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## Research Article

# Prevalence of Corotidenary Atheroma in Patients with Coronary Disease: Results of a Monocentric Transverse Study in the Algerian East

***Rachid Merghit[1*], Mouloud AIT Athmane[2], Ikhlas Gueriane[1] and Abdelhak Lakehal[3]***

[1]*Cardiology Service, University Hospital Center, Ali Mendjli Constantine, 25000, Algeria*
[2]*Cardiology Service, Annaba University Hospital Center, 23000, Algeria*
[3]*Epidemiology Service, University Hospital Center of Constantine, 25150, Algeria*

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A B S T R A C T

**Introduction:** Patients with ischemic heart disease often have many damages of another vascular territory sometimes without clinical translation, these associations are important to know. Carotid involvement is the most important in terms of morbidity and cardiovascular mortality.

**Objective:** In our study we have studied the prevalence of carotid atheroma in coronary patients recruited in cardiology in the university hospital centers of the city of Constantine.

**Patients and Methods:** Our study is descriptive, cross-sectional, monocentric performed in units of cardiovascular exploration of the Regional University Hospital of Constantine. Included subjects had at least one significant coronary lesion ≥50 on a main coronary artery, for each patient, a guided anamnesis and a cardiovascular clinical examination preceded the realization of the supra aortic trunk echodoppler by a vividE9 General Electric ultrasound system started in January 2014, using a linear scanning probe 12L, intended for peripheral vascular exploration, allowing for targeted screening and a precise lesion description. The TSA echodoppler is said to be pathological, if it was at least one atheromatous plaque and / or hemodynamic damage, on one of the carotid axes (common carotid, internal carotid, external carotid), or a carotid intima- media thickness IMT ≥ 1mm. The processing and exploitation of the data made use of SPSS22 software. The processing and exploitation of the data made use of SPSS22 software.

**Results:** Three hundred coronary patients, middle aged of 61 with predominantly male net, were included. The average IMT of our population was higher among men than women; significant difference (P = 0.042). 51% of our global population had at least one atheromatous lesion on the left common carotid (LCC), dominated by atheromatous plaques (49.7%), hemodynamic lesions were observed in 1.3% of our coronary patients. The same finding was noted for the right common carotid (RCC), affected in 51.4% of our population whose predominant lesions were atheromatous plaques in 50.7%, followed by hemodynamic damages (0.7%).49.3% and 49% of our global population had at least one lesion on the left internal carotid (LIC), and the right internal carotid (RIC). Hemodynamic lesions were more frequent on RIC (5% vs 2%). 47% and 49% of our global population respectively had at least one attack on LEC and REC. Hemodynamic damages were observed in 1.7% on LEC and 1.3% on REC.

**Conclusion:** Despite the development of vascular functional explorations, there is currently no argument about screening for extracardiac atherosclerotic lesions in populations of selected asymptomatic subjects, according to age criteria or risk factors. In practice, it is when a localization of atherosclerosis becomes symptomatic that the problem of a possible lesional association arises. Coronary artery disease is the most important in terms of morbidity and mortality, and it is often in the context of ischemic heart disease assessment that the modalities for evaluating the extension of atheromatous disease are discussed. These vascular lesions, however, have a significant prognostic importance, like the other comorbidities associated. The search for these lesions therefore seems important to adapt the therapeutic arsenal at the individual level.

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[*]*Correspondence to: Rachid Merghit, Cardiology Service, University Hospital Center, Ali Mendjli Constantine, Algeria 25000; Tel: 213661495; E-mail: mer18net@yahoo.fr*

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## Introduction

A true systemic disease, atherosclerosis can affect many arterial vascular territories of different sizes (coronary, carotid, renal arteries, mesenteric arteries, aorta, lower extremity arteries, etc.), causing acute or chronic ischemic events whose main targets are the myocardium, the brain and the lower limbs. In a given individual, the disease favors development on certain arterial axes rather than others. This state of affairs is partly explained by the spectrum of CVRF present in this same individual, some of which are strongly associated with the development of atherosclerosis lesions in specific vascular territories. Coronary Artery Disease is currently the most common and most serious entry point for the atherothrombotic disease, its association with carotid atheromatous damage aggravates even more the prognosis of this category of patients, for this its screening is justified in order to ensure the most complete care of these patients.

## Materials and Methods

Our epidemiological study is observational, descriptive, analytical and mocentric conducted on a sample of 300 consecutive confirmed coronary patients, with at least one lesion ≥ 50% on a main coronary artery, whatever their age and sex; The informed consent and the commitment of the patient for this project are required, respecting the anonymity. The included patients benefited from a collection of the anthropometric measurements (weight, size, and BMI), a collection of information (CVRF, cardio-cerebrovascular diseases), a complete clinical examination, a biological assessment including a complete lipid profile (HDLc, CHOLt, TG, LDLc), a fasting glucose, a creatinine level and calculated Creatinine clearance according to the MDRD formula. A cervical echo-doppler examination (SAT-Echo) was performed by a vividE9 General Electric ultrasound system started in January 2014, using a 12L linear scanning probe, for all patients, centered on the carotid axes. In our work, the SAT echodoppler is said to be pathological it was at least one atheromatous plaque and / or hemodynamic lesion, on one of the carotid axes (common carotid, internal carotid, external carotid), or a carotid intima-media thickness. (IMT) ≥ 1mm. IMT is measured on the posterior wall, of the common carotid, using the zoom, at a distance of one centimeter, from the carotid bulb between the adventitious interface light interface; the calculation is automatic thanks to a software integrated into the Echo device.

The atheromatous plaque is defined by a focal thickening, of the carotid wall measuring more than 50% with respect to the adjacent wall or by a focused region greater than 1.5 mm, with protrusion in the arterial lumen, We chose velocimetric criteria to define carotid stenosis, end-diastolic velocity (EDV), maximal systolic velocities (MSV), internal carotid artery (ICA) and carotid artery (CA) are measured, and in the end, calculating the carotid systolic ratio (MSV IC / MSV CC); a hemodynamic damage is defined by a carotidian ratio≥2 (Table 1). The patient data as well as the results of all the examinations initially recorded on a data sheet established for this purpose, later transferred into a database (EXCEL 2013 file) designed for the same purpose. The statistical analysis is performed using the SPSS 22 software. The results are presented with 95% confidence intervals, as mean, median, standard deviation, and minimum and maximum values, for the quantitative variables as percentages with their standard deviation for the qualitative variables.

**Table 1:** Velocimetric criteria for the internal carotid artery stenosis.

| Stenosis | Maximal systolic velocitiy cm/s | End- systolic velocity cm/s | Carotid report |
|---|---|---|---|
| 0 | <125 | <40 | <2 |
| 0-50 % | <125 | <40 | <2 |
| 50-69% | 125-130 | 40-100 | 2-3.5 |
| ≥ 70% | >230 | >100 | >3.5 |
| Pre occlusion | High, low unquantifiable | Variable | Variable |

## Results

Characteristics of the global population: Between June 2015 and March 2016, we previously collected 300 coronary patients (Table 2). The mean age of this population was 61.3 ± 11.3 years with extreme ages ranging from 23 to 85 years, and a median of 62 years, with a significant male predominance (78.3%), this population was relatively thin (mean BMI 27.92 ± 4.66 kg / m2, mean waist size 95.55 ± 11.20 cm). The majority of our coronarians accumulate more than three CVRFs (72.7%). The most prevalent CVRF were age (69%), followed by hypertension (58.7%), physical inactivity (57.3%), dyslipidemia (52.7%), overweight (49%), and diabetes (47.4%). The lowest observed CVRFs were active smoking (32.3%), obesity (29.3%), and a family history of early cardiovascular disease (CVD) early (26.4%). Diabetes is associated with hypertension and dyslipidemia respectively in 36% and 47.3% of cases; the triple association is observed in 37.7%. The personal history of cerebrovascular diseases (ischemic stroke, hemorrhagic stroke, TIA), were observed in 2.7%. The majority of our patients (60.7%) were coronary angiography for ACS acute coronary syndrome, the rest for stable ischemic heart disease, mono-truncal involvement, 30.7% bitroncular and 22% truncal tripletism, trunk involvement. left common is observed in 5.6%.

**Table 2:** Characteristics of the global population.

| VARIABLES | RESULTS (n ou %) |
|---|---|
| Middle age | 61 ,3 ± 11,3 years |
| Sex ratio M/W | 3,6 |
| Average number of VRFs | 4,09 |
| Number ≥ three CVRF | 72,7% |
| Age ≥ 50 years (M) et ≥ 60ans (W) | 69% |
| Hypertension | 58,7% |
| Sedentarity | 57,3% |
| Dyslipidemia | 52,7% |
| Overweight | 49% |
| Diabetes | 47,4% |
| Active smoking | 32,3 % |
| Obesity | 29,3% |
| Android obesity | 32% |
| Family coronary artery disease | 26,4% |
| Chronic kidney disease | Légère : 9,7%, moderate : 5%, severe : 1,3% |
| Personal cerebro vascular history | 2,7% |

**Frequency of Carotid Involvement in Our Coronary Patients**

The echo -Doppler SAT was pathological in 185 coronary patients representing 61.7% (Table3). Measurement of IMT involved 146 patients (48.67%), in whom Doppler ultrasound showed no plaques or stenosis, detected atherosclerosis at 31 patients, or nearly 10.34 % of the coronary population and 21.23% of the coronary group with normal SAT echo-Doppler. The distribution of mean IMT by sex, shows a significantly higher rate in men compared to women (Table 4).

**Table 1:** Distribution of abnormalities of SAT according to patient sex.

| | Men | Women | Total | P |
|---|---|---|---|---|
| Pathological SAT | 152(64,7%) | 33(50,8%) | 185(61,7%) | 0,041 |
| Normal SAT | 83(35,3%) | 32(49,2%) | 115(38,3%) | |
| Total | 235(100%) | 65(100%) | 300(100) | |

**Table 4:** Distribution of average IMT.

| | Men | Women | Total | P |
|---|---|---|---|---|
| Average IMT (cm) | 0,96±0,18 | 0,91±0,2 | 0,93±0,17 | 0,042 |

A carotid lesion hemodynamic was observed in 12% of cases, the distribution of atherosclerotic lesions shows that (Table 5 & 6):

i. 51% of our global population had at least one atheromatous lesion on the left common carotid (LCC), dominated by atheromatous plaques (49.7%). Hemodynamic damages were observed in 1.3% of our coronary patients.

ii. The same finding was noted for the right common carotid (RCD), affected in 51.4% of our population whose predominant lesions were atheromatous plaques in 50.7%, followed by hemodynamic damages (0.7%).

iii. 49.3% and 49% of our global population had at least one lesion on the left internal carotid (LIC), and the right internal carotid (RIC). Hemodynamic lesions were more frequent on RIC (5% vs 2%).

iv. 47% and 49% of our global population respectively had at least one attack on LEC and REC. Hemodynamic lesions were observed in 1.7% on LEC and 1.3% on REC.

**Table 5:** Distribution of carotid atherosclerotic lesions.

| | Plates | Hemodynamic damages | Thrombosis | Total |
|---|---|---|---|---|
| LCC | 147(49,7%) | 3(1,0%) | 1(0,3%) | 151 (51%) |
| RCC | 152(50,7%) | 2(0,7%) | 0(0%) | 154 (51,4%) |
| LIC | 142(47,3%) | 5(1,7%) | 1(0,3%) | 148 (49,3%) |
| RIC | 132(44,0%) | 12(4%) | 3(1%) | 147 (49%) |
| LEC | 137(45,7%) | 5(1,7%) | 0(0%) | 142 (47%) |
| REC | 143(47,7%) | 3(1,0%) | 1(0,3%) | 147 (49%) |

Carotid atheromatous disease is predominantly bilateral, with no significant difference between the two sexes (Table 6), and the frequency of hemodynamic carotid lesions was significantly higher in cases of severe coronary disease (Table 7). Coronary involvement is called severe if there is truncal hemodynamic involvement or damage to the left coronary trunk, isolated or associated with other truncal lesions.

**Table 6:** Anatomical seat of carotid lesions.

| | Men | Women | Total | P |
|---|---|---|---|---|
| Unilateral | 2(1,6%) | 0 (0,0%) | 2(1,3%) | 0,502 |
| Bilateral | 124(98,4%) | 28(100,0%) | 152(98,7%) | |

**Table 7:** Frequency of carotid involvement according to the severity of coronary artery disease.

| Characteristics | | Severe coronary involvement | Non Severe coronary involvement | Global Population | P |
|---|---|---|---|---|---|
| Hemodynamic carotid involvement | Yes | 15(18%) | 21(9,7%) | 36(12%) | P=0,0001 |
| | No | 68(82,0%) | 196(90,3%) | 264(88,0%) | |
| Total | | 83(100,0%) | 217(100,0%) | 300(100,0%) | |

**Discussion**

Despite the development of vascular functional investigations, there is currently no argument for screening for extracardiac atherosclerotic lesions in populations of selected asymptomatic subjects, depending on age criteria or risk factors. In practice, it is when an atherosclerosis localization becomes symptomatic that the problem of a possible lesional association arises and becomes really serious. Coronary artery disease is the most important in terms of morbidity and mortality, and it is often in the context of ischemic heart disease assessment that the modalities for evaluating the extension of atheromatous disease are discussed. These vascular lesions, however, have a significant prognostic importance, like the other comorbidities associated. The search for these lesions and damages, therefore seems important to adapt the therapeutic arsenal to the individual scale.

In our investigation, a carotid hemodynamic lesion was associated with coronary artery disease in 12% of cases, especially if this coronary artery disease is severe. Our results are close to the majority of such epidemiological series (Table 8): Faggioli et al. Becker and Gabrielle, Salasidis, Fontan et al., Fukuda, Lanzer, Komorovsky, Przewłocki, Imori, Aboyans et al. and Laraba. The therapeutic strategy for multi-local atheromatous disease remains controversial, but it is coronary artery disease that dominates the prognosis.

In case of symptomatic carotid stenosis greater than 70%, the indication of endarterectomy is the subject of a consensus. In case of symptomatic carotid stenosis greater than 70%, the indication of endarterectomy is the subject of a consensus. The treatment of double localization can be proposed at the same time. The problem of asymptomatic carotid stenosis is delicate, and opinions are divided. Decisions should be made

on a case-by-case basis and based on age, sex, severity of coronary artery disease, presence on the cerebral CT areas of silent ischemia and the study of echogenicity of atheromatous plaque. to identify these subgroups of patients at very high risk of stroke.

**Table 8:** Frequency of coronary and carotid association (literature review).

| Study/ 1st author | Number of patients | Category of patients | Frequency of association (carotid and coronary) |
|---|---|---|---|
| Faggioli [3] 1990 | 539 | Patients proposed for coronary artery bypass surgery | carotid stenosis ≥75% :8,7% |
| Beker and Gabriel [4] 1991 | meta analysis | coronary artery disease | carotid stenosis ≥50% : entre 2%- 39% |
| Salasidis [5] 1995 | 387 | Coronary revascularisation | carotid stenosis ≥75% :8,5% |
| Fontan [6]1999 | 146 | Patients proposed for coronary artery bypass surgery | carotid stenosis ≥75% :9,4% |
| Fukuda [7] 2000 | 308 | Patients proposed for coronary artery bypass surgery | - carotid stenosis ≥50% :14%<br>- carotid stenosis ≥80% :7% |
| P. Lanzer [8] 2003 | 1855 | Severe coronary artery disease | carotid stenosis ≥75% :8,6% |
| Komorovsky [9] 2004 | - | Severe coronary artery disease | carotid stenosis ≥50% :30% |
| Przewłocki [10] 2009 | 545 | coronary artery disease | carotid stenosis ≥50% :19,8 % |
| Yoichi Imori [11] 2014 | 1253 | coronary artery disease | carotid stenosis ≥75% :8,6% |
| Aboyans [12] 2016 | - | coronary artery disease | carotid stenosis ≥50% :12 % |
| Laraba [13] 2016 | 320 | Acute coronary syndrome ACS | carotid stenosis ≥50% :16,7% |
| Our study 2017 | 300 | coronary artery disease | - carotid stenosis ≥50% :12%<br>- carotid stenosis ≥50% :18% if severe coronary artery disease |

## Conclusion

Solid studies show the value of detecting extracardiac atherosclerotic sites in the coronary patient. It is therefore necessary, on the data of the clinical examination but also by the reasoned use of non-invasive imaging methods on the basis of the recommendations, to better plan the patient's assessment. At this price and importance, we can consider appropriate and relevant care, with an acceptable cost/benefit ratio.

## Conflicts of Interest

None.

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