Intracranial aneurysms in an African country

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Abstract

Background: Characteristics of intracranial aneurysms display ethnic variations. Data on this disease from the African continent is scarce and often conflicting. Aim: To describe site, age and gender distribution of intracranial aneurysms among Kenyans. Study Design and Setting: Retrospective study at Kenyatta National Hospital, Kenya. Materials and Methods: All records of black African patients with a diagnosis of intracranial aneurysms seen at Kenyatta National Hospital, the largest referral hospital in the Eastern and Central African region, over the period from January 1998 to December 2007 were examined for site, age and gender distribution. The data gathered were coded, analyzed with SPSS 11.50. Results: Fifty-six cases of intracranial aneurysms were analyzed. The posterior communicating artery was the most affected (35.7%), followed by the anterior communicating artery (26.8%), while the posterior cerebral artery was the least affected (2%). Multiple aneurysms were present in 2%. The mean age at presentation was 50.9 years (range 21-80 years) and the gender distribution was equal. Conclusions: Intracranial aneurysms among Kenyans occur most commonly on the posterior communicating artery, in young individuals, and without gender bias. The distribution differs from that described in the literature and this requires search for risk factors.

Key words: Age, gender, intracranial aneurysms, site

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Introduction

Intracranial aneurysms occur in 1-6% of healthy subjects.^[1] Their localization shows wide diversity,^[2] but most saccular aneurysms occur in the circle of Willis and its branches.^[3,4] Site, age and gender distribution of aneurysms may show ethnic variations.^[5-10] In Africa, with rise in ischemic cardiovascular disease risk factors,^[11,12] intracranial aneurysms are likely to gain prominence. Evidence from some African states indicates that these aneurysms are not uncommon and the incidence may be doubling every five years.^[13] Data from the continent is scarce, and often conflicting.^[13,14] This study reports site, age and gender distribution of intracranial aneurysms among Kenyans.

Materials and Methods

Records of patients with the diagnosis of intracranial aneurysms from the largest Eastern and Central African

regional hospital, Kenyatta National Hospital, in Nairobi Kenya, from January 1998 to December 2007 were examined for site, age and gender distribution. The study had the ethical approval from the Kenyatta National Hospital-Ethics and Research Committee (KNH-ERC/01/404). Only the patients with complete records and a confirmed diagnosis of aneurysm were included. Those whose records were incomplete for age, gender and those with uncertain diagnosis were excluded. The patient files were categorized into age groups of 10 and subsequently for each group by gender (male and female). The data obtained were coded, entered and analyzed using SPSS version 11.50 Illinois. Descriptive statistics were used to report the means, modes and frequencies.

Results

Of the 76 patients presented with subarachnoid hemorrhage (SAH) during the study period, in 58 it was aneurysmal SAH. Two patients were excluded from further analysis,

one because of incomplete records and the other for uncertain diagnosis. All patients underwent conventional cranial computed tomography (CT) scan as a baseline investigation. However, 36 (64.3%) of the aneurysms were confirmed by CT angiogram and 20 by four-vessel angiography (35.7%). Majority of the aneurysms (98%) were single, and confined to the circle of Willis, predominantly in the anterior circulation. Posterior communicating artery was the most affected site (35.7%), followed by anterior communicating artery (26.8%). The internal carotid artery was the third most involved (17.9%) site, while the least affected was the posterior cerebral artery (2%). Multiple aneurysms were detected in only 2% of the cases, in the middle cerebral artery [Figure 1].

Of the 56 patients, 17 patients died (30.4%), 12 while waiting for surgery, two during operation and three within 48 h of postoperative period while 39 (69.6%) were successfully treated and discharged.

Age distribution

The most commonly affected age groups were 41-50 and 51-60 years while the least affected age groups were 21-30 and 70-80 years. The mean age was 50.9 years (Range: 21-80). 39.2% (N=22) of the patients were aged 50 years and below. Nine (45%) of the aneurysms on the posterior communicating artery were seen in patients under 40 years of age, while aneurysms on other arteries were seen in patients above 40 years of age [Table 1].

Gender distribution

The gender distribution was equal. However, the gender distribution varied depending on the artery affected. For example, aneurysms of the posterior communicating artery showed a slight female predominance, those of the anterior communicating artery had a male predominance; while those of the internal carotid artery showed female predominance of about 4:1 [Figure 2].



Figure 1: Site distribution of intracranial aneurysm

Discussion

The observations of the current study suggest that intracranial aneurysms are more common than previously reported from African countries 20-30 years ago.^[15,16,17] Even though the rates may appear lower than those reported from some of the African countries,^[7,13] they suggest that aneurysms constitute a significant problem for neurosurgeons in Kenya to look out for.

In this study, similar to the observations in the literature arteries in the anterior half of the circle of Willis were more affected than in the posterior half.^[2,5,18] The posterior communicating artery was the most commonly affected artery as in a few studies on black Africans.^[15,19] This finding is, however, at variance with most studies which report the anterior communicating artery as the commonest site of intracranial aneurysms.^[1,20] Studies in different ethnic groups suggest wide variations in the artery most involved in aneurysms [Table 2].

The other observation in the present study was that the number of arteries involved was fewer than the reported in other studies.^[1,4,14] Saccular aneurysms develop from defects in the tunica media and internal elastic lamina of arteries which render them less resistant to intraluminal pressure changes. The defects most frequently develop at vessel branching points where blood flow is turbulent and shear forces are greatest^[3] and are accelerated by hypertension and/or atherosclerosis.^[4] The reported wide variations suggest that the sites of aneurysm show ethnic diversity as suggested by Firouznia and colleagues.^[3] The determining factors may include genetic factors, intrinsic mural factors, and the branching pattern of the cerebral



Figure 2: Gender distribution of intracranial aneurysms

Age group (years)	Site of intracranial aneurysms						
	Posterior communicating	Anterior communicating	Internal carotid	Anterior cerebral	Middle cerebral	Posterior cerebral	Multiple
21-30	2	-	-	-	-	-	-
31-40	7	-	-	-	-	-	-
41-50	5	1	2	5	-	-	-
51-60	3	13	5	-	2	-	1
61-70	2	1	3	-	2	-	-
71-80	1	-	-	-	-	1	-
Total counts	20	15	10	5	4	1	1

Table 1: Age distribution of intracranial aneurysms

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Author	Population	Sample	Most frequent		
		size	site		
Louw et al., 2004 ^[7]	South African	223	Internal carotid		
Anim, 1985 ^[16]	Ghanaian	310	Anterior cerebral		
Ohaegbulam	American	73	Posterior		
et al., 1990 ^[19]	(Black)		communicating		
	American	171	Middle cerebral		
	(White)				
Krishna	Indian	451	Anterior		
et al., 2005 ^[21]			communicating		
El-Khamlichi	Morrocan	200	Internal carotid		
et al., 2001 ^[13]					
lwamoto et al., 1999 ^[5]	Japanese	57	Middle cerebral		
Oh et al., 2008 ^[22]	Polish	17	Internal carotid		
Sim, 2004 ^[23]	Korean	2500	Anterior		
			communicating		
Firouznia	Iranian	130	Anterior		
et al., 2005 ^[3]			communicating		
Current Study	Kenyan	58	Posterior		
·			communicating		

Table 2: Ethenic groups - Most frequent site of aneurysm

arteries. In the present study, among individuals aged above 40 years, the commonest site of aneurysm was the anterior communicating artery. In the study from India by Krishna *et al.*,^[21] anterior communicating artery was the commonest site in adults and in children it was the internal carotid artery bifurcation. These observations suggest that age may play a factor in addition to other predisposing factors in determining the site of aneurysm development.

The location of the aneurysm determines the clinical presentation, prognosis and management.^[24] For example, aneurysms in the posterior cerebral circulation rupture more commonly than those in other sites.^[5,25] The predominant involvement in this Kenyan population was anterior circulation. The high rate of rupture observed in the present study in the anterior circulatiom may be due to other factors such as atherosclerosis, hypertension, lack of awareness among the primary physicians and referral pattern.

The reported incidence of multiple cerebral aneurysms varied between 5 and 35% with higher incidence in patients aged above 40 years [Table 3].^[7] The frequency of multiple aneurysms in our series was 2%. Multiple cerebral aneurysms are more common in post-menopausal

Table 3: Incidence of multiple aneurysms						
Author	Population	Sample size	Incidence (%)			
Firouznia <i>et al.</i> , 2005 ^[3] Sim, 2004 ^[23] Vega-Basulto <i>et al.</i> , 2003 ^[6] Inagawa and Hirano, 1990 ^[28]	Iranian Korean Cuban Japanese	130 2500 524 84	10 8.6 21.5 19			
El Khamlichi <i>et al.</i> , 2002 ^[13] Louw <i>et al.</i> , 2004 ^[7] Current study, 2009	Morrocan South African Kenyan	200 223 56	9 34.5 2			

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Author	Population	Sample	Mean	M:F
		size	age	
El Khamlichi <i>et al.,</i> 2001 ^[13]	Moroccan	200	52	1:1.1
Louw et al., 2004 ^[7]	South African	223	45.5	1:1.7
Inagawa and Hirano, 1990 ^[28]	Japanese	84	65	1:1.7
Vega-Basulto <i>et al.,</i> 2003 ^[6]	Cuban	524	46	1:3
Sim, 2004 ^[23]	Korean	2,500	61	1:1.4
Firouznia et al., 2005 ^[3]	Iranian	130	45.8	1:1.5
Iwamoto et al., 1999 ^[5]	Japanese	57	-	1:2.4
Yu-Xiang <i>et al.</i> , 2006 ^[8]	Chinese	251	69	1:1.4
Krishna <i>et al.</i> , 2006 ^[21]	Indian	451	48.21	1:1.05
Current study	Kenyan	58	49	1:1

women, hypertensive patients, smokers and patients with family history,^[26] and the prognosis is poor when compared to single aneurysm.^[27] The low incidence in our study may be due to younger age of the study population.

The prevalence rates are highest in the seventh decade and in females the higher prevalence has two peaks, 40-49; and 60-69 years.^[5,8] The mean age of the patients in our study was 50.9 years and 66% of the patients were in the 40-60 years age group. Similar were the observations in other studies [Table 4].^[3,6,7,21] None of our patients was aged below 20 years. Even though rare, aneurysms have been described in this age group.^[21,23] Age as an idependent variable may suggest that ethnic^[19,29] and genetic^[30] factors influence the age at presentation. Aneurysms are more common in women over 50 years of age^[5,8,31] and also some studies have reported that the female gender is risk factor for both formation and growth of aneurysms.^[32-34]

This study suggests that intracranial aneurysms are not uncommon in Kenyans. The most common arterial site in young is posterior communicating artery and in the older individuals it is anterior communicating artery. This distribution differs from the reported observations in other populations. There is a need to study the possible risk factors for this difference.

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