Arterial aneurysms are rare in children and aneurysms of the internal carotid artery are even rarer. Very few cases have been reported in the literature and the management of such cases presents a problem.

Case Report
The patient was a Coloured male, aged 5 years (Fig. 2).

History (from mother). Three weeks before admission the child injured his left arm but definitely not his neck. A few days later a swelling appeared on the left side of the neck. This swelling gradually increased in size and the patient developed a certain degree of dysphagia. Initially the swelling was painless but for about 3 days before admission he experienced a degree of pain and also developed a slight temperature. Twenty-four hours before admission the child was admitted to another hospital, where he was treated with antibiotics and a diagnosis of a peritonsillar abscess was made. The patient was admitted to the Karl Bremer Hospital on 13 May 1963. He presented with a temperature of 100°F and a pulse rate of 100/minute. There was a marked swelling of the left side of the neck and carotid region. A left facial-nerve palsy was evident.

On examination of the throat there was a marked peritonsillar swelling, but with no oedema or redness of the fauces; the left tonsil appeared to be displaced inferiorly; there was some exudate in the pharynx, but no other abnormalities were evident. Further general examination proved to be negative.

Special investigations. WBC 22,000/cu.mm. Differential count, polymorphs 82%, lymphocytes 8%, monocytes 2%, staff cells 5%, myelocytes 2%, metra-myelocytes 1%. Hb 71 G/100 ml., ESR 128 mm. in 1 hour.

The patient was first seen by Dr. P. de Villiers, registrar in the Ear, Nose and Throat Department, who very wisely inserted a needle into the peritonsillar swelling to find a jet of bright red blood. Subsequently a tracheostomy was performed followed by a bilateral carotid angiogram (Fig. 1).

Angiogram. On the left side there was a large saccular aneurysm of the internal carotid artery, about 2 inches above the common carotid bifurcation. Cerebral arterial filling was found only of the middle cerebral artery. The right carotid angiogram was found to be normal; there was good cross-filling to the left side.

After routine pre-operative preparation the patient was taken to the operating theatre. Because of the high situation of the aneurysm, it was thought that excision and graft replacement would be very difficult. Because of the patient's age his cooperation was inadequate and it was therefore decided to do an EEG on the operating table. Under general anaesthesia the internal carotid artery could be compressed and occluded to elucidate the EEG changes. If the changes had been marked, it would have been decided to apply a Crutchfield clamp for the gradual occlusion of the common carotid artery after ligation of the external carotid artery. While the EEG electrodes were being placed and before anaesthesia was induced the aneurysm ruptured, which resulted in a sudden gush of blood from the patient's nose, tracheostomy tube and mouth. While blood was vigorously sucked out of his pharynx and trachea there was no option but to expose the common carotid artery without anaesthesia. The artery was then immediately compressed digitally and this controlled the bleeding. The patient was then anaesthetized.

By the time the patient was under anaesthesia it was noticed that the left facial palsy was improving. After a few days the swelling disappeared completely and so did the facial-nerve palsy (Figs. 3 and 4).
seen a month later and found to be absolutely normal. It should be pointed out that no cause for this temperature, raised white blood-cell count and raised ESR was found. There was no evidence of subacute bacterial endocarditis, tonsillitis or of a septic focus.

Interesting Aspects

There are several interesting aspects to this case:
1. The unusual site of the lesion.
2. The exact aetiology of the aneurysm.

Zakrzewski\(^1\) quotes Killian who published a review of the world’s literature concerning aneurysms of the carotid system and its branches. There were 3,407 cases. Of these, 787 were aneurysms of the cervical carotid artery and 173 concerned the extracranial internal carotid artery, i.e. 5\% of the total number. He does not quote the ages of these patients. Bergan and Trippel\(^2\) state that aneurysms of the extracranial carotid arteries are rare, but are being seen in vascular clinics with greater frequency. Crawford, De Bakey and Cooley\(^3\) analyzed 107 cases of peripheral arterial aneurysms which were treated over the preceding 5 years. Of these there were only 4 carotid-artery aneurysms and these were all due to trauma.

DISCUSSION

The aetiology of aneurysms are (a) congenital defects, (b) trauma, (c) infection (syphilitic and mycotic), (d) atherosclerosis and (e) post-stenotic aneurysms.

In this patient there was a vague history of trauma to the left arm. It may be that this was a traction injury but it is difficult to see how this could have produced an aneurysm of the internal carotid artery. Secondly, the aneurysm was fairly high in the neck and trauma at that site is difficult to visualize as the artery would be protected by the ascending ramus of the mandible and the mastoid process. The most likely aetiological factor is probably that of sepsis and this aneurysm should then be labelled as a mycotic aneurysm. Barker,\(^4\) in discussing the pathogenesis of aneurysms states that mycotic aneurysms are caused by:
1. Infected emboli from subacute bacterial endocarditis (SBE),
2. Bacteraemia, and
3. Contagious infection.

Of such cases 90\% are usually due to bacterial endocarditis. The author quotes 11 other authors who documented their mycotic aneurysms. Most of their patients had SBE. This patient showed no evidence of subacute bacterial endocarditis. His blood culture was negative. It is possible that he had an infection in the throat, although this was not confirmed by the mother or by his examination on admission. There was a slight exudate but no evidence of a true tonsillitis. On the other hand, the patient had pyrexia, a raised white blood-cell count and a raised sedimentation rate. No cause for these abnormalities was found. Whatever the aetiology, the main factor in this patient was the treatment, as it was obvious that something had to be done fairly rapidly after the patient’s admission.

TREATMENT OF EXTRACRANIAL CAROTID ANEURYSMS

Ambrose Paré, in 1552, published the first account of operative ligation of the common carotid artery. His patient developed aphasia and a left monoplegia. Watson and Silverstone\(^5\) state that the first authentic and completely reported case was done on 17 October 1803. Fleming, a ship’s surgeon on board H.M.S. Tannant, ligated the common carotid artery without mishap for a suicidal laceration of the neck. Astley Cooper performed the first common carotid ligation for an aneurysm of the artery on 1 November 1805. His patient developed a hemiplegia on the 8th postoperative day and died on the 21st day. Rogers\(^6\) reports 19 personal cases of ligation of the common carotid artery for intracranial aneurysms. He states that it is reasonably safe provided that the tolerance test to the common carotid artery is satisfactory. He quotes: ‘I have no hesitation in stating that in a reasonably fit person provided the tolerance test is satisfactory, it is safe to divide the great vessel in the neck. On the other hand, an experience of delayed hemiplegia in one case of internal carotid ligation along with the series of complications and fatalities, in recently published cases of ligation of this artery in the neck, leads me to assert with equal confidence that ligation of the internal carotid artery as a primary procedure, is dangerous.’ It is possible that this was a traction injury but it is difficult to see how this could have produced an aneurysm of the internal carotid artery. Secondly, the aneurysm was fairly high in the neck and trauma at that site is difficult to visualize as the artery would be protected by the ascending ramus of the mandible and the mastoid process. The most likely aetiological factor is probably that of sepsis and this aneurysm should then be labelled as a mycotic aneurysm. Barker,\(^4\) in discussing the pathogenesis of aneurysms states that mycotic aneurysms are caused by:
1. Infected emboli from subacute bacterial endocarditis (SBE),
2. Bacteraemia, and
3. Contagious infection.

Of such cases 90\% are usually due to bacterial endocarditis. The author quotes 11 other authors who documented their mycotic aneurysms. Most of their patients had SBE. This patient showed no evidence of subacute bacterial endocarditis. His blood culture was negative. It is possible that he had an infection in the throat, although this was not confirmed by the mother or by his examination on admission. There was a slight exudate but no evidence of a true tonsillitis. On the other hand, the patient had pyrexia, a raised white blood-cell count and a raised sedimentation rate. No cause for these abnormalities was found. Whatever the aetiology, the main factor in this patient was the treatment, as it was obvious that something had to be done fairly rapidly after the patient’s admission.

TREATMENT OF EXTRACRANIAL CAROTID ANEURYSMS

Ambrose Paré, in 1552, published the first account of operative ligation of the common carotid artery. His patient developed aphasia and a left monoplegia. Watson and Silverstone\(^5\) state that the first authentic and completely reported case was done on 17 October 1803. Fleming, a ship’s surgeon on board H.M.S. Tannant, ligated the common carotid artery without mishap for a suicidal laceration of the neck. Astley Cooper performed the first common carotid ligation for an aneurysm of the artery on 1 November 1805. His patient developed a hemiplegia on the 8th postoperative day and died on the 21st day. Rogers\(^6\) reports 19 personal cases of ligation of the common carotid artery for intracranial aneurysms. He states that it is reasonably safe provided that the tolerance test to the common carotid artery is satisfactory. He quotes: ‘I have no hesitation in stating that in a reasonably fit person provided the tolerance test is satisfactory, it is safe to divide the great vessel in the neck. On the other hand, an experience of delayed hemiplegia in one case of internal carotid ligation along with the series of complications and fatalities, in recently published cases of ligation of this artery in the neck, leads me to assert with equal confidence that ligation of the internal carotid artery as a primary procedure, is dangerous.’

In this paper the author advised that the artery should be divided to prevent embolus formation from blood clot which formed in the distal segment. He postulates that there is an anastomosis between the external carotid arteries in the neck across the midline. Therefore, after tying the common carotid artery there is still some bloodflow to the internal carotid. The main difficulty of carotid ligation before modern techniques were developed, was residual neurological defects.

Pilcher and Thuss\(^7\) surveyed the literature in detail and concluded that 20 - 30\% of patients will develop symptoms referable to the brain after carotid-artery ligation. Watson and Silverstone\(^5\) analyzed 20 cases where the common carotid artery was ligated for carcinoma of the head and neck. 11 of the 20 patients died from cerebral complications. They suggest that the frequent variations and abnormalities in the anatomy of the arteries of the neck and brain explain the variety of cerebral complications occurring after common-carotid ligation.

Thompson and Austin\(^8\) report 6 cases of carotid aneurysms which they treated by wrapping with fascia lata, because of these grave neurological complications. Their results were good. Lahey and Warren\(^9\) thought that ligation of the common carotid artery for carotid body tumors was prohibitive. Dandy\(^10\) treated 88 patients, ligation the internal carotid artery. Five developed neurological complications and 4 were fatal.

Moore and Baker\(^11\) suggest that it seems likely that development of an increased collateral circulation to the brain, stimulated by the presence of an aneurysm and to a greater extent by an arteriovenous fistula, has permitted occlusion of the common or internal carotid artery with less risk than under other circumstances. They quote De Fournestraux’s collected series of statistics where there is a striking difference in mortality rate from carotid ligation under various circumstances: ligation for haemorrhage 54\%, for tumours 46\%, for aneurysm 15-5\%, for pulsating exophthalmos 7\%. The authors treated 88 patients with carcinoma of the head and neck where they had to perform a common carotid or an internal carotid-artery ligation. Cerebral complications developed in 45-4\%, and
30.6% died. In a later series the rate of complication was much lower. They found no significant decreased rate of complication with age; there was no significant difference according to the site of ligation, e.g. where the common carotid artery alone was ligated, the complication rate was 41%. Where the common and internal carotid or internal carotid alone was ligated, the complication rate was 47%. They found that hypotension was the one common factor that influenced the percentage of patients who developed cerebral complications. The prevention of hypotension has significantly decreased the number of complications in their series. Matas\textsuperscript{12} reported 53 occlusions of the common carotid artery with 2 deaths. He believed that his good results were due to gradual compression of the vessel.

Brackett\textsuperscript{12} analyzed 65 cases where the internal carotid artery was ligated for intracranial aneurysms. 21 of these patients had cerebral complications and there were 6 deaths. He found that the important factor was the site of the aneurysm. Where the aneurysm was in the supraclinaloid position, the percentage of cerebral complications was high, whereas in patients with arteriovenous fistulae the risk was very low. Age was not an important factor. Black and German,\textsuperscript{14} however, on a review of 35 cases of common carotid-artery ligation for intracranial aneurysms, had very good results with no significant cerebral complications.

With the advancement of vascular surgery in recent years, these extracranial carotid-artery aneurysms have become less of a problem as far as treatment is concerned. There are many reports of successful treatment where the aneurysm was excised with reconstruction of the artery, using hypothermia and general anaesthesia. Rootman and Bradford\textsuperscript{15} used hypothermia and a temporary internal by-pass in a patient with an internal carotid-artery aneurysm. They anastomosed the external carotid artery to the distal segment of the internal carotid. The patient recovered fully.

Nabseth and Deterling\textsuperscript{16} report 5 patients with myotic aneurysms which were treated in several different ways. They state that although there are several ways of treating myotic aneurysms, they feel that the primary objective should be to remove the aneurysms, as antibiotics do not consistently control the infection. Where the aneurysm is situated in a non-critical area, simple ligation plus excision should be adequate. In a critical area excision plus arterial reconstruction should be done. If an end-to-end anastomosis is possible, the result was found to be very satisfactory. Occasionally a prosthesis has to be used and the authors feel that a plastic prosthesis is better than a homograft, and a vein graft even better still.

The aetiology of the aneurysm in this patient is either trauma or infection. If one considers the high white blood-cell count and the raised ESR, a myotic aneurysm is favoured. Ideally, this patient should have had the aneurysm excised with reconstruction of the artery. Unfortunately, or maybe fortunately, this could not be done because of the patient's dramatic change on the operating table and all that could be done was a proximal ligation with an apparent good result. It is felt that the excision of the aneurysm and reconstruction would have been difficult because the aneurysm was so high. An interesting feature was the seventh-nerve palsy which one feels is due to compression of the nerve after its exit from the stylomastoid foramen. This palsy was due to neuroparaxia as the nerve recovered gradually and the patient had complete facial movements 3 weeks after the operation. It may be argued that one could ligate the internal carotid artery with impunity in a child, but there is no authoritative evidence of this in the literature. It is obvious that one should not take unnecessary risks and with sound modern arterial surgical techniques this would be irresponsible.

SUMMARY

A 5-year-old child with a left internal carotid-artery aneurysm presented with the clinical signs of a peritonsillar abscess. Fortunately a pre-operative diagnosis was made by angiography. The patient was treated by internal carotid-artery ligation as an emergency measure when the aneurysm ruptured on the operating table before induction of the anaesthesia. The patient recovered fully with no residual neurological signs, although there was a left facial nerve palsy on admission.

I wish to thank Dr. C. J. du Toit, Head of the Ear, Nose and Throat Department, Karl Bremer Hospital, for referring this case. I am indebted to Dr. J. M. M. Basson of the Department of Radiology, Karl Bremer Hospital for the angiograms and also to Mr. R. Ellis for the photographs.

REFERENCES

8. Thompson, J. E. and Austin, D. J. (1957): Ibid., 74, 80.

PREPARATION FOR NATURAL CHILDBIRTH

MRS. L. STERNWEILER, CAPE TOWN

It is more than 6 years ago that I wrote my last article in the Journal.\textsuperscript{3} Since then 6,000 women have attended my classes for natural, fearless and prepared childbirth.

It can be stated with confidence that for the 10% of all White pregnant women in Cape Town who attend relaxation classes, prejudice has been lessened—as judged not only by first-hand evidence of those thousands of mothers who speak of their childbirth as the greatest thrill of their lives, but also by the fact that the majority of women return for refresher courses in subsequent pregnancies.

To deal with 6,000 women in the short space of time of 6 years was made possible, firstly, by the encouragement and support of an understanding and progressive Department of Obstetrics and Gynaecology at the University of Cape Town; secondly, by the fullest support and confidence given to me by so many medical practitioners and obstetricians in Cape Town; and lastly, by the thousands of pregnant women, to all of whom I owe a deep debt of gratitude.

The Department of Obstetrics and Gynaecology of the University of Cape Town arranges a yearly lecture for the