SPONTANEOUS EXTRACRANIAL ANEURYSMS OF THE INTERNAL CAROTID ARTERY*

By A. ZAKRZEWSKI (Poznań)

The spontaneous aneurysms of the internal carotid artery displaced towards the throat are not common. Still less common are reports on them in otolaryngological journals—the majority of the described cases are to be found in surgical periodicals. In 1951, Killian published a review of the whole world’s literature concerning the aneurysms of the carotid system and its branches. From a general number of 3,407 aneurysms of this area 787 cases concerned the cervical region and from the latter 173 concerned the extracranial segment of the internal carotid artery. The traumatic origin of the aneurysms of this last-mentioned and other groups was noticed more often than any other origin. The most uncommon were the spontaneous aneurysms, in the development of which it was impossible to find out the existence of any traumatic, inflammatory or congenital factors. In the list, from 1946, of Shumacker and Carter who examined personally 351 patients from the three biggest American centres of vascular surgery, 119 aneurysms of the most different localizations and only two aneurysms of the common carotid artery and two of the internal carotid artery were represented. Winslow, who culled the bibliography of the aneurysms of the internal carotid artery in its extracranial segment published up to 1925 quotes 106 cases, from which 42 were spontaneous. His collection points out the frequency of the spontaneous aneurysms in women—30 women out of 42 patients.

Arnulf in his monograph (1957) on pathology and surgery of the carotid arteries underlines, too, the scarce incidence of the extracranial aneurysms of the internal carotid artery quoting the list of 15 Manod’s and Vanvert’s cases from 1895 to 1921.

Shipley, Winslow and Walker described, in 1937, two own cases and their review of literature comprises 18 cases from which only six were spontaneous aneurysms.

The spontaneous aneurysms develop rather slowly on the ground of inflammation of the vascular wall. Most frequently they are of the luetic origin and in this group of aneurysms the striking feature is the young age

* From Otolaryngological Clinic of Medical Academy in Poznań (Head of the Clinic: Professor Dr. A. Zakrzewski).
Spontaneous Extracranial Aneurysms

of patients. The spontaneous (non-luetic) aneurysms, however, are mostly met with in between 40 and 50 (Arnulf).

The pathological anatomy of aneurysms of the internal carotid artery does not show any different feature in comparison with aneurysms of other vessels. The sac of the aneurysm varying in size from a small nut to an orange when lying close to the neighbouring organs displaces them and exerts pressure on them (the vagus, sympathetic, hypoglossal, and phrenic nerves, the jugular vein, the palatine tonsil).

The constantly increasing aneurysms most often lead to complications sooner or later. The clots filling up the lumen of the sac of aneurysm lead to serious embolisms of the brain. The infection of the wall of aneurysm causes its rupture and sudden death ensues.

The symptomatology of the aneurysms of the internal carotid artery is typical enough. The first symptoms are scarce and vague. The aneurysms do not deform the neck for a long time but they displace themselves towards the throat rather early. The examination reveals them easily owing to the presence of distinct pulsation and typical systolic murmur at auscultation. These signs as well as the pulsation noticed by the patient disappear on compression of the common carotid artery. In anamnesis the patients complain of irritation of the throat, dysphagia and difficulty in swallowing, cough, severe headache radiating sometimes to the arm.

The examination of the throat reveals at the first glance the picture resembling a peritonsillar abscess. The disturbances of phonation (the compression on the vagus nerve), the atrophy of one half of the tongue with characteristic deviation of its apex to the side of aneurysm (the hypoglossal nerve) and Horner’s syndrome may be present at aneurysms developing constantly and for a long time.

Arteriography is now-a-days a quite reliable diagnostic method, deprived of any danger. Arnulf does not see any contra-indication to the use of contrast medium directly to the sac of aneurysm by its puncture from the throat with a thin needle. The treatment of the aneurysms of the internal carotid artery may be surgical only. The old conservative methods as the lasting external compression of the common carotid artery, the external cooling, the injection into the sac of aneurysm of solutions irritating its walls are given up completely now-a-days. Winslow (1926) made up a list of 106 cases of aneurysms of carotid arteries and showed a high mortality rate of non-operated patients. Out of 106 above-mentioned cases 35 were not operated, 25 of them died and only three cured. The lot of one patient was unknown and six patients showed neither aggravation nor improvement. Out of the group of operated, 46 were cured, 22 died and two improved.

The operative treatment consists most often in the ligation of the internal carotid artery or, if it is not possible, of both the common and the external carotid arteries or in the excision of the sac of aneurysm which
A. Zakrzewski

in the case of the aneurysm of the internal carotid artery is possible exceptionally only. As for the surgical treatment of the aneurysm of the internal carotid artery the rôle of this artery in supplying the brain with the arterial blood must be taken into consideration. The patient’s age is of essential importance in planning the treatment by ligation of the artery. The computations of the authors mentioned above show high mortality percentage in persons above forty due to the ligation of the internal carotid artery.

CASE I

A female patient, L.M., aged 61, came to the Clinic on March 16th, 1957, with a difficulty in deglutition and speaking lasting for a long time, these symptoms increasing swiftly. The sensation of a strong pulsation at the right side of the throat and about the right ear had persisted for many months. Four weeks before coming, the patient suffered a bad pain at swallowing, connected with a high fever. On application of antibiotics the sore throat had disappeared. Yet the difficult deglutition and pulsation continued. The patient went to see a surgeon who diagnosed a peritonsillar abscess and tried to incise it. Severe hemorrhage followed, which could be controlled only after a few days of hospitalization and due to, fortunately, the insufficient incision ventured on base of a faulty diagnosis.

General examination. Normal constitution, well-nourished, pulse rate 92, pulse normally tense, blood pressure 130/90, indistinct speech, defective utterance.

Detailed examination. Ears and nose without pathological changes. Mouth and throat: very deficient dentition, tongue and hard palate unchanged. Considerable protrusion of the right tonsil towards the front and midline so that the uvula remains in contact with palatine arch of the left side. The right lateral wall of the throat considerably protruded from behind the posterior palatine arch, the mucous membrane of this region congested and of red-livid colour. On palpation the pulsation synchronous with pulse can be felt along with a considerable tension and elasticity of the throat wall. The protrusion extends upwards as far as the eustachian tube and downwards displaces the epiglottis to the left and hangs above the larynx. Vocal cords not to be seen.

Additional examinations. Sedimentation rate 26/52, Hb 57 per cent., erythrocytes 3,000,000, besides these no notable deviation from a normal state. Wassermann reaction—negative.

The puncture from the throat at the spot of the biggest protuberance had given a liquid arterial bright blood, which, during the puncture, had pushed back the piston of the syringe. An aneurysm of the throat was at once suspected.

In face of this, on March 13th, 1957, we came on to the angiography and then to the ligation of the internal carotid artery: by incision along the anterior edge of the sternomastoid muscle the common, external and internal carotid arteries had been laid bare on a considerable length. The internal carotid artery, baglike swollen, ran through in a winding way. On compressing the external carotid artery the protrusion in throat did not subside but continued pulsating strongly. After putting a ligature on the internal carotid artery the
Spontaneous Extracranial Aneurysms

pulsation in the throat disappeared. Two ligatures had been put on the internal carotid artery and only one of them was partially tightened.

The patient tolerated well the straightening of the internal carotid artery without signs of the ischsemia of the brain. On March 19th, 1957, a serial angiography on application of 15 c.c., 45 per cent. perabrodil to the common carotid artery was performed—on radiograms only the filled-up external carotid artery and its branches could be seen. Then 10 c.c. of perabrodil were injected directly into the sac of the aneurysm in the throat and the radiograph was taken on which the aneurysm of internal carotid artery was shown, 4 by 3 cm. in size.

![Fig. 1.](image)

Case I. The patient L.M. The sac of aneurysm of internal carotid artery filled up with contrast medium. In none of serial radiograms the supra-aneurysmal segment of internal carotid artery could be demonstrated.

Some part of the contrast medium penetrated from the aneurysm downwards and filled the internal carotid artery approximately as far as the spot of its branching off from the common carotid artery—the place of ligature (Fig. 1). The aneurysm is situated close to the base of the skull. On serial angiograms the supra-aneurysmal segment of the internal carotid artery had not been demonstrated. An hour after the end of angiography a radiological control (a lateral radiograph) was performed. The radiograph showed the aneurysm still filled with contrast medium and a wide, evenly and flatly ended segment of the internal carotid artery. This radiograph proves that there is no outflow of the
blood upwards from the aneurysm and that the lumen of the internal carotid artery close to the base of the skull had been closed (angiograms were described by Dr. Grdziki).

On March 20, 1957, both the silk ligatures on the internal carotid artery had been tightened, the pulsation in the throat disappeared completely, nodular formation in the throat grew considerably smaller and became softer. In the course of several days the formation in the throat reduced distinctly, the patient was better, but at punctures of the sac of aneurysm a partially coagulated and black blood was obtained. All the time the patient was under cover of antibiotics (penicillin and streptomycin). The wound on the neck was completely healed after three weeks, the radiological controls showed in the lumen of the sac of aneurysm some residual contrast medium which was evacuating very slowly.

On May 6th, 1957, the patient left the Clinic in a very good general condition, an insignificant intumescence of the lateral wall of the throat still being noticed. We must emphasize the fact that all the time there was not even a trace of a brain ischaemia. On January 6th, 1958, the periodic examination demonstrated a complete disappearance of all complaints regarding the throat. The patient speaks, swallows and breathes normally. The examination of the throat revealed some insignificant thickening of the mucous membrane of the soft palate in close vicinity of the right tonsil. The pulsation of the lateral wall of the throat could not be noticed. General condition of the patient was normal.

On July 3rd, 1961, the general and neurological examinations did not show any abnormality. Electro-encephalography demonstrated the normal bio-electric function of the brain.

On August 2nd, 1962—the last examination (5 years and 4 months after operation) confirmed the good condition of the patient and the normal state and correct function of the throat.

**CASE II**

A female patient, N.C., aged 62, came to the Clinic on September 18th, 1957, with anamnesis that the sensation of a strong pulsation at the left side of the throat had persisted for several months. Lately she had noticed the difficulty and obstacle in swallowing of solid food at first, and then of fluid food as well. The family doctor had diagnosed a peritonsillar abscess on the left side.

**General examination.** The patient in good condition, well-nourished. The speech in a small degree changed, indistinct. The skin and mucous membranes normally supplied with blood. Pulse rate 75. The pulse well tense. Blood pressure 140/80.

**Detailed examination.** Ears and nose without essential changes. The mouth, hard palate, and tongue, not changed. The patient toothless. On the left side of the throat the protrusion of the lateral wall could be seen, the mucous membrane being unchanged. The left tonsil displaced towards midline and the front. This protrusion extended in the nasopharynx as far as the pharyngeal ostium of the eustachian tube, and descended to the level of the larynx which was displaced to the right side. Except for this displacement the larynx was not changed.

Except the increased sedimentation rate (27/53) additional examinations did not show any more distinct changes. Wassermann reaction was negative.
Spontaneous Extracranial Aneurysms

The protrusion in the throat pulsated distinctly simultaneously with the peripheral pulse. The suspicion of an aneurysm displaced towards the throat was put forward and angiography was resolved. The trial (October 10th, 1957) of angiography through the skin failed and that is why on October 25th, 1957 by incision along the anterior edge of the left sternomastoid muscle, the common carotid artery was laid bare and injected with 20 c.c., 45 per cent. perabrodil. The serial angiograms showed the aneurysm of the internal carotid artery filled up with contrast medium. After the compression of the external carotid artery the angiography was performed again; the aneurysm filled up once more with contrast medium. In this way the diagnosis of the aneurysm of only the internal carotid artery was proved. From the upper part of the aneurysm the shadow of the internal carotid artery appeared running upwards and forming intracranially a normal siphon (Fig. 2). The radiological control performed after an hour stated that the contrast medium had disappeared from the aneurysm (the angiograms were described by the radiologist Dr. J. Grądzi).

Consequently, the temporary ligature on the external carotid artery was removed and it was put at once on the internal carotid artery (with partial tightening); thus the lumen of the artery was narrowed. The patient tolerated well the narrowing of the internal carotid and therefore, on October 29th, 1957,
the ligature on the artery was still more tightened, the lumen of the artery became narrower than at the first compression. Immediately after this manipulation the patient complained of a slight headache which disappeared within several hours. The protrusion in the throat was still pulsating, but it became smaller.

As the condition of the patient was good—on November 4th, 1957, the ligature on the internal carotid artery was completely tightened and thus the lumen of the artery closed. The patient tolerated this measure quite well without any signs of brain ischaemia. The protrusion in the throat did not pulse any more and grew smaller.

Within two days the patient was well, there were no paresis of limbs or any other signs of brain ischaemia. On the third day, after the total closing of the artery, the patient suddenly became drowsy and aphasic, an hemiparesis was noticed on the right side.

The consulting neurosurgeon was rather apt to consider the above-mentioned signs as due to brain edema than to the cerebral embolism. Patient was put on pendimidine, strychnine, caffeine and 40 per cent. glucose. On the next day the patient’s condition was better, the paresis of right upper limb began to disappear, the general condition was good but aphasia was still present.

On November 9th, 1957, the pendimidine was withdrawn as the paresis of the upper extremity had diminished considerably and that of the lower extremity was beginning to disappear, too. The internist’s examination found the patient in good condition.

On November 18th, 1957, the paresis of the right extremities continued receding and the patient began to utter some words.

On November 27th, 1957, the patient was better, she could raise quite freely the extremities of the right side, understand all that was spoken to her, and pronounce several simple words. The wound on the neck was nearly completely healed.

On December 12th, 1957—the neurological examination: the paresis of right limbs practically disappeared, only in more precise motions a lowered adroitness of the right hand could be noticed. The gait was synergic. The speech: the sensory aphasia disappeared completely, the motor dysphagia was receding, too.

December 23rd, 1957. The patient in good general state, able to walk without help. The speech: motor disorders still present. In the throat: a remnant thickening of the mucosa on spot of the former bulge due to aneurysm. All symptoms in the throat disappeared.

The electro-encephalographic examination December 17th, 1957, revealed diffuse moderate dysrhythmia, there was theta dysrhythmia of medium amplitude bilaterally and also appeared single spikes.

On July 30th, 1962 (four years and nine months after operation) the control examination found the patient in good condition; the patient works normally, walks correctly, her only complaint is that the speech “is not as easy” as before the operation; the usual conversation with the patient did not confirm it, however.

Neurological examination (August 2nd, 1962—Dr. F. Tokarz) showed a slight right-sided paresis; the motor dysphasia as well as the superficial hypotesia on the right side are slightly marked.
Spontaneous Extracranial Aneurysms

Control electro-encephalography taken on August 6th, 1962, showed more moderate slow activity and still the single spikes with tendency to lateralization on the left side.

On the basis of the experience from the two above-described cases of large aneurysms of the internal carotid artery treated by ligation of this artery the great diagnostic and prognostic importance of serial angiography must be emphasized.

In the first case the radiological examination showed a complete closing of the lumen of the internal carotid artery close to the base of the skull; the ligation of the artery beneath the sac of the aneurysm did not produce in consequence any changes in the blood supply of the brain which was proved in the post-operative course.

In the second case the appearance of functional disturbance of the brain was to be expected since before the ligation of the artery an intracranial segment of the internal carotid artery entirely unobstructed with typical syphon on the base of the skull was discerned on angiograms. We must conclude from the moderate consequence in the second case of the lowered blood supply of the brain after the ligation that in this latter case, too, before the operation there must have existed some gradual adaptation to poor blood supply of the brain due to the existence of aneurysm along the extracranial segment of the internal carotid artery. Gradual and repeated narrowing of the lumen of the artery before its definitive closing was not—we may infer—of decisive importance in the prevention of serious encephalic complications in this then 62-year-old woman. The partial adaptation must, no doubt, have already existed before. The artery which on some segment of its course has a baglike dilatation with elastic and susceptible to pulsating motions walls is doubtlessly on its distal segment a less efficient blood vessel than a similar artery without a sacciform dilatation on any segment of its course. The cause of a worse passage of the blood through the artery with aneurysm on its course are the whirls of the blood inside the aneurysm. The experiments with a model imitating the passage of the blood through the artery with aneurysm and through the artery without any, performed by Dr. Pruszewicz, an assistant to this Clinic, have confirmed the above-mentioned supposition.

Conclusions

1. The aneurysms of the internal carotid artery simulating a peritonsillar abscess are rarely met with.
2. Serial angiography is the essential diagnostic and prognostic method.
3. The treatment of these aneurysms consists in proximal ligation of the internal carotid artery and, if it is impossible, of the common and external carotid arteries. The ligation of the internal or common carotid
A. Zakrzewski

arteries must be performed, observing, if possible, the duty of gradual narrowing of the lumen of the vessel in order to prevent the brain from being suddenly deprived of the arterial blood supply.

4. A several year observation of the two above-described patients enjoying good health, operated some years ago, proves that the method of operation was properly adjusted.

Acknowledgements

I acknowledge with thanks the help received from the Radiological Laboratory of Neurosurgical Clinic of Poznań Medical Academy in particular from Dr. J. Grądzki, the Head of this Laboratory, and from Dr. F. Tokarz, adjunct to the Neurological Clinic.

REFERENCES