CAROTID INSUFFICIENCY—DIAGNOSIS AND SURGICAL TREATMENT

A REPORT OF TWENTY-ONE CASES*

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Carotid insufficiency is one of the most important problems that neurosurgeons have ever faced. As a cause of disability, invalidism and loss of human dignity, it has few equals. The solution of this pressing problem is a challenge to neurosurgeons everywhere.

At present the exact incidence of this condition is not known with certainty. However, Fisher's\(^{10-12}\) magnificent work on this subject as well as mounting evidence from other sources\(^{1, 9, 11, 16, 22, 24, 26, 27, 31}\) leaves little doubt that it is one of the common causes of cerebrovascular accidents. In 432 routine unselected autopsies in adults, Fisher\(^{12}\) found occlusion of one or both internal carotid arteries or severe stenosis of one or both of the internal carotid arteries at the bifurcation in the neck in approximately 10 per cent of cases. Furthermore, a clinical pathological study of 45 cases of occlusion of the internal carotid at the bifurcation in the neck revealed that in 85 per cent severe neurologic disturbances were produced. Lofstrom, Webster and Gurdjian\(^{19}\) in 100 consecutive cases of hemiparesis or hemiplegia found internal carotid occlusion or severe stenosis to be present in 29 cases.

In a six-month period, March to September 1957, after certain changes had been made in our arteriographic apparatus, the most important of which was the use of a flexible nonmetallic cassette in which the film comes within one-eighth of an inch of the patient's shoulder, we have been able to show the bifurcation of the carotid artery in the neck in the great majority of all carotid arteriograms without additional injections. In 249 carotid arteriograms in 174 patients, 43 patients and 51 arteries showed some degree of stenosis or occlusion in the internal carotid at the bifurcation in the neck which was thought to be the cause of symptoms of which 24 of the patients complained (Table 1).

By all odds the most common cause of occlusion or stenosis is an arteriosclerotic plaque which begins in the carotid sinus at the bifurcation of the artery in the neck and slowly encircles the intima and occludes the artery.\(^{12}\) In addition, a superimposed thrombus on an ulcer in the plaque may be the final occluding factor, or hemorrhage into the plaque may suddenly occlude

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the vessel. It is worth noting that an arteriosclerotic plaque at this segment of the vessel is more common than in any other artery of the body except the abdominal aorta.\textsuperscript{21} Fisher\textsuperscript{12} states that if there is a segmental stenosis or occlusion in the neck, there is much less likely to be arteriosclerotic disease in the intracranial branches of the carotid tree and our observations confirm this finding. DeBakey\textsuperscript{5} has reported a similar situation in the iliacs and femorals distal to occlusions of the abdominal aorta. Other causes of occlusion or stenosis of the carotid in the neck are trauma,\textsuperscript{2,22} dissecting aneurysm from the aorta, arteriosclerotic occlusion of the carotid or innominate as they arise from the arch of the aorta,\textsuperscript{27} saddle emboli from the heart,\textsuperscript{13} arteritis, and pressure by tumors or infections in the neck,\textsuperscript{17,32}

The sequence of events that follow occlusion or severe stenosis of the internal carotid artery is finally coming to light.\textsuperscript{12} At the present time these events may be generally classified as ischemic, embolic or thrombotic.

\begin{table}[h]
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\begin{tabular}{l|c}
\hline
Detected carotid artery disease & 43 patients \\
& 51 arteries \\
\hline
Total occlusion & 5 \\
Severe stenosis (60% or more) & 12 \\
Moderate stenosis (30% or more) & 14 \\
Mild stenosis & 20 \\
Bilateral disease & 8 \\
\hline
\end{tabular}
\caption{Incidence of carotid artery disease in a six-month period, March to September 1957, in 249 consecutive carotid arteriograms on 174 patients}
\end{table}

Whether or not occlusion or stenosis of one internal carotid artery without resulting embolus or propagating thrombus will produce symptoms depends upon the adequacy of the collateral circulation in the head as well as the patency of the other carotid and vertebrais and the stability of the blood pressure. If the blood pressure drops in the presence of inadequate collateral circulation, transitory symptoms may develop. Should further stenosis of the carotids and/or vertebrais develop, a state of chronic ischemia may lead to gradually progressive senility and/or hemiparesis.

Following occlusion of the internal carotid in the neck, the most common finding is a thrombus which forms distal to the plaque and which may propagate upward to occlude the middle or anterior cerebral arteries or a portion of the thrombus may break off from movement of or pressure on the neck and float upward as an embolus, occluding major or minor vessels in the head. There is also good reason to believe that mural thrombi form just distal to the point of severe stenosis and break off as emboli which may occlude large or small vessels in the head.

Fisher\textsuperscript{11} states that prior to angiography there had grown up a classical concept of thrombosis of the internal carotid artery, namely, monocular blindness with contralateral hemiplegia. We agree with him that this is