



## OUTCOMES AND CHARACTERISTICS OF ROTATIONAL ATHERECTOMY IN A TERTIARY CARE HOSPITAL

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### Abstract

**Objectives:** A retrospective review of the short-term outcomes of rotational atherectomy in a high Syntax and high CathPCI Risk population.

**Methodology:** A total of 40 patients who had rotational atherectomy between June, 2020 to November 2020 were reviewed retrospectively in Jinnah hospital lahore Institute of Cardiology, Lahore Pakistan, after ethical committee approval. The patients were followed-up clinically for major adverse cardiovascular events (MACE) and procedure success after three months.

**Results:** Patients undergoing rotational atherectomy were at high risk with a mean NCDR CathPCI risk score of  $50.2 \pm 11$  and a mean Syntax score of  $31.2 \pm 6.24$ . The patients mean age was  $68.2 \pm 8.1$  years, 81% were male, 80% were type 2 diabetics, 37.5% have chronic kidney disease and 27(67.5%) have  $>32$  of syntax score. Of the 27 people, all except one person in the high-risk syntax group reported a successful procedure. After 3 months, 4 patients reported major adverse cardiovascular events. Of these three, one had died during the procedure and recurrent myocardial infarction was noticed in remaining two patients. These two patients refused revascularization and were medically treated. Even with revascularization; one patient expired. All patients with major adverse cardiovascular events syntax score  $>32$ .

**Conclusion:** Despite increased Syntax score angioplasty with Rotaablation achieved good clinical outcomes with urgent percutaneous coronary intervention in calcified lesions with major adverse cardiovascular events.

**Key words:** Rotational/Directional atherectomy; Coronary artery disease and Percutaneous coronary intervention (PCI).

### INTRODUCTION

Coronary artery calcification (CAC) is a communal angiography finding that makes percutaneous coronary interventions (PCI) more challenging<sup>1-2</sup>. Compared to lesions with little or no calcium content, calcified lesions are more likely to cause post-PCI complications from stent mal-apposition and insufficient expansion<sup>3-4</sup>. A strong association exists between CAC with male and advanced age.

A CAC is present in 90% of men over the age of 70<sup>5</sup>. Following PCI with drug-eluting stents, a recent retrospective analysis of large multiethnic sample revealed that CAC is still an independent predictor of complications. In order to treat calcified lesions, rotational atherectomy (RA) along with mechanical debulking must be done reduce the lesions<sup>6</sup>. In RA, calcified atherosclerotic plaques are differentially sanded using a rotablator diamond-tipped instrument (Boston Scientific, USA) on a guide wire at 140,000 to 180,000 rpm. There is a lot of evidence for RA from the US and Europe, but little research on low- and middle-income countries (LMICs) has been published<sup>7</sup>. Rotational atherectomy had no impact on late luminal loss and recurrent cardiac events, according to data from the ROTAXUS study, which was primarily conducted in Caucasian patients<sup>8</sup>. There was no change in results among patients who underwent Percutaneous coronary intervention without or with RA at the two-year follow-up<sup>8</sup>. While Baruah DK et al. stated 97.8% of treatment success rate among Indian patients, with 7% of MACE and 99% treatment success rate was reported by G Minocha et al among Indians, reporting MACE in 9% of patients. This comparison favorably shows less MACE in comparison to ROTAXUS study which shows 28% of MACE at nine months and 30% at two years<sup>9-10</sup>. In contrast to, where stable angina is the predominate symptom, a study of these South Asian studies reveals that acute coronary syndrome (ACS) is the prominent symptom<sup>11</sup>. Additionally, the typical burr size was smaller. Data on Pakistani patients underwent RA is insufficient. Due to factors including age, frailty, numerous comorbidities, complex modifications, genetics, environmental factors, and a lack of resources, it is expected that the characteristics and results of rotational atherectomy in our patients will vary. A debilitating surgical risk affects the majority of our patients who are admitted for rotablation<sup>12</sup>. We need to look at whether our patients' outcomes are similar to or different from those of the ROTAXUS trials and the Indian studies. This study also aims to share our PCI-assisted RA experience.

## **METHODOLOGY**

A total of 40 patients who had rotational atherectomy between June, 2020 to November 2020 were reviewed retrospectively in Jinnah hospital lahore Institute of Cardiology Lahore Pakistan, after ethical committee approval. The patients electronic and paper medical records were maintained. According to our cardiac catheterization lab records; patients were selected who needed atherectomy using a rotablative device (Boston Scientific, USA) prior to Percutaneous coronary intervention (PCI). After that, patient's medical history and angiograms were reviewed. In this study, patients' baseline, angiographic, and procedural characteristics were noted. The Syntax scale was used to measure the complexity of the angiography, and the NCDR CathPCI risk score was used to determine the clinical risk. The study's main finding was the procedure's immediate success, which was determined by the presence of TIMI Grade III (thrombolysis in myocardial infarction) flow and less than 50% residual stenosis following coronary intervention in the target vessel. All-causes of mortality, myocardial infarction; defined as a new ECG pathological Q wave or angiographic evidence of an occluded flow-limiting coronary artery and revascularization of the target lesion defined as a bypass surgery or percutaneous intervention performed to restenosis the target lesion were the secondary endpoints. The patients were followed-up clinically for major adverse cardiovascular events (MACE) and procedure success after three months. Patients who underwent PCI involving RA were chosen for the study's goals. A predesigned proforma was used to collect data. Results and MACE data were gathered using chart reviews. The data were presented as standard deviation and mean for quantitative variables and percentages for categorical variables using SPSS V20.0.

## **RESULTS**

The patients mean age was  $68.2 \pm 8.1$  years, 81% were male, 80% were type 2 diabetics, 37.5% have chronic kidney disease and 27(67.5%) have >32 of syntax score. Of the 40 patients, 24 (60%) exhibited left ventricular systolic dysfunction (left ventricular ejection fraction  $\leq 40\%$ ), and 18 (45%) had previously experienced MI. Angina pectoris was the common presentation seen in 24 (60%) followed by STEMI in 2 (5%) and N STEMI in 15 (37.5%).

Characteristics	N (%) / Mean ± SD
<b>Total Patients</b>	<b>N= 40</b>
Age in years	68.2 ± 8.1
Males	34 (85%)
Hypertension	35 (87.5%)
Diabetes	32 (80%)
Smoking	17 (42.5%)
Dyslipidemia	25 (62.5%)
Hemodialysis	5 (12.5%)
Chronic Kidney Disease	15 (37.5%)
STEMI	2 (5%)
Left ventricular Dysfunction	24 (60%)
Angina	24 (60%)
NSTEMI	15 (37.5%)
Prior MI	18 (45%)
Cardiogenic Shock	1 (2.5%)
Prior CABG	8 (20%)
Prior PCI	5 (12.5%)

The left anterior descending artery (LAD) was the site of the target in RA in the majority of patients (80%), trailed by the left main coronary artery (LCA) (25%). Rotablated lesions had an average length of 35.12 ± 13.1 mm. 13 (32.5%) of the total rotablated lesions were bifurcation lesions. Before the treatment, all patients were assessed by the cardiothoracic surgeon with triple-vessel disease and left main coronary artery disease with Syntax score >22. The average score for syntax was 31.2 ± 6.24 patients. In 27 (67.5%) had syntax score greater than 32. According to an NCDR CathPCI mean risk score of 50.2±11 and a mean Syntax score of 31.2 ± 6.24, respectively, our patients had significantly increased risks for both mortality and complicated coronary lesions. Table 2 provides the patients' angiographic features.

**Table-II** shows the Procedural and Angiographic features of patients Enduring Rotational Atherectomy.

Characteristics	N (%) / Mean ± SD
<b>Total Patients</b>	<b>N= 40</b>
<b>Target lesion location (Vessel)</b>	
LAD	32 (80%)
Left Main	10 (25%)
RCA	7 (17.5%)
LCX	9 (22.5%)
Bifurcation Lesions n (%)	13 (32.5%)
Target lesion length	35.12 ± 13.1 mm
<b>Syntax score</b>	
<22	3 (7.5%)
22-32	10 (25%)
>32	27 (67.5%)
Mean CathPCI Score	50.2±11
Mean Syntax Score	31.2 ± 6.24
Burr size in mm	1.5
TPM placed	36 (90%)
TPM retained	8 (20%)
<b>Number of burrs</b>	
1 burr	38 (95.0%)

2 burr	2 (5%)
Intra-aortic balloon pump	1 (2.5%)
No reflow	3 (7.5%)
Total vessels rotablated	1.30±0.42
Inotropes	17 (42.5%)
Intravascular Ultrasound	7 (13.7%)
Contrast used in ml	240.21± 109.8

6 (15%) of the patients had a temporary pacemaker placed prior to the treatment, but only 1 (16.7%) needed retention. The mean burr size used had an average diameter of 1.5 mm. 38 patients (95.0%) had single burr used, and the average number of rotablated vessels per patient was 1.30± 0.42. Three patients (7.5%) did not experience reflow and 17 (42.6%) required inotropes. 240.21± 109.8ml was the average contrast volume that was used. Drug-eluting stents (DES) were placed in all 40 patients, and intravascular ultrasonography was done in 5 (12.5%) patients.

Of the 27 people, all except one person in the high-risk syntax group reported a successful procedure. After 3 months, 4 patients reported major adverse cardiovascular events. Of these three, one had died during the procedure and recurrent myocardial infarction was noticed in remaining two patients. These two patients refused revascularization and were medically treated. Even with revascularization; one patient expired. All patients with major adverse cardiovascular events syntax score>32.

**Table-III** shows the Rotational Atherectomy outcomes.

	Overall	Syntax Score	
	Outcomes	>32	<32
Immediate Procedural Success	39 (97.5%)	27(97.0%)	13(100%)
<b>Major Adverse Cardiovascular Events At 3 months</b>			
Total Major Adverse Cardiovascular Events	4 (10%)	4 (14.8%)	0(0%)
Death	1 (2.5%)	1 (3.7%)	0(0%)
Target Lesion Revascularization	1 (2.5%)	1 (3.7%)	0(0%)
Myocardial Infarction	2 (5%)	1 (3.7%)	1 (7.7%)

**DISCUSSION**

Rotablation is a safe and effective treatment for calcified lesions, according to the European expert document if in the hands of skilled practitioners<sup>13-14</sup>. Angiographic features, despite significantly high-risk clinical factors, showed that our procedural success was high and comparable to global statistics. The majority of patients did not have ACS, in contrast to earlier evidence from South Asia<sup>15</sup>. Due to a lack of resources, intravascular imaging has been used sparingly and a single- burr method has been the norm. For any AR effort, we report the highest average syntax score ever<sup>16</sup>. No RA-related studies that evaluated participants' NCDR CathPCI risk scores were found in our literature search. Compared to ROTAXUS, our MACE rates were higher, but our patient population was more complex and at greater risk (Figure 1). Our patients' baseline characteristics (Table 1) were comparable to data from Europe<sup>17-18</sup>. The average age ranges from 67 to 70.5 years, with the percentage of men ranging from 68 to 86%, according to a survey of the available literature. The most often reported comorbidities were dyslipidemia, hypertension, and diabetes mellitus<sup>19-20</sup>. Patients primarily developed angina pectoris followed by NSTEMI in practically all studies. Our patients exhibited considerably higher levels of high-risk clinical parameters than those in other trials, including LV dysfunction, active myocardial infarction, high syntax scores, ICT procedures, and acute coronary syndrome (ACS) presentation<sup>21</sup>. In the previous literature, the rates of current MI (4–14%) and LV dysfunction (defined as LV ejection fraction< 40%) were both 25–32%. Numerous studies have been done on syntax

scoring, which is a key factor in post-RA results. In one study, an adverse hospital outcome was predicted with a sensitivity of 73% and a specificity of 62% using a cut-off value for the Syntax Score of 15. The majority of our RA patients were either turned down for CABG or refused surgery by the surgical team, which is why there is a disparity in the patient group<sup>22</sup>. Although the target vessel is the LMCA with a frequency of 2.1–16.3% in the literature, LAD routinely rotablated with a 50%–70% frequency. The reported length of coronary lesions ranges from 20.6–39 mm<sup>23</sup>.

Garca et al. found that there were  $2.36 \pm 0.8$  rotated vessels on average. During complex PCI, the amount of contrast used is a crucial component. It has, however, hardly ever been documented in rotational atherectomy investigations<sup>24</sup>. A mean contrast volume of  $201.0 \pm 113.6$  ml was only measured by ROTAXUS. This is lower than in our study, although it might be explained by our patients' increased risk and complex alterations. To achieve stent dilation and rotation after implantation, IVUS is essential. Due to financial limitations, we could only use IVUS for LMCA treatments. Studies have revealed significant variations in IVUS usage; Rathore et al<sup>25</sup>. The kind of drug-eluting stent used to treat the patients varied greatly as well. Previous trials primarily employed sirolimus-eluting and paclitaxel stents, whereas we primarily used everolimus-eluting stents. As sirolimus and paclitaxel eluting stents are currently no longer used, this simply reflects improvements in stent design and medication delivery<sup>26</sup>. Our procedural success rate (92–95%) is similar to the success rates noted in numerous investigations. Only one research by M. H. Chiang et al. that showed rotablation scores with high syntax scores, an almost identical procedural success rate of 91.2%, and a MACE of 16.1% could be discovered in our review of the literature<sup>27</sup>.

## CONCLUSION

Despite increased Syntax score angioplasty with Rotaablation achieved good clinical outcomes with urgent percutaneous coronary intervention in calcified lesions with major adverse cardiovascular events. But to investigate RA outcomes in LMICs with a high-risk patient group, larger prospective trials are required.

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