size slowly for eight years, and then grew rapidly during the next four years, extending during this time to the floor of the mouth, one tonsil and the hard and soft palates. When the patient was seen by Dr. Gibson, he felt that any operation would be very bloody, if not impossible, on account of the extent and character of the lesion. Hulen's⁹ patient, a woman, aged 43, had a typical cavernous angioma involving the left half of the tongue and measuring 3.4 by 3.2 by 3.5 cm. The tumor had been present for twenty years without change in size and without causing symptoms except for a slight impediment of the speech.

The removal of angiomas may be followed by a recurrence, as in the patient reported by Rigby.¹⁰ Two years after the tumor had been dissected out and the right lingual artery and veins ligated, the patient was found to have a recurrent cavernous angioma of the right border and dorsum of the tongue.

The importance of recognizing the smaller and less evident angiomas is exemplified by Miller's¹¹ experience, in which a supposed enlarged papilla at the base of the tongue was removed. Considerable hemorrhage followed, and much difficulty was encountered in the effort to control it. The angiomatous character of the lesion was recognized after operation.

The diagnosis of cavernous angioma of the tongue as a rule offers no difficulty. At times the enlargement of the tongue, due to lymphangioma (lymphangiomatous macroglossia), calls for differentiation from hemangioma. In lymphangioma the bluish appearance is seldom evident, the surface contains groups of small vesicles containing clear fluid, owing to dilatation of the superficial lymph spaces, and recurring inflammation, with pain and swelling of the tongue, is common. This liability to recurring attacks of inflammation causing progressive enlargement of the tongue is a striking characteristic of lymphangioma. The occurrence of nevi elsewhere in the oral cavity suggests the character of the tongue tumor, but is not conclusive evidence of the angiomatous character of the lingual lesion. For example, Howell¹² reports the case of a child, aged 6 years, who had a congenital nevus of the lower lip involving the mucous membrane of the gum, and a lymphangioma of the tongue. The nevus would bleed at times, and the lymphangioma of the tongue presented the characteristic vesicles, which would break down and ulcerate; the tongue becoming exceedingly painful at times and progressively enlarged.

Our patient, because of the stationary character of the lesion, and the freedom from symptoms, refused to consult the surgeon and radium therapist for an opinion as to the advisability of local treatment.

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TRAUMATIC EROSION OF AN ANOMALOUS RIGHT SUBCLAVIAN ARTERY

THROUGH THE POSTERIOR WALL OF THE ESOPHAGUS*

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Anomalies of the great vessels, while thoroughly described in textbooks, are not often found at the necropsy table, and when discovered they are generally considered of little clinical importance. The present case, therefore, is of unusual interest since an accidental injury to an anomalous artery was the immediate cause of death.

The patient was a sturdy white boy, 9 years of age.¹ The physical and mental development were normal and general health good. There is one point of interest in the patient's early history. As a small child he apparently experienced some difficulty in swallowing, since he refused to take solid food until after he was 3 years old.

The onset of the fatal illness is somewhat obscure, but probably antedates death by about seventeen days, when the boy awoke with a severe frontal headache, which persisted and which was the next day accompanied by fever and vomiting. The temperature was 104 F., and the illness was attributed by the family physician to a smallpox vaccination which had been performed four days previously. The child's condition remained the same for several days, and then improved. This apparent

improvement was only temporary, and the child became more seriously ill a few hours later. He was restless and stuporous, and responded only momentarily to stimuli. Because of the seriousness of his condition, the child was sent to the hospital by his physician.

On admission, the patient was unconscious. The temperature was 103 F., and the respiration was regular and somewhat increased in rate. There was a generalized muscular rigidity of the body, with hyperactivity of the tendon reflexes. A diagnosis of epidemic (lethargic) encephalitis was made. The problem with which the clinician was confronted was that of a very sick boy who was unconscious and who could not be given food because of spasticity of the muscles of the lower jaw. A nasal tube was therefore inserted and left in place, and through this water and food were administered at regular intervals.

For a week the patient's condition remained essentially unchanged. He was kept well nourished by the use of

Fig. 2.—Lateral view, showing posterior limit of tumor near base of tongue. The irregular surface and tortuous vascular channels are distinctly evident. No pulsation was visible. No superficial vesicles, as are frequently seen in lymphangioma, were present.

9. Hulen: Report of a Case of Cavernous Angioma of the Tongue, *New York M. J.* **62**: 531, 1895.

10. Rigby: Cavernous Naevus of the Tongue, *Clinical Society's Transactions* **39**: 230, 1906.

11. Miller: Angioma of the Base of the Tongue with Specimen and Slide, *Brooklyn M. J.* **12**: 41, 1898.

12. Howell: Lymphangioma of the Tongue, *Brit. J. Child. Dis.* **16**: 213, 1919.

* From the Brady Laboratory of Pathology and Bacteriology, Yale University School of Medicine.

I am indebted to Prof. Edwards A. Park for the use of the clinical history of the case.

gavage, and the prognosis seemed hopeful; but, without warning on the morning of February 15, he began to expectorate bright red blood, and rapidly went into shock, showing a pale, clammy skin and weak pulse. The nasopharynx was packed with gauze, and the usual methods used to combat shock. A transfusion was started, but death occurred before it could be completed.

The necropsy findings were definite. The gastro-intestinal tract as far as the transverse colon was filled with freshly clotted blood. The stomach was so greatly distended that the clot which was removed virtually paralleled the liver in

on the left side, and to run across the esophagus at practically a right angle.

The thoracic aorta was carefully studied and was seen to have four large branches given off in this order: right common carotid, left common carotid, left subclavian and right subclavian, the last mentioned being the vessel which passed from left to right behind the trachea and esophagus as described above. Figure 2 shows clearly the origin and relations of the branches.

The brain was removed, and the diagnosis of epidemic encephalitis confirmed by microscopic examination.

COMMENT

The case presents several unusual features. The presence of an anomaly of the great vessels is in itself of some interest. The arrangement of the arteries in this case exemplifies a well recognized deviation from the normal which is apparently found in a definite number of individuals. Goldbloom² gives the percentage of occurrences in anatomic dissections as from 0.4 to 1.6 per cent. Such an anomaly is rarely discovered at necropsy, since the routine procedure in removing the neck organs is not such as to lead to its detection. The structures are generally removed by "blind" dissection and the vessels cut near their origin, and in this way the variation may pass unnoticed.

The method of origin of such an anomaly is developmental, and is considered to be due to a persistence of the lower right arch. Under normal circumstances, this primitive right branch of the aorta undergoes partial atrophy, leaving one arch. Development may be ab-

Fig. 2.—Point of origin and course of an anomalous right subclavian artery.

normal and both arches may persist, in which case rotation of the heart brings the right arch behind the trachea and esophagus. In the type of anomaly under discussion, it is assumed that the lower half of the right arch remains in the form of the subclavian vessel, and this accounts for the peculiar relationship between the vessels and the neck organs noted above. As Goldbloom suggests, the cause of such an anomaly probably rests in the failure of development of the fourth arterial arch, which normally forms the innominate, and the subsequent persistence of the lower right arch, which continues to function as the right subclavian artery.

The chief point of interest in the case is the clinical application. It is a relatively common practice to insert a nasal tube for feeding comatose patients, and not infrequently the tubes are left in place to minimize the trauma incident to repeated introduction. In persons

Fig. 1.—Traumatic erosion of an anomalous right subclavian artery through posterior wall of esophagus.

size. No bleeding points could be found in the mucosa of the stomach or intestine. The esophagus was therefore removed and opened with unusual care in the search for the source of the hemorrhage. There were several superficial longitudinal ulcers along the posterior wall in the folds of the mucosa (Fig. 1). One of the ulcers, situated about 7 cm. from the superior edge of the larynx, showed a raw base with a small mass of fibrin adherent at about its center point. Beneath this fibrin plug was a small perforation of the esophageal wall. The perforation extended into a large arterial trunk, which was adherent to the esophagus. This artery, on being traced, was seen to arise from the aorta

2. Goldbloom, A. A.: The Anomalous Right Subclavian Artery and Its Possible Clinical Significance, *Surg., Gynec. & Obst.* **34**: 378 (March) 1922.

with normal vessels, this process is practically without danger; but in a small group (from 0.4 to 1.6 per cent.) in whom there is an anomalous artery lying against the posterior wall of the esophagus, the continued use of a feeding tube is obviously fraught with danger.

It seems logical that such an anomalous artery will compress the lumen of the esophagus and cause difficulty in swallowing. Goldbloom quotes several instances among his series of similar anomalies in which dysphagia was described clinically. In this case the boy had had difficulty in swallowing as a small child, but had entirely overcome his handicap so that if he had died in adult life this possible clue would have been lost. The fact unfortunately remains that this type of arterial anomaly cannot be determined clinically. The long continued use of a feeding tube must, therefore, always be considered dangerous in an undeterminable group of persons. Because of this, the clinician should be warned of the possible occurrence of fatal accidents similar to the one which caused the death of this child.

ZONULE PROTECTION IN CATARACT EXTRACTION *

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The several discussions on cataract and the causes of failure in extraction, at the St. Louis session of the association in 1910, suggested that injury to the suspensory ligament or zonule of the lens was a factor in the failures. With the hope of eliminating a portion of this injury, I began a series of experiments in the removal of the anterior capsule of the lens, trying to do it in such a way that there would be the least possible traction on the zonule in the manipulation of the extraction. Although the number of these operations has not been great, the results are instructive, not only in regard to the immediate subject—i. e., the removal of the capsule—but also in subjects near akin to it, such as posterior capsule interference with vision, residual cortex, loss of vitreous, prolapse of the iris, the corneal incision, and the value of cultures.

TECHNIC

The patients operated on number 105. They were not specially selected, but were the run of patients as they presented themselves. With each of them, cultures from the eye that was to be operated on were taken on agar-agar, and negative results were required over a period of three days before the operation was attempted. As *Bacillus pyocyaneus* was found in one of the cultures, and *Staphylococcus albus* and *aureus* in many of them, there is no question about the protection of this procedure to both patient and operator. Another evidence of this protection lies in the fact that seven of these patients had lost the fellow eye under the care of other operators, when, according to the statements of the patients, such cultures had not been taken. Possibly all might have been saved had this precaution been exercised.

The anesthesia employed was phenacain (holocain), 1 or 2 per cent. and cocain, 5 per cent., the phenacain being used every ten minutes for thirty minutes or longer

preceding the operation, and the cocain for not longer than ten or twelve minutes. In addition to this, during the last three years, I have injected, subconjunctivally, above the cornea to either side of the intended conjunctival flap, a minim (0.06 c.c.) of a solution of cocain, 5 per cent., in epinephrin, 1:4,000, three minutes previous to making the incision. It is placed on either side of the flap because several times the margin of the pupil has dilated beyond the clear cornea when the injection was placed directly above the incision. The day previous to operating, atropin, 1 per cent., was used, except in suspected glaucoma, and again the morning previous to the operation and with the anesthetic at the time of the operation. All of these solutions were freshly prepared in a 1:20,000 solution of mercuric chlorid, with as much sterilizing as is possible with the cocain.

For fixation, the double fixation forceps were employed, and for the incision, the rectangular keratome was used in forty-seven of the cases, and the Graefe knife in fifty-six; in two, the record does not mention the instrument.

The method of making the corneal incision has been to keep as near as possible within the clear cornea, just at the sclerocorneal junction, with the Graefe knife, beginning from 2 to 2.5 mm. above the horizontal meridian and finishing with a conjunctival flap of from 3 to 5 mm., and with the rectangular keratome, beginning in the conjunctiva 2 mm. or more above the cornea and slipping the knife forward so as to keep at the clear corneal margin. If the incision proved to be too small, it was enlarged with the iris scissors. With sharp scissors, this is a harmless, safe procedure, provided the scissors blade that enters the anterior chamber is kept in front of the iris. Blunt ended blades, however, are to be preferred, as with them the danger of injuring the iris is lessened.

Fig. 1.—A greatly enlarged drawing, which shows the serrated knife edge of the last mentioned capsule abscission forceps. Actual length of cutting blade, 5.5 mm.; width of each blade, 0.75 mm.

In every case with one exception, there was a small or a medium sized iridectomy upward or a previous iridectomy. In the exception, the pupillary margin became lost behind the clear cornea, owing to the subconjunctival injection of cocain-epinephrin above the corneal wound, and a simple ex-

traction was performed. In each case, the iris was replaced from the angles of the corneal wound before the use of the capsule forceps and again after the delivery of the lens.

In the first few cases, the capsule was cut through by means of de Wecker scissors. Frequently, only a small slit was obtained, and it was necessary to enlarge this with a sickle needle. Then a notch and a tooth were tried on the end of scissors of the McClure type; then forceps with a knife blade of the sheep shearing type; then forceps with an undulating blade of the bread knife type. At times, any of these would slip over the surface of the lens. This led to the present type of forceps, in which the teeth are sharp and the sulci in between have a sharp knife edge. It was with

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