Management of polyvascular disease: a cross-sectional monocentric study in eastern Algeria

Prise en charge de la maladie poly artérielle : résultats d'une étude transversale monocentrique à l'est Algérien

Rachid Merghit¹, Ikhlas Gueriane¹, Mouloud Ait Athmane², Abdelhak Lakehal³

¹ Cardiology department, Regional Military University Hospital, Ali Mendjeli, Constantine, Algeria 25,000

² Cardiology department, Annaba university hospital center, Algeria 23,000

³ Epidemiology department, university hospital center of Constantine, Algeria 25,000

Corresponding author :

Rachid MERGHIT
mer18net@yahoo.fr

DOI : <https://doi.org/10.48087/BJMSoa.2021.8104>

Received : November 10, 2020

Accepted : April 16, 2021

Published : June 04, 2021

This is an open access article distributed under the terms of the Creative Commons Attribution International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium or format, provided the original author and journal are appropriately credited.

ABSTRACT

Introduction. The rates of atherosclerotic disease as well as its multifocal aspects have been increasing significantly. It is important to know these associations to ensure a comprehensive management of this category of patients. **Aim.** To estimate the frequency of the principal peripheral atherosclerotic associations in patients with coronary artery disease referred to cardiology in the University Hospital of Constantine. **Methods.** Our study is descriptive, cross-sectional, and mono-centric carried out in the unit of cardiovascular investigations of the Regional Military University Hospital of Constantine. The included patients had at least one significant coronary lesion ≥ 50 in a principle coronary artery. All our patients underwent an ultrasound evaluation (supra- aortic trunk echo-Doppler, Doppler Ultrasound of the aorta and lower limbs). Data was processed using SPSS Statistics V22. **Results.** The frequency of the association of Peripheral Artery Disease and Coronary Artery Disease was 34.7% representing the most frequent association. A hemodynamic carotid lesion ($\geq 50\%$) and Abdominal Aortic Aneurysm were associated respectively with Coronary Artery Disease in 12% and 4.6% of patients in the current study. The triple association of coronary artery disease, Abdominal Aortic Aneurysm and hemodynamic carotid disease was observed in 2.67%, whereas the triple association of Peripheral Artery Disease, coronary artery disease, and carotid stenosis $\geq 50\%$ was observed in 6.67%. The frequency of the association of coronary artery disease, Peripheral Artery Disease and Abdominal Aortic Aneurysm was estimated at 3, 66%. The therapeutic strategy for multi-focal atherosclerotic disease is still discussed, but coronary artery disease dominates the prognosis. **Conclusion.** Carrying out a comprehensive assessment of patients with coronary artery disease helps significantly in establishing an adapted and pertinent management with an acceptable Benefit-Cost Ratio.

Keywords: coronary artery disease; peripheral atheromatous disease; pan-vascular therapy.

RÉSUMÉ

Introduction. Le profil systémique de la maladie athéromateuse augmente, en conséquence, les possibilités d'une atteinte multi focale, ces associations sont importantes à connaître, afin d'assurer une prise en charge complète de cette catégorie de patients. **Objectifs.** Démontrer l'intérêt d'une prise en charge globale du patient coronarien par la détection des principales associations athéromateuses périphériques chez une population de malades coronariens recrutés en cardiologie dans les centres hospitalier universitaires de la ville de Constantine. **Patients et méthodes.** Notre étude est descriptive, transversale, mono centrique réalisée en unité des explorations cardiovasculaires de l'hôpital régional universitaire de Constantine. Les sujets inclus avaient aux moins une lésion coronaire significative ≥ 50 sur une artère coronaire principale. L'ensemble de nos malades ont bénéficiés d'un bilan échographique doppler. Le traitement et l'exploitation des données ont fait appel au logiciel SPSS22. **Résultats.** Les associations athéromateuses périphériques chez le patient coronarien sont fréquentes (34,7% d'association avec une artériopathie oblitérante des membres inférieurs, 12% d'association avec une lésion carotidienne hémodynamique et 4,6% d'association entre anévrisme de l'aorte abdominale et coronaropathie), imposant une prise en charge pan vasculaire de tous patients présentant une localisation athéromateuse initiale surtout coronaire. La stratégie thérapeutique en cas d'atteinte athéromateuse plurifocales reste discutée, mais c'est la coronaropathie qui domine le pronostic. **Conclusion.** Intérêt d'une approche globale de tous patients athéromateux, afin d'assurer la prise en charge la plus complète.

Mots clés : coronaropathie ; atteinte athéromateuse périphérique ; prise en charge pan vasculaire

INTRODUCTION

The systemic profile of atherosclerotic disease increases as a consequence the possibilities of multi-focal implication and the patients with poly vascular disease are considered to be those who affected, symptomatic or not, at least of two arterial vascular regions [1]. The employment and the intelligent use of vascular imaging techniques has opened our eyes and show us the hidden asymptomatic damages, but potentially alarming ones. This needs a best planning and a methodic organization for the diagnostic

process, better choosing of the necessary and the first-rate explorations, and focusing on optimized and improved screening of lesions, utilizing the accessible resources for the sake as well as the benefits of patients. Our study attempts to demonstrate the benefit of global management of the coronary patient by detection of the principal peripheral atherosclerotic associations in patients with coronary artery disease (CAD), so as to guarantee the most complete care and support of these patients.

Citation :

Merghit R, Gueriane I, Ait Athmane M, Lakehal A. Management of polyvascular disease : a cross-sectional monocentric study in eastern Algeria. *Batna J Med Sci*. 2021;8(1):19-23. <https://doi.org/10.48087/BJMSoa.2021.8104>

PATIENTS AND METHODS

Our mono-centric epidemiological study is descriptive, analytical supervised on a sample of 300 recognized and consecutive patients with CAD, at the cardiology department of the University Hospital of Constantine. These patients had at least one lesion $\geq 50\%$ on a main coronary artery; in spite of their age and sex, excluding those who refused to participate in this study, informed consent and patient engagement for this study are required, respecting anonymity.

On the day of the session, the included patients benefited from a collection of anthropometric measurements (weight, height, calculation of the BMI), a collection of information (cardiovascular risk factors (CVRF), cardio-cerebrovascular pathology), a complete clinical examination, a biological assessment including the complete lipid profile (HDL-c, TC, TG, LDL-c), a fasting blood sugar level, a creatinine level and calculated creatinine clearance according to the MDRD equation. All ultrasonography explorations (Doppler ultrasound of the aorta and lower limbs, and supra-aortic trunks echo-Doppler) were performed by the principal investigator, to avoid inter-observer variations, and by the same ultrasonography machine (vividE9 General Electric ultrasound system started in January 2014), using a 3S probe for abdominal exploration and a 12L linear scanning probe, planned for peripheral vascular exploration (carotid, lower limbs).

For all of our patients, an aortic and lower limbs ultrasonography (Doppler Ultrasonography of the lower extremity arteries), and a supra-aortic trunks echo-Doppler were performed. Doppler Ultrasonography of the lower extremity arteries involves the entire arterial tree from the abdominal aorta to the ankle arteries; in each territory, along with a systematized exploration, which is carried out on a patient at rest, in decubitus according to a specific protocol for each territory [2]. We measure the maximum external anteroposterior diameter (from adventitia to adventitia) obtained on a perpendicular cross section to the axis of the aorta which generates the most achievable perfect circular section. A measurement is realized on supra-kidney, at the level of the superior mesenteric artery and infra-kidney at the level of the largest spotted transverse diameter, under the renal arteries, and then the average of three measurements of each level is taken.

We take as definition of aneurysm, a localized dilation of the abdominal aorta, with an anteroposterior diameter $> 30\text{mm}$, with an increase of 50% compared to mean normal diameter of the order of 20mm. an aortic ectasia is described as an anteroposterior diameter of the aorta between 25 and 30 mm [3]. For each region (aorto-iliac, femoral, popliteal, infra-popliteal), we noticed the presence or not of a hemodynamic lesion $\geq 50\%$ based on the velocimetric criteria (measurement of the peak systolic velocity (PSV) and the pulsed wave Doppler velocity ratios, at the site of the stenosis and upstream); at the iliac stage, for a stenosis $\geq 50\%$, a PSV $> 200\text{--}250\text{ cm/s}$, and a PSV ratio $> 2\text{--}2.5$; at the subinguinal level, a ratio greater than 2.5 to 3 is generally accepted to differentiate stenosis and stricture of more than 50% [3]. The supra-aortic trunks echo-Doppler was performed, following a previous exploration, focused especially on the carotid axes. In our current study, the echo-Doppler is said to be pathological, if at least one atheromatous plaque and / or a hemodynamic lesion has been existent, on one of the carotid axes (common carotid artery, internal carotid artery, external carotid artery), if this is not the case, we make use of the carotid intima-media thickness (IMT) $\geq 1\text{mm}$ [4]. IMT is measured on the posterior wall, of the common carotid artery, employing the zoom, at a

between the lumen-intima interface and media-adventitia interface; the calculation is automatic (software integrated system into the Echo device). Atheromatous plaque is determined by a focused thickening of the wall measuring $> 50\%$ in proportion to the adjacent wall or by a focused region $> 1.5\text{ mm}$, with protrusion into the lumen [4]. We chose and opted for velocimetric criteria in order to define carotid stenosis [4], calculating end-diastolic velocities (EDV), peak systolic velocity (PSV), at the level of the internal carotid artery (ICA) as well as at the level of the common carotid artery (CCA) and ultimately, the calculation of the systolic carotid ratio (PSV ICA / PSV CCA); a hemodynamic lesion is characterized by a carotid ratio between 2-3.5.

Statistical analysis

Patients' data as well as the results of all initially recorded exams on a datasheet established and settled for this purpose, are transferred afterwards to a database (EXCEL 2013) designed for the same purpose. Statistical analysis is performed using SPSS Statistics 22. Results are presented and awarded with 95% confidence intervals, as mean, median, standard deviation, and minimum and maximum values, for the quantitative variables and as a percentage with their standard deviation for categorical variables.

RESULTS

Population's characteristics

Between June 2015 and March 2016, we collected 300 patients with CAD. The mean age of this population was 61.3 ± 11.3 years with extremes of age extending 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 $27.92 \pm 4.66\text{ kg/m}^2$, mean waist size measurement $95.55 \pm 11.20\text{ cm}$). The majority of our patients with CAD have more than three CVRF (72.7%). The predominant CVRFs were age (69%), followed by High Blood Pressure (HBP) (58.7%), sedentary lifestyle (57.3%), dyslipidemia (52.7%), overweight (49%), and diabetes (47.4%). The least observed CVRF were active smoking (32.3%), obesity (29.3%), and a family history of early CAD (26.4%). Diabetes is associated respectively with High Blood Pressure (HBP) and dyslipidemia in 36% to 47.3% of cases; the triple association is noticed in 37.7%. Personal history of cerebrovascular diseases (ischemic stroke, hemorrhagic stroke, transient ischemic attack), were spotted in 2.7%. The majority of our patients (60.7%) had coronary angiography for Acute Coronary Syndrome (ACS), the rest for stable and balanced Arteriosclerotic Heart Disease (ASHD). 41.67% had mono-truncal lesion, 30.7% a bi-truncal lesion and 22% a tri-truncal lesion and lastly 5.6% of patients had a lesion of the left coronary trunk (LCT) (Table 1).

Table 1 : population's characteristics

Variables	n or %
Mean age (years)	61,3 $\pm$ 11,3
Sex ratio	3,6
Average number of CVRF	4,09
≥ 3 CVRF	72,7%
HBP	58,7%
Sedentary lifestyle	57,3%
dyslipidemia	52,7%
Overweight	49%
Diabetes	47,4%

(Table 1 continued)

Active smoking	32,3 %
Obesity	29,3%
Android obesity	32%
Familial CAD	26,4%
CKD	mild : 9,7% ; moderate : 5% ; severe : 1,3%
Personal history of cerebrovascular diseases	2,7%
Increased LVM	54%
Total altered LVEF	16,6%
Altered LV filling pressure	54,3%
Mono-truncal	41,67%
Bi-truncal	30,7%
Tri-truncal	22%.
LCT lesion	5,6%

Frequency of peripheral atherosclerotic associations

34.7% had at least one hemodynamic lesion $\geq 50\%$ on the arterial axes of the lower limbs; 4.7% an AAA and 12 % a hemodynamic carotid lesion (Tables 2, 3, 4).

Therapeutic management of different peripheral atherosclerotic associations

The therapeutic management of our poly arterial patients is divided into two sections: the management of CAD, and the management of peripheral arterial disease.

On the coronary level, a myocardial revascularization was decided for the majority of our patients (69.6%) with almost equal part between percutaneous transluminal angioplasty (PTA) and coronary artery bypass grafting (CABG); medical treatment was only indicated for 30.3% of patients (Tables 5,6,7).

Among the patients who were proposed for CABG (91 patients):

- Double bypass (17.59%)

-Triple bypass (43.95%)

- Quadruple bypass (38.46%)

Among the patients who were proposed for coronary angioplasty (118 patients):

- Mono PCI (43.2%)

- Double PCI (51.7%)

- Triple PCI (5.1%)

Table 2 : Frequency of abdominal aortic aneurysm (AAA) in a patient with coronary artery disease (CAD)

	Severe coronary damage	No severe coronary damage	Global population	P
Normal diameter	57(68,67%)	194(89,40%)	251(83,7%)	0,0001
Aortic ectasia	16(19,27%)	19(8,92%)	35(11,7%)	
Aortic aneurysm	10(12,04%)	4(1,68%)	14(4,7%)	
Total	83(100%)	217(100%)	300(100%)	

Table 3 : Frequency of carotid damage in a patient with CAD

		Severe coronary damage	No severe coronary damage	Global population	P
Hemodynamic deterioration of the carotid artery	Yes	15(18%)	21(9,7%)	36(12%)	0,0001
	No	68(82,0%)	196(90,3%)	264(88,0%)	
Total		83(100,0%)	217(100,0%)	300(100,0%)	

Table 4 : Frequency of AAA and carotid damage in a patient with CAD

	Severe CAD	No severe CAD	Global population	P
AAA and Hemodynamic deterioration of the carotid artery	6(7,2%)	2(0,92%)	8(2,67%)	0,0001
Total	83(100%)	217(100%)	300(100%)	

Table 5 : Treatment Profile for the general population

Treatment type	Global population
Medical treatment	91(30,3%)
PTA	118(39,3%)
CABG	91(30,3%)
TOTAL	300(100,0%)

Table 6: Treatment by the percutaneous transluminal angioplasty

PTA number	Global population
3	6(5,1%)
2	61(51,7%)
1	51(43,2%)
Total	118(100,0%)

Table 7: Treatment with CABG

Bypass number	Global population
4	35(38,46%)
3	40(43,95%)
2	16(17,59%)
Total	91(100,0%)

On the peripheral vascular level, all of our poly arterial patients have benefited from a therapeutic adaptation and readjustment, regardless of the symptomatic PAD was or not; Quadruple therapy was applied according to the recommendations of most savant societies in patient with polyvascular disease, with coronary lesion (HAS, TASCII, ACC / AHA).

- Twenty-five (25) patients, representing 8.34% of the global population and 24.03% of patients with poly arterial damages (PAD, carotid stenosis), were proposed for peripheral revascularization procedure of the lower limbs:
 - ✓ Surgical treatment (Vascular bypass):23 patients (aorto-bifemoral bypass or aorto-femoral bypass).
 - ✓ Endovascular treatment: it concerned two patients, with a small iliac stenosis, one on the right common iliac artery, and the other on the left external iliac artery, benefiting from iliac artery stenting, after dilation and distension of the lumen by the deflated balloon, we got such a good result.
- Five (05) patients underwent a carotid endarterectomy for symptomatic carotid stenosis:
 - ✓ Three (03) patients had benefited from a combined procedure CABG and endarterectomy of carotid artery, with a good and even a treasured postoperative follow-up.
 - ✓ One (01) patient underwent PTA with placement of a bare-metal coronary stent segment; after that, a carotid endarterectomy was performed, but the postoperative follow-up was sadly marked by the death of the patient after an ischemic stroke.

- ✓ One (01) 35-year-old patient with severe CAD (LCT and bi-truncal lesion) with LV systolic / diastolic dysfunction, first underwent a triple CABG, with good postoperative follow-up and results. Six months later, a carotid endarterectomy was accomplished, not to mention the good postoperative follow-up.

- Two (02) patients were proposed for an aortic aneurysmectomy for an AAA, one of whom was competently and successfully operated, having benefited from a professional and qualified treatment of the aneurysm, a good current progress. The other died while waiting for vascular surgery.

In this study we have perceived that there is a substantial gap between the recommendations and our daily practice. Almost half of our patients (49%) with overweight, and 1/3 with obesity (29.3%). More than half of our sample represented an unbalanced diabetes (53.5%). More than 1/3 of our coronary patients continue to smoke (32.3%) and almost 2/3 of our patients with CAD are unbalanced in terms of blood pressure. Regarding dyslipidemia, the therapeutic objectives are not achieved in almost half of our variety of patients with CAD. This has led us for all of our patients, based on current recommendations, to a strict and serious correction of CVRF:

- Balance of the HBP, referring to the most recent recommendations of the ESH / ESC 2011, 2017, with an intention of Blood Pressure <140/90 mmHg for all patients, excluding diabetic patients: Blood Pressure <140 / 85mmHg.
- Balance of diabetes, with an objective of glycated hemoglobin (hemoglobin A1C): HBA1c ≤ 6.5%.
- Correction of dyslipidemia, with an objective LDL <0.7g / l, HDL> 0.40g / l, TG <1.5g / l, Total-cholesterol <2g / l.
- Regular physical activity at a minimum of 30 to 45 minutes triweekly.
- Adapted Mediterranean diet, rich in vegetables and fruits, low in saturated fat (butter, cheese, fatty cats of meats, sausages...).

DISCUSSION

The frequency of the combination of CAD and PAD in our study was 34.7% ± 5.3, considerably higher than that in the general population [5]. Carotid stenosis in patients with CAD is frequent (more than 10%) [6, 7], the results are similar to the majority of epidemiological series [5, 8-16]. The prevalence of the AAA in patients with CAD is higher than that of the general population according to several studies [17-20].

The therapeutic strategy for multifocal atherosclerotic peripheral vascular diseases remains to be discussed but CAD is still getting the lion's share and dominating the prognosis.

The indications for carotid surgery have become stricter and more accurate, in particular due to the improved medical treatment leading to a significant reduction in the risk of an ischemic episode. As a result, carotid surgery, in the absence of symptoms, will become increasingly and progressively rare and with a difficult justification [15]. The identification of groups of patients particularly at risk will become crucial in order to offer the best risk-benefit ratio in this situation.

Decisions must be made on a case-by-case basis and depend on age, sex, severity of the CAD, the presence of regions with a silent ischemia on a CT-scan brain in patients as well as the study of the echogenicity of atheromatous plaque allowing us as a doctor and as a researcher also to identify these subgroups of patients at very high risk of ischemic stroke but especially the presence of asymptomatic microembolism measured by transcranial Doppler which is currently the best established

additional criterion and the ideal norm, even if randomized studies are still lacking to prove their worth added [4]. In the episode of symptomatic carotid stenosis, the indication for endarterectomy is the subject of a consensus [15]. There is a controversy concerning the optimal therapeutic attitude to follow in a patient with a bifocal carotid and coronary lesion: combined surgery and sequential surgery [16]. Sequential surgery caused two problems, the delay between the two operations and the increased risk of peri-operative cardio cerebro-vascular complications. Combined surgery attempts to reduce this risk by treating both lesions simultaneously. If an asymptomatic AAA is associated with CAD justifying a CABG, the latter will be performed initially and followed by surgical treatment of the aneurysm in order to reduce peri-operative morbidity and mortality. Sometimes it is possible to offer treatment for both lesions at the same time. As for the association of CAD and PAD lesions requiring surgical treatment, the benefit of coronary artery revascularisation, at first and more in the early stages, must always be evaluated and judged rationally in order to reduce the operative risks [21].

CONCLUSION

It is often as part of the assessment and valuation of Arteriosclerotic Heart Disease that the modalities and procedures of estimating the expanse of atherosclerotic disease are really considered and discussed. It is therefore necessary, based on the data from the clinical examination but also through the methodical use of non-invasive imaging methods, to deal with the patient's assessment as best we can. At this amount, we can consider appropriate and relevant care.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interests.

REFERENCES

1. Becker, F., Artériopathie oblitérante des membres inférieurs. *Journal des Maladies Vasculaires*, 2016. 41(2):96. <https://doi.org/10.1016/j.jmv.2015.12.034>.
2. AbuRahma, A.F. and E.B. Diethrich, Doppler ultrasound in evaluating the localization and severity of peripheral vascular occlusive disease. *South Med J*, 1979. 72(11):1425-8. DOI: 10.1097/00007611-197911000-00024.
3. Dharmasaroja, P.A., et al., Extracranial carotid stenosis and peripheral arterial disease in Thai patients with coronary artery disease. *Angiology*, 2010. 61(4):329-32. <https://doi.org/10.1177/0003319709356423>.
4. Geroulakos, G., et al., Characterization of symptomatic and asymptomatic carotid plaques using high-resolution real-time ultrasonography. *Br J Surg*, 1993. 80(10):1274-7. <https://doi.org/10.1002/bjs.1800801016>.
5. Aboyans, V., et al, Stratégie de la conduite des examens chez le patient polyvasculaire, in EMC - Angéiologie. 2016. Doi : 10.1016/S2211-0364(16)65599-1.
6. Mathur, K.S., S.K. Kashyap, and V. Kumar, Correlation of the extent and severity of atherosclerosis in the coronary and cerebral arteries. *Circulation*, 1963;27(5):929-34. <https://doi.org/10.1161/01.CIR.27.5.929>.
7. Giertsen, J.C., Atherosclerosis in an Autopsy Series. 3. Inter-Relationship between Atherosclerosis in the Aorta, the Coronary and the Cerebral Arteries. *Acta Pathol Microbiol Scand*, 1965. 63: p. 391-403. <https://doi.org/10.1111/apm.1965.63.3.391>
8. Faggioli, G.L., G.R. Curl, and J.J. Ricotta, The role of carotid screening before coronary artery bypass. *J Vasc Surg*, 1990. 12(6): p. 724-9; discussion 729-31. <https://doi.org/10.1067/mva.1990.24458>
9. Becker F, G.F., Chirurgie coronaire et sténoses carotidiennes : données épidémiologiques. *Compte rendu du 16e congrès d'angiologie de langue française*, 1991.
10. Salasidis, G.C., et al., Carotid artery duplex scanning in preoperative assessment for coronary artery revascularization : the association between peripheral vascular disease, carotid artery stenosis, and stroke. *J Vasc Surg*, 1995. 21(1): p. 154-60; discussion 161-2. [https://doi.org/10.1016/S0741-5214\(95\)70254-7](https://doi.org/10.1016/S0741-5214(95)70254-7).
11. Fontan, C., et al., Bilan d'extension de la maladie athéromateuse au cours de la coronaropathie. Étude rétrospective chez 146 patients coronariens en centre de réadaptation. *Annales de Réadaptation et de Médecine Physique*, 1999. 42(2): p. 76-81. [https://doi.org/10.1016/S0168-6054\(99\)80044-0](https://doi.org/10.1016/S0168-6054(99)80044-0)
12. Fukuda, I., et al., Carotid and aortic screening for coronary artery bypass grafting. *Ann Thorac Surg*, 2000. 70(6): p. 2034-9. [https://doi.org/10.1016/S0003-4975\(00\)02132-9](https://doi.org/10.1016/S0003-4975(00)02132-9)
13. Lanzer, P., Vascular multimorbidity in patients with a documented coronary artery disease. *Z Kardiol*, 2003. 92(8): p. 650-9. <https://doi.org/10.1007/s00392-003-0954-z>.
14. Komorovsky, R., et al., Impact of carotid arterial narrowing on outcomes of patients with acute coronary syndromes. *Am J Cardiol*, 2004. 93(12): p. 1552-5. <https://doi.org/10.1016/j.amjcard.2004.03.012>
15. Przewlocki, T., et al., Polyvascular extracoronary atherosclerotic disease in patients with coronary artery disease. *Kardiol Pol*, 2009. 67(8A): p. 978-84. PMID: 19784902
16. Imori, Y., et al., Co-existence of carotid artery disease, renal artery stenosis, and lower extremity peripheral arterial disease in patients with coronary artery disease. *Am J Cardiol*, 2014. 113(1): p. 30-5. <https://doi.org/10.1016/j.amjcard.2013.09.015>
17. Gallimard, J.F., et al., [Ultrasonic detection of arteriosclerosis of the main arterial trunks in the coronary patient]. *Arch Mal Coeur Vaiss*, 1986. 79(7): p. 1054-60. PMID: 3096228
18. Hodara, M., et al., [Detection of asymptomatic abdominal aorta in coronary disease patients having undergone coronarography]. *J Mal Vasc*, 1995. 20(4): p. 279-84. PMID: 8586947
19. Monney, P., et al., High prevalence of unsuspected abdominal aortic aneurysms in patients hospitalised for surgical coronary revascularisation. *Eur J Cardiothorac Surg*, 2004. 25(1): p. 65-8. [https://doi.org/10.1016/S1010-7940\(03\)00674-2](https://doi.org/10.1016/S1010-7940(03)00674-2).
20. Long, A., et al, Prévalence des anévrismes de l'aorte abdominale et des dilatations de l'aorte sous-rénale chez les patients présentant un syndrome coronarien aigu et une sténose coronaire démontrée : Résultats d'une étude prospective monocentrique. *Annales de Chirurgie Vasculaire*, 2010. 24(5): p. 657-664. <https://doi.org/10.1016/j.acvfr.2011.01.005>.
21. Gerhard-Herman, M.D., et al., 2016 AHA/ACC Guideline on the Management of Patients with Lower Extremity Peripheral Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol*, 2017. 69(11): p. e71-e126. <https://doi.org/10.1016/j.jmv.2015.12.034>.

This article was published in the "Batna Journal of Medical Sciences" **BJMS**, the official organ of the « Association pour la Recherche Pharmaceutique et l'Enrichissement des Connaissances – Batna »

The content of the Journal is "Open Access" and allows the reader to download and use the content for personal or educational purposes without requesting permission from the publisher/author.

Advantages of publishing in **BJMS** :

- Open access : once published, your article is available for free download.
- Free submission: no submission fee, unlike most "Open Access" journals
- Possibility to publish in 3 languages : French, English, Arabic
- Quality of proofreading: geographically independent proofreaders/reviewers, respecting anonymity, to guarantee the neutrality and quality of the manuscripts.

For more information, contact BatnaJMS@gmail.com or log on to the journal's website: www.batnajms.net