A COMPLETE review of published cases of internal carotid artery occlusions in children has been given by Fischer and Friedmann in 1956\(^1\) and by Wisoff and Rothballer in 1961.\(^2,3\)

Frantzen, Jacobsen, and Therkelsen in 1961\(^4\) reported three cases of traumatic occlusion of the internal artery in children. The cause of a traumatic occlusion of the internal carotid artery might be a direct lesion of the arterial wall due to a trauma involving the neck. When thrombosis occurs after trauma to the head, an intimal lesion caused by stretching of the artery or by its impinging upon the transverse processes of the cervical vertebrae might be responsible for the thrombotic occlusion.

As in other types of carotid artery occlusion, various forms of conservative treatment with anticoagulants, vasodilator drugs, and stellate block have been used in reported cases.

From the reports on spontaneous or traumatic internal carotid artery occlusion, no final conclusion can be drawn as to whether the natural course of the disease is influenced by any type of treatment. Thus King and Langworthy in 1941\(^5\) and Shapiro in 1952\(^6\) reported good results in two patients to whom no treatment was given. In one of three cases reported by Stevens\(^7\) the hemiparesis subsided following treatment with anticoagulants and papaverine. In the cases of Frantzen et al.\(^4\) where anticoagulant therapy was given to only one of the three patients, all patients showed more or less the same residual symptoms.

On the other hand, in their review of 24 previously reported cases of internal carotid artery occlusion, Wisoff and Rothballer in 1961\(^3\) showed that there were six fatalities among 12 children who received no treatment, but none among 12 treated children, most of whom received anticoagulant therapy.

If conservative treatment has any effect on the natural course of the disease, it is probably by preventing secondary thrombosis of the circulation collateral to the cerebral infarction. While the effect of anticoagulant therapy in patients with cerebral infarction is questionable, one would expect that the outlook for a child with occlusion of the carotid artery would be better if the circulation could be restored, and it is toward this goal that treatment should be directed.

Surgical treatment of internal carotid artery occlusion in children has been reported by Krayenbühl and Weber in 1944.\(^8\) They resected the thrombosed segment of the artery in the neck of a 13-year-old boy. Petit-Dutaillis et al. in 1949\(^9\) tried a carotid-jugular anastomosis in a boy of 13. They stated that a hemianopsia disappeared following the operation. Cabieses and Saldias in 1956\(^10\) explored the carotid artery in a 9-year-old boy with a spontaneous occlusion of the internal carotid artery. The artery was found to be pulseless and indurated in the first 2 cm. in the neck. It was not considered advisable to perform any radical surgery on the diseased vessel. However, the child recovered completely during the following 6 months of treatment with anticoagulants and papaverine. Murphey and Shillito in 1959\(^11\) performed an arteriometry of the thrombosed internal carotid artery in a 10-year-old boy. Only a weak reflux could be obtained.

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Case Report

A boy aged 2 years and 10 months was admitted in semicoma to the neurosurgical department, Copenhagen County Hospital in Glostrup, following a head injury suffered as a passenger in a car involved in a traffic accident.

He was stuporous and reacted only to painful stimulation. A 2-cm.-long contused wound was seen in the left mastoid region below the ear. Left miosis, right central facial paralysis, and right hypotonic hemiparesis with bilateral Babinski were noted. X-ray of the skull showed no fractures.

During the following days there was no improvement in the right-sided hemiparesis. Electroencephalogram showed a focus of slow waves in the left temporo-occipital region.

On the fifth day following the injury a left percutaneous carotid arteriography was performed under general anesthesia with use of 2 4-ml. doses of 60 per cent Urografin. A complete occlusion of the internal carotid artery was demonstrated 2 cm. above the bifurcation of the common carotid artery. There was only a very slight filling of the siphon and the middle cerebral artery via the ophthalmic artery (figs. 1 and 2). The arteriography was without complications; in particular, no hematoma developed in the neck.

The child was operated upon immediately with exploration of the left common, the internal, and the external carotid arteries. The internal carotid artery was found to be pulseless except for the first 2 cm. During systole this segment dilated to twice the diameter of the vessel above. An arteriotomy was performed on the internal carotid artery, which measured only 5 mm. in diameter, and a thrombectomy was done. No intimal lesion was noted through the limited arteriotomy in the internal carotid artery. Suction was applied through a polyethylene catheter that was passed up into the artery as far as the base of the skull. Then some pulsating reflux was obtained. The vessel was flushed with a heparin-saline solution, and then sutured. Irregular pulse and bradycardia occurred during the dissection of the carotid bifurcation. These irregularities were corrected following infiltration of the bifurcation with Lidocain.

The postoperative course was uneventful, and the right hemiparesis subsided almost completely within 5 days. Seventeen days after operation another arteriography with 4 4-ml. doses of 60-per cent Urografin showed normal filling of the left internal carotid arteries, of both anterior cerebral arteries, and of the left middle cerebral artery (figs. 3 and 4).

The child was discharged in good condition. Neither heparin nor any other anticoagulant therapy was given in the postoperative period. Exam-
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2 months after operation showed no paresis, although he used his left hand in preference to the right.

**Discussion**

It is usually impossible by arteriography to get any conclusive preoperative information on the extent of a thrombosis in the internal carotid artery, and especially to discover whether the intracranial vessels—specifically the carotid siphon—are involved, thus making surgical intervention futile. Only in a few cases will the siphon fill through the ophthalmic artery. Surgical intervention is usually necessary to prove if it is possible to restore circulation. The risk of such a procedure might be worth taking for the patient, in order to get two patent arteries instead of one. If, however, the patient is of advanced age with arteriosclerotic occlusion of the internal carotid artery, the clinical improvement is usually negligible, even if the circulation can be surgically restored.

The improvement seen in the case reported can probably be explained by the patient's youth and by the fact that apart from the traumatic lesion his vessels were quite healthy. The good result in this case encourages the authors to suggest thrombectomy as the treatment of choice in young persons, even if some days have elapsed since the thrombosis occurred.

**Summary**

Arteriographically verified traumatic thrombosis of the internal carotid artery in the neck of a boy 2 years and 10 months old was treated by thrombectomy. A preoperative right hemiparesis subsided within 5 days after the operation. Postoperative arteriography proved restored circulation.

**References**

Among the reflex results of certain emotional states are an increase in the adrenalin in the blood and an increase in the sugar content of the blood; the heart beats more rapidly, blood leaves the abdominal organs to fill the vessels of the brain, the heart, the lungs and the muscles. The blood pressure rises, the number of red blood cells increases in the circulating blood and the coagulability of the blood is accelerated. The usefulness of the more rapid circulation is obvious and the value is evident of more red blood cells to carry the oxygen needed during great exertion and of a speedier clotting of the blood in preparation for the quick control of hemorrhage from any wounds received. As Cannon puts it: "Every one of the visceral changes that have been noted—the cessation of processes in the alimentary canal (thus freeing the energy supply for other parts); the shifting of blood from the abdominal organs to the organs immediately essential to muscular exertion; the increased vigor of contraction of the heart; the discharge of extra blood corpuses from the spleen; the deeper respiration; the dilation of the bronchioles; the quick abolition of the effects of muscular fatigue; the mobilizing of sugar in the circulation—these changes are directly serviceable in making the organism more effective in the violent display of energy which fear or rage or pain may involve."—O. H. Perry Pepper, M.D. Opuscula Medica. (Reprinted from The Journal of Nervous and Mental Disease, Vol. 82: 641, December, 1935).
Traumatic Occlusion of the Internal Carotid Artery in a Child: Restored Circulation by Means of Thrombectomy
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