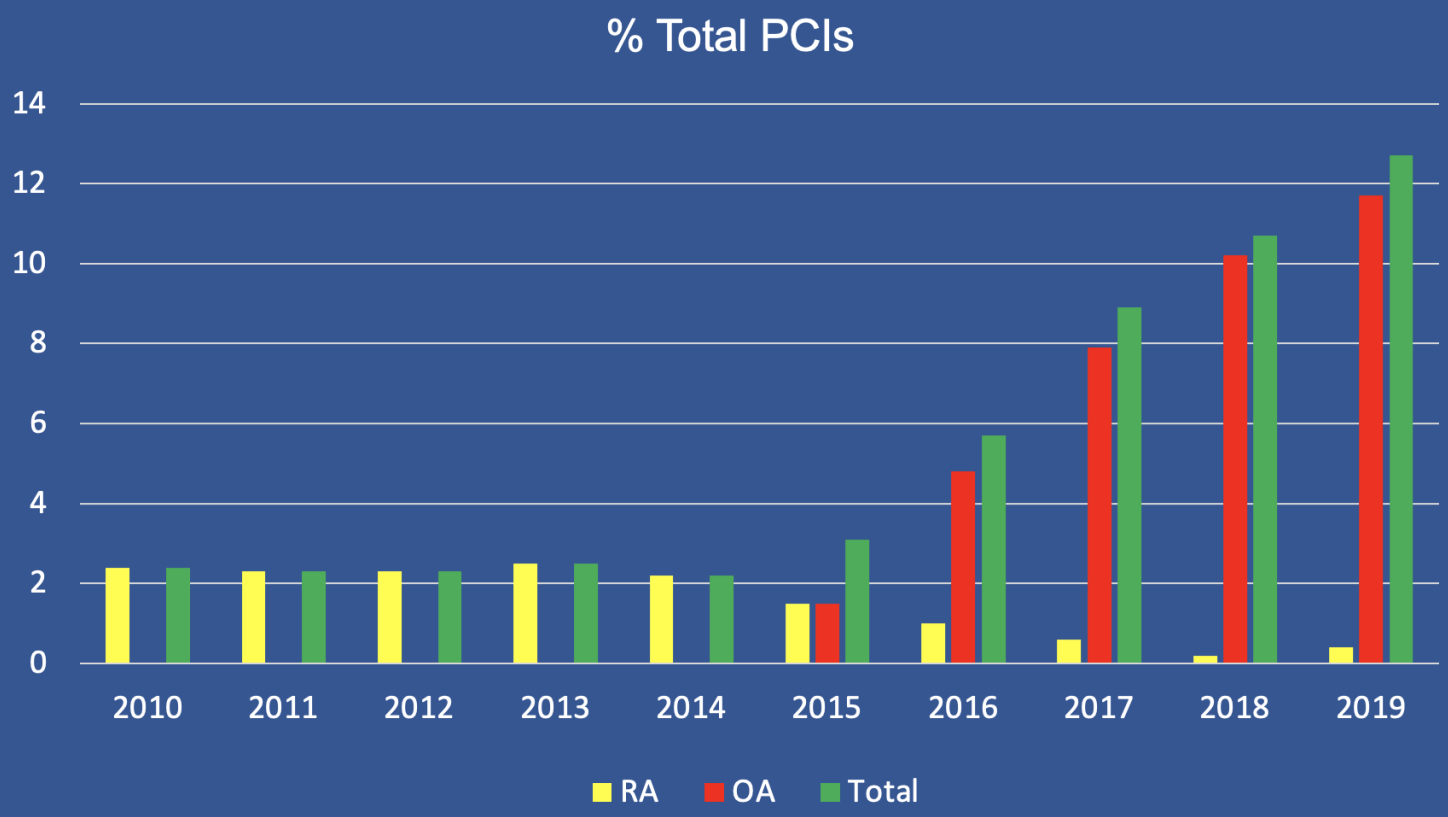
Methods

- Between January 1, 2010 and December 31, 2019, clinical data and coronary angiograms for patients undergoing atherectomy prior to stenting for calcified coronary lesions at IU Health Methodist Hospital were retrospectively reviewed.
- Data was pooled, and patients were divided into rotational (RA) and orbital (OA) atherectomy groups.
- Demographic and procedural variables as well as 30-day and 1-year death, MACE and bleeding events were compared.

Results

- 368 patients were analyzed (158 RA and 210 OA).
- RA use in our institution has slowed since around 2013 (and OA use has increased.
- The RA group had significantly more patients with history of CVA as well as composite of prior MI/PCI/CABG.
- Death, MACE, and bleeding at 30-days were similar for both groups.
- MACE and target vessel revascularization were also similar between groups at 1-year.
- When 30-day atherectomy outcomes were reanalyzed by access site, death and MACE were similar for TR and TF patients, but bleeding events were significantly reduced for TR patients.

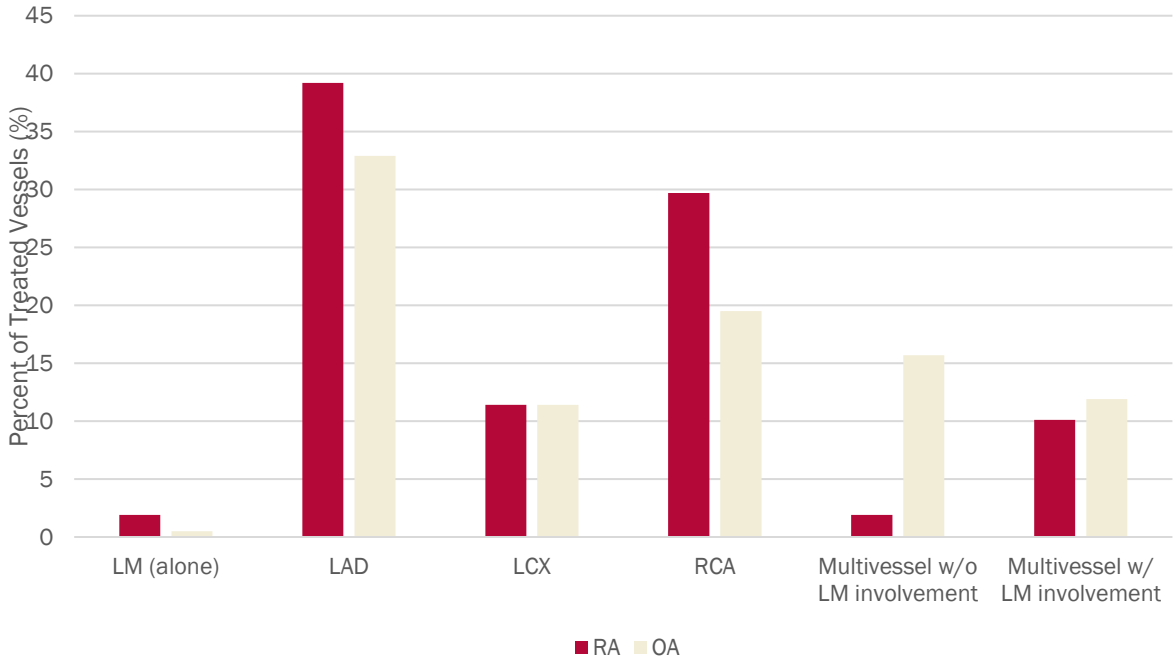
Atherectomy Utilization at IU Health Methodist Hospital



Baseline Demographics

Variable	RA (n=158)	OA (n=210)	p-value
Age	70.1 ± 9.8	68.5 ± 10.3	0.133
Male	113 (72)	146 (70)	0.678
BMI	30.3 ± 6.9	30.6 ± 6.19	0.662
HTN	149 (94)	203 (97)	0.271
HLD	140 (89)	186 (89)	0.991
DM	88 (56)	128 (61)	0.311
PVD	52 (33)	68 (32)	0.914
ESRD	22(14)	37(18)	0.394
Smoker	31(20)	32(15)	0.221
Prior CVA	38(24)	29(14)	0.008
Prior MI/PCI/CABG	194	213	0.015
Prior MI	74(47)	80(38)	0.055
Prior PCI	76(48)	101(48)	0.808
Prior CABG	44(28)	32(15)	0.002
Vessel Treated			
LM	3(2)	1(0.4)	0.193
LAD	62(39)	69(33)	0.206
Lcx	18(11)	23(11)	0.895
RCA	47(30)	40(19)	0.017
Other	9(6)	21(10)	0.135
Multivessel w/ LM	16(10)	25(12)	0.592
Multivessel w/o LM	3(2)	31(15)	<0.001

Vessels Treated



RA vs OA Outcomes

	Rotational (N=158)	Orbital (N=210)	p-value
30 Day Complications			
MACE	4(3)	3(1)	0.236
Cardiac Death	3(2)	1(0.4)	0.404
Revascularization (TLR or CABG)	1(0.6)	1(0.4)	0.829
Nonfatal MI	0(0)	1(0.4)	1
Noncardiac death	0(0)	4(2)	0.138
Bleeding	37(23)	26(12)	0.005
72-hour bleeding	10(6)	4(2)	0.028
Transfusion	15(9)	13(6)	0.259
Hemorrhagic stroke	0(0)	1(0.4)	1
GI bleed	2(1)	1(0.4)	0.414
Tamponade	3(2)	0(0)	0.078
Access site hematoma/bleed	7(4)	7(3)	0.586
1 Year Complications			
MACE	19(12)	21(10)	0.537
Cardiac Death	4(2)	9(4)	0.367
Revascularization (TLR or CABG)	9(5)	8(4)	0.393
Nonfatal MI	6(4)	4(2)	0.269
Noncardiac death	5(3)	15(7)	0.080

RA vs OA Procedural Variables

Variable	RA (n=158)	OA (n=210)	p-value
Fluoroscopy time	26.2 ± 11.5	24.7 ± 11.9	0.225
Contrast	207.7 ± 83.2	212.0 ± 81.7	0.620
Number of vessels	1.15 ± 0.37	1.42 ± 0.67	<0.001
Stents (atherectomy vessel)	1.65 ± 0.7	1.67 ± 0.79	0.801
Stent length (atherectomy vessel)	38.6 ± 20.5	38.7 ±21.5	0.964

RA vs OA Subdivided by EF

	Orbital	Rotational	p-value
EF>50%	N=123	N=74	
30d Mace	4(3.3)	4(5.4)	0.4769
30d All Death	2(1.6)	0(0)	0.5285
30d Cardiac Death	1(0.8)	0(0)	1
30d Revascularization	0(0)	1(1.4)	0.3756
30d Bleed	8(6.5)	7(9.5)	0.5802
EF<50%	N=83	N=67	
30d Mace	4(4.8)	2(3)	0.6921
30d All Death	4(4.8)	2(3)	0.6921
30d Cardiac Death	4(4.8	2(3)	0.6921
30d Revascularization	0(0)	0(0)	1
30d Bleed	6(7.2)	8(11.9)	0.4014

Radial vs Femoral Approach

	Femoral (N=252)	Radial (N=105)	p-value
30 Day Complications			
MACE	5(2)	2(2)	0.960
Cardiac Death	4(2)	0(0)	0.324
Revascularization (TLR or CABG)	1(0.4)	0(0)	1
Bleeding	56(22)	7(7)	<0.001
72-hour bleeding	14(6)	0(0)	0.013
Transfusion	23(9)	5(5)	0.162
Hemorrhagic stroke	0(0)	1(1)	0.294
GI bleed	3(1)	0(0)	0.558
Tamponade	3(1)	0(0)	0.558
Access site hematoma/bleed	13(5)	1(1)	0.062

Discussion

- Registry data evaluating the use of RA and OA has shown no significant change in the trends of OA or RA use for inpatient PCI.
- RA is the predominant used atherectomy tool.
- However, there is a trend for more usage of OA in large academic teaching hospitals.

Megaly M, Brilakis ES, Sedhom R, Tawadros M, Elbadawi A, Mentias A, Alaswad K, Kirtane AJ, Garcia S, Pershad A. Outcomes with Orbital and Rotational Atherectomy for Inpatient Percutaneous Coronary Intervention. Cardiology and Therapy. 2021 Jun;10(1):229-39.

Discussion

- Our own institution has seen a decline in the use of RA since the year 2013 and a steady increase in the use of OA since 2015.
- The increasing use of OA is likely driven by:
  - bidirectional cutting
  - potential for larger debulking area
  - increased deliverability with *Glideassist®* and the *ViperWire Advance®* with Flex Tip

Discussion

- In the two largest matched cohorts to date, OA when compared to RA is associated with reduced risk of in-hospital mortality.
  - Driven by lower rates of periprocedural MI.

Megaly M, Brilakis ES, Sedhom R, Tawadros M, Elbadawi A, Mentias A, Alaswad K, Kirtane AJ, Garcia S, Pershad A. Outcomes with Orbital and Rotational Atherectomy for Inpatient Percutaneous Coronary Intervention. Cardiology and Therapy. 2021 Jun;10(1):229-39.

Meraj PM, Shlofmitz E, Kaplan B, Jauhar R, Doshi R. Clinical outcomes of atherectomy prior to percutaneous coronary intervention: A comparison of outcomes following rotational versus orbital atherectomy (COAP-PCI study). Journal of Interventional Cardiology. 2018 Aug;31(4):478-85.

Discussion

- Our study did not show any difference in 30-day or 1-year MACE or periprocedural MI between OA and RA.
- However, there were more bleeding events in the RA vs OA group.

Discussion

- Prior studies demonstrated a higher risk of perforation and tamponade with OA as compared to RA.
- There were no difference in these variables between RA and OA in our study.

Megaly M, Brilakis ES, Sedhom R, Tawadros M, Elbadawi A, Mentias A, Alaswad K, Kirtane AJ, Garcia S, Pershad A. Outcomes with Orbital and Rotational Atherectomy for Inpatient Percutaneous Coronary Intervention. Cardiology and Therapy. 2021 Jun;10(1):229-39.

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Discussion

- The OA group had higher rates of multivessel treatment.

Discussion

- TR access for RA and OA has lower risk of in-hospital major bleeding and major access site complications.
- Our study was consistent with prior literature by demonstrating fewer bleeding events in the TR group than the TF group at 30 days.

Watt J, Austin D, Mackay D, Nolan J, Oldroyd KG. Radial versus femoral access for rotational atherectomy: a UK observational study of 8622 patients. Circulation: Cardiovascular Interventions. 2017 Dec;10(12):e005311.

Doshi R, Shlofmitz E, Jauhar R, Meraj P. Orbital Atherectomy Via Transradial Access: A Multicenter Propensity-Matched Analysis. J Invasive Cardiol. 2019 Nov 1;31(11):325-30.

Limitations

- It is a retrospective observational study.
  - Characteristic limitation of selection bias
- Single center
  - Only reflects the practice and experience of providers at our facility.
- Small sample size

Conclusion

- In our institution, both RA and OA have been successfully used to treat calcified coronary lesions with similar short-and long-term outcomes.
- The rapid increase in OA use likely reflects improved ease of device and/or increased operator comfort.
- Also, TR access for atherectomy may improve overall procedural safety by reducing bleeding events.