Outcomes of PCI of all comers: the experience of a Kuwaiti independent healthcare institution

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We present the cumulative percutaneous coronary intervention (PCI) data of all comers (stable angina and acute coronary syndromes [ACS]) who presented to Hadi Clinic between January 2018 and December 2020. As a low-volume PCI centre in the Middle East, we wanted to find out if the outcomes of our PCI procedures are different from those of high-volume PCI centres in the UK and the Western world.

Prospectively collected data of all comers for PCI (urgent and elective) were retrospectively analysed. Pre-procedural data included patients' baseline characteristics (age, gender, clinical presentation and comorbidities). Intra-procedural data included access route, coronary anatomy, lesion complexity, number of stents deployed, door-to-balloon time for primary PCI, and any intra-procedural complications. Post-procedural data included average length of in-hospital stay, intra-hospital morbidity and mortality, and mortality or admission with ACS 12–36 months after the index procedure.

A total of 567 patients underwent coronary catheterisation for the three-year period between January 2018 and December 2020. Mean age was 60.9 ± 9.4 years, and 459/567 (81.0%) were male. Comorbidities included dyslipidaemia 515/567 (90.9%), hypertension 460/567 (81.2%), diabetes 346/567 (61%), known prior coronary disease 250/567 (44.2%), and smoking 188/567 (33.1%). Clinical presentation was stable angina 130/567 (22.9%), non-ST-elevation acute coronary syndrome (NSTEACS) 312/567 (55%), ST-elevation myocardial infarction (STEMI) 125/567 (22.0%), and STEMI with cardiogenic shock 13/125 (10.4%). The radial approach was used in 544/567 (95.94%), the average SYNTAX score was 34.8 ± 9.6, and the average number of stents 2.6. The total number of PCI was 367 (122.3 annually) with PCI procedural complete success in 349/367 (95.1%), partial success 5/367 (1.36%), PCI procedural complications 3/367 (0.82%), PCI in-hospital mortality 1/367 (0.27%), door-to-balloon time for primary PCI 31.8 ± 12.2 minutes, subsequent admission with ACS after 12–36 months 2/367 (0.54%), and post-discharge mortality after 12–36 months 1/367 (0.27%).

In conclusion, our patient population have more comorbidities and more complex coronary disease in comparison to their western counterparts. Our annual PCI numbers have been significantly lower than the recommended 400 minimum cut-off figure, yet we have achieved comparable outcomes to those of larger institutions of the western world.

Introduction

Over the past two decades, extensive debates continued to be held to determine the minimum annual percutaneous coronary intervention (PCI) numbers an interventional healthcare institution must meet in order to maintain high-quality performance and ensure patient safety throughout the entirety of patients' hospital stay. While PCI procedures have become routine, they remain quite complex and potentially risky.

Table 1. Demographics and baseline characteristics

Variables	N=567
Mean age ± SD, years	60.9 ± 9.4
Male, n (%)	459 (81.0)
Smoker, n (%)	188 (33.1)
Diabetes, n (%)	346 (61)
Hypertension, n (%)	460 (81.2)
Dyslipidaemia, n (%)	515 (90.9)
Obesity, n (%)	44 (7.8)
Known coronary artery disease, n (%)	250 (44.2)
Prior HF hospitalisation, n (%)	26 (4.5)
Known chronic kidney disease, n (%)	18 (3.2)
Chronic obstructed pulmonary disease, n (%)	55 (9.7)
Previous venous thromboembolism, n (%)	11 (1.9)

Key: HF = heart failure; SD = standard deviation

Table 2. Percutaneous coronary intervention (PCI) performed

Outcomes	Number (%) N=367
Complete success	349 (95.1)
Partial success	5 (1.4)
Unsuccessful with neutral outcome	10 (2.7)
Unsuccessful with complications	3 (0.8)
Lesion complexity	
A	14 (3.8)
B1	59 (16.1)
B2	112 (30.5)
C	182 (49.6)
PCI average SYNTAX score	34.8 ± 9.6

Operators' expertise, cardiac catheter laboratory (Cathlab) team competence and equipment readiness, coronary care unit (CCU) preparedness, and cardiac surgery availability or accessibility, are all essential factors that must be diligently optimised, for they collectively determine the quality of the short- and long-term procedural outcomes.

In 2000, British Cardiovascular Intervention Society (BICS) guidelines recommended 200 to be the minimum number of annual PCI procedures a UK cardiac centre must achieve to retain its competency and safety.[1] In 2005, this number was raised to 400 PCI procedures per annum,[2,3] which continues to remain the standard today. Conversely, in 2000, the American College of Cardiology/American Heart Association (ACC/AHA) had set the minimum acceptable annual PCI figure at 400 procedures,[4,5] before subsequently lowering it down to only 50 annual PCI procedures in their revised 2013 guidelines.[6]

While it might stand to reason that high-volume PCI centres would be more experienced than low-volume institutions, the subject continues to remain controversial. Some studies have demonstrated that an increase in PCI institutional volume was associated with a decrease in adverse outcomes,[7] while other studies have failed to demonstrate objective evidence to support an arbitrary minimum annual number of PCI procedures that organisations must achieve for them to retain their competency and safety.[8,9]

As a Middle Eastern, relatively low-volume PCI institution, we wanted to ascertain whether our outcome figures are adversely influenced by our procedural volume. Our centre has two PCI operators, a full-timer who performs about 70% of the procedures, and a part-timer who performs about 30% of the procedures. The part-time PCI operator works at another government institution where he also performs PCI procedures.

All research activities within our hospital must first be examined and approved by the Ethics Committee, particularly prospective research studies where deviation from standard clinical practice is expected or planned, in which case obtaining informed consent from each patient would be essential if the study is approved. Before our study was commenced, its protocol was indeed reviewed by the hospital Ethics Committee, which approved it and also deemed it unnecessary for us to obtain patients' informed consent. This is because our study only involved retrospective analysis of anonymised data and no deviation from standard clinical practice.

Method

Prospectively collected data of all comers for PCI (urgent and elective) were retrospectively analysed. Pre-procedural data included patients' baseline characteristics (age, gender, clinical presentation and comorbidities). Intra-procedural data included access route, coronary anatomy, lesion complexity, SYNTAX score, number of stents deployed, door-to-balloon time for primary PCI, and any intra-procedural complications. Post-procedural data included average length of in-hospital stay, intra-hospital morbidity and mortality, and mortality or admission with acute coronary syndrome (ACS) 12–36 months after the index procedure (follow-up period).

Results

A total of 567 patients underwent coronary catheterisation for the three-year period between January 2018 and December 2020 (**table 1**). Mean age was 60.9 ± 9.4 years, and 459/567 (81.0%) were male. Recorded comorbidities included dyslipidaemia 515/567 (90.9%), hypertension 460/567 (81.2%), diabetes 346/567 (61%), known prior coronary disease 250/567 (44.2%), and smoking 188/567 (33.1%). The clinical presentation was stable angina in 130/567 (22.9%) patients, non-ST-elevation ACS (NSTEACS) in 312/567 (55%), ST-elevation myocardial infarction (STEMI) in 125/567 (22.0%), and STEMI with cardiogenic shock in 13/125 (10.4%).

The radial approach was used in 544/567 (95.94%) patients. The average SYNTAX score was 34.8 ± 9.6, and the average number of stents was 2.6 (**table 2**).

Outcome data

Normal coronary arteries were present in 53/567 (9.3%), mild-to-moderate coronary artery disease (CAD) in 106/567 (18.7%), and severe left main stem or three-vessel CAD requiring surgical referral in 41/567 (7.2%). The total number of PCI performed was 367 (122.3 annually). PCI procedural complete success was achieved in 349/367 (95.1%), and partial success in 5/367 (1.36%): PCI procedural complications occurred in 3/367 (0.82%), and PCI in-hospital mortality was 1/367 (0.27%) (**table 2**). The mean door-to-

Table 3. Demographics and baseline characteristics of primary PCI versus non-primary PCI

Variables	All PCI (N=367)		
	Non-primary PCI N=242 n (%)	Primary PCI N=125 n (%)	p value
Male	210 (86.7)	111 (89.0)	1.00
Diabetes	164 (67.6)	72 (57.9)	0.233
Hypertension	213 (88.0)	82 (65.3)	0.002*
Dyslipidaemia	231 (95.6)	116 (92.6)	0.319
Obesity	17 (7.1)	0 (0.0)	0.138
Smoker	77 (31.9)	61 (48.4)	0.176
Known ischaemic heart disease	129 (53.5)	26 (21.1)	0.002*
Prior hospitalisation with HF	7 (2.7)	0 (0.0)	0.571
Known chronic kidney disease	11 (4.4)	8 (6.3)	1.00
COPD	14 (5.8)	0 (0.0)	0.309
Prior venous thromboembolism	3 (1.3)	1 (1.1)	1.00

*Significant.

Key: COPD = chronic obstructive pulmonary disease; HF = heart failure; PCI = percutaneous coronary intervention

balloon time for primary PCI was 31.8 ± 12.2 minutes. Subsequent admission with ACS after 12–36 months occurred in 2/367 (0.54%) cases, and post-discharge mortality after 12–36 months was 1/367 (0.27%). It is important to note that the BCIS reported overall PCI annual mortality for the same time interval was 2.0%, with an average 3.25% mortality within one month.[10]

Table 3 provides a breakdown of the demographics and baseline characteristics of patients receiving primary PCI versus non-primary PCI.

Discussion

As far as we are aware, we are the first private cardiac healthcare institution in the Middle East to publish their PCI data. In relative terms, our patient baseline characteristics reflect a sicker cohort with worse comorbidities in comparison to their European and American counterparts, which may be explained by a number of factors.

Lifestyle

The predominant culture in Kuwait is one of sedentary living, with little awareness of coronary disease or its risk factors. The latest World Health Organisation (WHO) data revealed that cardiovascular disease accounted for 41% of total deaths in the country, while all cancers and chronic respiratory diseases constituted only 15% and 3% of all deaths, respectively.[11] The prevalence of obesity and physical inactivity in Kuwait are reported as 38.3% and 53.6%, respectively.[12] This is in contrast to the UK and Europe, wherein the average prevalence of obesity and physical inactivity amounts to 18%[13] and 39%,[14] respectively.

Healthcare structure and comorbidities

In Kuwait, while primary healthcare facilities are available, there exists no formal communication channels between them and secondary- or tertiary-care institutions. As a consequence, CAD risk factors are often suboptimally treated. The prevalence of type 2 diabetes and dyslipidaemia in Kuwait are reported as 14.7%[11] and 37%,[15] compared with 7.0%[16] and 23.5%[17] in the UK and Western Europe, respectively. For hypertension, however, the ratios are broadly similar (24.4% in Kuwait[18] and 23% in Western Europe[19]).

ACS presentation

Sedentary lifestyle, and particularly physical inactivity, tends to be associated with less prominent stable angina symptoms; for the latter are precipitated by physical exertion, the avoidance of which would naturally result in the absence of angina pectoris. Similarly, some sufferers of stable angina elect to minimise their level of physical activity, below the threshold that would generate their angina, so they can remain comfortable and not experience the symptoms. As such, patients end up not seeking medical help, while their coronary arteries are becoming progressively occluded over time. In our patients, ACS presentation was shown to be more common than stable angina presentation (77% *vs.* 23%), while this percentage is almost reversed in Western patients (36% *vs.* 64%).[20] Furthermore, our ACS sufferers tend to be late presenters, for they often misinterpret their symptoms as heartburn or stomach ache. Globally, late presenters suffer worse outcomes.[21]

SYNTAX score

Our data have shown that our average SYNTAX score was higher in comparison with USA and UK scores (34.8 *vs.* 26.5),[22] indicating more complex coronary anatomy, probably due to the compounding effects of all the aforementioned factors.

Summary

In spite of all the above challenges, with a small total number of patients and no selective inclusion, our PCI success rate, complication rate and door-to-balloon time figures are comparable to the outcome data of high-volume European and American tertiary healthcare institutions. Notwithstanding the inherent challenges that small numbers pose, particularly in the primary PCI group, acting as a tight denominator wherein every complication would be magnified in percentage terms. This is in contrast to high-volume tertiary cardiac centres, where the large number of patients act as a buffer, so complications end up becoming somewhat diluted in percentage terms, however many they might be in absolute numbers. Nevertheless, we

Key messages

- Institutional annual percutaneous coronary intervention (PCI) volume does not seem to be the right metric to determine the quality of service or to ascertain patient safety
- Institutional annual PCI volume could be replaced with a matrix designed to improve all parts of the process and ensure readiness at all PCI multidisciplinary team levels (staff and equipment)
- National healthcare regulators should consider compelling individual centres to publish their annual PCI volumes and outcome data, a level of transparency and responsibility that is already being achieved in the West. However, the Middle East needs to catch up

recognise that our study remains ironically limited by its small number of patients, and by the fact that it was conducted in a single site. Therefore, our experience could be either unique or replicable, and other small PCI units cannot derive from it any generalisation to substantiate or validate their own performances. Rather, they need to examine their own figures and results for they might be significantly different

Conflicts of interest

None declared.

Funding

None.

Study approval

Before our study was commenced, its protocol was reviewed by the hospital Ethics Committee, which approved it and also deemed it unnecessary for us to obtain patients' informed consent. This was because our study only involved retrospective analysis of anonymised data and no deviation from standard clinical practice.

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