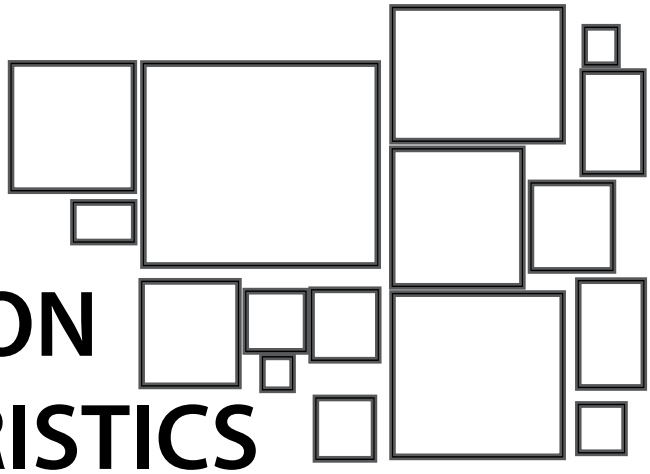

LESION CHARACTERISTICS

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Muhammad Dzafir Ismail[1], Nor Ashikin Md Sari[1], Doreen Sumpat[2], Wan Azman Wan Ahmad[1]
1 Pusat Perubatan Universiti Malaya, Kuala Lumpur; 2 Hospital Sultanah Bahiyah, Kedah

Summary

1. The left anterior descending artery (LAD) remains the most frequently treated lesion, as previously reported.
2. Majority of lesions treated were de novo lesions (95.0%); and complex lesions (type B2 and C) made up 59.4% of all PCI cases.
3. Generally, drug eluting stents (DES) (76.9%) were the standard PCI practice. The use of bare-metal stent (BMS) had decreased, however the use of drug eluting balloon (DEB) had increased.
4. Most of the ISR lesions were treated with DEB (62.9%).
5. The rate of left main stem (LMS) intervention (majority unprotected) continued to increase compared to the previous cohort with a high procedural success rate (97.5%). Radial approach was becoming more popular even in this high-risk lesion intervention.
6. Vein grafts remained the most commonly treated in graft PCI (84.7%) with increasing left internal mammary artery (LIMA) intervention (14.9%).
7. The number of chronic total occlusion (CTO) >3 months PCI constituted 7.8% of all lesions treated with a good success rate (74.8%).
8. The use of coronary imaging modalities (intravascular ultrasound [IVUS] and optical coherence tomography [OCT]) as well as fractional flow reserve (fractional flow reserve:FFR) were still very low.
9. Post-procedural lesion complications rate remained low despite more complex PCIs being performed.

Anatomical location of lesions

Between the year of 2015 and 2016, a total of 26,969 lesions were treated via PCI. LAD remained the most common culprit artery (47.2%), followed by right coronary artery (RCA:31.8%) and left circumflex artery (LCx:16.8%). The proximal segment of each coronary artery (LAD, RCA and LCx) was the most common site being treated. Intervention to LMS increased significantly to 871 (3.2%) cases, compared to only 541 (2.8%) cases reported in the previous cohort. [Table 4.1]

Table 4.1 Summary of location of lesions treated with PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Location of lesion				
None	5 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Left main stem	**541 (2.8)**	**423 (3.2)**	**448 (3.2)**	**871 (3.2)**
Left anterior descending artery (LAD)	**9,304 (48.2)**	**6,111 (46.9)**	**6,610 (47.5)**	**12,721 (47.2)**
LAD proximal	6,477 (33.5)	4,343 (33.3)	4,726 (34.0)	9,069 (33.7)
LAD mid	2,098 (10.9)	1,332 (10.2)	1,417 (10.2)	2,749 (10.2)
LAD distal	350 (1.8)	198 (1.5)	234 (1.7)	432 (1.6)
D1	325 (1.7)	201 (1.5)	205 (1.5)	406 (1.5)
D2	46 (0.2)	32 (0.2)	24 (0.2)	56 (0.2)
D3	8 (0.0)	5 (0.0)	4 (0.0)	9 (0.0)
Right coronary artery (RCA)	**6,011 (31.1)**	**4,087 (31.4)**	**4,481 (32.2)**	**8,568 (31.8)**
RCA proximal	2,707 (14.0)	1,963 (15.1)	2,123 (15.3)	4,086 (15.2)
RCA mid	1,829 (9.5)	1,119 (8.6)	1,260 (9.1)	2,379 (8.8)
RCA distal	1,080 (5.6)	738 (5.7)	830 (6.0)	1,568 (5.8)
PDA	208 (1.1)	150 (1.2)	135 (1.0)	285 (1.1)
PLV	187 (1.0)	117 (0.9)	133 (1.0)	250 (0.9)
Left circumflex artery (LCx)	**3,287 (17.0)**	**2,276 (17.5)**	**2,262 (16.3)**	**4,538 (16.8)**
LCX proximal	1,648 (8.5)	1,178 (9.0)	1,193 (8.6)	2,371 (8.8)
LCX distal	985 (5.1)	651 (5.0)	637 (4.6)	1,288 (4.8)
OM1	528 (2.7)	356 (2.7)	368 (2.6)	724 (2.7)
OM2	100 (0.5)	75 (0.6)	52 (0.4)	127 (0.5)
OM3	26 (0.1)	16 (0.1)	12 (0.1)	28 (0.1)
Graft	**166 (0.9)**	**131 (1.0)**	**118 (0.8)**	**249 (0.9)**
Saphenous vein graft	149 (0.8)	103 (0.8)	108 (0.8)	211 (0.8)
Left internal mammary artery graft	15 (0.1)	27 (0.2)	10 (0.1)	37 (0.1)
Right internal mammary artery graft	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Radial artery graft	2 (0.0)	1 (0.0)	0 (0.0)	1 (0.0)
Missing	**15**	**20**	**2**	**22**

Lesion characteristics

The vast majority of lesions were de novo lesions (95.0%). The rates of restenosis and in-stent restenosis (ISR) were similar to the previously reported cohort. The rate of PCI due to stent thrombosis was also low at 0.5%. [Table 4.2] The very low rate of stent thrombosis was comparable to another well-established registry (SCAAR registry).[1]

Complex lesions (type B2 and C) made up half of all treated lesions (59.4%). [Table 4.3] Among the high-risk lesions treated, there was a reduction in bifurcation intervention (5.2% vs 6.5%) from the previous cohort. Interestingly, the rate of angioplasty to CTO and calcified lesions had increased (7.8% vs 6.6% and 8.4% vs 6.0% respectively). [Table 4.4] In terms of TIMI flow, 95.7% achieved TIMI III flow after angioplasty. [Table 4.5]

Types of stents and devices used

The number of coronary stents per patient was similar to the previous cohort (1.7 stent/patient). DES was used in 76.9% cases. The use of BMS had reduced from 12.5% to 3.6%. The use of dedicated bifurcation stents and covered stents were rare (0.2%). [Table 4.6]

The use of aspiration catheters had reduced to 4.7% from 5.7% as this could be due to the current evidence.[2] Interestingly, the plain-old balloon angioplasty (POBA) only strategy was still used in 14.7% of cases. DEB was gaining popularity as evidenced by its increased use (7.5% to 10.1%). With increasing number of angioplasty in calcified and CTO lesions, the use of cutting or scoring balloon and microcatheters had increased (1.4% to 2.6% and 4.6% to 5.7% respectively).

The application of functional assessment by FFR was low at 1.5%. The use of IVUS and OCT were also low at 3.1% and 1.2% respectively. These could be largely attributed to cost, reimbursement, as well as the lack of these facilities in participating hospitals. The use of rotational atherectomy and embolic protection devices were low at 1.0% and 0.1% respectively. [Table 4.8]

Lesion complication during PCI

Overall, post-procedural complication was low. Major dissection (type C and above) was at 1.3%, no-reflow was at 0.3% and perforation was at 0.4%. [Table 4.9]

Table 4.2 Characteristics of lesions treated by PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesions				
De novo	18,347 (95.3)	12,356 (95.1)	13,151 (94.9)	25,507 (95.0)
Restenosis (no prior stent)	19 (0.1)	19 (0.1)	18 (0.1)	37 (0.1)
Stent thrombosis	85 (0.4)	64 (0.5)	60 (0.4)	124 (0.5)
In-stent restenosis	804 (4.2)	549 (4.2)	628 (4.5)	1,177 (4.4)
Not available	74	60	64	124
Total	**19,329**	**13,048**	**13,921**	**26,969**

Table 4.3 Prevalence of lesions according to American College of Cardiology (ACC) classifications, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesions				
A	2,179 (11.4)	1,731 (13.5)	1,552 (11.3)	3,283 (12.3)
B1	5,491 (28.8)	3,494 (27.2)	4,018 (29.2)	7,512 (28.2)
B2	2,763 (14.5)	1,972 (15.3)	2,243 (16.3)	4,215 (15.8)
C	8,634 (45.3)	5,659 (44.0)	5,955 (43.3)	11,614 (43.6)
Not available	262	192	153	345
Total	**19,329**	**13,048**	**13,921**	**26,969**

Table 4.4 Prevalence of high-risk lesion type, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
[#]Types of lesions				
Ostial	1,435 (7.4)	1,167 (8.9)	942 (6.8)	2,109 (7.8)
Bifurcation	1,259 (6.5)	753 (5.8)	647 (4.6)	1,400 (5.2)
Total occlusion	1,140 (5.9)	863 (6.6)	778 (5.6)	1,641 (6.1)
CTO >3 months	1,285 (6.6)	1,030 (7.9)	1,073 (7.7)	2,103 (7.8)
Thrombus	1,085 (5.6)	761 (5.8)	704 (5.1)	1,465 (5.4)
Calcified lesion	1,160 (6.0)	1,129 (8.7)	1,141 (8.2)	2,270 (8.4)
LMS	425 (2.2)	331 (2.5)	337 (2.4)	668 (2.5)

[#]*Patients are allowed to be in more than one type of category.*

Table 4.5 Comparison of TIMI flow grade by pre and post procedure, NCVD-PCI Registry, 2013–2016

Year	TIMI flow grade	Pre-procedure	Post-procedure
		No. (%)	**No. (%)**
2013-3014	TIMI-0	2,595 (15.0)	344 (1.9)
	TIMI-1	1,553 (9.0)	85 (0.5)
	TIMI-2	4,746 (27.4)	326 (1.8)
	TIMI-3	8,407 (48.6)	16,907 (95.7)
	Not available	590	388
	Missing	1,438	1,279
	Total	**19,329**	**19,329**
2015	TIMI-0	1,975 (17.4)	257 (2.2)
	TIMI-1	847 (7.5)	60 (0.5)
	TIMI-2	2,212 (19.5)	178 (1.5)
	TIMI-3	6,287 (55.5)	11,166 (95.8)
	Not available	386	269
	Missing	1,341	1,118
	Total	**13,048**	**13,048**
2016	TIMI-0	2,135 (19.5)	311 (2.5)
	TIMI-1	848 (7.7)	64 (0.5)
	TIMI-2	2,012 (18.3)	175 (1.4)
	TIMI-3	5,978 (54.5)	12,048 (95.6)
	Not available	393	142
	Missing	2,555	1,181
	Total	**13,921**	**13,921**
2015-2016	TIMI-0	4,110 (18.4)	568 (2.3)
	TIMI-1	1,695 (7.6)	124 (0.5)
	TIMI-2	4,224 (18.9)	353 (1.5)
	TIMI-3	12,265 (55.0)	23,214 (95.7)
	Not available	779	411
	Missing	3,896	2,299
	Total	**26,969**	**26,969**

Table 4.6 Types of stents used, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**23,538**	**16,526**	**15,914**	**32,440**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	16,412 (73.3)	11,182 (74.4)	12,413 (79.3)	23,595 (76.9)
Bare metal stent	2,802 (12.5)	750 (5.0)	364 (2.3)	1,114 (3.6)
Bio-absorbable stent	294 (1.3)	184 (1.2)	144 (0.9)	328 (1.1)
Antibody coated stent	48 (0.2)	2 (0.0)	0 (0.0)	2 (0.0)
*Others	290 (1.3)	9 (0.1)	11 (0.1)	20 (0.1)
Drug eluting balloon	1,572 (7.0)	1,499 (10.0)	1,556 (9.9)	3,055 (10.0)
Bifurcated stent	70 (0.3)	14 (0.1)	9 (0.1)	23 (0.1)
Covered stent	23 (0.1)	42 (0.3)	24 (0.2)	66 (0.2)
Combo stent	891 (4.0)	1,351 (9.0)	1,136 (7.3)	2,487 (8.1)
Missing	1,136	1,493	257	1,750

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.7 Lesion characteristics for patients who have undergone PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Pre-procedure stenosis, %				
N	18,425	12,317	11,881	24,198
Mean (SD)	86.6 (11.7)	87.1 (11.7)	87.6 (12.2)	87.3 (12.0)
Median (Min – Max)	90.0 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)
Missing, No. (%)	904 (4.7)	731 (5.6)	2,040 (14.7)	2,771 (10.3)
Post-procedure stenosis, %				
N	18,529	12,462	12,284	24,746
Mean (SD)	4.2 (17.9)	4.5 (18.8)	5.5 (20.5)	5.0 (19.7)
Median (Min – Max)	0.0 (0 – 100.0)	0.0 (0 – 100.0)	0.0 (0 – 100.0)	0.0 (0 – 100.0)
Missing, No. (%)	800 (4.1)	586 (4.5)	1,637 (11.8)	2,223 (8.2)
Estimated lesion length, mm				
N	17,874	11,921	12,673	24,594
Mean (SD)	25.4 (15.7)	26.6 (16.4)	26.7 (16.7)	26.7 (16.6)
Median (Min – Max)	20.0 (1.0 – 131.0)	22.0 (1.0 – 133.0)	22.0 (1.0 – 150.0)	22.0 (1.0 – 150.0)
Missing, No. (%)	1,455 (7.5)	1,127 (8.6)	1,248 (9.0)	2,375 (8.8)
Lesion result, No. (%)				
Successful	18,669 (96.9)	12,486 (96.3)	13,357 (96.2)	25,843 (96.3)
Unsuccessful	600 (3.1)	485 (3.7)	521 (3.8)	1,006 (3.7)
Not available	60	77	43	120

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
*Stent length, mm				
N	17,590	11,925	12,643	24,568
Mean (SD)	30.2 (16.9)	31.2 (17.8)	31.5 (18.3)	31.4 (18.0)
Median (Min – Max)	25.0 (8.0 – 167.0)	26.0 (8.0 – 154.0)	26.0 (8.0 – 156.0)	26.0 (8.0 – 156.0)
Not available, No. (%)	1,739 (9.0)	1,123 (8.6)	1,278 (9.2)	2,401 (8.9)
**Stent diameter, mm				
N	17,562	11,885	12,601	24,486
Mean (SD)	2.9 (0.4)	2.9 (0.5)	3.0 (0.5)	2.9 (0.5)
Median (Min – Max)	3.0 (2.0 – 5.8)	3.0 (2.0 – 6.0)	3.0 (2.0 – 6.0)	3.0 (2.0 – 6.0)
Not available, No. (%)	1,767 (9.1)	1,163 (8.9)	1,320 (9.5)	2,483 (9.2)
Maximum balloon size used, mm				
N	17,758	12,094	12,757	24,851
Mean (SD)	3.0 (0.6)	3.1 (0.6)	3.1 (0.6)	3.1 (0.6)
Median (Min – Max)	3.0 (1.0 – 6.0)	3.0 (1.0 – 5.5)	3.0 (1.0 – 6.0)	3.0 (1.0 – 6.0)
Missing, No. (%)	1,571 (8.1)	954 (7.3)	1,164 (8.4)	2,118 (7.9)
Maximum stent/balloon deploy pressure, atm				
N	17,571	12,021	12,697	24,718
Mean (SD)	15.7 (4.4)	15.9 (4.5)	16.0 (4.5)	16.0 (4.5)
Median (Min – Max)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)	16.0 (1.0 – 40.0)
Missing, No. (%)	1,758 (9.1)	1,027 (7.9)	1,224 (8.8)	2,251 (8.3)
Direct stenting, No. (%)				
Yes	1,402 (7.5)	956 (7.4)	824 (6.0)	1,780 (6.7)
No	17,385 (92.5)	11,965 (92.6)	12,940 (94.0)	24,905 (93.3)
Not applicable	542	127	157	284
Other adjunctive procedure, No. (%)				
Yes	404 (2.4)	250 (2.0)	179 (1.3)	429 (1.7)
Ventilator	*132 (32.7)*	*81 (32.4)*	*58 (32.4)*	*139 (32.4)*
Temporary cardiac pacing wire	*79 (19.6)*	*57 (22.8)*	*46 (25.7)*	*103 (24.0)*
No	16,502 (97.6)	12,179 (98.0)	13,228 (98.7)	25,407 (98.3)
Not applicable	302	32	34	66
Missing	2,121	587	480	1,067

**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.8 Types of devices used during PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	1,106 (5.7)	676 (5.2)	586 (4.2)	1,262 (4.7)
Balloon only/POBA	2,492 (12.9)	2,089 (16.0)	1,864 (13.4)	3,953 (14.7)
Drug eluting balloon	1,457 (7.5)	1,315 (10.1)	1,408 (10.1)	2,723 (10.1)
Drug eluting stent	12,998 (67.2)	8,912 (68.3)	10,175 (73.1)	19,087 (70.8)
Cutting balloon/ scoring balloon	279 (1.4)	221 (1.7)	467 (3.4)	688 (2.6)
Coil	19 (0.1)	3 (0.0)	3 (0.0)	6 (0.0)
OCT	161 (0.8)	199 (1.5)	119 (0.9)	318 (1.2)
Mother and child	23 (0.1)	57 (0.4)	29 (0.2)	86 (0.3)
Microcatheter	884 (4.6)	755 (5.8)	795 (5.7)	1,550 (5.7)
Angiojet	26 (0.1)	15 (0.1)	11 (0.1)	26 (0.1)
IVUS	516 (2.7)	392 (3.0)	432 (3.1)	824 (3.1)
Flowire/FFR	232 (1.2)	193 (1.5)	218 (1.6)	411 (1.5)
Rotablator	182 (0.9)	143 (1.1)	131 (0.9)	274 (1.0)
Bare metal stent	2,454 (12.7)	681 (5.2)	338 (2.4)	1,019 (3.8)
Embolic protection	31 (0.2)	13 (0.1)	9 (0.1)	22 (0.1)
Others	1,742 (9.0)	572 (4.4)	167 (1.2)	739 (2.7)
Embolic protection status	**N = 31**	**N = 13**	**N = 9**	**N = 22**
Filter	10 (90.9)	7 (77.8)	5 (100.0)	12 (85.7)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	1 (9.1)	2 (22.2)	0 (0.0)	2 (14.3)
Missing	20	4	4	8

#Patients are allowed to be in more than one type of category.

Table 4.9 Types of post-procedure complications, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**19,329**	**13,048**	**13,921**	**26,969**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications**				
Dissection	**324 (1.7)**	**186 (1.4)**	**171 (1.2)**	**357 (1.3)**
Flow limiting	42 (14.4)	11 (6.0)	14 (8.3)	25 (7.1)
Non-flow limiting	249 (85.6)	172 (94.0)	155 (91.7)	327 (92.9)
Not available	22	3	2	5
Missing	11	0	0	0
No-reflow	**120 (0.6)**	**35 (0.3)**	**36 (0.3)**	**71 (0.3)**
Transient	78 (69.6)	20 (58.8)	18 (60.0)	38 (59.4)
Persistent	34 (30.4)	14 (41.2)	12 (40.0)	26 (40.6)
Not available	8	1	6	7
Missing	0	0	0	0
Perforation	**49 (0.3)**	**52 (0.4)**	**65 (0.5)**	**117 (0.4)**

**Results are only showed for the number of patients who were reported to have the complications.*

In-stent restenosis (ISR)

In this present cohort, 4.4% of PCIs were ISR. A quarter of these patients presented with ACS. Among those who presented with ACS, 20.9% presented with STEMI and 79.1% presented with NSTEMI/UA. [Table 4.10]

62.9% of ISR were treated with DEB and 32.9% were treated with DES. The use of cutting or scoring balloon had increased from 12.6% to 16.5%. Similarly, there was also an increase in the use of coronary imaging in ISR (IVUS and OCT with 11.0% and 3.4% respectively). [Table 4.12]

Consistent with the previous cohort, the rate of lesion complication after ISR treatment was very low; there was no major dissection, no-reflow was at 0.1%, and perforation was at 0.4%. [Table 4.13]

Table 4.10 ACS status of in-stent restenosis PCI, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Acute coronary syndrome, No. (%)				
Yes	194 (24.1)	133 (24.2)	159 (25.3)	292 (24.8)
No	610 (75.9)	416 (75.8)	469 (74.7)	885 (75.2)
ACS type, No. (%)	**N = 194**	**N = 133**	**N = 159**	**N = 292**
STEMI	59 (30.9)	30 (23.1)	30 (19.1)	60 (20.9)
NSTEMI	58 (30.4)	53 (40.8)	85 (54.1)	138 (48.1)
UA	74 (38.7)	47 (36.2)	42 (26.8)	89 (31.0)
Not available	3	3	2	5
STEMI, No. (%)	**N = 59**	**N = 30**	**N = 30**	**N = 60**
Anterior	39 (70.9)	18 (60.0)	15 (50.0)	33 (55.0)
Non-anterior	16 (29.1)	12 (40.0)	15 (50.0)	27 (45.0)
Not available	4	0	0	0

Table 4.11 Types of stents used in the in-stent restenosis, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of stents used	**867**	**677**	**735**	**1,412**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	301 (35.4)	203 (32.2)	246 (33.5)	449 (32.9)
Bare metal stent	22 (2.6)	8 (1.3)	0 (0.0)	8 (0.6)
Bio-absorbable stent	1 (0.1)	1 (0.2)	2 (0.3)	3 (0.2)
Antibody coated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	4 (0.5)	0 (0.0)	1 (0.1)	1 (0.1)
Drug eluting balloon	511 (60.0)	392 (62.1)	466 (63.5)	858 (62.9)
Bifurcated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	0 (0.0)	0 (0.0)	1 (0.1)	1 (0.1)
Combo stent	11 (1.3)	27 (4.3)	18 (2.5)	45 (3.3)
Missing	16	46	1	47
Total	**867**	**677**	**735**	**1,412**

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.12 Types of devices used in the in-stent restenosis, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	24 (3.0)	15 (2.7)	19 (3.0)	34 (2.9)
Balloon only/POBA	190 (23.6)	123 (22.4)	141 (22.5)	264 (22.4)
Drug eluting balloon	463 (57.6)	339 (61.7)	406 (64.6)	745 (63.3)
Drug eluting stent	249 (31.0)	169 (30.8)	208 (33.1)	377 (32.0)
Cutting balloon/scoring balloon	101 (12.6)	67 (12.2)	127 (20.2)	194 (16.5)
Coil	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	20 (2.5)	19 (3.5)	21 (3.3)	40 (3.4)
Mother and child	0 (0.0)	3 (0.5)	0 (0.0)	3 (0.3)
Microcatheter	54 (6.7)	35 (6.4)	60 (9.6)	95 (8.1)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	84 (10.4)	64 (11.7)	66 (10.5)	130 (11.0)
Flowire/FFR	12 (1.5)	15 (2.7)	11 (1.8)	26 (2.2)
Rotablator	3 (0.4)	1 (0.2)	3 (0.5)	4 (0.3)
Bare metal stent	20 (2.5)	6 (1.1)	0 (0.0)	6 (0.5)
Embolic protection	1 (0.1)	4 (0.7)	0 (0.0)	4 (0.3)
Others	56 (7.0)	7 (1.3)	6 (1.0)	13 (1.1)
Embolic protection status	**N = 1**	**N = 4**	**N = 0**	**N = 4**
Filter	0 (0.0)	3 (100.0)	0 (0.0)	3 (100.0)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	1	1	0	1

#Patients are allowed to be in more than one type of category.

Table 4.13 Types of complications in post in-stent restenosis, NCVD-PCI Registry, 2013-2016

Year	2013 - 2014	2015	2016	2015 – 2016
Total no. of lesions	**804**	**549**	**628**	**1,177**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in ISR**				
Dissection	11 (1.4)	9 (1.6)	3 (0.5)	12 (1.0)
Flow limiting	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)
Non-flow limiting	10 (90.9)	9 (100.0)	3 (100.0)	12 (100.0)
No-reflow	1 (0.1)	0 (0.0)	1 (0.2)	1 (0.1)
Transient	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Persistent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	1	0	0	0
Perforation	0 (0.0)	2 (0.4)	3 (0.5)	5 (0.4)

**Results are only showed for patients with the complications.*

PCI of left main stem (LMS)

A total of 871 cases of LMS interventions were performed in 2015 and 2016. Majority (94.2%) were de novo lesions, 0.3% were stent thrombosis and 5.3% were ISR. [Table 4.14]

Up to 37.5% of PCI to LMS were performed in patients presented with ACS, of which 47.8% were in STEMI and 52.2% were in NSTEMI/UA. A third of these patients had history of previous angioplasty. 93.0% of LMS PCI was de novo (increased from 87.2% to 93.0%). Among STEMI patients who received PCI to LMS, 50.9% were performed in the PPCI setting. [Table 4.15]

Consistent with the general trend,[3] LMS intervention via radial approach increased from 34.4% to 48.7% in this cohort. Femoral approach is no longer a default route in high-risk angioplasty including LMS intervention. Successful intervention was achieved in 97.5% of cases. [Table 4.15] with low rate of post-procedural complications (1.7% of dissection, 0.5% of no-reflow, and 0.6% of perforation). [Table 4.19]

Most LMS lesions were treated with DES (89.9%) followed by Combo stent (5.6%) and DEB (3.4%). [Table 4.17] Cutting or scoring balloon were used in 4.5% of cases. Interestingly, despite the increasing recommendation to use coronary imaging during LMS intervention, the use of IVUS (19.7%) and OCT (3.6%) had reduced compared to the earlier cohort. [Table 4.18]

In terms of dual antiplatelet therapy (DAPT) use, 93.2% of LMS intervention was prescribed DAPT for 12 months with only 2.8% receiving DAPT beyond 12 months. [Table 4.20]

Table 4.14 Types of lesions in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of lesion in left main stem procedure				
De novo	506 (93.7)	392 (92.7)	427 (95.7)	819 (94.2)
Restenosis (no prior stent)	1 (0.2)	0 (0.0)	1 (0.2)	1 (0.1)
Stent thrombosis	5 (0.9)	2 (0.5)	1 (0.2)	3 (0.3)
In-stent restenosis	28 (5.2)	29 (6.9)	17 (3.8)	46 (5.3)
Previous DES	*13 (86.7)*	*17 (100.0)*	*11 (100.0)*	*28 (100.0)*
Previous BMS	*2 (13.3)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Previous others	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*	*0 (0.0)*
Not available	*13*	*12*	*6*	*18*
Not available	1	0	2	2
Total	541	423	448	871

Table 4.15 Clinical presentation of left main stem, NCVD-PCI Registry, 2013–2016

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Acute coronary syndrome, No. (%)				
Yes	157 (29.0)	160 (37.8)	167 (37.3)	327 (37.5)
No	384 (71.0)	263 (62.2)	281 (62.7)	544 (62.5)
ACS type, No. (%)	**N = 157**	**N = 160**	**N = 167**	**N = 327**
STEMI	72 (46.2)	69 (43.9)	85 (51.5)	154 (47.8)
NSTEMI	46 (29.5)	54 (34.4)	46 (27.9)	100 (31.1)
UA	38 (24.4)	34 (21.7)	34 (20.6)	68 (21.1)
Not available	1	3	2	5
Previous PCI, No. (%)				
Yes	185 (34.2)	124 (29.3)	149 (33.3)	273 (31.3)
No	356 (65.8)	299 (70.7)	299 (66.7)	598 (68.7)
Previous CABG, No. (%)				
Yes	69 (12.8)	29 (6.9)	32 (7.1)	61 (7.0)
No	472 (87.2)	394 (93.1)	416 (92.9)	810 (93.0)
PCI status, No. (%)				
Elective	418 (77.3)	314 (74.2)	341 (76.1)	655 (75.2)
NSTEMI/UA	64 (11.8)	57 (13.5)	45 (10.0)	102 (11.7)
STEMI	59 (10.9)	52 (12.3)	62 (13.8)	114 (13.1)
Elective, No. (%)	**N = 418**	**N = 314**	**N = 341**	**N = 655**
Staged PCI	198 (47.6)	164 (52.6)	166 (49.1)	330 (50.8)
Ad hoc	218 (52.4)	148 (47.4)	172 (50.9)	320 (49.2)
Not available	2	2	3	5
Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
NSTEMI/UA, No. (%)	**N = 64**	**N = 57**	**N = 45**	**N = 102**
Urgent	18 (28.6)	22 (39.3)	17 (37.8)	39 (38.6)
Non-urgent	45 (71.4)	34 (60.7)	28 (62.2)	62 (61.4)
Not available	1	1	0	1
STEMI, No. (%)	**N = 59**	**N = 52**	**N = 62**	**N = 114**
Rescue	23 (41.1)	14 (26.9)	16 (25.8)	30 (26.3)
Primary	26 (46.4)	23 (44.2)	35 (56.5)	58 (50.9)
Facilitated	0 (0.0)	2 (3.8)	1 (1.6)	3 (2.6)
Delayed routine PCI	3 (5.4)	4 (7.7)	4 (6.5)	8 (7.0)
Delayed selective PCI	3 (5.4)	2 (3.8)	3 (4.8)	5 (4.4)
Pharmacoinvasive	1 (1.8)	7 (13.5)	3 (4.8)	10 (8.8)
Not available	3	0	0	0

Year	**2013 – 2014**	**2015**	**2016**	**2015 – 2016**
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Percutaneous entry, No. (%)				
Brachial	1 (0.2)	2 (0.5)	2 (0.4)	4 (0.5)
Radial	186 (34.4)	183 (43.3)	241 (53.8)	424 (48.7)
Femoral	381 (70.4)	272 (64.3)	238 (53.1)	510 (58.6)
Pre-procedure stenosis, %				
N	504	386	352	738
Mean (SD)	83.0 (13.2)	82.9 (13.8)	84.6 (13.9)	83.7 (13.9)
Median (Min – Max)	85.0 (0 – 100.0)	87.5 (0 – 100.0)	90.0 (0 – 100.0)	90.0 (0 – 100.0)
Missing, No. (%)	37 (6.8)	37 (8.7)	96 (21.4)	133 (15.3)
Pre-procedure TIMI flow, No. (%)				
TIMI-0	39 (8.1)	28 (7.8)	39 (11.9)	67 (9.7)
TIMI-1	41 (8.5)	30 (8.4)	29 (8.8)	59 (8.6)
TIMI-2	186 (38.6)	81 (22.6)	76 (23.1)	157 (22.8)
TIMI-3	216 (44.8)	220 (61.3)	185 (56.2)	405 (58.9)
Not available	15	11	18	29
Missing	44	53	101	154
Post-procedure stenosis, %				
N	516	403	378	781
Mean (SD)	2.6 (13.4)	2.8 (15.2)	1.7 (9.9)	2.2 (12.9)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 90.0)	0 (0.0 – 100.0)
Missing, No. (%)	25 (4.6)	20 (4.7)	70 (15.6)	90 (10.3)
Post-procedure TIMI flow, No. (%)				
TIMI-0	2 (0.4)	4 (1.0)	1 (0.2)	5 (0.6)
TIMI-1	2 (0.4)	4 (1.0)	0 (0.0)	4 (0.5)
TIMI-2	9 (1.8)	2 (0.5)	6 (1.5)	8 (1.0)
TIMI-3	496 (97.4)	378 (97.4)	401 (98.3)	779 (97.9)
Not available	4	4	5	9
Missing	28	31	35	66
Estimated lesion length, mm				
N	512	390	417	807
Mean (SD)	28.7 (19.8)	31.2 (20.1)	34.1 (21.4)	32.7 (20.9)
Median (Min – Max)	21.0 (3.0 – 100.0)	25.0 (4.0 – 100.0)	30.0 (4.0 – 100.0)	27.0 (4.0 – 100.0)
Missing, No. (%)	29 (5.4)	33 (7.8)	31 (6.9)	64 (7.3)
Lesion result, No. (%)				
Successful	533 (98.5)	407 (96.7)	438 (98.2)	845 (97.5)
Unsuccessful	8 (1.5)	14 (3.3)	8 (1.8)	22 (2.5)
Not available	0	2	2	4

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
*Stent length, mm				
N	517	407	429	836
Mean (SD)	34.0 (20.5)	36.4 (21.1)	41.4 (24.1)	39.0 (22.8)
Median (Min – Max)	28.0 (8.0 – 107.0)	30.0 (8.0 – 115.0)	36.0 (8.0 – 128.0)	33.0 (8.0 – 128.0)
Not available, No. (%)	24 (4.4)	16 (3.8)	19 (4.2)	35 (4.0)
**Stent diameter, mm				
N	517	407	426	833
Mean (SD)	3.3 (0.4)	3.3 (0.4)	3.4 (0.4)	3.4 (0.4)
Median (Min – Max)	3.3 (2.3 – 4.5)	3.5 (2.3 – 4.5)	3.5 (2.0 – 5.0)	3.5 (2.0 – 5.0)
Not available, No. (%)	24 (4.4)	16 (3.8)	22 (4.9)	38 (4.4)
Direct stenting, No. (%)				
Yes	36 (6.8)	10 (2.4)	2 (0.4)	12 (1.4)
No	492 (93.2)	411 (97.6)	444 (99.6)	855 (98.6)
Not applicable	13	2	2	4

#Patients are allowed to be in more than one type of category.
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.16 TIMI flow prior to intervention in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
TIMI flow prior to intervention in left main stem procedure				
TIMI-0	39 (8.1)	28 (7.8)	39 (11.9)	67 (9.7)
TIMI-1	41 (8.5)	30 (8.4)	29 (8.8)	59 (8.6)
TIMI-2	186 (38.6)	81 (22.6)	76 (23.1)	157 (22.8)
TIMI-3	216 (44.8)	220 (61.3)	185 (56.2)	405 (58.9)
Not available	15	11	18	29
Missing	44	53	101	154

Table 4.17 Types of stents used in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**759**	**635**	**680**	**1,315**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents				
Drug eluting stent	639 (85.4)	545 (89.1)	615 (90.6)	1,160 (89.9)
Bare metal stent	26 (3.5)	7 (1.1)	2 (0.3)	9 (0.7)
Bio-absorbable stent	1 (0.1)	2 (0.3)	3 (0.4)	5 (0.4)
Antibody coated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	4 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)
Drug eluting balloon	29 (3.9)	24 (3.9)	20 (2.9)	44 (3.4)
Bifurcated stent	2 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	1 (0.1)	0 (0.0)	1 (0.1)	1 (0.1)
Combo stent	45 (6.0)	34 (5.6)	38 (5.6)	72 (5.6)
Missing	11	23	1	24

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.18 Types of devices used in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices				
Aspiration/aspiration catheter	21 (3.9)	11 (2.6)	9 (2.0)	20 (2.3)
Balloon only/POBA	44 (8.1)	39 (9.2)	58 (12.9)	97 (11.1)
Drug eluting balloon	29 (5.4)	0 (0.0)	16 (3.6)	39 (4.5)
Drug eluting stent	444 (82.1)	359 (84.9)	396 (88.4)	755 (86.7)
Cutting balloon/scoring balloon	10 (1.8)	9 (2.1)	30 (6.7)	39 (4.5)
Coil	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	23 (4.3)	20 (4.7)	11 (2.5)	31 (3.6)
Mother and child	2 (0.4)	3 (0.7)	4 (0.9)	7 (0.8)
Microcatheter	36 (6.7)	27 (6.4)	27 (6.0)	54 (6.2)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	108 (20.0)	89 (21.0)	83 (18.5)	172 (19.7)
Flowire/FFR	7 (1.3)	11 (2.6)	8 (1.8)	19 (2.2)
Rotablator	30 (5.5)	21 (5.0)	21 (4.7)	42 (4.8)
Bare metal stent	22 (4.1)	6 (1.4)	2 (0.4)	8 (0.9)
Embolic protection	1 (0.2)	0 (0.0)	0 (0.0)	0 (0.0)
Others	32 (5.9)	13 (3.1)	1 (0.2)	14 (1.6)

#Patients are allowed to be in more than one type of category.

Table 4.19 Types of complications in post-left main stem, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in ISR**				
Dissection	16 (3.0)	7 (1.7)	8 (1.8)	15 (1.7)
Flow limiting	4 (28.6)	0 (0.0)	1 (12.5)	1 (6.7)
Non-flow limiting	10 (71.4)	7 (100.0)	7 (87.5)	14 (93.3)
Not available	1	0	0	0
Missing	1	0	0	0
No-reflow	5 (0.9)	1 (0.2)	3 (0.7)	4 (0.5)
Transient	1 (20.0)	0 (0.0)	1 (50.0)	1 (100.0)
Persistent	4 (80.0)	1 (100.0)	1 (50.0)	0 (0.0)
Not available	0	0	1	1
Missing	0	0	0	0
Perforation	1 (0.2)	2 (0.5)	3 (0.7)	5 (0.6)

#Patients are allowed to be in more than one type of category.

Table 4.20 Planned duration of dual antiplatelet therapy in left main stem procedure, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**541**	**423**	**448**	**871**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Planned duration of dual antiplatelet therapy in left main stem procedure (months)				
1	17 (3.3)	6 (1.6)	6 (1.5)	12 (1.5)
3	6 (1.2)	7 (1.8)	3 (0.7)	10 (1.3)
6	12 (2.3)	4 (1.0)	6 (1.5)	10 (1.3)
12	457 (88.2)	352 (91.7)	386 (94.6)	738 (93.2)
>12	26 (5.0)	15 (3.9)	7 (1.7)	22 (2.8)
Not available	21	26	28	54
Missing	2	13	12	25

PCI to the grafts

During 2015–2016, there was an increase in the number of bypass grafts angioplasty (from 166 cases in the previous cohort to 249 cases reported in the current cohort). Most of the interventions were performed in de novo lesions (84.0%), followed by ISR (15.2%) and stent thrombosis (0.8%). [Table 4.21] The vein grafts were treated in 84.7% of cases while LIMA in 14.9% of cases. There was an increasing number of LIMA interventions perhaps due to the improved skills and techniques of the interventional cardiologists. Additionally, graft PCIs were successful in 97.2% of cases. [Table 4.22]

The grafts were frequently treated with DES (68.3%) followed by DEB (18.5%) and POBA only strategy (7.6%). The use of coronary imaging modalities such as IVUS and OCT in graft PCI was very low (0.4% and 0.8% respectively). Direct stenting was only performed in 5.2% of cases. The use of embolic protection device remained low at 7.6%. [Table 4.22]

Post-procedural lesion complications in graft PCI were very low. [Table 4.24] Dual antiplatelet therapy was prescribed for 12 months in 88.1% of cases, while 2.3% of DAPT cases were given beyond 12 months. [Table 4.25]

Table 4.21 Lesion types in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Lesion type in graft PCI				
De novo	148 (89.2)	112 (88.9)	92 (78.6)	204 (84.0)
Restenosis (no prior stent)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Stent thrombosis	0 (0.0)	1 (0.8)	1 (0.9)	2 (0.8)
In-stent restenosis	18 (10.8)	13 (10.3)	24 (20.5)	37 (15.2)
Not available	0	5	1	6

Table 4.22 Clinical presentation of graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Graft, No. (%)				
18 LIMA	15 (9.0)	27 (20.6)	10 (8.5)	37 (14.9)
19 RIMA	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
20 SVG1	135 (81.3)	95 (72.5)	103 (87.3)	198 (79.5)
21 SVG2	11 (6.6)	7 (5.3)	3 (2.5)	10 (4.0)
22 SVG3	3 (1.8)	1 (0.8)	2 (1.7)	3 (1.2)
23 RAD1	1 (0.6)	1 (0.8)	0 (0.0)	1 (0.4)
24 RAD2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
25 RAD3	1 (0.6)	0 (0.0)	0 (0.0)	0 (0.0)
Pre-procedure stenosis, %				
N	150	118	77	195
Mean (SD)	86.2 (11.1)	86.3 (10.6)	89.9 (9.4)	87.7 (10.3)
Median (Min – Max)	90.0 (50.0 – 100.0)	90.0 (60.0 – 100.0)	90.0 (50.0 – 100.0)	90.0 (50.0 – 100.0)
Missing, No. (%)	16 (9.6)	13 (9.9)	41 (34.7)	54 (21.7)
Post-procedure stenosis, %				
N	154	125	92	217
Mean (SD)	3.9 (17.4)	1.9 (12.7)	3.7 (17.0)	2.7 (14.7)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)
Missing, No. (%)	12 (7.2)	6 (4.6)	26 (22.0)	32 (12.9)
Estimated lesion length, mm				
N	154	124	112	236
Mean (SD)	20.1 (12.7)	19.9 (13.0)	20.1 (13.6)	20.0 (13.3)
Median (Min – Max)	16.0 (5.0 – 90.0)	15.5 (4.0 – 93.0)	16.0 (4.0 – 90.0)	16.0 (4.0 – 93.0)
Missing, No. (%)	12 (7.2)	7 (5.3)	6 (5.1)	13 (5.2)
Lesion result, No. (%)				
Successful	161 (97.0)	129 (98.5)	113 (95.8)	242 (97.2)
Unsuccessful	5 (3.0)	2 (1.5)	5 (4.2)	7 (2.8)
*Stent length, mm				
N	155	126	110	236
Mean (SD)	24.5 (13.3)	24.0 (13.7)	24.8 (14.6)	24.4 (14.1)
Median (Min – Max)	20.0 (9.0 – 98.0)	18.0 (8.0 – 93.0)	20.0 (8.0 – 100.0)	19.0 (8.0 – 100.0)
Not available, No. (%)	11 (6.6)	5 (3.8)	8 (6.8)	13 (5.2)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
**Stent diameter, mm				
N	155	126	110	236
Mean (SD)	3.0 (0.6)	2.9 (0.5)	3.1 (0.6)	3.0 (0.5)
Median (Min – Max)	3.0 (2.0 – 4.5)	3.0 (2.0 – 4.5)	3.0 (2.0 – 5.0)	3.0 (2.0 – 5.0)
Not available, No. (%)	11 (6.6)	5 (3.8)	8 (6.8)	13 (5.2)
#Intracoronary devices				
Aspiration/aspiration catheter	9 (5.4)	8 (6.1)	7 (5.9)	15 (6.0)
Balloon only/POBA	10 (6.0)	9 (6.9)	10 (8.5)	19 (7.6)
Drug eluting balloon	26 (15.7)	19 (14.5)	27 (22.9)	46 (18.5)
Drug eluting stent	106 (63.9)	92 (70.2)	78 (66.1)	170 (68.3)
Cutting balloon/scoring balloon	2 (1.2)	4 (3.1)	5 (4.2)	9 (3.6)
Coil	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
OCT	1 (0.6)	2 (1.5)	0 (0.0)	2 (0.8)
Mother and child	1 (0.6)	1 (0.8)	0 (0.0)	1 (0.4)
Microcatheter	4 (2.4)	4 (3.1)	1 (0.8)	5 (2.0)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	2 (1.2)	0 (0.0)	1 (0.8)	1 (0.4)
Flowire/FFR	0 (0.0)	0 (0.0)	1 (0.8)	1 (0.4)
Rotablator	1 (0.6)	0 (0.0)	1 (0.8)	1 (0.4)
Bare metal stent	20 (12.0)	5 (3.8)	3 (2.5)	8 (3.2)
Embolic protection	14 (8.4)	12 (9.2)	7 (5.9)	19 (7.6)
Others	4 (2.4)	2 (1.5)	0 (0.0)	2 (0.8)
Embolic protection status	**N = 14**	**N = 12**	**N = 7**	**N = 19**
Filter	6 (100.0)	6 (75.0)	3 (100.0)	9 (81.8)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	2 (25.0)	0 (0.0)	2 (18.2)
Missing	8	4	4	8
Direct stenting, No. (%)				
Yes	19 (11.5)	7 (5.3)	6 (5.1)	13 (5.2)
No	146 (88.5)	124 (94.7)	111 (94.9)	235 (94.8)
Not applicable	1	0	1	1

#Patients are allowed to be in more than one type of category.
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.23 Types of stents used in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**190**	**157**	**135**	**292**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stent used in graft PCI				
Drug eluting stent	126 (66.3)	108 (73.5)	93 (68.9)	201 (71.3)
Bare metal stent	24 (12.6)	5 (3.4)	3 (2.2)	8 (2.8)
Bio-absorbable stent	1 (0.5)	1 (0.7)	0 (0.0)	1 (0.4)
Antibody coated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Drug eluting balloon	26 (13.7)	23 (15.6)	31 (23.0)	54 (19.1)
Bifurcated stent	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Covered stent	2 (1.1)	1 (0.7)	0 (0.0)	1 (0.4)
Combo stent	11 (5.8)	9 (6.1)	8 (5.9)	17 (6.0)
Missing	0	10	0	10
Total	190	157	135	292

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.24 Types of complications in post-left main stem, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of post-procedure complications in graft PCI**				
Dissection	1 (0.6)	3 (2.3)	0 (0.0)	3 (1.2)
Flow limiting	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Non-flow limiting	1 (100.0)	3 (100.0)	0 (0.0)	3 (100.0)
No-reflow	0 (0.0)	1 (0.8)	0 (0.0)	1 (0.4)
Transient	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Persistent	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)
Perforation	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

**Results are only showed for the number of patients who were reported to have the complications.*

Table 4.25 Planned duration of dual antiplatelet therapy in graft PCI, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**166**	**131**	**118**	**249**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Planned duration of dual antiplatelet therapy in graft PCI procedure (months)				
1	7 (4.3)	1 (0.8)	3 (3.0)	4 (1.8)
3	8 (4.9)	7 (5.9)	3 (3.0)	10 (4.6)
6	5 (3.1)	1 (0.8)	6 (6.0)	7 (3.2)
12	138 (85.2)	105 (89.0)	87 (87.0)	192 (88.1)
>12	4 (2.5)	4 (3.4)	1 (1.0)	5 (2.3)
Not available	3	9	16	25
Missing	1	4	2	6

PCI of CTO (>3 months)

A total of 2103 cases (7.8%) were CTO compared to 1285 (6.6%) in the previous cohort. Chronic total occlusion in LAD was the most frequently treated (43.7% of cases) followed by RCA (42.3%), and LCx (11.7%). The location of the CTO was mainly in the proximal segments compared to the distal segments. [Table 4.26]

As noted previously, most of the CTO cases (86.8%) were treated in elective settings which allow better planning and preparation. There was no difference in the preferred route of access (radial or femoral), and majority of cases were performed using 6F guide (86.6%) followed by 7F guide (13.0%).

The mean fluoroscopy time was 36.4 minutes and the mean contrast volume was 213.6 ml. The estimated lesion length was 44.3 mm, mean stent length was 51.3 mm and mean stent diameter was 2.8 mm. The success rate of CTO intervention in this cohort was 74.9%. [Table 4.27] Post-procedural lesion complications were approximately 5% of all CTO cases. 3.4% of cases were dissection (91.4% were non-flow limiting) and 0.7% were no-reflow. There was an increase in the number of perforations (from 0.9% to 1.3%). [Table 4.30]

Majority of CTO cases were treated with DES (82.6%) followed by DEB (11.3%). It is interesting to note that the use of DEB in treating CTO had increased compared to the previous cohort (11.3% vs 8.6%). [Table 4.28] Microcatheter was used in 48.4% of cases. However, the use of coronary imaging modalities such as IVUS and OCT were low (4.9% and 0.7% respectively). [Table 4.29]

In terms of DAPT use, most of the patients received standard 12 months DAPT regardless of the type of devices used. [Table 4.31]

Table 4.26 Summary of location of lesions treated with PCI and for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Location of lesion with CTO >3 months				
Left main stem	**21 (1.6)**	**18 (1.7)**	**21 (2.0)**	**39 (1.9)**
Left anterior descending artery (LAD)	**547 (42.6)**	**449 (43.6)**	**470 (43.8)**	**919 (43.7)**
LAD proximal	413 (32.1)	358 (34.8)	369 (34.4)	727 (34.6)
LAD mid	125 (9.7)	82 (8.0)	85 (7.9)	167 (7.9)
LAD distal	6 (0.5)	0 (0.0)	13 (1.2)	19 (0.9)
D1	3 (0.2)	2 (0.2)	3 (0.3)	5 (0.2)
D2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
D3	0 (0.0)	1 (0.1)	0 (0.0)	1 (0.0)
Right coronary artery (RCA)	**522 (40.6)**	**429 (41.7)**	**461 (43.0)**	**890 (42.3)**
RCA proximal	280 (21.8)	242 (23.5)	251 (23.4)	493 (23.5)
RCA mid	162 (12.6)	134 (13.0)	142 (13.2)	276 (13.1)
RCA distal	66 (5.1)	40 (3.9)	53 (4.9)	93 (4.4)
PDA	7 (0.5)	6 (0.6)	5 (0.5)	11 (0.5)
PLV	7 (0.5)	7 (0.7)	10 (0.9)	17 (0.8)
Left circumflex artery (LCx)	**192 (14.9)**	**129 (12.5)**	**116 (10.8)**	**245 (11.7)**
LCX proximal	109 (8.5)	71 (6.9)	69 (6.4)	140 (6.7)
LCX distal	53 (4.1)	37 (3.6)	30 (2.8)	67 (3.2)
OM1	27 (2.1)	15 (1.5)	16 (1.5)	31 (1.5)
OM2	3 (0.2)	4 (0.4)	0 (0.0)	4 (0.2)
OM3	0 (0.0)	2 (0.2)	1 (0.1)	3 (0.1)
Graft	**3 (0.2)**	**4 (0.4)**	**5 (0.5)**	**9 (0.4)**
LIMA	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
RIMA	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
SVG1	3 (0.2)	2 (0.2)	3 (0.3)	5 (0.2)
SVG2	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
SVG3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD1	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
RAD3	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	**0**	**1**	**0**	**1**

Table 4.27 Characteristics of PCI procedures performed for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
PCI status, No. (%)				
Elective	1,163 (90.5)	869 (84.4)	957 (89.2)	1,826 (86.8)
NSTEMI/UA	83 (6.5)	93 (9.0)	79 (7.4)	172 (8.2)
STEMI	39 (3.0)	68 (6.6)	37 (3.4)	105 (5.0)
Elective, No. (%)	**N = 1,163**	**N = 869**	**N = 957**	**N = 1,826**
Staged PCI	546 (47.2)	468 (54.0)	519 (54.3)	987 (54.1)
Ad hoc	612 (52.8)	399 (46.0)	437 (45.7)	836 (45.9)
Not available	5	2	1	3
NSTEMI/UA, No. (%)	**N = 83**	**N = 93**	**N = 79**	**N = 172**
Urgent	17 (20.5)	20 (21.7)	14 (18.4)	34 (20.2)
Non-urgent	66 (79.5)	72 (78.3)	62 (81.6)	134 (79.8)
Not available	0	1	3	4
STEMI, No. (%)	**N = 39**	**N = 68**	**N = 37**	**N = 105**
Rescue	12 (30.8)	12 (17.6)	5 (13.5)	17 (16.2)
Primary	19 (48.7)	31 (45.6)	16 (43.2)	47 (44.8)
Facilitated	0 (0.0)	3 (4.4)	3 (8.1)	6 (5.7)
Delayed routine PCI	4 (10.3)	14 (20.6)	4 (10.8)	18 (17.1)
Delayed selective PCI	3 (7.7)	8 (11.8)	6 (16.2)	14 (13.3)
Pharmacoinvasive	1 (2.6)	0 (0.0)	3 (8.1)	3 (2.9)
#Percutaneous entry, No. (%)				
Brachial	11 (0.9)	8 (0.8)	2 (0.2)	10 (0.5)
Radial	637 (49.6)	521 (50.6)	587 (54.7)	1,108 (52.7)
Femoral	798 (62.1)	634 (61.6)	648 (60.4)	1,282 (61.0)
$^French size type				
Guiding catheter	1,223 (96.4)	944 (91.7)	998 (93.1)	1,942 (92.4)
Guiding sheath	46 (3.6)	86 (8.3)	74 (6.9)	160 (7.6)
Not available	6	0	1	0
Missing	10	0	0	0
^French size (guiding catheter), No. (%)				
4	0 (0.0)	1 (0.1)	1 (0.1)	2 (0.1)
5	1 (0.1)	2 (0.2)	1 (0.1)	3 (0.2)
6	1,015 (83.2)	811 (85.9)	870 (87.2)	1,681 (86.6)
7	192 (15.7)	126 (13.3)	126 (12.6)	252 (13.0)
8	12 (1.0)	4 (0.4)	0 (0.0)	4 (0.2)
Others	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Not available	3	0	0	0

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Closure device, No. (%)				
No	974 (81.2)	759 (78.2)	0 (0.0)	1,529 (77.9)
Seal	62 (5.2)	52 (5.4)	96 (43.0)	148 (7.5)
Suture	83 (6.9)	79 (8.1)	74 (33.2)	153 (7.8)
Exoseal	33 (2.8)	12 (1.2)	16 (7.2)	28 (1.4)
Others	47 (3.9)	69 (7.1)	37 (16.6)	106 (5.4)
Not available	9	6	6	12
Missing	77	53	74	127
#^^Extent of coronary disease, No. (%)				
Single vessel disease	811 (63.9)	671 (65.1)	685 (63.8)	1,356 (64.5)
Multiple vessel disease	413 (32.5)	325 (31.6)	366 (34.1)	691 (32.9)
Graft	34 (2.7)	29 (2.8)	14 (1.3)	43 (2.0)
Left main	11 (0.9)	5 (0.5)	8 (0.7)	13 (0.6)
Not available	16	0	0	0
Fluoroscopy time, min				
N	1,104	937	978	1,915
Mean (SD)	35.9 (23.6)	34.6 (20.5)	38.1 (23.3)	36.4 (22.1)
Median (Min – Max)	30.4 (2.5 – 158.0)	30.3 (1.3 – 133.6)	33.4 (1.4 – 176.2)	32.2 (1.3 – 176.2)
Not available, No. (%)	120 (9.3)	61 (5.9)	56 (5.2)	117 (5.6)
Missing, No. (%)	61 (4.7)	32 (3.1)	39 (3.6)	71 (3.4)
Fluoroscopy total dose, mGy				
N	653	474	484	958
Mean (SD)	55449.3 (134968.9)	74980.4 (159340.0)	130609.9 (289384.8)	103085.5 (235772.4)
Median (Min – Max)	2988.0 (1.6 – 082615.0)	3173.0 (0 – 1174140.0)	5650.0 (100.0 – 3634163.0)	4039.9 (0 – 3634163.0)
Not available, No. (%)	411 (32.0)	425 (41.3)	411 (38.3)	836 (39.8)
Missing, No. (%)	221 (17.2)	131 (12.7)	178 (16.6)	309 (14.7)
Contrast volume, ml				
N	1,088	935	981	1,916
Mean (SD)	215.7 (90.6)	213.9 (89.0)	213.4 (88.8)	213.6 (88.9)
Median (Min – Max)	200.0 (26.0 – 500.0)	200.0 (21.0 – 500.0)	200.0 (18.0 – 500.0)	200.0 (18.0 – 500.0)
Not available, No. (%)	121 (9.4)	50 (4.9)	49 (4.6)	99 (4.7)
Missing, No. (%)	76 (5.9)	45 (4.4)	43 (4.0)	88 (4.2)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Thrombolytics prior to PCI procedure in STEMI, No. (%)				
Total no. of procedures among STEMI patients	**N = 79**	**N = 106**	**N = 84**	**N = 190**
Yes	20 (25.3)	9 (8.5)	13 (15.5)	22 (11.6)
No	59 (74.7)	97 (91.5)	71 (84.5)	168 (88.4)
Pre-procedure stenosis, %				
N	1,248	1,016	1,032	2,048
Mean (SD)	98.5 (8.2)	98.5 (9.1)	98.2 (12.1)	98.3 (10.7)
Median (Min – Max)	100.0 (0 – 100.0)	100.0 (0 – 100.0)	100.0 (0 – 100.0)	100.0 (0 – 100.0)
Missing, No. (%)	37 (2.9)	14 (1.4)	41 (3.8)	55 (2.6)
Post-procedure stenosis, %				
N	1,217	992	973	1,965
Mean (SD)	22.7 (41.2)	24.4 (42.0)	29.2 (44.2)	26.7 (43.2)
Median (Min – Max)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)	0 (0.0 – 100.0)
Missing, No. (%)	68 (5.3)	38 (3.7)	100 (9.3)	138 (6.6)
Estimated lesion length, mm				
N	1,035	801	812	1,613
Mean (SD)	42.0 (23.6)	43.9 (23.7)	44.6 (24.7)	44.3 (24.2)
Median (Min – Max)	38.0 (4.0 – 130.0)	40.0 (8.0 – 132.0)	40.0 (4.0 – 150.0)	40.0 (4.0 – 150.0)
Missing, No. (%)	250 (19.5)	229 (22.2)	261 (24.3)	490 (23.3)
Lesion result, No. (%)				
Successful	1,003 (78.2)	783 (76.1)	788 (73.8)	1,571 (74.9)
Unsuccessful	280 (21.8)	246 (23.9)	280 (26.2)	526 (25.1)
Not available	2	1	5	0
*Stent length, mm				
N	970	766	771	1,537
Mean (SD)	48.9 (25.6)	50.8 (26.0)	51.7 (27.3)	51.3 (26.7)
Median (Min – Max)	44.0 (8.0 – 167.0)	48.0 (12.0 – 154.0)	46.0 (8.0 – 156.0)	48.0 (8.0 – 156.0)
Not available, No. (%)	315 (24.5)	264 (25.6)	302 (28.1)	566 (26.9)
**Stent diameter, mm				
N	965	762	764	1,526
Mean (SD)	2.8 (0.4)	2.8 (0.4)	2.8 (0.4)	2.8 (0.4)
Median (Min – Max)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)	2.8 (2.0 – 4.0)
Not available, No. (%)	320 (24.9)	268 (26.0)	309 (28.8)	577 (27.4)

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Maximum balloon size used, mm				
N	1,005	821	811	1,632
Mean (SD)	2.9 (0.6)	2.9 (0.6)	3.0 (0.6)	3.0 (0.6)
Median (Min – Max)	3.0 (1.0 – 5.0)	3.0 (1.0 – 5.5)	3.0 (1.0 – 6.0)	3.0 (1.0 – 6.0)
Not available, No. (%)	280 (21.8)	209 (20.3)	262 (24.4)	471 (22.4)
Maximum stent/balloon deploy pressure, atm				
N	986	810	805	1,615
Mean (SD)	16.6 (4.6)	16.4 (4.8)	16.6 (4.9)	16.5 (4.8)
Median (Min – Max)	16.0 (2.0 – 34.0)	16.0 (4.0 – 40.0)	16.0 (2.0 – 40.0)	16.0 (2.0 – 40.0)
Not available, No. (%)	299 (23.3)	220 (21.4)	268 (25.0)	488 (23.2)

#Patients are allowed to be in more than one type of category.
$French size type was not available in the old CRF. In the old CRF, information was only collected for French size for guiding catheter.
^French size is reported by number of lesions instead of number of procedures. In the old CRF, French size was reported under section 6 cath lab visit, no 6b, whereas in the new CRF, it was reported under section 7 PCI proc details, no11.
**In old CRF, patients were allowed to be presented in different categories. In new CRF, patients were included in a unique category.*
Single vessel disease is for patients with single vessel disease information (old CRF)/patients with only one information of either LAD, LCx or RCA.
Multiple vessel disease is for patients with multiple vessel disease information (old CRF)/patients with more than one information of LAD, LCx or RCA.
Left main stem (LMS) is for patients with information on LMS (LMS alone or in combination with LAD, LCx, RCA or single vessel disease).
Graft is for patients with information on graft (graft alone or in combination with LAD, LCx, RCA, single vessel disease, multiple vessel disease or LMS).
**Summation of stent length was used for lesions which were treated with more than one stent.*
***Average of stent diameter was used for lesions which were treated with more than one stent.*

Table 4.28 Types of stents used for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of stents used	**1,709**	**1,346**	**1,286**	**2,632**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
Types of stents for lesion with CTO >3 months				
Drug eluting stent	1,424 (83.5)	1,056 (80.4)	1,084 (84.8)	2,140 (82.6)
Bare metal stent	67 (3.9)	20 (1.5)	3 (0.2)	23 (0.9)
Bio-absorbable stent	13 (0.8)	8 (0.6)	8 (0.6)	16 (0.6)
Antibody coated stent	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
*Others	21 (1.2)	1 (0.1)	0 (0.0)	1 (0.0)
Drug eluting balloon	147 (8.6)	160 (12.2)	132 (10.3)	292 (11.3)
Bifurcated stent	2 (0.1)	1 (0.1)	1 (0.1)	2 (0.1)
Covered stent	1 (0.1)	1 (0.1)	1 (0.1)	2 (0.1)
Combo stent	29 (1.7)	66 (5.0)	49 (3.8)	115 (4.4)
Missing	4	33	8	41

**Stents which are not listed in the NCVD-PCI Stent List.*

Table 4.29 Types of devices used during PCI for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
#Intracoronary devices used for lesion with CTO >3 months				
Aspiration/aspiration catheter	20 (1.6)	22 (2.1)	16 (1.5)	38 (1.8)
Balloon only/POBA	177 (13.8)	135 (13.1)	116 (10.8)	251 (11.9)
Drug eluting balloon	118 (9.2)	125 (12.1)	108 (10.1)	233 (11.1)
Drug eluting stent	845 (65.8)	634 (61.6)	681 (63.5)	1,315 (62.5)
Cutting balloon/scoring balloon	16 (1.2)	13 (1.3)	23 (2.1)	36 (1.7)
Coil	5 (0.4)	1 (0.1)	0 (0.0)	1 (0.0)
OCT	11 (0.9)	11 (1.1)	3 (0.3)	14 (0.7)
Mother and child	6 (0.5)	9 (0.9)	6 (0.6)	15 (0.7)
Microcatheter	467 (36.3)	478 (46.4)	539 (50.2)	1,017 (48.4)
Angiojet	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
IVUS	66 (5.1)	48 (4.7)	54 (5.0)	102 (4.9)
Flowire/FFR	7 (0.5)	7 (0.7)	1 (0.1)	8 (0.4)
Rotablator	19 (1.5)	18 (1.7)	9 (0.8)	27 (1.3)
Bare metal stent	59 (4.6)	16 (1.6)	3 (0.3)	19 (0.9)
Embolic protection	1 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)
Others	145 (11.3)	33 (3.2)	30 (2.8)	63 (3.0)
Embolic protection status	**N = 1**	**N = 0**	**N = 0**	**N = 0**
Filter	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Balloon/distal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Proximal	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Missing	1	0	0	0

#Patients are allowed to be in more than one type of category.

Table 4.30 Types of post-procedure complications for lesion with description of CTO >3 months only, NCVD-PCI Registry, 2007–2014

Year	2013 – 2014	2015	2016	2015 – 2016
Total no. of lesions	**1,285**	**1,030**	**1,073**	**2,103**
	No. (%)	**No. (%)**	**No. (%)**	**No. (%)**
***Types of complication for lesion with CTO >3 months**				
Dissection	55 (4.3)	39 (3.8)	33 (3.1)	72 (3.4)
Flow limiting	4 (7.7)	2 (5.3)	4 (12.1)	6 (8.5)
Non-flow limiting	48 (92.3)	36 (94.7)	29 (87.9)	65 (91.5)
Not available	2	1	0	1
Missing	1	0	0	0
No-reflow	16 (1.2)	5 (0.5)	9 (0.8)	14 (0.7)
Transient	5 (33.3)	2 (40.0)	4 (57.1)	6 (50.0)
Persistent	10 (66.7)	3 (60.0)	3 (42.9)	6 (50.0)
Not available	1	0	2	2
Perforation	12 (0.9)	14 (1.4)	13 (1.2)	27 (1.3)

**Results are only showed for the number of patients who were reported to have the complications.*

Table 4.31 Duration of thienopyridine in patients who underwent PCI and lesion with description of CTO >3 months only, NCVD-PCI Registry, 2013–2016

Year	Duration of clopidogrel/ ticlopidine (months)	#Intracoronary devices used		
		Balloon only/POBA	Drug eluting stent	Bare metal stent
		No. (%)	No. (%)	No. (%)
2013-3014	1	24 (16.1)	5 (0.6)	15 (27.8)
	3	7 (4.7)	6 (0.7)	1 (1.9)
	6	5 (3.4)	13 (1.6)	3 (5.6)
	12	108 (72.5)	784 (95.0)	33 (61.1)
	>12	5 (3.4)	17 (2.1)	2 (3.7)
	Not available	24	11	4
	Missing	4	9	1
	Total	**177**	**845**	**59**
2015	1	2 (1.7)	8 (1.3)	5 (35.7)
	3	9 (7.4)	2 (0.3)	2 (14.3)
	6	4 (3.3)	6 (1.0)	1 (7.1)
	12	105 (86.8)	582 (95.4)	6 (42.9)
	>12	1 (0.8)	12 (2.0)	0 (0.0)
	Not available	11	17	2
	Missing	3	7	0
	Total	**135**	**634**	**16**
2016	1	3 (2.9)	3 (0.5)	0 (0.0)
	3	0 (0.0)	6 (0.9)	1 (50.0)
	6	3 (2.9)	3 (0.5)	0 (0.0)
	12	96 (93.2)	621 (97.3)	1 (50.0)
	>12	1 (1.0)	5 (0.8)	0 (0.0)
	Not available	7	24	1
	Missing	1	19	0
	Total	**111**	**681**	**3**
2015-2016	1	5 (2.2)	11 (0.9)	5 (31.3)
	3	14 (6.1)	8 (0.6)	3 (18.8)
	6	7 (3.1)	9 (0.7)	1 (6.3)
	12	201 (87.8)	1,203 (96.4)	7 (43.8)
	>12	2 (0.9)	17 (1.4)	0 (0.0)
	Not available	18	41	3
	Missing	4	26	0
	Total	**251**	**1,315**	**19**

#Patients are allowed to be in more than one type of category.

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