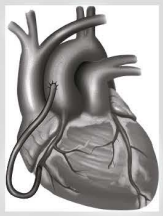

CHAPTER 4: PROCEDURAL DETAILS

4.1 PROCEDURAL SETTINGS

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This chapter summarizes the procedural details and treatment received by patients who underwent PCI in 2007-2009 based on our registry.

Over the 3 years period from 2007-2009, a total of 11,498 PCI procedures were performed. The majority of the PCI were performed as Elective case (90.1%; n=10,263). Five percent (5%) (n=579) of the total procedures were performed for Acute Myocardial Infarction (AMI) and 4.6% (n=526) were for NSTEMI/UA (Table 4.1.1).

Femoral is the most common approach for percutaneous entry for PCI which accounts for 59% (n=6472), followed by Radial which is 40% (n=4374). There has been an increasing trend of radial approach from 36% in 2007 to 44% in 2009 (Table 4.1.1). The other site includes brachial 1%. In emergency cases (NSTEMI/UA), Femoral approach is the more preferred choice at 78% (n=394) (Table 4.1.6).

The size of percutaneous access was measured based on the French size. 79.1% (n=9090) of patients had a size 6 French, 16.3% (n=1876) size 7 French, 1.3% (n=135) size 5 French and 1% (n=114) size 8 French (Table 4.1.1).

As for the methods of closure for percutaneous entry, we used 2.5% (n=287) of seal and 1.9% (n=214) suture. The majority of the cases (93%; n=10697) had no closure device and were manually compressed (Table 4.1.1).

Looking at the extent of coronary artery disease, 53.1% (n=6110), we found that PCI were performed in multiple vessel disease, 46.1% (n=5301) in single vessel disease and the remaining were grafts (1.1%; n=130) and Left Main disease (0.7%; n=82) (Table 4.1.1).

The mean fluoroscopy time was 21 minutes (SD 19), and the median was 15min (2,180). The mean dose of radiation was 686mGy (SD 2203), median dose was 123mGy (3, 47351) (Table 4.1.1).

Most of the contrasts used for these procedures were non ionic in 86% (n=9868). Only 2% (n=192) were ionic. The mean contrast volume was 177 mls (SD 66), and the median was 160 ml (Table 4.1.1).

Treatment of patients undergoing PCI

19.5% (n=513) of STEMI patients received thrombolytic treatment prior to the procedure. Of these patients, 24.6% (n=126) received thrombolysis more than 7 days before procedure, 34.7% (n=178) within 12-24 hours and 6.8% (n=35) received it within less than 3 hours (Table 4.1.1).

6% (n=689) of PCI received GP IIb/IIIa blocker, and in this group of patients, 42% (n=289) received it prior to PCI, 40% (n=275) received it during procedure and 9.0% (n=65) received it after the procedure (Table 4.1.1).

Intravenous unfractionated Heparin was given in 92% (n=10565). In 80% (n=8418), Heparin were given during the procedure, and 17% (n=1845) were given prior to the procedure (Table 4.1.1).

Four-percent (n=512) of patients received low molecular weight heparin (LMWH). The majority 83% (n=423) of these patients received prior to procedure, 6% (n=30) received it during procedure and 6% (n=31) received it after procedure (Table 4.1.1).

Both Aspirin and Clopidogrel are the two most common antiplatelet agents used in PCI. Aspirin use is in 97% (n=11,147) and Clopidogrel in 98% (n=11,278). In both Aspirin and Clopidogrel use, 94% of cases were given prior to the procedure. The most common loading dose for Clopidogrel is 300mg which accounts for 47% (n=5265) of cases and 5% (n=526) received a loading dose of 600mg. 37% (n=4161) received only 75mg prior to the PCI (these patients had been on long term Clopidogrel therapy prior to procedure). Ticlopidine was only used in 3% (n=350) of cases (Table 4.1.1).

Following PCI, the duration of Clopidogrel will depend on the clinical setting and the type of stents implanted. About 24.1% (n=2774) of the cases were planned for 1 month of Clopidogrel, 5.8% (n=670) for 3 months, 12.5% (n=1432) for 6 months, 38.7% (n=4454) for 12 months and 11.2% (n=1291) for longer than 1 year (Table 4.1.5).

Summary

1. The majority of PCI performed in Malaysia from 2007-2009 were performed as Elective case (90.1%).

2. Femoral access remains the most common percutaneous entry; however, radial approach is becoming more popular (36% in 2007 to 40% in 2009).

3. 53.1% of PCI were performed in multiple vessel disease and 46.1% in single vessel disease.

4. Clopidogrel and Aspirin are the two most common antiplatelet therapies for patients undergoing coronary intervention and more than 90% received Clopidogrel as loading dose. Those who did not receive loading dose of Clopidogrel had been on long term Clopidogrel therapy prior to the procedure.

Table 4.1.1 Characteristics of PCI procedures performed, NCVD-PCI Registry, 2007-2009

	2007 Total No. of Procedures =3928		2008 Total No. of Procedures =3654		2009 Total No. of Procedures =3916		ALL Total No. of Procedures =11498	
	No.	%	No.	%	No.	%	No.	%
PCI Status, No. (%)								
Elective	3545	90.2	3323	90.9	3495	89.2	10363	90.1
NSTEMI/UA	190	4.8	173	4.7	163	4.2	526	4.6
AMI	182	4.6	155	4.2	242	6.2	579	5
Not Available	11	0.3	3	0.1	16	0.4	30	0.3
Percutaneous entry, No. (%)								
Brachial	28	1	39	1	47	1	114	1
Radial	1331	36	1336	39	1707	44	4374	40
Femoral	2340	63	2050	59	2082	54	6472	59
French size, No. (%)								
5	15	0.4	35	1	85	2.2	135	1.2
6	2902	73.9	2908	79.6	3280	83.8	9090	79.1
7	801	20.4	575	15.7	500	12.8	1876	16.3
8	50	1.3	42	1.1	22	0.6	114	1
Others	0	0	0	0	1	0	1	0
Not Available	1	0	0	0	2	0.1	3	0
Closure device, No. (%)								
No	3619	92.1	3393	92.9	3685	94.1	10697	93
Seal	83	2.1	82	2.2	122	3.1	287	2.5
Suture	40	1	127	3.5	47	1.2	214	1.9
Others	6	0.2	1	0	17	0.4	24	0.2
Not Available	180	4.6	51	1.4	45	1.1	276	2.4
Extent of Coronary disease, No. (%)								
Single vessel disease	1706	43.4	1626	44.5	1969	50.3	5301	46.1
Multiple vessel disease	2172	55.3	2016	55.2	1922	49.1	6110	53.1
Graft	38	1	49	1.3	43	1.1	130	1.1
Left main	36	0.9	29	0.8	17	0.4	82	0.7
Fluoroscopy time, minutes								
N	3153		3139		3754		10046	
Mean(SD)	22 (22)		21 (19)		19 (16)		21 (19)	
Median(min,max)	16 (2,180)		16 (2,180)		15 (2,180)		15 (2,180)	
Not Available	775	20	515	14	162	4	1452	13
Total dose, mGy								
N	1480		1209		1774		4463	
Mean(SD)	615 (2650)		769 (2466)		689 (1484)		686 (2203)	
Median(min,max)	122 (3,47351)		118 (3,39166)		129 (4,18341)		123 (3,47351)	
Not Available	2448	62	2445	67	2142	55	7035	61

Table 4.1.1 Characteristics of PCI procedures performed, NCVD-PCI Registry, 2007-2009

	2007 Total No. of Procedures =3928		2008 Total No. of Procedures =3654		2009 Total No. of Procedures =3916		ALL Total No. of Procedures =11498	
	No.	%	No.	%	No.	%	No.	%
Contrast type, No. (%)								
Ionic	156	4	20	1	16	0	192	2
Non-ionic	2977	76	3022	83	3869	99	9868	86
Not Available	795	20	612	17	31	1	1438	13
Contrast volume, ml								
N	3223		3173		3765		10161	
Mean(SD)	180 (72)		176 (64)		175 (63)		177 (66)	
Median(min,max)	165 (25,500)		160 (18,480)		160 (15,500)		160 (15,500)	
Not Available	705	18	481	13	151	4	1337	12
Thrombolytics prior to PCI Procedure in STEMI, No. (%)								
Yes	129	19.5	159	22.9	225	17.7	513	19.5
No	527	79.7	534	77.1	1049	82.3	2110	80.3
Not Available	5	0.8	0	0	0	0	5	0.2
Thrombolytics given prior to PCI Procedure in STEMI, No. (%)								
<3 hrs	17	13.2	8	5	10	4.4	35	6.8
3-6 hrs	14	10.9	12	7.5	9	4	35	6.8
6-12 hrs	13	10.1	13	8.2	16	7.1	42	8.2
12-24 hrs	27	20.9	62	39	89	39.6	178	34.7
1-7 days	13	10.1	17	10.7	32	14.2	62	12.1
>7 days	33	25.6	35	22	58	25.8	126	24.6
Not Available	12	9.3	12	7.5	11	4.9	35	6.8
Adjunctive pharmacotherapy								
IIb/IIIa Blockade, No. (%)								
Yes	247	6	226	6	216	6	689	6
No	3648	93	3428	94	3700	94	10776	94
Missing	33	1	0	0	0	0	33	0
IIb/IIIa Blockade given, No. (%)								
Prior	101	41	79	35	109	50	289	42
After	21	9	20	9	24	11	65	9
During	98	40	104	46	73	34	275	40
Not Available	27	11	23	10	10	5	60	9
Heparin, No. (%)								
Yes	3531	90	3267	89	3767	96	10565	92
No	381	10	387	11	149	4	917	8
Not Available	16	0	0	0	0	0	16	0

Table 4.1.1 Characteristics of PCI procedures performed, NCVD-PCI Registry, 2007-2009

	2007 Total No. of Procedures =3928		2008 Total No. of Procedures =3654		2009 Total No. of Procedures =3916		ALL Total No. of Procedures =11498	
	No.	%	No.	%	No.	%	No.	%
Heparin given, No. (%)								
Prior	681	19	485	15	679	18	1845	17
After	8	0	5	0	13	0	26	0
During	2724	77	2681	82	3013	80	8418	80
Not Available	118	3	96	3	62	2	276	3
LMWH, No. (%)								
Yes	210	5	152	4	150	4	512	4
No	3661	93	3502	96	3766	96	10929	95
Not Available	57	1	0	0	0	0	57	0
LMWH given, No. (%)								
Prior	165	79	130	86	128	85	423	83
After	19	9	5	3	7	5	31	6
During	12	6	9	6	9	6	30	6
Not Available	14	7	8	5	6	4	28	5
Ticlopidine, No. (%)								
Yes	152	4	100	3	98	3	350	3
No	3738	95	3554	97	3818	97	11110	97
Not Available	38	1	0	0	0	0	38	0
Ticlopidine given, No. (%)								
Prior	132	87	92	92	91	93	315	90
After	2	1	1	1	2	2	5	1
During	2	1	2	2	1	1	5	1
Not Available	16	11	5	5	4	4	25	7
Aspirin, No. (%)								
Yes	3751	95	3559	97	3837	98	11147	97
No	162	4	95	3	79	2	336	3
Not Available	15	0	0	0	0	0	15	0
Aspirin given, No. (%)								
Prior	3440	92	3349	94	3735	97	10524	94
After	40	1	14	0	21	1	75	1
During	58	2	15	0	22	1	95	1
Not Available	213	6	181	5	59	2	453	4
Clopidogrel, No. (%)								
Yes	3831	98	3584	98	3863	99	11278	98
No	90	2	70	2	53	1	213	2
Not Available	7	0	0	0	0	0	7	0

Table 4.1.1 Characteristics of PCI procedures performed, NCVD-PCI Registry, 2007-2009

	2007 Total No. of Procedures =3928		2008 Total No. of Procedures =3654		2009 Total No. of Procedures =3916		ALL Total No. of Procedures =11498	
	No.	%	No.	%	No.	%	No.	%
Clopidogrel given, No. (%)								
Prior	3567	93	3320	93	3663	95	10550	94
After	72	2	85	2	137	4	294	3
During	97	3	72	2	46	1	215	2
Not Available	95	2	107	3	17	0	219	2
Prior, No. (%)								
<6 hrs	615	17	634	19	547	15	1796	17
6-12 hrs	1181	33	791	24	894	24	2866	27
>34-72 hrs	315	9	380	11	1084	30	1779	17
>72 hrs	1164	33	1250	38	978	27	3392	32
Not Available	292	8	265	8	160	4	717	7
First starting dose, No. (%)								
75 mg	1331	35	1142	32	1688	44	4161	37
300 mg	1802	47	1676	47	1787	46	5265	47
600 mg	282	7	169	5	75	2	526	5
>600 mg	1	0	0	0	0	0	1	0
Not Available	415	11	597	17	313	8	1325	12
Loading Dose (STEMI Only), No. (%)								
75	190	29	192	28	574	46	956	37
300	340	52	368	54	587	47	1295	50
600	67	10	34	5	17	1	118	5
>600	1	0	0	0	0	0	1	0
Not Available	60	9	88	13	77	6	225	9
Planned duration of Clopidogrel/Ticlopidine, No. (%)								
1 month	1008	25.7	894	24.5	872	22.3	2774	24.1
3 months	267	6.8	187	5.1	216	5.5	670	5.8
6 months	834	21.2	299	8.2	299	7.6	1432	12.5
12 months	875	22.3	1642	44.9	1937	49.5	4454	38.7
>12 months	548	14	334	9.1	409	10.4	1291	11.2
Not Available	396	10.1	298	8.2	183	4.7	877	7.6

Table 4.1.2 Comparison of STEMI and NSTEMI patients who received ad-hoc PCI, NCVD-PCI Registry, 2007-2009

Year	Cath/PCI same lab visit	STEMI		NSTEMI	
		No.	%	No.	%
2007	Yes	591	89.4	453	91.3
	No	59	8.9	40	8.1
	Not Available	11	1.7	3	0.6
	Total	661	100	496	100
2008	Yes	584	84.3	472	81.2
	No	102	14.7	102	17.6
	Not Available	7	1	7	1.2
	Total	693	100	581	100
2009	Yes	1103	86.6	632	77.1
	No	161	12.6	182	22.2
	Not Available	10	0.8	6	0.7
	Total	1274	100	820	100
All	Yes	2278	86.7	1557	82.1
	No	322	12.3	324	17.1
	Not Available	28	1.1	16	0.8
	Total	2628	100.1	1897	100

Table 4.1.3 Usage of thrombolytics in STEMI patients who underwent PCI, NCVD-PCI Registry, 2007-2009

Year	PCI status	STEMI						
		Thrombolytics						
		Yes		No		Missing		Total
		No.	%	No.	%	No.	%	
2007	Rescue	52	40.3	17	3.2	1	20	70
	Primary	3	2.3	91	17.3	1	20	95
	Not Available	74	57.4	419	79.5	3	60	496
	Total	129	100	527	100	5	100	661
2008	Rescue	46	28.9	20	3.7	0	0	66
	Primary	4	2.5	69	12.9	0	0	73
	Not Available	109	68.6	445	83.3	0	0	554
	Total	159	100	534	99.9	0	0	693
2009	Rescue	70	31.1	35	3.3	0	0	105
	Primary	8	3.6	107	10.2	0	0	115
	Not Available	147	65.3	907	86.5	0	0	1054
	Total	225	100	1049	100	0	0	1274
All	Rescue	168	32.7	72	3.4	1	20	241
	Primary	15	2.9	267	12.7	1	20	283
	Not Available	330	64.3	1771	83.9	3	60	2104
	Total	513	99.9	2110	100	5	100	2628

Table 4.1.4 Patients who underwent PCI after thrombolytics therapy, NCVD-PCI Registry, 2007-2009

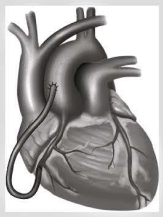
Year	Thrombolytics given	PCI Status			
		Urgent		Rescue	
		No.	%	No.	%
2007	<3 hrs	5	17.9	11	20.8
	3-6 hrs	1	3.6	11	20.8
	6-12 hrs	4	14.3	7	13.2
	12-24 hrs	11	39.3	9	17.0
	>24 hrs	3	10.7	11	20.8
	Not Available	4	14.3	4	7.5
	Total	**28**	**100**	**53**	**100**
2008	<3 hrs	2	8.3	3	6.3
	3-6 hrs	3	12.5	7	14.6
	6-12 hrs	0	0	9	18.8
	12-24 hrs	12	50.0	17	35.4
	>24 hrs	6	25.0	9	18.8
	Not Available	1	4.2	3	6.3
	Total	**24**	**100**	**48**	**100**
2009	<3 hrs	5	15.6	5	6.9
	3-6 hrs	1	3.1	4	5.6
	6-12 hrs	2	6.3	10	13.9
	12-24 hrs	15	46.9	24	33.3
	>24 hrs	5	15.6	26	36.1
	Not Available	4	12.5	3	4.2
	Total	**32**	**100**	**72**	**100**
All	<3 hrs	12	14.3	19	11.0
	3-6 hrs	5	6.0	22	12.7
	6-12 hrs	6	7.1	26	15.0
	12-24 hrs	38	45.2	50	28.9
	>24 hrs	14	16.7	46	26.6
	Not Available	9	10.7	10	5.8
	Total	**84**	**100**	**173**	**100**

Table 4.1.5 Duration of Thienopyridine in patients who underwent PCI, NCVD-PCI Registry, 2007-2009

Year	Duration of Clopidogrel/Ticlopidine	Intracoronary devices used					
		Balloon only		Drug Eluting Stent		Bare Metal Stent	
		No.	%	No.	%	No.	%
2007	1 month	132	29	35	1	1039	44
	3 months	21	5	120	5	199	8
	6 months	95	21	709	30	376	16
	12 months	84	19	844	35	305	13
	>12 months	53	12	489	20	239	10
	Not Available	64	14	201	8	192	8
	Total	449	100	2398	100	2350	100
2008	1 month	108	28	19	1	914	50
	3 months	18	5	41	2	136	7
	6 months	39	10	235	9	141	8
	12 months	130	33	1714	68	412	23
	>12 months	36	9	352	14	101	6
	Not Available	60	15	167	7	117	6
	Total	391	100	2528	100	1821	100
2009	1 month	113	26	70	3	789	46
	3 months	29	7	30	1	136	8
	6 months	35	8	164	6	145	9
	12 months	176	40	2023	73	445	26
	>12 months	33	8	427	15	135	8
	Not Available	50	11	48	2	55	3
	Total	436	100	2762	100	1705	100
All	1 month	353	28	124	2	2742	47
	3 months	68	5	191	2	471	8
	6 months	169	13	1108	14	662	11
	12 months	390	31	4581	60	1162	20
	>12 months	122	10	1268	16	475	8
	Not Available	174	14	416	5	364	6
	Total	1276	100	7688	100	5876	100

Table 4.1.6 Access site of patients who underwent procedures, by PCI status, NCVD-PCI Registry, 2007-2009

Year		Elective		NSTEMI/UA		AMI		Not Available	
		No.	%	No.	%	No.	%	No.	%
2007	Brachial	28	1	0	0	0	0	28	1
	Radial	1276	38	37	20	0	0	1276	38
	Femoral	2030	61	145	80	0	0	2030	61
2008	Brachial	38	1	0	0	0	0	0	0
	Radial	1287	41	33	20	0	0	0	0
	Femoral	1780	57	132	80	0	0	0	0
2009	Brachial	42	1	2	1	0	0	0	0
	Radial	1622	47	42	26	0	0	0	0
	Femoral	1755	51	117	73	0	0	0	0
All	Brachial	108	1	2	0	0	0	0	0
	Radial	4185	42	112	22	0	0	0	0
	Femoral	5565	56	394	78	0	0	0	0



4.2 LESION CHARACTERISTICS

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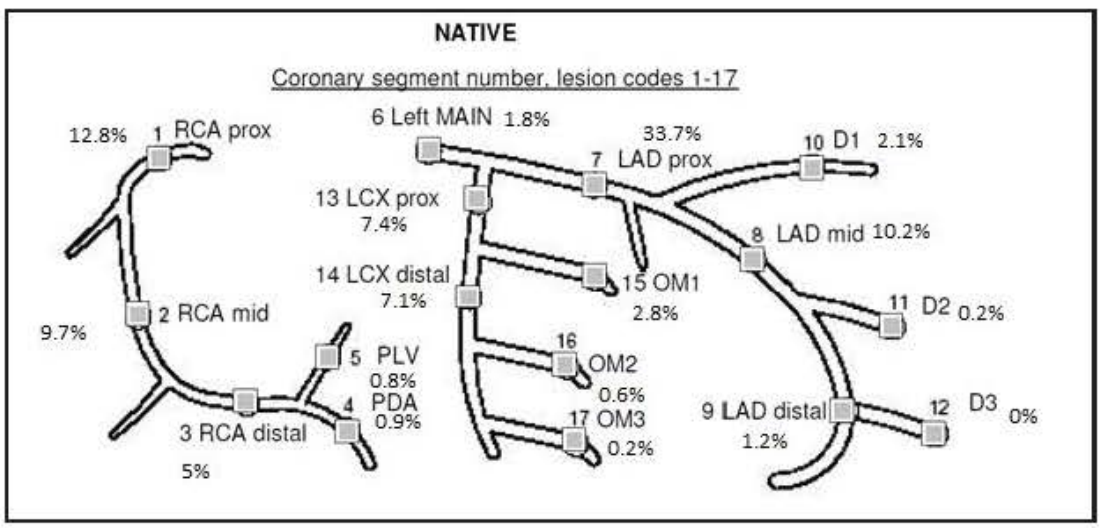
From 2007 to 2009, a total of 10,602 patients were admitted for PCI procedure. This registry reported 11,498 PCI procedures were done during the same period. A total of 15,538 lesions were treated with PCI. On average, 1.47 lesions per patient were treated with PCI and 1.35 lesions were treated during each procedure.

Anatomical location of the lesion

Figure 4.1 Anatomical location of lesions treated with Percutaneous Coronary Intervention, NCVD-PCI Registry, 2007-2009



Among the 15,538 lesions treated with PCI, proximal left anterior descending artery is the commonest lesion location (33.7%). This is followed by proximal right coronary artery (12.8%), mid left anterior descending artery (10.2%) and mid right coronary artery (9.7%). Left main stem PCI was performed in 1.8% of all PCI. PCI to the graft was performed in 204 lesions. Among the graft lesions, three lesions were in previous radial graft, twenty four lesions were located within the LIMA graft and one in the RIMA graft. The majority of lesions were in the saphenous vein grafts. (Table 4.2.1)

Table 4.2.1 Summary of location of lesions treated with Percutaneous Coronary Intervention, NCVD-PCI Registry, 2007-2009

Location of lesion	2007		2008		2009		All	
	No.	%	No.	%	No.	%	No.	%
Left Main Stem	**97**	**1.8**	**95**	**1.8**	**95**	**1.8**	**287**	**1.8**
Left Anterior Descending Artery (LAD)	**2646**	**47.9**	**2407**	**46.7**	**2473**	**47.5**	**7526**	**47.4**
LAD proximal	1906	34.5	1654	32.1	1780	34.2	5340	33.7
LAD mid	534	9.7	571	11.1	520	10	1625	10.2
LAD distal	73	1.3	62	1.2	50	1	185	1.2
D1	122	2.2	109	2.1	110	2.1	341	2.1
D2	9	0.2	10	0.2	11	0.2	30	0.2
D3	2	0	1	0	2	0	5	0
Right Coronary Artery (RCA)	**1654**	**30.1**	**1427**	**27.7**	**1559**	**30**	**4640**	**29.2**
RCA proximal	727	13.2	610	11.9	696	13.4	2033	12.8
RCA mid	567	10.3	472	9.2	506	9.7	1545	9.7
RCA distal	279	5.1	249	4.8	258	5	786	5
PDA	45	0.8	48	0.9	49	0.9	142	0.9
PLV	36	0.7	48	0.9	50	1	134	0.8
Left Circumflex Artery (LCx)	**998**	**18.1**	**931**	**18.2**	**952**	**18.4**	**2881**	**18.1**
LCX proximal	387	7	369	7.2	424	8.2	1180	7.4
LCX distal	412	7.5	374	7.3	344	6.6	1130	7.1
OM1	154	2.8	147	2.9	140	2.7	441	2.8
OM2	35	0.6	30	0.6	36	0.7	101	0.6
OM3	10	0.2	11	0.2	8	0.2	29	0.2
Graft	**60**	**1.0**	**84**	**1.7**	**60**	**1.0**	**204**	**1.3**
Saphenous Vein Graft	52	0.9	74	1.5	50	0.9	176	1.1
Left Internal Mammary Artery Graft	7	0.1	10	0.2	7	0.1	24	0.2
Right Internal Mammary Artery Graft					1	0.0	1	0.0
Radial Artery Graft	1	0.0			2	0.0	3	0.0

Lesion characteristics

Table 4.2.2 Characteristics of lesions treated by PCI, NCVD-PCI Registry, 2007-2009

Lesion type	No.	%
De Novo	14614	92
Restenosis		
In Stent restenosis	740	5
Restenosis (No prior stent)	34	0
Stent thrombosis	80	1
Missing Data	400	3

The majority of the lesions treated in the registry are de novo (14614 lesions, 92%). In-stent restenosis (ISR) constitute a total of 740 lesions (5%). Acute stent thrombosis was very rare in the registry.

The mean lesion length was 23.5 mm (SD ± 14.2mm). The mean pre-procedure lesion estimated stenosis was 84.2% (SD ± 12.0%).

Most of the lesions were of type B (48%) followed by type C (36%). Among the lesions treated by PCI, about 28% were of high risk characteristics (such as ostial, bifurcation, totally occluded and thrombus). The cardiac centres involved in the registry were treating high risk lesions with PCI.

Table 4.2.3 Prevalence of lesion according to American College of Cardiology (ACC) classifications, NCVD-PCI Registry, 2007-2009

Lesion type	No.	%
A	1989	13
B1	4151	26
B2	3546	22
C	5711	36
Missing Data	471	3

Table 4.2.4 Prevalence of high risk lesion type, NCVD-PCI Registry, 2007-2009

Lesion type	No.	%
Ostial	1084	7
Bifurcation	1299	8
CTO<3mo	449	3
CTO>3mo	1132	7
Thrombus	530	3

Most of the lesions (92%) achieved TIMI 3 flow after the intervention (Table 4.2.5).

Table 4.2.5 Comparison of TIMI flow grade before and after procedure, NCVD-PCI Registry, 2007-2009

TIMI flow grade	Pre-Procedure (%)	Post-Procedure (%)
TIMI-0	1804 (11%)	265 (2%)
TIMI-1	1162 (7%)	80 (1%)
TIMI-2	3101 (20%)	170 (1%)
TIMI-3	9088 (57%)	14623 (92%)
Missing Data	713 (4%)	730 (5%)

Type of Stents Used

Table 4.2.6 Types of stents used, NCVD-PCI Registry, 2007-2009

Type of stent	2007		2008		2009		All	
	No.	%	No.	%	No.	%	No.	%
Drug Eluting Stent	3469	54	3405	59	3624	62	10498	58
Bare Metal Stent	2864	44	2185	38	2061	35	7110	39
Antibody stent	109	2	127	2	133	2	369	2
Bio-absorbable polymer	20	0	50	1	69	1	139	1

A total of 18,116 stents were used in 15,538 lesions treated with PCI. An average of 1.17 stents was used per lesion treated. Drug eluting stents were used in 58% of PCI while bare metal stents were used in 39% of PCI. From 2007 to 2009, we notice a trend of reduction in bare metal stents usage and a trend of increase in drug eluting stents usage (Table 4.2.6).

About 17.6% of patients were treated with direct stenting. Balloon only angioplasty (POBA) without stenting was performed in 1276 (8%) patients. Drug eluting balloon was getting increasing popular over the registry period.

The mean stent length was 29.5 mm (standard deviation ± 17.0mm). The mean stent diameter was 3.0mm (SD ± 1.8mm).

Lesion Complications during PCI

Table 4.2.7 Types of post procedure complications, NCVD-PCI Registry, 2007-2009

Type of complication	No.	% of procedure
Dissection	685	4
No reflow	195	1
Transient	130	
Persistent	43	
Non specified	22	
Acute closure	57	0
Perforation	49	0

The most common complication during PCI was vessel dissection. PCI failed in about 3.1% of lesions. Perforation and acute closure were rare during PCI.

Additional Devices during PCI

Other devices were not commonly used during PCI. The most common additional devices used during PCI were cutting balloon and intravascular ultrasound.

Table 4.2.8 Types of devices used during PCI, NCVD-PCI Registry, 2007-2009

Device	No.	%
Cutting balloon	331	2
IVUS	603	4
Rotablator	134	1
Distal Embolic Protection	64	0
Other Intracoronary devices	915	6

In stent restenosis (ISR)

A total of 740 (5% of all lesions treated) in-stent restenosis (ISR) were noted in the 2007-2009 registry. Nearly all of the reported ISR occurred in the native coronary artery (97%). ISR within the saphenous vein graft occurred in 17 cases. No ISR was reported in the LIMA graft. The majority of the ISR (338 lesions, 46%) occurred in the previous drug eluting stent (DES) implantation. A total of 284 (38%) of ISR occurred in the previous bare metal stent (BMS) implantation.

Table 4.2.9 Types of prior stents used in In-Stent Restenosis, NCVD-PCI Registry, 2007-2009

Type of prior stent	No.	%
Bare Metal Stent	284	38
Drug Eluting Stent	338	46
Others	15	2
Missing Data	103	14

The mean estimated length of the lesions was 22.2 (SD ±14.6) mm. Among all the ISR, 12.6% of cases was of TIMI 0 flow. TIMI 3 flow was seen only in 53.7% of cases prior to intervention. Nearly all (94.2%) achieved TIMI 3 flow after the intervention.

A total of 273 cases of ISR presented as acute coronary syndrome (ACS). Most of them presented with myocardial infarct. Non ST elevation MI were the diagnosis of presentation in 44.3% and ST elevation MI was diagnosed in 37.7% of ISR. Unstable angina was diagnosed in 18% of patients with ISR presented with ACS.

Balloon angioplasty (including cutting balloon) without stenting was performed in 34% of cases. About half of the ISR's were treated with stenting. Most (75.3%) of the ISR's were treated with drug eluting stents. Bare metal stents were used in 19% of the ISR. The mean stent diameter was 4.0 (SD ±2.0) mm. The mean length of stents used was 29.5 (SD ± 18.3) mm. Direct stenting was not used as frequently as in naïve coronary artery lesion. Drug eluting balloons (DEB) have become increasingly popular over the three years. DEB was used in 10% of patients with ISR stenting.

Table 4.2.10 Types of stents used in the In-Stent Restenosis, NCVD-PCI Registry, 2007-2009

Type of stents used in the ISR	No.	%
Drug eluting stent	367	75
Bare metal stent	90	19
Antibody coated stent	3	1
Other stent	20	4

Cutting balloon was used more frequently among patients with ISR. A total of 20% of cases used cutting balloon in the intervention. Intravascular ultrasound (IVUS) guidance was used in about 18% of cases.

Table 4.2.11 Types of devices used in the In-Stent Restenosis, NCVD-PCI Registry, 2007-2009

Device	No.	% of all ISR cases
Cutting balloon	145	20
IVUS	130	18
Rotablator	4	1
Distal Embolic Protection	2	0
Other Intracoronary devices	32	4

Complications were uncommon in the intervention of in-stent restenosis. Dissection was the most common complication. PCI was unsuccessful in seven patients.

Table 4.2.12 Types of complications in post In-Stent Restenosis, NCVD-PCI Registry, 2007-2009

Type of complication	No.	% of Total Procedure
Dissection	17	2
Unsuccessful PCI	19	2.6
No reflow (transient)	4	1
Perforation	3	0

PCI of left main stem

Table 4.2.13 Types of complications in post In-Stent Restenosis, NCVD-PCI Registry, 2007-2009

Types of lesion	No.	%
De Novo	266	91
In-Stent Restenosis		8
Previous DES	14	
Previous BMS	4	
Missing data	2	1

A total of 291 LMS lesion interventions were performed from 2007 to 2009. Most of the lesions were of de novo lesions and 8% were in stent restenosis. The majority of the left main stem intervention was done on unprotected LMS. Indeed, only 44 (12.1%) patients have had previous bypass surgery. Most of the interventions were performed using femoral approach (74.9%) but radial approach was not uncommon (19.2%).

Most of the LMS interventions were done as elective cases. About 34.7% of all LMS interventions were performed in patients presented with acute coronary syndrome. We see an increasing trend of LMS interventions among patients with acute coronary syndrome over the years.

Table 4.2.14 Clinical Presentation of Left Main Stem, NCVD-PCI Registry, 2007-2009

Clinical Presentation	No.	% of total procedure
Elective PCI	189	65
Acute Coronary Syndrome		
ST elevation Myocardial Infarct	48	16.5
NSTEMI	39	13.4
Unstable Angina	13	4.5
Missing data	1	1

Mean pre-procedure lesion stenosis was 80.5% (SD ±13.6%). TIMI flow prior to PCI is presented in the table. The TIMI flow 3 was achieved in 95.9% of patients after the procedure.

Table 4.2.15 TIMI Flow Prior to Intervention, NCVD-PCI Registry, 2007-2009

TIMI flow Prior to Intervention	No.	%
TIMI-0	25	9
TIMI-1	19	7
TIMI-2	63	22
TIMI-3	179	62
Missing	5	2

The mean length of the lesions was 27.4 mm (SD ±18.4). Most lesions were stented. Direct stenting technique was used in six patients. Most of the lesions (86%) were stented with

drug eluting stents. The mean stent length was 34.4 mm (SD ±21.2) and the mean stent diameter was 5.2 mm (SD ± 2.5). This long length is most likely due to the operator stenting across the left main stem into either into the LAD or LCx.

Table 4.2.16 TIMI Flow Prior to Intervention, NCVD-PCI Registry, 2007-2009

Type of stents	No.	%
Drug Eluting Stent (DES)	381	86
Bare Metal Stent (BMS)	55	12
Antibody stent	6	1
Missing	1	0

LMS intervention with intravascular ultrasound (IVUS) was uncommon in this cohort of patients. Only 34% of the interventions were performed with IVUS guidance. Intra-aortic balloon pump support was used in 13.4% of patients undergoing LMS intervention.

Table 4.2.17 Types of devices used in Left Main Stem, NCVD-PCI Registry, 2007-2009

Device	No.	% of total LMS
IVUS	98	34
Intra aortic balloon pump	39	13.4
Rotablator	14	5
Cutting balloon	18	6
Distal Embolic Protection	11	4

PCI to the Grafts

A total of 204 PCI were performed in the bypass grafts. Most of the grafts were saphenous vein grafts (76.3%) and LIMA grafts (11.8%).

Table 4.2.18 Lesion types, NCVD-PCI Registry, 2007-2009

Lesion type	No.	%
De Novo	179	88
In Stent restenosis	4	2
Stent thrombosis	0	0
Restenosis (No prior stent)	17	8
Missing data	4	2

The mean length of the lesions was 34.4 mm (SD±21.2). TIMI flow before and after PCI is shown in the table.

Table 4.2.19 Lesion types, NCVD-PCI Registry, 2007-2009

TIMI flow grade	Pre-Procedure	Post-Procedure
TIMI-0	9	3
TIMI-1	19	0
TIMI-2	69	2
TIMI-3	103	195
Missing	4	4

Most patients were discharged with long term dual antiplatelet therapy. About 60% of patients were planned for dual antiplatelet therapy for twelve months or more.

Table 4.2.20 Planned duration of dual antiplatelet therapy, NCVD-PCI Registry, 2007-2009

Planned duration of dual antiplatelet therapy	No.	%
1 month	33	16
3 months	6	3
6 months	26	13
12 months	109	53
>12 months	20	10
Missing data	10	5

Summary

1. Both in stent re-stenosis (ISR) and stent thrombosis were uncommon; ISR accounted for 5% of the lesion treated. The incidence of stent thrombosis was only 1%.

2. Most (58%) of the lesions treated were type B2 or type C. 28% of the lesions had high risk characteristics.

3. There is a trend of increasing use of drug-eluting stents (DES). In our registry, DES comprised 58% of stents.

4. Procedural success was about 97%. Perforation and other major complications were very rare during PCI.

5. ISR in the previous DES accounted for 46% of the lesion and 3/4th of them were treated with DES.

6. 1.9% (291 lesions) of PCI included left main stem and only 34% were performed with IVUS guidance.