



IS THERE ANY RELATIONSHIP BETWEEN ACUTE STROKE AND PARANASAL SINUSITIS AMONG CENTRAL AFRICAN PATIENTS?

Michel Lelo Tshikwela*	M.D., Ph.D, Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo.*Corresponding Author
Anglade Banzuzi N'sompá	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Angèle Mbongo	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Nancy Moyo Kimfuidi	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Serge Malenga Mpaka	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Stéphane Yanda Tongo	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Cynthia Minouche Bukamba	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Frederick Tshibusu Tshienda	M.D. Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Antoine Molua Aundu	M.D.,Ph.D.Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Jean Mukaya Tshibola	M.D.,Ph.D.Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Joseph- Médard Kabeya Kabenkama	M.D.,Ph.D.Department of Radiology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Richard Matanda Nzanza	M.D.,Ph.D.Department of Otorhinolaryngology, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo
Benjamin Longo-Mbenza	M.D.,Ph.D., D. Sc. Department of Internal Medicine, Kinshasa University Hospital, Kinshasa University, Democratic Republic of the Congo

ABSTRACT

Objective: Many patients with ischemic stroke lesions seemed to have incidental paranasal sinusitis. In our community, these data have not yet been assessed. Therefore, the aim of this study was to examine the relationship between the two pathologies.

Materials and methods: A prospective study was conducted from January 2015 to December 2016, to assess the brain computed tomographic images of 215 black Africans suffering from acute stroke. Data concerning the association of ischemic stroke and paranasal sinusitis, age, sex, risk factors, type of sinusitis and Glasgow scale score were accessed using logistic regression models.

Results: The incidence of paranasal sinusitis in all acute stroke patients was 32%. In this group of 70 patients, the average age was 57.4 years old. The association was more common in patients between 65 and 89 years old ($p < 0.005$). The sex ratio was 1. The common stroke risk factors were chronic hypertension (66%) and diabetes mellitus (30%). Chronic paranasal sinusitis was found in 43 patients. Maxillary sinuses were involved in 74.4%. A Glasgow scale score < 8 (unfavorable outcome) was seen in 58 patients (84%).

Conclusion: In this study, the findings suggest a strong association of acute stroke and sinusitis. Paranasal sinusitis seems to be a marker of poor outcome in acute stroke. Future studies are needed to confirm these findings.

KEYWORDS : ischemic stroke, sinusitis, association, black Africans.

INTRODUCTION

Ischemic stroke is a leading cause of disability and death worldwide and in sub-Saharan Africa (Di Carlo, 2009), (Feigin et al., 2014), (Tshikwela et al., 2015), (Owolabi et al., 2019).

Currently, there is a high stroke incidence, prevalence and mortality in contrast to the relative decline in stroke incidence in high-income countries due to better awareness and control of vascular risk factors (Owolabi et al., 2019). In our daily

practice of brain computed tomography, many patients with acute stroke lesions seemed to have paranasal sinusitis. This pilot study was conducted to examine whether ischemic stroke may be associated with sinusitis and to determine any relationship between the two pathologies in central Africa.

MATERIALS AND METHODS

This was a single center, prospective study of patients referred to our department of radiology for head CT from January 2015 to December 2016. The patients selected suffered from first occurrence of ischemic stroke lesions. The CT examinations were performed with a helicoidally machine (Hitachi Eclon, Japan 2000) within 3 days of symptom onset. In our department, the selected image plan began at the base of the skull, extending from the maxillary sinuses to the vertex, in the usual 10 mm cuts, spaced 5 mm apart, without using material contrast.

We determined the incidence of sinusitis seen as mucosal thickening, inflammatory fluid accumulation and submucosal cysts in the frontal, ethmoid, sphenoid, and maxillary sinus in all ischemic stroke patients, and selected patients matched for age and sex, common risk factors, type of sinusitis (acute or chronic) and Glasgow scale score.

The study was approved by the ethics committee of the hospital. Statistical analyses of the data were performed using the commercial software SPSS 23.

RESULTS

A total of 215 patients with first even of acute stroke were recorded, of which, 70 (32%) had associated ischemic lesions with sinusitis. The average age was 57. 4 years old ranging from 25 to 89 years old. The association was more common in patents between 65 and 89 years old ($p < 0.005$). The sex ratio was 1. The common stroke risk factors recorded were: chronic and uncontrolled hypertension (66%) and co-morbidities of diabetes mellitus (30%) and obesity (2%). Incidental chronic sinusitis was found in 43 patients and acute was found in 27 patients.

Maxillary sinuses were involved in 74.4% of cases, and ethmoidal sinuses were involved in 11. 4%. A Glasgow scale score < 8 was seen in 84% of patients with unfavorable outcomes.

DISCUSSION

The aim of this study was to examine whether sinusitis was associated with acute stroke and to determine any relationship between the two pathologies in Central African patients. It is known that identifying the cause of stroke in each case is important for managing the acute phase of the disease, minimizing its progression and preventing its recurrence (Silva et al., 2015).

In this study, the incidence of sinusitis in patients with cerebral infarction was 32. 6%. Some published studies reported the association of sinusitis and cerebral ischemia. Previously in 2003 in the USA, Schlosser et al. found an incidence of 12% in a population of 244 patients admitted with ischemic stroke (Schlosser et al., 2003). In 2009 in France, Righini et al. reported a case of a 28-year-old woman with acute sphenoid sinusitis complicated by ischemic stroke in the left caudate nucleus, lentiform nucleus, and posterior part of the internal capsule (Righini et al., 2009). In 2018 in Korea, Lee et al. reported a study of 22.959 patients with chronic rhinosinusitis who had consistently increased risk of stroke regardless of age and sex (Lee et al., 2018). More recently in 2019, Wattanachayakul et al., in a systemic review and meta-analysis of the risk of stroke among patients with chronic rhinosinusitis concluded that chronic rhinosinusitis is associated with a higher risk of stroke (Wattanachayakul et al., 2019).

Intracranial infectious complications of sinusitis are well known and scary and include lobar and epidural abscesses, subdural empyema, meningitis, sinus thrombosis and cerebritis (Bayonne et al., 2009), (Szyfter et al., 2018). Vascular complications remain complex but increasingly understood. In their introduction, Miller et al., reported that the relationship between infection and stroke may have been suspected as early as the second century A.D., when Galen described "apoplexy" as due to "some inflammatory disease that exists in the head" and the twenty-first century has brought exciting advances in our understanding of the complex interactions between infection and stroke (Miller et al., 2016). And according to Heikinheimo, chronic infections may increase the risk of stroke through a variety of mechanisms. First, they can influence other risk factors such as serum lipids. Infections can be risk factors alone and in combination with conventional risk factors and genetic predisposition. Second, they can damage the vascular endothelium. Third, recurrent bacteremia triggers platelet activation and causes a procoagulant state. Chronic dental infections and chronic chlamydia pneumoniae-infection and antibodies are prevalent in both coronary heart disease and in stroke patients (Heikinheimo, 2015). Also, HIV/AIDS infection accelerated atherosclerogenesis and increased the risk of stroke in young black Africans (Longo-Mbenza et al., 2011). In our previous studies concerning the predictors of stroke-associated case fatality in black Central Africans patients (Longo-Mbenza et al., 2008), (Lelo et al., 2015), hyperleucocytosis and a high level of fibrinogen from infections were implicated.

In this study, chronic sinusitis was found in 43 patients and acute sinusitis was found in 27 patients. Grau et al., reported that chronic infections, such as periodontitis, chronic bronchitis and infection with *Helicobacter pylori*, *Chlamydia pneumoniae* or Cytomegalovirus, might increase stroke risk (Grau et al., 2010), and we presume that chronic sinusitis may be a risk factor for stroke as are chronic hypertension and diabetes mellitus in central Africa, adding information to the numerous diagnostic and therapeutic challenges related to stroke diagnosis and management in resource-limited settings (Gadama et al., 2017). Age, sex and stroke risk factors, were the same as those observed in our previous studies.

Recently, Fabre et al., reported one case of ischemic stroke on MRI, that was associated with carotid arteritis and complete obstruction of the maxillary sinuses and had a favorable outcome after endoscopic drainage of the sinuses and broad-spectrum antibiotic therapy. They hypothesized that complication from this site of the paranasal sinuses were probably due to the spread of an infectious inflammatory reaction to the intrapetrous carotid artery and its branches via the pterygoid venous plexus (Fabre et al., 2018). In our daily practice, we found that maxillary sinuses were involved in 74. 4% of cases and ethmoidal sinuses were involved in 11.4%.

In this series of acute stroke and sinusitis patients, a Glasgow scale score < 8 was seen in most of patients (84%). Several authors have suggested that prestroke infections are related to the severity of stroke (Longo-Mbenza et al., 2011); (Lelo et al., 2015), (Heikinheimo, 2015). In Malawi, another country located south of the Sahara, Heikinheimo found that heart failure, malignancy, heavy alcohol drinking, larger lesion size and upper respiratory tract infection were risk factors associated with an unfavorable outcome. Our research hypothesis was that this association may be a sign of poor prognosis.

The limitations of this study are related to being monocentric, having an observational design and being hospital-based.

Many stroke studies are community-based. Additionally, a small number of stroke cases in the population were studied. Finally, the study did not take into account other predictors of poor outcome. All these biases might have been introduced and might not be a true representation of what happened in the community; hence extrapolations of the results to the rest of the community should be done with caution.

Despite these limitations, this study carried out locally in Central Africa and based on CT scan data, seems to be the first one in this area, as far as we are aware. It provides valuable information on acute stroke in black Africans by confirming pathology often associated, for managing the acute phase of the disease, minimizing its progression and preventing its recurrence.

In future studies, each of the biases should be taken into consideration to scientifically estimate the significance and robustness of this epidemiological data to demonstrate the clinical implication of paranasal sinusitis in determining poor outcomes of patients suffering from acute stroke.

CONCLUSION:

In this study conducted in central Africa, the findings suggest a strong association between ischemic stroke and sinusitis. And if sinusitis may be considered a risk factor, it seems to be a marker of poor outcome.

REFERENCES

1. Bayonne E, Kania R, Tran P, Huy B, Herman, P. (2009). Intracranial complications of rhinosinusitis. A review, typical imaging data and algorithm of management. *Rhinology*; 47: 59-65.
2. Di Carlo A. Human and economic burden of stroke (2009). *Age Ageing*; 38: 4-5.
3. Fabre C, Atallah I, Wroblewsky I, Righini CA. (2018) Maxillary sinusitis complicated by stroke. *Eur Ann Otorhinolaryngol Head Neck Dis*, 135(6): 449-451.
4. Feigin VL, Forouzanfar MH, Krishnamurthi R et al. (2014) Global and regional burden of stroke during 1990-2010: findings from the Global Burden of Disease Study 2010. *Lancet*; 383: 245-254.
5. Gadama YG, Mwangalika G, Kinley et al. (2017) Challenges of stroke management in resource-limited settings: A case-based reflection. *Malawi Med J.*; 29(2): 189-193.
6. Grau AJ, Urbaneck C, Palm F. (2010) Common infections and the risk of stroke. *Nat Rev Neurol.* ; 6(12):681-694.
7. Heikinheimo T. (2015) Infectious, stroke and brain. What are the outcomes? Academic dissertation. Department of Neurology, Helsinki University, Finland.
8. Lee WH, Kim J-W, Lim J-S, Kong IG, Choi HG. (2018). Chronic rhinosinusitis increases the risk of hemorrhagic and ischemic stroke: A longitudinal follow-up study using a national sample cohort. *PLoS ONE*; 13(3): e 0193886. <https://doi.org/10.1371/journal.pone.0193886>
9. Lelo TM, Bugugu CG, Yanda TS, et al. (2015). Clinical, Biological and CT Predictors of In-Hospital Mortality in Ischemic Stroke Patients in Central Africa. *J Trop Dis*, 4:1.
10. Longo-Mbenza B, LongokoloMashi M, Lelo TM, et al. (2011). Relationship between younger age, autoimmunity, cardiometabolic risk, oxidative stress, HAART, and ischemic stroke in africans with HIV/AIDS. *ISRN cardiol*:897908.
11. Longo-Mbenza B, Lelo TM, Mbuilu PJ. (2008). Rates and predictors of stroke-associated case fatality in black central African patients. *Cardiovascular Journal of Africa*; 19, 2:72-76.
12. Miller EC, Elkind MS. (2016). Infection and Stroke: an Update on Recent Progress. *Curr Neurol Neurosci Rep.*; 16(1):2.
13. Owolabi M, Sa FS, Akinyemi R, Gebreyohanns M, Ovbiagele R. (2019) The Sub-Saharan Africa conference on stroke (SSACS): An idea whose time has come. *J Neurol Sci.*; 400:194-198.
14. Righini CA, Bing F, Bessou P, Boubagra K, Rey E. (2009). An acute ischemic stroke secondary to sphenoid sinusitis. *Ear Nose Throat J*; 88: E23-28.
15. Schosser M, Hazeleleft S, Gareri M, Wright K, Allen K. (2003). Incidence of sinusitis in acute ischemic stroke patients. *Journal of Stroke and Cerebrovascular Diseases*; 12, 5: P248.
16. Silva GS, Koroshetz WJ, Gonzalez RG, Schwamm LS. Causes of ischemic stroke. In Gonzalez RG et al (eds). *Acute ischemic stroke*. DOI: 101007/978-3-3-462-12751-9_2.
17. Szyfter W, Bartochowska A, Borucki L, Maciejewsk A, Kruk- Zagaewska A. (2018) Simultaneous treatment of intracranial Complications o paranasal sinusitis. *European Archives of Oto-Rhino-Laryngology*; 275 (5) 1165-1173
18. Tshikwela ML, Londa FB, Tongo SY. (2015). Stroke subtypes and factors associated with ischemic stroke in Kinshasa, Central Africa. *Afr Health Sci*; 15: 68-73.
19. Wattanachayakul P, Rujirachun P, Ungprasert P. (2019). Risk of Stroke among Patients with Chronic Rhinosinusitis: A Systematic Review and Meta-analysis. *Journal of Stroke and Cerebrovascular Diseases*, 28(5):1185-1191.