RESEARCH ARTICLE

IMPACT OF TYPE 2 DIABETES IN NON-ST-ELEVATION MYOCARDIAL INFARCTION (NSTEMI).

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Abstract

Objectives: The aim of this work is to expose the experience of our center in managing severe multi vessel coronary artery disease in diabetic NSTEMI patients.

Methods: This is a retrospective study of 105 patients admitted for a high risk non ST-Elevation Myocardial Infarction (NSTEMI) to the cardiology department of the military hospital, Rabat, Morocco. Data was collected from January 2013 to December 2014.

We enrolled patients in two groups: Group 1: diabetic patients (N 53) and Group 2: non diabetic patients (N 52).

Results: The mean age was almost comparable between the 2 groups: 62 years in diabetics against 60 years in non-diabetics. The mean diabetes duration was about 8.6 years. Diabetic patients are more likely to develop arterial hypertension; smoking is the most important cardiovascular risk factor in non-diabetic group. Tri-truncular coronary lesion was more frequent in diabetics (55%), whereas non-diabetic patients had more mono-truncular lesions (53%). 59% of diabetic patients underwent PCI vs 53 % in non diabetic group, 26% of diabetic patients underwent CABG. 15% of diabetic group and 16% of non diabetic group were managed by medical treatment only.

For in-hospital MACE, there were no significant differences in outcomes between the 2 groups. (Group 1: 10.4% vs Group 2: 10.5%, p .06).

Conclusions: In diabetic NSTEMI patients, coronary artery disease was more severe; in our center, PCI was non inferior in term of intra hospital MACE compared to CABG.

Introduction:

1. Type 2 diabetes is a life threatening disease. More than 80% of deaths occur in low and middle-income countries. In 2030, World Health Organization (WHO) predicts that diabetes will be the seventh leading cause of death worldwide and the number of affected patients will reach approximately 560 million [1].

2. In Morocco, the latest data estimates that 1.5 million people suffer from diabetes and that the prevalence exceeds 14% in adults > 50 years. [2]

3. Diabetes increases the risk of acute coronary syndrome (ACS) and worsens the prognosis [3–6].

4. The objective of our study is to evaluate the impact of type 2 diabetes on patients with high risk NSTEMI.

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Material And Methods:
This is a retrospective study of 105 patients admitted for a High risk Non ST-Elevation Myocardial Infarction (NSTEMI) to the cardiology department of the Military Hospital, Rabat, Morocco. Data was collected from January 2013 to December 2014.

We enrolled patients in two groups: Group 1: Diabetic patients (N53) and Group 2: Non diabetic patients (N52).

The high risk nstemi diagnosis was based on the definition esc guidelines:
Presence of chest pain described as one of the following criteria:
Prolonged (20 min) anginal pain at rest;
New onset (de novo) angina (class II or III of the Canadian Cardiovascular Society classification)
Recent destabilization of previously stable angina (crescendo angina);or Post-MI angina

One or more of the following criteria:
Rise or fall in cardiac troponin compatible with MI
Dynamic ST- or T-wave changes (symptomatic or silent)
GRACE score >140

Data has been collected:
1. On the basis of the hospital medical file filled out by the treating physicians.
2. Based on the register of the catheterization room.

All patients received pre-treatment with aspirin (loading dose: 200 mg) and clopidogrel (loading dose: 300 mg or 600 mg). All procedures were performed under effective intravenous heparin anticoagulation according to standard regimens.

Results:
Clinical characteristics:
Clinical characteristics are summarized in (Table 1). The mean age was almost comparable between the 2 groups: 62 years in diabetics against 60 years in non-diabetics. The mean duration of diabetes was about 8.6 years. Diabetic patients seem to be more likely to develop arterial hypertension. Smoking is the most important cardiovascular risk factor in non-diabetic group.

Table 1: Clinical characteristics.

| Cardiovascular risk factors | Group 1 N(%) | Group 2 N(%) |
|-----------------------------|-------------|-------------|
| Hypertension                | 29 (54.7%)  | 18 (34.6%)  |
| Smoking                     | 18 (34%)    | 34 (65.4%)  |
| Dyslipidemia                | 14 (26.4%)  | 10 (19.2%)  |
| Obesity                     | 12 (22.6%)  | 8 (15.3%)   |
| Hereditary CAD              | 3 (5.6%)    | 5 (11.9%)   |

CAD - Coronary Artery Disease

Angiographic findings:
The angiographic findings are summarized in (Figure 1). Tri-truncular coronary lesion was more frequent in diabetics (55%), whereas non-diabetic patients had more mono-truncular lesions (53%).
**Angiographic findings**

Revascularization strategy:
59% of diabetic patients underwent PCI vs 53% in non-diabetic group, there was also no significant difference in the two groups concerning surgical management.
15% of diabetic group and 16% of non-diabetic group were managed by only medical treatment.

**Revascularization strategy**

| Type         | Group 1 | Group 2 |
|--------------|---------|---------|
| TRIRUNCUAR   | 55%     | 33%     |
| BITRUNCULAR  | 15%     | 10%     |
| MONOTRUNCULAR| 26%     | 53%     |
| NORMAL       | 4%      | 4%      |

OMT: Optimal medical treatment; CABG: Coronary Artery Bypass Grafting; PCI: Percutaneous Intervention

**Intra-hospital MACE**:
No significant difference in term of MACE was observed between the 2 groups (Group1: 10.4% vs Group 2: 10.5%, p:0.6).
Discussion:
1. Diabetes has always been described as a risk factor of coronary heart disease. The link between the pathogeneses of diabetes and atherosclerosis is explained by insulin resistance phenomenon, which causes dyslipidemia and hyperglycemia, leading to reduced nitric oxide synthesis in blood artery walls [7].
2. Thus, coronary lesions are more extensive, with a higher rate of tritruncular lesions as found in our study: 55% of diabetic patients presented with tritruncular lesion. The lesions are also significantly longer, located in distality with a bad downstream quality, which explains the use of incomplete or less aggressive revascularization. [8]
3. The revascularization strategy is still shared between the Coronary Artery Bypass Grafting (CABG), multi-stage PCI or even Optimal Medical Treatment (OMT). Indeed, due to the lack of large randomized trials, the choice between these strategies remains difficult. It depends on the severity of atherosclerosis, the anatomy of coronary arteries, the composition and location of lesions, the presence of comorbidities, including diabetes [9,10]. Hlatky et al. analyzed data of 7812 patients from 10 randomized trials, comparing the effectiveness of CABG vs PCI in diabetic type 2 patients with multivessel coronary artery disease, showed in long-term follow-up the superiority of CABG [11].
4. In a large meta-analysis of 6 randomized trials ( MASS II, FREEDOM, BARI, SYNTAX, CARDla, Kmlesh) comparing long-term adverse clinical outcomes of CABG vs PCI in insulin-treated type 2 diabetic patients, CABG was significantly better than PCI but there was a higher rate of stroke in CABG group [12]. CABG seems to be the effective strategy in managing multivessel coronary artery disease in diabetic patients, especially if the SYNTAX score is >22 as recommended by 2018 ESC/EACTS Guidelines of myocardial revascularization [13].
5. In our study, only 26% of diabetic patients underwent CABG, and almost 60% had PCI. No significant difference in MACE or rehospitalization rate was noticed (Group1 : 10,4% vs Group 2 : 10,5%, p :0,6).
6. The multicentric NCDR ACTION Registry-GWTG reported almost similar results : 74 941 diabetic patients hospitalized for NSTEMI ACS, coronary angiography analysis showed multivessel coronary disease. The patients were enrolled into 3 groups based on the revascularization strategy: 46.2% had PCI with Drug Eluting Stent (DES) implantation, 17.3% were managed by OMT, and only 36.4% underwent CABG. Surgery was used in selected patients (Left main coronary artery disease (LM) and proximal left anterior descending (LAD) coronary artery stenosis) [14].

Conclusion:
In diabetic NSTEMI patients, coronary artery disease was more severe; In our center, PCI was non inferior in term of intra hospital MACE compared to CABG.

References:
1. Grupa Robocza Europejskiego Towarzystwa Kardiologicznego (ESC) do spraw cukrzycy, stanu przedcukrzycowego i chorób układu sercowo-naczyniowego we współpracy z Europejskim Towarzystwem Badań nad Cukrzycą (EASD). Wytyczne ESC dotyczące cukrzycy, stanu przedcukrzycowego i chorób układu sercowo-naczyniowego opracowane we współpracy z EASD. Kardiol Pol 2013; 71 (supl. XI): 319-394.
2. Etat de santé de la population marocaine 2012, ministère de la santé.
3. Glucose tolerance and mortality: comparison of WHO and American Diabetes Association diagnostic criteria. The DECODE study group. European Diabetes Epidemiology Group. Diabetes epidemiology: collaborative analysis of diagnostic criteria in Europe. Lancet 1999; 354: 617-621.
4. The DECODE Study Group. Is the current definition for diabetes relevant to mortality risk from all causes and cardiovascular and noncardiovascular diseases? Diabetes Care 2003; 26: 688-696.
5. Ning F, Tuomilehto J, Pyörälä K, Onat A, Söderberg S, Qiao Q. DECODE Study Group. Cardiovascular disease mortality in Europeans in relation to fasting and 2-h plasma glucose levels within a normoglycemic range. Diabetes Care 2010; 33: 2211-2216.
6. Franklin K, Goldberg RJ, Spencer F, Klein W, Budaj A, Brieger D, Marre M, Steg PG, Gowda N, Gore JM. GRACE Investigators. Implications of diabetes in patients with acute coronary syndromes. The Global Registry of Acute Coronary Events. Arch Intern Med 2004; 164: 1457-1463.
7. Keymel S, Heinen Y, Balzer J, Rassaf T, Kelm M, Lauer T, Heiss C. Characterization of macro- and microvascular function and structure in patients with type 2 diabetes mellitus. Am J Cardiovasc Dis 2011; 1: 68-75.
8. Ledru F, Ducimetière P, Battagia S, et al. New diagnostic criteria for diabetes and coronary artery disease: insights from an angiographic study. J Am Coll Cardiol 2001;37:1543–50.

9. Bypass Angioplasty Revascularization Investigation 2 Diabetes Study Group. Baseline characteristics of patients with diabetes and coronary artery disease enrolled in the Bypass Angioplasty Revascularization Investigation 2 Diabetes (BARI 2D) trial. Am Heart J 2008; 156: 528-536.

10. BARI 2D Study Group; Frye RL, August P, Brooks MM, Hardison RM, Kelsey SF, MacGregor JM, Orchard TJ, Chaitman BR, Genuth SM, Goldberg SH, Hlatky MA, Jones TL, Molitch ME, Nesto RW, Sako EY, Sobel BE. A randomized trial of therapies for type 2 diabetes and coronary artery disease. N Engl J Med 2009; 360: 2503-2515.

11. Hlatky MA, Boothroyd DB, Bravata DM, Boersma E, Booth J, Brooks MM, Carrié D, Clayton TC, Danchin N, Flather M, Hamm CW, Hueb WA, Kähler J, Kelsey SF, King SB, Kosinski AS, Lopes N, McDonald KM, Rodriguez A, Serruys P, Sigwart U, Stables RH, Owens DK, Pocock SJ. Coronary artery bypass surgery compared with percutaneous coronary interventions for multivessel disease: a collaborative analysis of individual patient data from ten randomised trials. Lancet 2009; 373: 1190-1197.

12. Bundhun PK, Wu ZJ, Chen MH. Coronary artery bypass surgery compared with percutaneous coronary interventions in patients with insulin-treated type 2 diabetes mellitus: a systematic review and meta-analysis of 6 randomized controlled trials. Cardiovasc Diabetol 2016; 15: 2.

13. Franz-Josef Neumann(ESC Chairperson) (Germany), Miguel Sousa-Uva(EACTS Chairperson) (Portugal), Anders Ahlsson (Sweden), Fernando Alfonso (Spain), Adrian P. Banning (UK), Umberto Benedetto(UK), Robert A. Byrne (Germany), Jean-Philippe Collet (France), Volkmar Falk (Germany), Stuart J. Head(The Netherlands), Peter Ju¨ni (Canada), Adnan Kastrati (Germany), Akos Koller (Hungary), Steen D. Kristensen (Denmark), Josef Niebauer (Austria), Dimitrios J. Richter (Greece), Petar M. Seferovic (Serbia), Dirk Sibbing (Germany), Giulio G. Stefanini (Italy), Stephan Windecker (Switzerland), Rashmi Yadav (UK), Michael O. Zembala(Poland) 2018 ESC/EACTS Guidelines on myocardial revascularization European Heart Journal (2018) 00, 1–96 doi:10.1093/eurheartj/ehy394

14. Pandey A, McGuire DK, de Lemos JA, Das SR, Berry JD, Brilakis ES, Banerjee S, Marso SP, Barsness GW, Simon DN, Roe M, Goyal A, Kosiborod M, Amsterdam EA, Kumbhani DJ. Revascularization trends in patients with diabetes mellitus and multivessel coronary artery disease presenting with non-ST elevation myocardial infarction: insights from the National Cardiovascular Data Registry Acute Coronary Treatment and Intervention Outcomes Network Registry-Get with the Guidelines (NCDR ACTION Registry-GWTG). Circ Cardiovasc Qual Outcomes 2016; 9: 197-205.