Cervical Bruits in Hemodialysis Patients

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SUMMARY Twenty-five patients receiving chronic hemodialysis were studied with systematic cervical auscultation and periorbital Doppler tests to determine the incidence of cervical bruits and their significance. Eighteen (72%) of the patients had bruits. All of the bruits heard in this study were loudest in the supraclavicular fossa, and in no patient was a bruit heard along the carotid arteries without a louder bruit of similar characteristics more proximally. No patient with a bruit in the area of the carotid bifurcation had an abnormal ipsilateral periorbital Doppler examination, and none had symptoms of cerebral ischemia. There was no evidence in these patients that the bruits were related to occlusive arterial disease. It is concluded that most cervical bruits in patients receiving hemodialysis are the result of a hyperdynamic circulatory state associated with anemia and arteriovenous fistulae.

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IT HAS BEEN REPORTED that asymptomatic cervical and supraclavicular bruits are heard in a large proportion of patients receiving chronic hemodialysis. It was assumed that these bruits were caused by a hyperdynamic circulatory state secondary to anemia and the presence of arteriovenous fistulae rather than to underlying arterial obstruction. No specific attempt was made, however, to determine whether or not these patients had obstructive arterial lesions. More complete information about the genesis of these bruits is important because of the frequency with which patients receiving chronic hemodialysis develop neurologic symptoms and die of cerebrovascular disease. The physician must decide whether or not the cervical bruit is causally related to the symptom. In the presence of a bruit, the physician needs to determine whether the bruit simply represents a hyperkinetic circulatory state or an underlying hemodynamically significant arterial lesion.

We have conducted a non-invasive assessment of the extracranial carotid arteries in patients undergoing hemodialysis. Using systematic supraclavicular and cervical auscultation and periorbital Doppler tests we have attempted to determine the incidence of bruits in the cervical region, to identify anatomically the origin of the bruits, and to determine the presence or absence of hemodynamically significant arterial stenoses.

Methods

Twenty-five consecutive, randomly selected patients undergoing chronic hemodialysis at the Nashville Veterans Administration Medical Center were studied. All patients were examined independently by 2 of the authors. Informed consent was obtained from each patient according to a protocol approved by the Vanderbilt University Committee for the Protection of Human Subjects.

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Auscultation of both sides of the neck was performed in a systematic manner. The areas auscultated were: 1) the supraclavicular fossa; 2) the proximal common carotid artery at the lower end of the medial border of the sternocleidomastoid muscle; 3) the common carotid artery bifurcation at the level of the superior border of the larynx and medial to the sternocleidomastoid muscle; 4) at the angle of the mandible, and 5) over the eyes.

Periorbital Doppler studies were performed with a continuous wave (9.4 mHz) directional Doppler instrument (Model 806C, Parks Electronics, Beaverton, OR). The technique of Ackerman was used. The direction of flow in the supratrochlear and supraorbital arteries was established. The influence on the direction of flow in these arteries was then determined after digital compression of the ipsilateral superficial temporal and ipsilateral and contralateral facial arteries. The test was considered abnormal if the direction of flow in the periorbital arteries was reversed at rest or if there was an obliteration or reversal of flow in the periorbital arteries in response to digital compression. The Doppler signals from each brachial artery were obtained and recorded as: absent, normal, or increased (high pitched, continuous signals).

The hematocrit of each patient was determined prior to dialysis. Mean arterial pressure (MAP) was determined for each patient during 3–5 dialyses near the time of testing, utilizing a minimum of 25 individual blood pressure measurements by sphygmomanometry. One third of the pulse pressure (systolic minus diastolic) plus the diastolic pressure was utilized to determine MAP.

Results

Among the 25 chronic hemodialysis patients studied, 18 (72%) had cervical bruits (table). All 18 had bruits audible over at least one of the supraclavicular fossae and in 5 over both supraclavicular fossae. In 4 patients the bruits radiated distally to the area of the proximal common carotid artery. Among the 13 patients with audible bruits over a single supraclavicular fossa, in 7 it was heard distally, and in all the forearm fistula was ipsilateral to the bruit. A cer-
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TABLE Location of Bruits

<table>
<thead>
<tr>
<th>Site</th>
<th>Patient number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supraclavicular fossa</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0 0 0 + 0 0 0 + + 0 0 0 + 0 + 0 0 0 + 0 + 0 + + 0</td>
</tr>
<tr>
<td>Left</td>
<td>+ 0 0 + + 0 0 0 0 0 0 + + + + 0 + + 0 + + + + +</td>
</tr>
<tr>
<td>Common carotid artery</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0 0 0 + 0 0 0 + 0 0 0 0 0 + 0 + 0 0 0 + 0 + 0 + 0</td>
</tr>
<tr>
<td>Left</td>
<td>+ 0 0 + + 0 0 0 0 0 + + + + 0 + 0 0 0 + + + + 0</td>
</tr>
<tr>
<td>Carotid bifurcation</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0 0 0 + 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 + 0 0 0</td>
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<tr>
<td>Left</td>
<td>+ 0 0 + + 0 0 0 0 0 0 + + 0 0 0 + 0 0 0 + + 0 + 0</td>
</tr>
<tr>
<td>Orbit</td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 + 0 0 0</td>
</tr>
<tr>
<td>Left</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 + 0 0 0</td>
</tr>
</tbody>
</table>

+ = bruit present; 0 = bruit absent.

valic bruit was not heard in the one patient with a fistula in the leg.

Eleven (44%) patients had bruits audible over the proximal common carotid artery. Seven of these had unilateral bruits and in 3 the bruits were heard distal to the carotid bifurcation area. Four patients had bilateral bruits; in 3 the bruits were heard distally. All of the unilateral bruits were heard on the side of the forearm fistula, and in all the bruits there was an association with a bruit of similar quality in the ipsilateral supraclavicular fossa.

Six (24%) patients had bruits audible over the carotid bifurcation area. The bruits were bilateral in 2 patients and unilateral in 4. In the 4 patients with unilateral bruits, the forearm fistula was ipsilateral. In all 6, the bruits were associated with a bruit of similar quality over the ipsilateral proximal common carotid artery. No patient had an isolated bruit over the carotid bifurcation area.

Only one patient had an ocular bruit and it was heard over both eyes. In this patient there was a bruit heard over the left supraclavicular fossa, but none over the common carotid artery or its bifurcation.

Two patients had abnormal periorbital Doppler examinations. In both patients, the abnormality was present only on the left side. Neither of these patients had a bruit over the area of the carotid bifurcation, but both had an ipsilateral proximal common carotid artery bruit. Neither had symptoms of cerebrovascular disease.

Of the 24 patients with forearm fistulae, 21 had abnormal Doppler signals over the ipsilateral brachial artery. The signals, in each instance, were high pitched and continuous throughout systole and diastole. The 3 patients with normal brachial artery Doppler signals did not have cervical bruits.

The average hematocrit of the 25 patients was 22%. Those with bruits had an average hematocrit of 22%, and those without bruits 23%. The average MAP (in mm Hg) was 103 ± 8 SD in the group with bruits, and 106 ± 3 SD in those without bruits. These differences were not statistically significant.

Discussion

Atherosclerotic vascular disease causes two-thirds of the deaths in patients on maintenance hemodialysis.4,8 Congestive heart failure, sudden death, myocardial infarction, cerebrovascular syndromes, and pericarditis are major sources of morbidity and mortality. Identification of treatable illnesses has been urgently sought in order to lengthen the life expectancy of these patients. Therefore, in this population it is important to recognize disease of the extracranial vasculature at an early stage in order to reduce the potential hazard of stroke if possible.

Patients receiving chronic hemodialysis with arteriovenous fistulae and anemia typically have a hyperdynamic circulation. Measurements of cardiac index are uniformly elevated, ranging from 4.31 to 4.93 l/min/m², or about 30 percent higher than controls.7,11 Transient occlusion of the fistulae and/or blood transfusion increasing hematocrit values to greater than 30 percent have returned cardiac indices toward normal.7,10,11 Recent investigations have linked these increased work demands on the heart to the genesis of bruits.1 We have extended these observations and verified the relationship between a hyperkinetic circulation and cervical bruits in patients receiving chronic hemodialysis.

Our results confirm the high incidence (72%) of cervical bruits in these patients. All of the bruits heard in this study were loudest in the supraclavicular fossa. In no patient was a bruit heard along the carotid arteries without hearing a louder bruit of similar quality more proximal in location. No patient with a bruit heard over the carotid bifurcation had an abnormal ipsilateral periorbital Doppler exam, and none had symptoms of cerebral ischemia. There was no
evidence on physical examination that the bruits were related to occlusive arterial disease. It is likely that the bruits were caused by the hyperdynamic circulatory state which occurs in patients with anemia and increased blood flow through arteriovenous fistulae.11

This study does not imply that patients on chronic hemodialysis may not develop occlusive vascular disease with bruits.18 Our results indicate that when the bruit is loudest in the supraclavicular fossa but also is heard, at the same or with lesser intensity, over the proximal common carotid artery and the carotid bifurcation area, the bruit is likely to be secondary to a hyperdynamic circulatory state.

In conclusion, systematic auscultatory examination of patients on chronic hemodialysis with cervical bruits needs to be emphasized. If only the areas over the carotid bifurcation had been examined, carotid occlusive disease would have been suspected incorrectly in 24%. By correctly identifying the origin of cervical bruits in uremic patients on dialysis, invasive diagnostic and therapeutic techniques may be directed toward those patients who may potentially benefit and they can be avoided in those where the sound is generated by a hyperdynamic circulation.

Acknowledgment

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References

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