Scientific Research Publishing

World Journal of Cardiovascular Diseases, 2019, 9, 891-898
https://www.scirp.org/journal/wjcd
ISSN Online: 2164-5337
ISSN Print: 2164-5329

Atrial Fibrillation during Cerebral Infarction in Brazzaville: Frequency and Predictive Factors

Stéphane Méo Ikama[1*], Yann Luiz Ngouabi[1], Ghislain Mpandzou[2], Paul Macaire Ossou-Nguiet[2], Jospin Makani[1], Thibault Gankama[1], Christian Kouala-Landa[1], Louis Igor Ondze-Kafata[1], Bertrand Fikhaem Ellenga-Mbolla[1], Thierry Raoul Gombet[1], Suzy Gisèle Kimbally-Kaky[1]

[1]Department of Cardiology, Brazzaville University Hospital Center, Brazzaville, Congo
[2]Department of Neurology, Brazzaville University Hospital Center, Brazzaville, Congo
Email: *stephane.mikama@gmail.com

How to cite this paper: Ikama, S.M., Ngouabi, Y.L., Mpandzou, G., Ossou-Nguiet, P.M., Makani, J., Gankama, T., Kouala-Landa, C., Ondze-Kafata, L.I., Ellenga-Mbolla, B.F., Gombet, T.R. and Kimbally-Kaky, S.G. (2019) Atrial Fibrillation during Cerebral Infarction in Brazzaville: Frequency and Predictive Factors. *World Journal of Cardiovascular Diseases*, **9**, 891-898.
https://doi.org/10.4236/wjcd.2019.912079

Received: September 30, 2019
Accepted: December 14, 2019
Published: December 17, 2019

Abstract

In order to contribute to the improvement of brain infarction management in Brazzaville, a cross-sectional and analytical study with prospective data collection was conducted in the cardiology and neurology departments of the Brazzaville University Hospital, from February 1 to July 31, 2018. It included patients hospitalized for cerebral infarction confirmed with imaging, and having done an etiological assessment with at least one electrocardiogram at rest and one of long duration. Among these 138 patients included, 11 had atrial fibrillation, equaling a frequency of 7.9%. The mean age of AF patients was 71 ± 8.8 years. The cardiovascular risk factors found were hypertension in eight cases (72.7%), diabetes in five cases (45.5%), abdominal obesity in four cases (36.4%). AF was permanent in 10 cases (91%), and paroxysmal in one case (9%). It was valvular in three cases (27.3%) and non-valvular in eight cases (72.7%). The cardiopathy involved was hypertensive in seven cases (63.6%), ischemic and valvular in two cases each. The CHA2DS2-VASc score, calculated in eight patients, was an average of 2.2, and ≥2 in more than 80% of patients; HAS-BLED score of 2.4 on average was ≥ 3 in more than 72% of patients. Digoxin was prescribed in seven cases (63.6%) and an anti-vitamin K in eight cases (72.7%). In multivariate analysis, age (OR = 20.10, p = 0.023), arterial hypertension (OR = 23.82, p = 0.011), and dyslipidemia (OR = 2.03, p = 0.032) were the predictive factors found. AF is infrequent during brain infarction in Brazzaville. This systematic research raises the problem of age in our context.

Keywords

Atrial Fibrillation, Cerebral Infarction, Frequency, Predictive Factors, Congo

1. Introduction

Cerebral ischemia is a major public health problem worldwide [1] [2]. Indeed, it is the second leading cause of death in the world and in developing countries, it is responsible for 30% of deaths occurring in the first three weeks of its onset, and also responsible of 30% of cases of acquired permanent physical handicap [3] [4] [5]. Among these etiological mechanisms, cerebral embolisms occupy a prominent place alongside the atherothrombosis of large vessels. Cerebral ischemia of cardio-embolic origin is generally more serious, with a high risk of recurrence, and a high mortality rate, hence it's of great importance of recognizing a cardio-embolic origin in order to ensure better prevention by anticoagulant therapy [6] [7] [8] [9]. These cardiac-origin cerebral embolisms are usually associated with supraventricular arrhythmias, such as atrial fibrillation (AF) or atrial flutter, which are evidenced by several diagnostic methods, including ECG at rest, Holter ECG, continuous monitoring, and implantable devices, each with varying sensitivity and specificity, particularly for the detection of paroxysmal AF [10] [11] [12]. Also, in order to help improve the management of patients with cerebral infarction in our context, we began the present study with a triple objective: to determine the frequency of AF during cerebral infarctions, to list the main etiologies of AF, and identify its predictive factors.

2. Patients and Methods

It was a cross-sectional prospective data collection, descriptive and analytical, conducted from February 1st to July 31st, 2018 at the Brazzaville University Hospital, in cardiology and neurology departments. Were included, all patients hospitalized for an ischemic stroke, confirmed by medical imaging (computed tomography [CT] and/or magnetic resonance imaging [MRI]), and having an etiological assessment done, including an ECG at rest, an 24-hour ECG Holter, and a cardiac Doppler ultrasound if appropriate. Patients who had not been able to produce a cerebral CT scan or MRI were excluded.

The patients' sociodemographic, clinical, paraclinical, and therapeutic patient data were collected and analyzed. Several variables were studied, including:

- Socio-demographic variables: age, sex, educational level, standard of living defined by the ECOM survey [13] according the monthly income: low (<152 US$), medium (152 - 254 US$), and high (>254 US$); lifestyle habits (regular physical activity, consumption of tobacco, alcohol);
- Cardiovascular risk factors: arterial hypertension, diabetes mellitus, abdominal obesity (waistline > 94 cm in men, > 80 cm in women) [14], smoking, dyslipidemia, sedentary lifestyle;
- Clinical and paraclinical variables: history of cerebral ischemia, atrial fibrillation, topography of the cerebral ischemia (CT or MRI), nature of the AF (permanent or paroxysmal), type of the AF (valvular or non-valvular) the nature of the underlying cardiac disease; the level of thyroid hormones (TSH and T4L) looking for hyperthyroidism;

- The therapeutic variables: evaluation of the CHA2DS2-VASc and HAS-BLED scores, the rate control and anti-thrombotic treatments used.

Sampling was done by exhaustive pulling. Thus, out of 1781 hospitalized patients, 261 were for a stroke, of which 147 for a cerebral infarction. Among these ones, 138 files were selected by simple random pulling, and making our study sample.

Statistical analysis

The software CSPro 7.1 and Stata 12.0 allowed the recording, the classification and the analysis of the data. The qualitative and quantitative variables were compared with the Pearson Khi-2 test and the Student's test. Multivariate logistic regression analysis allowed the identification of predictive factors for AF. The threshold of significance was set at a value of $p < 0.05$.

Ethical clearance

This study has obtained ethical clearance from the Congolese Ethical Comittee for Research in Health Sciences.

3. Results

Of the 138 patients included, 11 had atrial fibrillation (AF), equals a frequency of 7.9%. The mean age of AF patients was 71 ± 8.8 years (range: 53 to 83 years) with a sex ratio of 0.83. The cardiovascular risk factors found were: arterial hypertension in eight cases (72.7%), diabetes in five cases (45.5%) and abdominal obesity in four cases (36.4%). Table 1 presents the main characteristics of patients according to the existence or not of AF. Regarding medical imaging, the middle and anterior cerebral arteries were the most frequent topographies, with 47% and 30% of cases respectively. AF was permanent in 10 cases (91%), and paroxysmal in one case (9%). It was labeled valvular in three cases (27.3%) and non-valvular in eight cases (72.7%). Cardiopathies involved were hypertensive in seven cases (63.6%), ischemic and valvular (mitral stenosis and mitral insufficiency) in two cases each. The CHA2DS2-VASc score, calculated in eight patients was at average at 2.2, and ≥2 in more than 80% of patients; HAS-BLED score of 2.4 on average was ≥ 3 in more than 72% of patients. For the rate control treatment, digoxin was used in seven cases (63.6%), a calcium channel blocking inhibitor in four cases (36.4%), and a beta-blocker in three cases (27.3%). Anti-thrombotic treatment was made of low molecular weight heparin (LMWH) in nine cases (81.8%), an anti-vitamin K in eight cases (72.7%), platelet antiaggregant (acetylsalicylic acid) in two cases (18.2%), and a direct oral anticoagulant in one case (9.1%). Multivariate analysis after logistic regression noted that, of the various factors analyzed, only age (OR = 20.10, p = 0.023), arterial hypertension (OR = 23.82, p = 0.011), and dyslipidemia (OR = 2.03, p = 0.032) were predictive factors for the occurrence of AF during cerebral infarction. Table 2 presents the results of the logistic regression.

4. Discussion

In the literature, the frequency of atrial fibrillation during cerebral infarctions is

Table 1. Characteristics of the studied population.

	AF group (n = 11)	Sinusal rhythm group (n = 127)	p
Age (*years*)	71 ± 8.8	67.2 ± 10.2	0.03
Men, *n* (%)	5 (45.5)	60 (47.2)	0.61
Secondary educational level, *n* (%)	5 (45.5)	60 (47.2)	0.52
Medium socioeconomic level, *n* (%)	7 (64)	72 (56.7)	0.43
Cardiovascular risk factors, *n* (%)			
arterial hypertension	8 (72.7)	110 (86.7)	0.02
diabetes mellitus	5 (45.5)	33 (20.5)	0.04
tobacco use	4 (36.4)	24 (19)	0.16
abdominal obesity	4 (36.4)	79 (62.2)	0.06
dyslipidemia	6 (54.5)	87 (68.5)	0.32
sedentariness	7 (64)	62 (48.8)	0.34
Alcohol consumption, *n* (%)	6 (54.5)	78 (61.4)	0.65
History of stroke, *n* (%)	3 (27.3)	37 (29.1)	0.20
History of AF, *n* (%)	2 (18.2)	-	-

AF: atrial fibrillation.

Table 2. Logistic regression of the atrial fibrillation associated factors.

	OR	CI (95%)	p
Age (>70 years old)	20.10	1.5 - 67.3	0.023
Sex	7.02	0.7 - 68.6	0.094
Arterial hypertension	23.82	10.2 - 101.9	0.011
Abdominal obesity	2.44	1 - 5.93	0.069
Alcohol consumption	1.26	0.3 - 12	0.837
Dyslipidemia	2.03	0 - 5.7	0.032
History of stroke	11.29	2.0 - 77.7	0.162
Sedentariness	0.99	0.27 - 3.59	0.989
Tobacco use	5.40	0.6 - 45.5	0.123
Diabetes mellitus	1.27	0.36 - 4.46	0.701

OR: odds ratio CI: confidence interval.

very variable, especially in its paroxysmal form, ranging from 2% to 26% according to the series [10] [14] [15] [16] [17]. This great variability is probably due to methodological differences, not only related to the duration of the study and the size of the sample which is the case in our study, but also and especially to the methods used to detect AF. Indeed, if the diagnosis of permanent AF is easy on the standard ECG alone, it is more difficult for paroxysmal AF. In the different studies, there is a clear correlation between the duration of the recording and the detection rate of paroxysmal AF. In these different series, the lowest AF frequencies were obtained with recordings lasting 24 to 48 hours [12] [18] [19] [20], while the highest FA frequencies were recorded with implantable devices, performing long-term recordings of up to 1500 hours on average [21]-[26]. This is the case for Ritter *et al.* [23], who reported in a comparative study of FMD detection, frequencies of 2% and 17%, depending on whether it was a recording of shorter duration (168 h) or longer duration (1536 h). Thus,

the short recording time (24 to 48 hours) may explain the low detection rate of AF, as some authors have shown [18] [19] [20]. In addition, more recent studies have highlighted the importance of certain recording methods in the detection of paroxysmal AF, with much greater sensitivity and specificity than traditional recording methods. This is the case of continuous monitoring in Neurovascular Intensive Care Unit (NICU), by conventional or automated method [22]; this latter makes it possible to detect paroxysmal AF with a high sensitivity from the first 72 hours after admission to NICU. However, despite the ever-increasing number of strokes in our context, the scarcity of these units makes it difficult to exploit this innovative and beneficial technique. In our series as well as in other studies in sub-Saharan Africa [15] [17] [27] [28], patients with cerebral infarction are relatively young, compared to those in Western series [29], the frequency of AF increases with age [30], which may explain the relative rarity of this rhythm disorder during cerebral infarctions in this part of the continent where high blood pressure is the main risk factor for stroke. Regarding factors predicting the occurrence of AF during cerebral infarctions in our series, only advanced age (>70 years old), the presence of arterial hypertension, and the existence of dyslipidemia were identified as factors associated with AF, as other authors have also shown [10] [15]. However, there are a multitude of other factors often involved in the onset of AF, including diabetes mellitus, obesity, sleep apnea syndrome, and many others [31]. The systematic search for these various factors and their effective management could help to reduce the risk of atrial fibrillation and the burden of morbidity and mortality attributable to it.

5. Conclusion

This preliminary study showed that atrial fibrillation (AF) is relatively infrequent during brain infarction in Brazzaville. It is frequently found in elderly people, mostly hypertensive, constituting its main predictive factors. Its systematic research in the etiological assessment of cerebral infarctions raises the problem of age because of the profitability of the 24 h Holter, its availability and its cost. Hence it's in need of preventive measures based on the effective management of modifiable risk factors (hypertension, diabetes, dyslipidemia, obesity) to reduce the burden of AF and its complications.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Lemogoum, D., Degaute, J.P. and Bovet, P. (2005) Stroke Prevention, Treatment and Rehabilitation in Sub-Saharan Africa. *American Journal of Preventive Medicine*, **29**, 95-101. https://doi.org/10.1016/j.amepre.2005.07.025

[2] Murray, C.J.L. and Lopez, A.D. (1997) Mortality by Cause for Eight Regions of the World: Global Burden of Disease Study. *The Lancet*, **349**, 1269-1276.

https://doi.org/10.1016/S0140-6736(96)07493-4

[3] Dennis, M.S., Burn, J.P., Sandercock, P.A., Bamford, J.M., Wade, D.T. and Warlow, C.P. (1993) Long-Term Survival after First-Ever Stroke: The Oxfordshire Community Stroke Project. *Stroke*, **24**, 796-800. https://doi.org/10.1161/01.STR.24.6.796

[4] Hankey, G.J. and Warlow, C.P. (1999) Treatment and Secondary Prevention of Stroke: Evidence, Costs and Effects on Individuals and Populations. *The Lancet*, **354**, 1457-1463. https://doi.org/10.1016/S0140-6736(99)04407-4

[5] Heller, R.F., Langhorne, P. and James, E. (2000) Improving Stroke Outcome: The Benefits of Increasing Availability of Technology. *Bulletin of the World Health Organization*, **78**, 1337-1343.

[6] Mohr, J.P., Caplan, L.R., Melski, J.W., *et al.* (1978) The Harvard Cooperative Stroke Registry: A Prospective Registry. *Neurology*, **28**, 754-762. https://doi.org/10.1212/WNL.28.8.754

[7] Sandercock, P., Bamford, J., Dennis, M., *et al.* (1992) Atrial Fibrillation and Stroke: Prevalence in Different Types of Stroke and Influence on Early and Long Term Prognosis (Oxfordshire Community Stroke Project). *British Medical Journal*, **305**, 1460-1465. https://doi.org/10.1136/bmj.305.6867.1460

[8] Hohnloser, S.H., Crijns, H.J., Van Eickels, M., *et al.* (2009) Effect of Dronaderone on Cardiovascular Events in Atrial Fibrillation. *The New England Journal of Medicine*, **360**, 668-678. https://doi.org/10.1056/NEJMoa0803778

[9] Connolly, S.J., Ezekowitz, M.D., Yusuf, S., *et al.* (2009) Dabigatran versus Warfarin in Patients with Atrial Fibrillation. *The New England Journal of Medicine*, **361**, 1139-1151. https://doi.org/10.1056/NEJMoa0905561

[10] Rizos, T., Rasch, C., Jenetzky, E., *et al.* (2010) Detection of Paroxysmal Atrial Fibrillation in Acute Stroke Patients. *Cerebrovascular Diseases*, **30**, 410-417. https://doi.org/10.1159/000316885

[11] Alhadramy, O., Jeerakathil, T.J., Majumdar, S.R., Najjar, E., Choy, J. and Saqqur, M. (2010) Prevalence and Predictors of Paroxysmal Atrial Fibrillation on Holter Monitor in Patients with Stroke or Transient Ischemic Attack. *Stroke*, **41**, 2596-2600. https://doi.org/10.1161/STROKEAHA.109.570382

[12] Jabaudon, D., Sztajzel, J., Sievert, K., Landis, T. and Sztajzel, R. (2004) Usefulness of Ambulatory 7-Day ECG Monitoring for the Detection of Atrial Fibrillation and Flutter after Acute Stroke and Transient Ischemic Attack. *Stroke*, **35**, 1647-1651. https://doi.org/10.1161/01.STR.0000131269.69502.d9

[13] Second Congolese Household Survey for Monitoring and Evaluating Poverty (2011) Ministry of Planning and Integration. QUIBB-ECOM2 Analysis Report. 142.

[14] Gombet, T.R., Ellenga-Mbolla, B., Ikama, M.S. and Etitiele, F. (2007) Risk Factors for Ischemic Stroke at the University Hospital of Brazzaville. *Médecine d'Afrique noire électronique*, **54**, 639-645.

[15] Damorou, F., Togbossi, E., Pessinaba, E., *et al.* (2008) Strokes and Emboligenic Cardiovascular Disease. *Mali Médical*, **23**, 31-33.

[16] Bendriss, L. and Khatouri, A. (2012) Ischemic Strokes. Frequency of Cardiovascular Etiologies Documented by an Extensive Cardiovascular Assessment. About 110 Ischemic Stroke Cases. *Annales de Cardiologie et d'Angéiologie*, **61**, 252-256. https://doi.org/10.1016/j.ancard.2012.04.011

[17] Ikama, M.S., Makani, J., Mpandzou, G., *et al.* (2018) Contribution of the ECG Holter in the Etiological Assessment of Cerebral Infarction in Brazzaville, Congo. *The Pan African Medical Journal*, **31**, 235. https://doi.org/10.11604/pamj.2018.31.235.17709

[18] Barthélémy, J.C., Féasson-Gérard, S., Garnier, P., *et al.* (2003) Automatic Cardiac Event Recorders Reveal Paroxysmal Atrial Fibrillation after Unexplained Strokes or Transient Ischemic Attacks. *Annals of Noninvasive Electrocardiology*, **8**, 194-199. https://doi.org/10.1046/j.1542-474X.2003.08305.x

[19] Hornig, C.R., Haberbosh, W., Lammers, C., Waldecker, B. and Dorndorf, W. (1996) Specific Cardiological Evaluation after Focal Cerebral Ischemia. *Acta Neurologica Scandinavica*, **93**, 297-302. https://doi.org/10.1111/j.1600-0404.1996.tb00524.x

[20] Schaer, B.A., Zellweger, M.J., Cron, T.A., Kaiser, C.A. and Osswald, S. (2004) Value of Routine Holter Monitoring for the Detection of Paroxysmal Atrial Fibrillation in Patients with Cerebral Ischemic Events. *Stroke*, **35**, e68-e70. https://doi.org/10.1161/01.STR.0000117568.07678.4B

[21] Elijovich, L., Josephson, S.A., Fung, G.L. and Smith, W.S. (2009) Intermittent Atrial Fibrillation May Account for a Large Proportion of Otherwise Cryptogenic Stroke: A Study of 30-Day Cardiac Event Monitors. *Journal of Stroke and Cerebrovascular Diseases*, **18**, 185-189. https://doi.org/10.1016/j.jstrokecerebrovasdis.2008.09.005

[22] Rizos, T., Güntner, J., Jenetzky, E., *et al.* (2012) Continuous Stroke Unit Electrocardiographic Monitoring versus 24-Hour Holter Electrocardiography for Detection of Paroxysmal Atrial Fibrillation after Stroke. *Stroke*, **43**, 2689-2694. https://doi.org/10.1161/STROKEAHA.112.654954

[23] Ritter, M.A., Kochhäuser, S., Duning, T., *et al.* (2013) Occult Atrial Fibrillation in Cryptogenic Stroke: Detection by 7-Day Electrocardiogram versus Implantable Cardiac Monitors. *Stroke*, **44**, 1449-1452. https://doi.org/10.1161/STROKEAHA.111.676189

[24] Wallmann, D., Tüller, D., Wusmann, K., *et al.* (2007) Frequent Atrial Premature Beats Predict Paroxysmal Atrial Fibrillation in Stroke Patients: An Opportunity for a New Diagnostic Strategy. *Stroke*, **38**, 2292-2294. https://doi.org/10.1161/STROKEAHA.107.485110

[25] Tayal, A.H., Tian, M., Kelly, K.M., *et al.* (2008) Atrial Fibrillation Detected by Mobile Cardiac Outpatient Telemetry in Cryptogenic TIA or Stroke. *Neurology*, **71**, 1696-1701. https://doi.org/10.1212/01.wnl.0000325059.86313.31

[26] Cotter, P.E., Martin, P.J., Ring, L., Warburton, E.A., Belham, M. and Pugh, P.J. (2013) Incidence of Atrial Fibrillation Detected by Implantable Loop Recorders in Unexplained Stroke. *Neurology*, **80**, 1546-1550. https://doi.org/10.1212/WNL.0b013e31828f1828

[27] Mapoure, N.Y., Tchaleu Nguenkam, C.B., Mbatchou Ngahane, H.B., *et al.* (2014) Predictors of in-Hospital Mortality for Stroke in Douala, Cameroon. *Stroke Research and Treatment*, **2014**, Article ID: 681209. https://doi.org/10.1155/2014/681209

[28] Adoukonou, T.A., Vallat, J.M., Joubert, J., *et al.* (2010) Stroke Management in Sub-Saharan Africa. *Revue Neurologique*, **166**, 882-893. https://doi.org/10.1016/j.neurol.2010.06.004

[29] Gunalp, M., Atalar, E., Coskun, F., *et al.* (2006) Holter Monitoring for 24 Hours in Patients with Thromboembolic Stroke and Sinus Rhythm Diagnosed in the Emergency Department. *Advances in Therapy*, **23**, 854-860. https://doi.org/10.1007/BF02850206

[30] Furberg, C.D, Psaty, B.M., Manolio, T.A., Gardin, J.M. and Smith, V.E. (1994) Prevalence of Atrial Fibrillation in Elderly Subjects (the Cardiovascular Health Study). *American Journal of Cardiology*, **74**, 236-241. https://doi.org/10.1016/0002-9149(94)90363-8

[31] Lévy, S., Maarek, M., Coumel, P., *et al.* (1999) Characterization of Different Subsets of Atrial Fibrillation in General Practice in France: The ALFA study. The College of French Cardiologists. *Circulation*, **99**, 3028-3035. https://doi.org/10.1161/01.CIR.99.23.3028