Cerebral Atherosclerosis in Uganda

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AND R. B. LOEWENSON, PH.D.

SUMMARY A study of arterial circles of Willis from a series of 715 consecutive autopsies in Ugandan Africans shows that severity of cerebral atherosclerosis increases with age. No significant difference exists between men and women nor among main tribal groups. The severity is less in Ugandan Africans than in United States blacks but is approximately the same in United States Caucasians. However, the Ugandan Africans show a more severe cerebral atherosclerotic involvement than do the Nigerians.

ATHEROSCLEROSIS is apparently a universal disease although its prevalence and severity vary among countries and racial groups. Most studies on atheroma and its complications in the African native come from Southern Africa, and the results have been conflicting.

Findings show that complications of atheroma such as cerebral and coronary thrombosis are rare in the South African Bantu.1-4 Edington6 suggests that coronary and cerebral complications of atheroma are rare also in West Africans. James7 in a study of Ugandan autopsies concluded that cerebral atheroma plays only a minor role in the etiology of cerebrovascular disease. Conversely, a high frequency of cerebrovascular disease in African populations has been reported.8-13

More recent attempts have been made to compare prevalence and severity of cerebral artery atherosclerosis at autopsy in Nigerians, U.S. blacks, and U.S. Caucasians.14-16 Results showed that Nigerians have a lower prevalence of disease with less severity than does either U.S. group.

We wish to report on the severity of cerebral atherosclerosis at autopsy in Ugandan Africans and compare it with that of Nigerians, U.S. blacks, U.S. Caucasians, and Asian Indians.

Methods

Mulago Hospital, Kampala, is a 1,000-bed general hospital which is a reference hospital for Uganda and also serves as a district hospital for Kampala and the surrounding districts. The hospital serves people of different tribes but the majority are Baganda. The Ruanda and Rundi tribes are immigrants. The general autopsy rate is approximately 25%. Among the autopsies the tribal distribution is: Baganda, 39%; Ruanda/Rundi, 20%; other tribes, 40%; non-Africans, 1%. About 95% are from Kampala and the surrounding districts. The male to female ratio of hospital admissions is 2:1, but the autopsy rate is 3:1. About 60% are in persons more than 30 years of age.

In this study 715 arterial circles of Willis from consecutive autopsies of patients aged 30 (one) to 79 years were dissected as far as the terminal branches, placed on thin cardboard, stapled and fixed in 10% formalin. In each case the age, tribe, and sex were recorded after the circles were scored (table 1). Specimens were placed in plastic envelopes and shipped to the University of Minnesota for coding according to the method described by Resch and Baker17 and Resch et al.18 Assessment of method reliability has been discussed by Loewenson et al.19 The circles of Willis of U.S. blacks from origins listed in table 2 were all scored at the University of Minnesota.

Results

Figure 1 shows the comparison of median vessel scores between Ugandan African men and women. No significant difference in degree of atherosclerosis between the two groups exists; however, both have a spout of increase in the 70 to 79 year age group. Figure 2 shows the median vessel scores for the main tribal groups in Uganda and again shows no significant difference except that the Ruanda/Rundi scores tend to be slightly lower than those of the Baganda and other tribes.

The total number of cases analyzed from different populations is shown in table 2 and median vessel scores are graphed in figure 3. When Ugandan Africans are compared with other populations (fig. 3), the following points become apparent. A comparison between U.S. blacks and Ugandan Africans shows no difference up to the age of 45 years. Then the U.S. blacks show a significant increase in degree of atherosclerosis when compared with the Ugandans. However, the Ugandans show approximately the same degree of atherosclerosis as U.S. Caucasians in Minnesota. When Ugandan Africans are compared with Asian Indians,

<table>
<thead>
<tr>
<th>Age</th>
<th>Baganda</th>
<th>Ruanda/Rundi</th>
<th>Other</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-39</td>
<td>68</td>
<td>45</td>
<td>80</td>
<td>133</td>
<td>60</td>
<td>193</td>
</tr>
<tr>
<td>40-49</td>
<td>63</td>
<td>35</td>
<td>83</td>
<td>146</td>
<td>35</td>
<td>181</td>
</tr>
<tr>
<td>50-59</td>
<td>78</td>
<td>18</td>
<td>47</td>
<td>113</td>
<td>30</td>
<td>143</td>
</tr>
<tr>
<td>60-69</td>
<td>85</td>
<td>19</td>
<td>44</td>
<td>111</td>
<td>37</td>
<td>148</td>
</tr>
<tr>
<td>70-79</td>
<td>34</td>
<td>5</td>
<td>11</td>
<td>43</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>328</td>
<td>122</td>
<td>265</td>
<td>546</td>
<td>169</td>
<td>715</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Origin</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uganda</td>
<td>715</td>
</tr>
<tr>
<td>Nigeria</td>
<td>334</td>
</tr>
<tr>
<td>U.S. blacks*</td>
<td>927</td>
</tr>
<tr>
<td>U.S. Caucasians†</td>
<td>3,390</td>
</tr>
<tr>
<td>India</td>
<td>296</td>
</tr>
</tbody>
</table>

*Maryland, Tennessee, Los Angeles, Colorado, Alabama.
†Minnesota.
The Ugandans have more atherosclerosis except in the 60 to 69 year age group.

The comparison between Ugandan Africans and Nigerians is striking. Whereas the Ugandan median vessel scores show a definite increase of atherosclerosis with age, corresponding values for the Nigerians are zero at all ages. These median vessel values of zero indicate that frequency of detectable atherosclerosis in the Nigerians is lower than 50% in any given age group.

Discussion

Evidence shows that coronary atherosclerosis and myocardial infarction are rare among African autopsy populations in Nigeria and Uganda. Clinical investigations have suggested that cerebrovascular disease may be common in both populations. The present study shows that U.S. blacks have more severe cerebral atherosclerotic involvement than do Ugandan Africans, especially after the age of 45 years. However, the most striking finding is that Nigerians have much less severe cerebral atherosclerosis than do Ugandan Africans, although earlier studies by Florentin et al. have shown that coronary atherosclerosis in the two countries is equally rare when compared with New York Caucasians.

This study shows that in Ugandan Africans the severity of atherosclerosis in both sexes is about equal in most age groups. Older women have slightly less severe atherosclerosis than do men of the same age group; this is in agreement with findings in other populations as reported by Resch and Baker and Resch et al. When Ugandan Africans and Nigerians are compared, there is probably greater severity of cerebral atherosclerosis in the Ugandans, but clinical studies do not suggest significant difference in clinical complications of cerebral atherosclerosis in the two populations.

References

17. Resch JA, Baker AB: Etiologic mechanisms in cerebral atherosclerosis:


FIGURE 2. Median vessel scores for cerebral atherosclerosis in the main tribal groups of Uganda.

FIGURE 3. Comparison of median vessel scores from Ugandan Africans and those from other countries and races.
Platelet Aggregability Measured by Screen Filtration Pressure Method in Cerebrovascular Diseases

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SUMMARY Platelet aggregability was measured using the screen filtration pressure (SFP) method in 50 elderly healthy people, 93 persons with essential hypertension, 166 patients with cerebral thrombosis at the recovery stage (more than two months after onset), and 74 patients with cerebral hemorrhage at the recovery stage. SFP by 3 μM ADP in the healthy persons, the hypertensive patients, and the patients in the recovery stages of hemorrhage and thrombosis were 148.7 ± 53.5, 176.2 ± 74.4, 189.8 ± 58.3 and 206.3 ± 58.9 mm Hg, respectively. The differences of the SFP between the healthy and each of the diseased groups were statistically significant (P < 0.01 to 0.05). Meanwhile, SFP of nine patients with cerebral thrombosis and 18 patients with hemorrhage was measured during their time course of the diseases from the onset to 180 days. SFP in the acute stage of thrombosis showed an increase and a gradual decrease during the time course, while SFP in the acute stage of hemorrhage showed the opposite — a decrease and a gradual increase. A statistically significant difference was observed between both groups within 30 days from the onset (P < 0.01). Screen filtration pressure in the acute stage of hemorrhage showed 95.2 ± 17.7 mm Hg in nine survival cases and 194.0 ± 96.2 mm Hg in nine deaths within ten days from the onset. The difference was statistically significant (P < 0.01). Such results suggest a role of platelets in cerebral thrombosis and hemorrhage and a usefulness in differential diagnosis of both diseases.

Introduction

RECENTLY we have reported hyperaggregability of platelets by adenosine 5'-diphosphate (ADP) and epinephrine in the acute stage of thromboembolic disorders including cerebral thrombosis. In the above report, the platelet aggregability was measured by the optical density (OD) method used by Born and O'Brien. Though the OD method is the most popular method for detecting platelet aggregability, it was not possible to avoid destruction or injury of platelets during the centrifugation procedure required for preparation of platelet-rich plasma as a testing sample. The screen filtration pressure (SFP) method was originated by Swank, who used whole blood to detect platelet aggregation. Thus, injury to the platelets during centrifugation, which could affect platelet sensitivity to ADP, can be avoided. Therefore, we measured platelet aggregability in patients with cerebral thrombosis or hemorrhage using the SFP method and compared the above values to those of patients with essential hypertension and of healthy subjects of the same age.

Methods

Three hundred eighty-three patients, including 50 healthy volunteers, were utilized. They were divided into four groups, i.e., healthy, essential hypertensives with more than 160 mm Hg systolic and more than 95 mm Hg diastolic blood pressure, and those with cerebral thrombosis or hemorrhage in their recovery stage with onset occurring more than two months before the examination.

There were 25 men and 25 women, age 52 to 78 years (average and SD: 64.0 ± 9.4), as the healthy volunteers; 43 men and 50 women, age 43 to 85 years (65.6 ± 8.5), had essential hypertension; 111 men and 55 women, age 41 to 84 years (62.4 ± 11.8), were in the recovery stage of cerebral thrombosis; and 50 men and 24 women, age 36 to 84 years (57.4 ± 10.0), were in the recovery stage of cerebral hemorrhage. The distribution of age in each of these groups was almost identical. In addition, three men and six women, age 49 to 84 years (66.8 ± 9.5), with cerebral thrombosis and ten men and eight women, age 52 to 87 years (66.4 ± 10.6), with cerebral hemorrhage were examined from the onset to 180 days after the stroke. Four patients with cerebral hemorrhage also were able to be examined prior to the stroke. Cerebral thrombosis and hemorrhage were diagnosed by using the definition cited by Millikan et al. One patient with cerebral thrombosis and nine with cerebral hemorrhage died while in the acute stage. These diagnoses were confirmed by autopsy. The patients were not given anticoagulants or drugs which might affect platelet function, such as aspirin, dipyridamole and pyridinolcarbamate during the observation period.

To estimate platelet aggregability by the SFP method, 9 ml of blood were collected from the cubital vein of the subjects using a plastic disposable syringe containing 1 ml of...
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