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Trends of coronary revascularization procedures in Gaza

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Abstract

Background: *we investigated the results of diagnostic coronary angiography and trends in rates of myocardial revascularization procedure included Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Grafting (CABG) procedures in Gaza between 2015 and 2018.*

Methods: *A descriptive retrospective study based on the analysis of all diagnostic Coronary Angiographies (CAG) based on the Ministry of Health hospitals in Gaza City Report and the Center of Bureau of Statistics, to evaluate the annual rate of PCI and CABG volume have been done since January 2015until January 2019.*

Results: *A total of 4887 diagnostic coronary angiography procedures were performed. The mean age of patients was 58.0±10.2 years. A 3245 of cases were male (66.4%). A total of 5225 revascularization procedures (PCI: 4286,CABG: 939) were performed during the study period. From 2014 to 2018 the PCI volume increased by 94 % (80/100 000 to 155/100 000)(P < 0.0001), CABG volume decreased by 47 % (30/100 000 to 17 /100 000) (P <0.0001), PCI/CABG ratio increased from 2.7 to 9.1(P<0.0001).The indications for diagnostic coronary angiography were stable angina (57% of cases), non-ST-elevation acute coronary syndrome (NSE-ACS) in 24.0%, ST-elevation myocardial infarction (STEMI) in 19.0%, the diagnostic coronary angiography results showed significant lesions in 64.5% of patients. About 19.2% of total cases have three vessel disease, 21% have two vessel disease and 24.4% of them have one vessel disease. The segments most involved were Left Anterior Descending Artery (LAD) which was involved in 47.2% of cases.*

Discussion: *We observed dramatic increases in the total coronary revascularization procedures with a marked decrease in CABG and increase in PCI procedures in Gaza.*

Introduction

Cardiovascular diseases are the number one cause of death globally. An estimated 17.7 million people died from CVDs in 2015, representing 31% of all global deaths. Over the last decade, improvements in medical and interventional treatments have changed the basic profile of patients needing surgery for ischemic heart disease, there have been several studies that have cited both an increase in Percutaneous Coronary Intervention (PCI) and a decrease in Coronary Artery Bypass Graft (CABG) surgery volumes in the treatment of coronary artery disease within the United States and abroad [1-4].

Cardiovascular diseases remains the leading cause of death among Palestinians, accounting for 30.3% of deaths recorded in 2017. [5,6].

In our study we evaluate the different clinical presentations that necessitate diagnostic and percutaneous coronary interventions, the significant of coronary artery stenosis, the trend of Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Graft (CABG) changes during the last years.

Methods

In ministry of hospital in Gaza, the primary PCI are available during official working hours five days a week (Sunday through Thursday from 8:00 am to 2:00 pm), while outside these time, the patient is directed toward pharmaco-invasive approach unless there is a contraindication for thrombolytic therapy or the patient is in a cardiogenic shock.

Study design

Descriptive case series study based on the registry indices of the Cardiology Department from period September January 2015 to January 2018.

Coronary heart disease defined as a common term for the buildup of plaque in the heart's arteries and involve both acute coronary syndrome and stable coronary heart disease.

Acute Coronary Syndrome (ACS) is a syndrome that occurs in response to decreased blood flow in the coronary arteries in which part of the heart muscle is unable to function properly or dies. It includes both Non-ST-Elevation ACS and ST-Elevation Myocardial Infarction (STEMI) based on elevation of ST segment on ECG. Non-ST-Elevation ACS includes Unstable Angina (UA) and Non-ST-Elevation Myocardial infarction (Non-STEMI).

"Diagnostic Coronary angiography is defined as the passage of a catheter into the aortic root or other great vessels for angiography of the native coronary arteries or bypass grafts supplying native coronary arteries."

PCI is defined as placement of an angioplasty guide wire, balloon, or other device (eg, stent, atherectomy, brachytherapy, or thrombectomy catheter) into a native coronary artery or CABG for the purpose of mechanical coronary revascularization. Primary PCI includes angioplasty of STEMI patients in less than 90 minutes in the hospital, and less than 120 minutes in transferred patients. Pharmaco-invasive PCI is a term used to imply the use of routine PCI within 24 hours of successful fibrinolysis or after failed one as a rescue PCI. Significant lesion in coronary artery was considered

as a stenosis of more than 50% of the arterial diameter noticed by expert cardiologist.

Study population

All patient presents with acute coronary syndrome and stable ischemic heart disease living in Gaza or North Gaza Governorate and underwent diagnostic coronary angiography in Alshifa Hospital was illustrated in Figure 1.

CAG, coronary angiography, STEMI, ST-segment elevation myocardial infarction; NSTEMI, non-ST-segment elevation myocardial infarction; UAP, unstable angina pectoris; AP, angina pectoris.

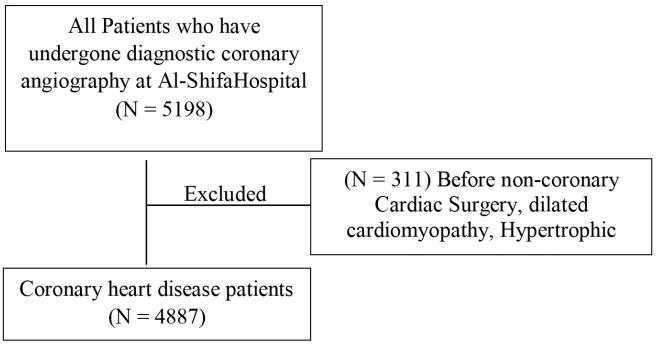

Figure 1. *Distribution of study population*

Study Outcome

The results of diagnostic coronary angiography were obtained from a sheet which is filled manually after each procedure. These sheets were retrieved from the archives in the Cardiology Department after obtaining an official approval from head of the department. It includes the indications to do the diagnostic PCI, results of significant lesions and recommendations.

Statistical Analysis

All data was analyzed by SPSS (version 23, IBM Corporation), continuous data expressed as Mean ± SD, categorical data as frequencies, Annual rates for PCIs and CABGs were referenced to the overall population of Palestine each year between 2014 and 2018 available from the Palestine Central Bureau of Statistics. Institutional PCI/CABG ratios were compared using Kruskal–Wallis analysis. Trends over time were calculated using linear regression. P value of < 0.05 were considered significant.

Results

Baseline Characteristics

A total of 4887 cases were enrolled in this study, 3245 (66.4 %) of them were males, while 1642 (33.6%) were females. The mean age was 58 ± 10.2 years. Male age mean was 57.2 ± 10and female mean age was 59.8± 10.2 years. The significant coronary artery stenosis was seen in 64.6% of the Patients, myocardial revascularization procedures was recommended in 53.9 % of the patients, characteristics are shown in Table 1.

The clinical diagnosis in the patients were 928 (19%)STEMI, 1172 (24%)NON-STEMI/UAP and 2878 (57%)stable angina pectoris (Figure 2) clinical presentation of patient underwent diagnostic coronary angiography.

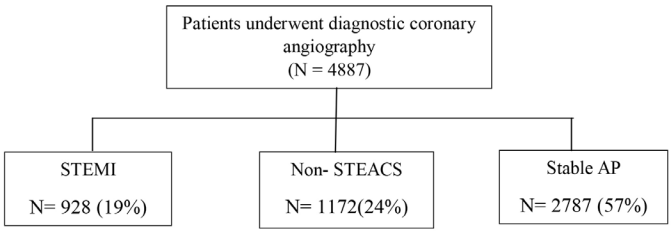

Figure 2. *Clinical presentation of patient underwent diagnostic coronary angiography*

Baseline characteristic	
Total	4887 cases
Age	58 ± 10.2 years
Gender (Male) - No. (%)	3245 (66.4 %)
Results - No. (%) Significant Lesion Non- significant lesion or normal	 3156 (64.6%) 1731 (35.4%)
Recommendation - No. (%) OMT or no intervention PCI CABG	2253 (46.1%) 2013 (41.2%) 621 (12.7%)

Table 1. *Baseline characteristics*

STEMI, ST-segment elevation myocardial infarction; non-STEACS: Non ST elevation acute coronary syndrome

Significant lesion findings

The percentage of the patient who has significant lesion shows to be different according to the clinical indication. Table 2 shows the different percentages of significant lesions according to the clinical presentation. As shown in the table, STEMI patients have the highest percentage of significant lesions about 92.7%. Table 2 suggested the percentage of significant coronary artery lesions among patient according to clinical presentation.

This age related increase in the number of significant lesion is also observed in our study, and shown in Figure 3.

Affected artery distribution

Left Anterior Descending artery (LAD) was the most frequent involved artery regardless the clinical indication, 47.2% of total cases, followed by Right Coronary Artery (RCA) 33.9% then Left circumflex Coronary Artery (LCX) about 26.5%. Left main disease was present in 7.7% of total cases, meanwhile isolated LM disease in only 2.4% of them.

About 19.2% of total cases have three vessel disease, 21% have two vessel disease and 24.4% of them have one vessel disease.

Recommendations of diagnostic coronary angiography

Overall, 46.1% of cases were recommended to take optimal medical therapy, 41.2% were recommended to do therapeutic PCI either single or staged. Only 12.7% of cases were referred to do CABG.

	STEMI	Non-STE ACS	Angina pectoris	Total
Total –No.	928	1172	2787	4887
Significant lesion/s - No. (%)	860 (92.7%)	782 (66.7%)	1514 (54.3%)	3156 (64.6%)
Non-significant lesion/s - No. (%)	35 (3.7%)	104 (8.9%)	332(11.9%)	471 (9.6%)
Normal - No. (%)	33 (3.5%)	286 (24.4%)	941(33.7%)	1260 (25.7%)

Table 2. *Significant lesions according to clinical presentation*

	PCI		CABG surgery		Total		PCI/CABG
	No.	Rate per 100,000	No.	Rate per 100,000	No.	Rate per 100,000	Ratio
2015	765	80	285	30	1050	110	2.7
2016	801	81	248	25	1049	107	3.2
2017	1118	111	231	23	1349	134	4.8
2018	1602	155	175	17	1963	172	9.1
Total	4286		939		5225		
P for trend	P<0.0001		P <0.0001		P<0.0001		P< 0.0001

Table 3. *Crude rates of coronary revascularization procedures per 100,000 of Gaza and North Gaza Governorate residents and temporal changes of both PCI and CABG done*

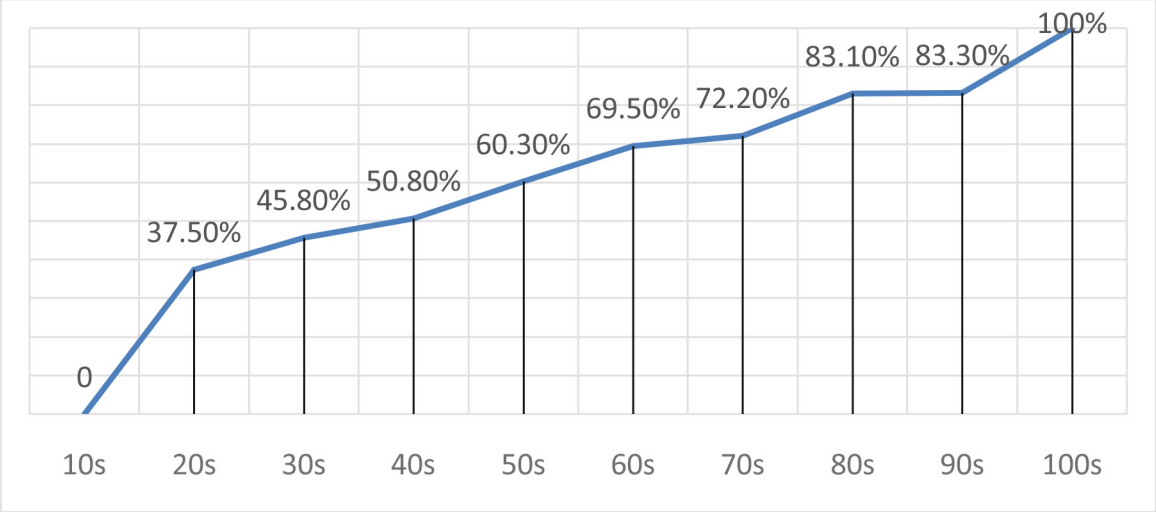

Figure 3. *The percentage of significant lesions observed between different age groups*

PCI and CABG Trends

Between 2015 and 2018 about 5411coronary revascularization procedures have been done, total procedures number has been increased over the 4 years from a rate of 110 per 100,000 population in 2015 to 172 per 100,000 population in 2018. There was a significant increase in the number and rate per 100,000 of PCI procedures done, while a noticed decline in the number and rate of CABG procedures. PCI/CABG increased from 2.7 in 2015 to 9.1 in 2018. The number and crude rates per 100,000 of Gaza and North Gaza Governorate residents of PCI and CABG procedures done, and PCI/CABG ratio from 2015 to 2018 are shown in Table 3.

Discussion

The major observation in our study was the dramatic shift from CABG to PCI as the revascularization of choice. This is in line with other reports published during the past 2 decades [7-11]. The marked increase in the national PCI to CABG ratio from2.7 to 9.1 in the period of our study reflects a dramatic shift in practice of cardiovascular specialists in Gaza. This huge progress is really comparable to that achieved Israel, form 3.6 in 2002 to 8.2 in 2014 [12].

The second major observation in our study was a significant decline (43%) in the total number of coronary artery by-pass grafting procedure from 2015 to 2018. In a more recent meta-

analysis of 100 trials in 95 553 patients with 262 090 patient years, PCI using newer-generation drug eluting stents was associated with a decreased need for revascularization [13]. In Israel the volume of CABG decreased by 59% from 2002 to 2013 [12].

The third major observation in our study is that the mean age of patients was 58±10.2 years, 66.4% men, and only 25.6% are ≥ 65 years, comparing these results in USA between 2000 and 2015, about 11,691 coronary angiographies shows that 63% men; 54% ≥ 65 years of age .[7]. And in our study About 19.2% of total cases have three vessel disease, 21% have two vessel disease and 24.4% of them have one vessel disease, compared to 30% in the same pre-mentioned study. Meaning that there is more patients in the USA have three-vessel disease than observed in Al-Shifa Hospital. The difference in age groups between those of USA and our population can explain the more significant lesions in USA population [7].

The forth major observation in our study was a significant increase in the total number of PCI procedures which differs from other regions of the world [7-11] may be related to multiple factors, the first factor was the absence of assessment of the hemodynamic significance of coronary artery stenosis in Gaza hospitals using tests such as functional flow reserve is a key to determine whether any form of revascularization is indicated. This is the most appropriateness criteria for coronary revascularization as a tool to prevent overuse of PCI. The second factor was starting in primary PCI in Al Shifa Hospital since January 2015, despite the potential for drug-eluting stents to reduce the need for subsequent coronary revascularization procedures was recommended in multiple trial especially in ACS and we use mostly Bare metal stents. The U.S. hospitals from 2001–2008, there was a substantial decrease in CABG utilization rates, but PCI utilization rates remained unchanged [14].

The fifth observation was total volume of coronary revascularization (107-172/100000) this volume in differ from the trends observed in Israel (425-500/100000) and OCED countries in most of them (219-435/100000)related to population pyramid in Palestine shows that the Palestinian society in yang society, and the population of the age under 15 years was 41.7% and the individuals of aged 65 years and above was 2.8 in Gaza strip [5]. The individuals of aged more than 65 years were seen in 14-21 in OCED countries and 11.3% in Israel.

Conclusion

The shift from CABG to PCI as the revascularization of choice reflects a dramatic shift in practice of cardiovascular specialists in Gaza and lead to a significant decline (43%)in the total number of coronary artery by-pass grafting. The tendency of an increase in the number of total myocardial revascularization in Gaza especially in PCI, differ from the trends observed in the OECD countries, many factors may have contributed for such increase, absence of assessment of the hemodynamic test and decreases volume of CABG.

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References

1. Eagle K, Nallamothu B, Mehta R, Granger C, Steg P, et al. Trends in acute reperfusion therapy for ST-segment elevation myocardial infarction from 1999 to2006: we are getting better but we have got a long way to go. *Eur Heart J*.2008;29:609-617.
2. Gogo PJ, Dauerman H, Mulgund J, Ohman E, Patel M, et al. Changes in patterns of coronary revascularization strategies for patients with acute coronary syndromes (from the CRUSADE quality improvement ini-tiative). *Am J Cardiol.* 2007;99:1222-1226.
3. Gerber Y, Rihal C, Sundt TR, Killian J, Weston S, et al. Coronary revascularization in the community. A population-based study,1990 to 2004. *J Am Coll Cardiol.* 2007;50:1223-1229.
4. Movahed M, Ramaraj R, Jamal M, Hashemzadeh M. Nationwide trends in the utilization of multivessel percutaneous coronary intervention(MVPCI) in the United States across different gender and ethnicities. *J Interv Cardiol.* 2009;22:247-251.
5. Ministry of Health, PHIC, Health Status, annual report, Palestine, July 2018.
6. Health at a glance-2015. OECD indicators. Available at: http://www.oecd.org/health/health-systems/health-at-a-glance-19991312.htm. Accessed May 28, 2016.
7. Ko W, Tranbaugh R, Marmur JD, Supino PG, Borer JS. Myocardial revascularization in New York State: variations in the PCI-to-CABG ratio and their implications. *J Am Heart Assoc*. 2012;1:e001446.
8. Desai NR, Bradley SM, Parzynski CS, Nallamothu BK, Chan PS, et al. Appropriate use criteria for coronary revascularization and trends in utilization, patient selection and appropriateness of coronary interventions. *JAMA*. 2015;314:2045-2053.
9. Davies J. Australian Institute of Health and Welfare (AIHW). Coronary revascularization in Australia, 2000. Available at: http://www.aihw.gov.au/publication-detail/?id=6442467493. Accessed May 29, 2016.
10. McNeely C, Markewell S, Vassileva C. Trends in patients characteristics and outcomes of coronary artery bypass grafting in 2000 to 2012 Medicare population. *Ann Thorac Surg.* 2016;102:132-138.
11. Culler SD, Kugelmass AD, Brown PP, Reynolds MR, Simon AW. Trends in coronary revascularization procedures among Medicare beneficiaries between 2008 and 2012. *Circulation*. 2015;131:362-370
12. Blumenfeld O, Na'amnih W, Shapira-Daniels A, Lotan C, Shohat T, et al. Trends in Coronary Revascularization and Ischemic Heart Disease–Related Mortality in Israel. *Journal of the American Heart Association,* 2017;6:e004734.
13. Tonino PA, De Bruyne B, Pijls NH, Siebert U, Ikeno F, et al. FAME Study Investigators. Fractional flow reserve versus angiography for guiding percutaneous coronary angiography. *N Engl J Med.* 2009;360:213-224.
14. Epstein AJ, Polsky D, Yang F, Yang L,Peter W. Groeneveld, MD, MS Coronary Revascularization Trends in the United States: 2001-2008. *JAMA.* 2011; 305: 1769-1776