influence of avertin for twenty-three days. Here the tube was passed by the nasal route and left *in situ*, being removed once daily to be cleaned. By this means the average daily intake of food for the whole twenty-three days was 260 calories, the theoretical caloric requirement being 300 daily.

Rectal feeding is useful in some cases, and patients seem to retain fluids well, but it is quite impossible in a severe case to give sufficient nourishment by this means alone, and intravenous infusions are necessary. The importance of giving sufficient food can hardly be over-emphasized, and success depends largely on nursing efficiency.

Summary

The treatment of tetanus may be summarized as follows:

1. As soon as possible after the diagnosis is made give 200,000 units of antitoxin (int.) intravenously.
2. One hour after the antitoxin has been given treat the wound. After appropriate surgical treatment irrigate with hydrogen peroxide.
3. Keep the patient as quiet as possible in a darkened room. If reflex spasms have not begun give large doses of bromide and as full fluid or semi-fluid diet as possible.
4. If the period of onset is four days or longer, and the reflex spasms are not severe, treatment with avertin need not be started at once, but it should be begun if the spasms become severe or if the patient shows signs of exhaustion. In such a case one basal anaesthetic dose daily may be sufficient.
5. If the period of onset is three days or less treatment with avertin should be begun at once and continued according to the severity and duration of the spasms. With prolonged spasms causing respiratory embarrassment the dosage should be larger and more frequent.
6. When avertin treatment has begun nasal oxygen should be given as required, and atropine hypodermically if there is respiratory difficulty.
7. Arrange that any necessary manipulations such as the giving of enemas, rectal salines, hypodermic injections, or local treatment of the wound are undertaken when the patient is most deeply under the influence of avertin.
8. Continue the avertin treatment as required, and reduce the dose gradually as the spasms become less.
9. If hyperpyrexia occurs treat by tepid sponging.

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The Ministry of Health has published a list of approved treatment centres under the Public Health (Venereal Diseases) Regulations, 1916, with particulars as to the days and hours for medical examination and treatment, and for intermediate treatment by or under the supervision of nurses or male attendants. A list of the hostels and other institutions for women which accept in-patients under the approved schemes of local authorities for the treatment of venereal diseases is appended. This list, designated "7, May, 1936," supersedes its predecessor, which was issued in March, 1934.

CAVERNOUS SINUS THROMBOSIS

A STUDY OF THE CASES OF RECOVERY

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Thrombophlebitis of the cavernous sinus is generally considered a rare but fatal condition; a study of the literature published on this subject reveals but a small number of cases of recovery. It is the object of this paper to review these cases to date, not only those recorded by Eagleton in 1926 but also those which have been published subsequently, to add one case from my own experience, and to ascertain what may be learnt from this material with regard to the prognosis and treatment of this grave condition.

Historical Review

The first mention of cavernous sinus thrombosis was made in 1818 by Abercrombie, who described the condition from a post-mortem finding. Vigla, in 1839, was probably the first to make a clinical diagnosis, but it was not until 1902 that attempts were made to attack this sinus surgically, by Dwight and Germain. With regard to the first recorded case of recovery there exists some doubt as to the correct diagnosis in several of the earlier publications, but probably that of Bircher in 1893 is the most authentic, and in this case the thrombosis was probably aseptic.

Anatomical Considerations

Though from the standpoint of operative surgery the cavernous sinus is one of the more inaccessible parts of the body, from the anatomical and pathological aspect it is open to attack from many directions, and to that extent is remarkably vulnerable to any pyogenic infection of the head and neck which has overcome the bounds of tissue resistance and invaded the blood stream. Without entering into any detail of the anatomy, it may be useful to recall that the main connecting channels of the cavernous sinus anteriorly are the ophthalmic veins, communicating with the angular veins and the venous system draining the region of the face, the pterygoid plexus, connecting with the venous drainage of the buccal and pharyngeal region below, and the petrosal sinus, communicating with the jugular bulb and the internal jugular, below and behind. The fact that the veins in this region possess few valves permits not only the rapid invasion of the sinus, which may occur through afferent channels such as the ophthalmic veins, but also a slower retrograde thrombosis and spread of infection along efferent tracts such as the internal pterygoid plexus and petrosal sinuses. Herein lies, to a great extent, the explanation of the two main clinical types of thrombophlebitis of the cavernous sinus. First, the acute fulminating invasion, usually associated with septic lesions of the face, presenting at an early date the well-known classical signs of swelling of the eyelids, chemosis, and proptosis, accompanied by the symptoms of fever, with rigors, due to the general blood stream infection. The rapid onset of meningitis and a fatal termination is, almost invariably, the result in such cases, and the diagnosis is seldom, if ever, in question.

In the second type, however, the invasion is more gradual and insidious. The septic or protective thrombosis advances in a retrograde manner against the blood stream, in the pterygoid plexus or petrosal sinus, and enters the cavernous sinus in its postero-inferior region. As may be expected, this type of case is associated generally with septic lesions of the middle ear and mastoid,

tonsillar region, or neck, and in contrast with the former may present none of the classical signs, rendering the diagnosis often a matter of difficulty, and tending to cause a delay in surgical intervention until perhaps it is of no avail. A study of the records shows that by far the majority of cases of recovery fall within this second category.

Cases of Recovery

Eagleton¹ in 1926 made a great contribution to the study of this subject, both by a review of all cases reported up to that date and from his personal observations of a considerable amount of clinical material, all carefully checked by findings at operation and at post-mortem examination. By this means not only has the course of infection been proved in those cases which have been suspected or definitely diagnosed, but also it has been shown that thrombosis of the cavernous sinus exists more frequently than is thought as a terminal complication in many fatal cases of meningitis in which the classical signs have not had time to develop. The practical value of the study of any such records rests in the help it may afford in the future diagnosis and treatment of the condition in question.

This end may be best achieved by making an analysis of the cases, for which purpose it seems best to adopt some form of classification of the cases according to their type and mode of onset—for example, (a) the acute fulminating and (b) the chronic compensatory—and of the treatment according as to whether it comprises: (1) major surgery, directed at the cavernous sinus itself; (2) accessory surgical measures, dealing with the primary source of infection and the draining of formed abscesses; (3) serotherapy, blood transfusions, etc., in treating the general blood stream infection; or (4) spontaneous recovery in the absence of any form of treatment. In applying this classification first to the recorded cases of recovery collected by Eagleton up to 1926, and the two from his own experience, we find that only one case of the acute infective type had recovered as the result of operation upon the cavernous sinus itself, and this was one of Eagleton's own cases. In addition to the direct attack upon the infected sinus the common carotid artery had been ligatured, a technical detail upon which the author lays great stress. Bircher in 1893 was the only other surgeon who could show a case of recovery from operation upon the sinus itself, but his case was of the chronic compensatory type following a mastoid infection.

Of the remaining number of recoveries, varying from twenty to forty (this large discrepancy is due to the overlapping of some publications and to the doubtful nature of some of the others), all have recovered as a result of operation draining the primary source of infection and the channel of approach, or, in some cases, spontaneously. They have conformed generally to the chronic compensatory type, and roughly half the number were of aural origin. One case, reported by Chisholm and Watkins, was dealt with by the administration of stock and autogenous vaccines only.

Cases Treated by Operation

Twelve cases have been published since Eagleton's work in 1926, in addition to the one reported in this paper. Of these, in three alone was operation undertaken on the cavernous sinus itself.

CASE I

Browder¹⁰ in 1933 reported the case of a male aged 23, admitted with a carbuncle on the right side of the nose and much swelling of the right upper lid following the application of x-rays. Examination of the right fundus showed early oedema of the optic nerve and engorgement of retinal veins, but no haemorrhages. *Staphylococcus aureus* was

cultured from the carbuncle and from the blood. It was thought that thrombophlebitis was spreading backwards to the cavernous sinus. This region was therefore exposed and electro-coagulation of the sinus carried out, up to the orbital fissure. The cranial wound was then closed without drainage. The operation was followed for several days by marked swelling of the right eye and proptosis, and orbital abscesses were drained for some months. The patient eventually recovered, with blindness of the right eye. At no time was the left eye involved.

CASE II

Christophe² in 1928 reported the case of a woman aged 32, who, after three months of gradually increasing pain from a filled right upper premolar, began to run a high temperature and rapidly lost the vision of the right eye. This was followed by exophthalmos, extreme chemosis, and limitation of movement; examination of the fundus was impossible owing to extravasated blood. At operation the following day the common carotid was first exposed and clamped, under local anaesthesia, and then under a general anaesthetic the orbit was exposed by turning out an osteoplastic flap; it was not found necessary to remove the eye in order to expose the wall of the cavernous sinus, which was then incised; some dark disorganized blood exuded. The clot, however, was not disturbed, but a drain was inserted and the wound otherwise closed. There was no shock following this operation, the temperature came down at once, and the general condition improved. The arterial clamp was replaced by a silk ligature on the sixth day. A temporary blockage of the orbital drainage precipitated an erysipelas, which drew attention to the question of the infecting organism. A radiograph disclosed an abscess of the root-filled premolar, which was promptly extracted. The patient then made a complete recovery. The author's experience in this case makes him put in a plea for the attempt to conserve the eye in this operation in future.

CASE III

Lauwers¹¹ in 1934 reported the case of a boy of 13 admitted with a history of ulceration of the right tonsil a fortnight previously, severe pains in the right side of the face (for which several teeth had been extracted), followed by rigors, swelling of the eyelids, and proptosis. A diagnosis of a right cavernous sinus thrombophlebitis was made and the patient operated on the following day. Under local anaesthesia the common carotid was ligatured, then under a general anaesthetic the external inferior ophthalmic vein was opened and drained of broken-down blood clot, through a catheter; the wound was then closed. The patient's condition steadily improved, the drainage tube was removed on the ninth day, and one month from the date of admission the patient was discharged.

Anti-infective Therapy

Under the heading of blood stream therapy come four cases, in three of which infection was caused by a staphylococcal lesion of the skin, which must be considered as acute infective rather than chronic compensatory cases.

CASE IV

Stout⁶ in 1931 published two cases of septic cavernous sinus thrombosis, one of which recovered under intensive treatment with bacteriophage. A female, aged 16, had a small furuncle on the chin, which was treated by incision and hot fomentations. The swelling increased and the temperature rose to 103° F. Local and hypodermic administrations of bacteriophage and deep thermo-cautery were applied, and 50 c.cm. of antistreptococcus serum was given. Blood culture showed the presence of *Staphylococcus aureus*. On the ninth day the right eye showed chemosis and proptosis, and four days later the left eye became similarly involved. Daily intravenous injections of bacteriophage were resorted to, and continued until urticaria, with painful joints, developed. The swelling of the eyes and face began to improve, and allowed an examination of the pupils, the right one being somewhat dilated; the retinal veins were congested, but the nerve and macula were normal. The

blood picture, which was closely watched, showed an increase in the leucocyte count. The gradual improvement was interrupted about the thirty-second day of illness with severe pains in the head and neck and vomiting. A spinal puncture showed turbid fluid under high pressure, with a high cell count, and staphylococci on culture. A trial intrathecal injection of 1 c.cm. of bacteriophage was made. This was well tolerated, and a daily injection of 4 c.cm. was given for four days. The patient's general condition improved, and she was discharged from hospital on the seventy-eighth day of illness with normal vision.

CASE V

Lewis⁵ in 1931 published the case of a boy of 15 who came under his care with a five-days history of a boil on the left cheek which had been incised on two occasions. Bacteriophage was given intravenously. There was a rapid onset of eye symptoms, extreme chemosis and proptosis, etc., with involvement of the cranial nerves and signs of meningitis. The temperature was 101°–104° F. This hopeless condition persisted for several weeks, when a gradual improvement set in, and in the course of three months, with the exception of total blindness of the left eye, the patient was restored to normal health.

CASE VI

Weizenhoffer⁶ in 1932 described the case of a woman aged 29 with a furuncle of the right auditory meatus. In spite of incision, infiltration in the neighbouring tissues increased and the temperature rose to 104° F. A pulmonary infarct then developed suddenly. Eight days from the onset of symptoms pain began in the left eye, with swelling of the lids and some proptosis, marked engorgement of the ciliary and fundus veins, and swelling of the disk. The right eye showed mild choking of the disk. The blood culture was positive for *Staphylococcus aureus*. Two days later the right eye began to swell, chemosis was marked, and the left external rectus was paralysed. The temperature rose to 105.4° F. with delirium and incontinence. Four days later 300 c.cm. of citrated blood was given intravenously. Then the swelling of the eyelids began to subside, the retinae became normal, and vision was unimpaired. During the following month transfusions were given on six further occasions. All signs and symptoms gradually cleared up, and the patient was discharged from hospital.

The author points out some features of this case: the unusual location and trivial nature of the original focus, the involvement of the cavernous sinus of the opposite side first, the absence of visual impairment, the long period, five days, between blood stream infection and the onset of eye symptoms, and finally the positive blood culture.

CASE VII

Gerrie¹² in 1935 reported the case of a youth of 18 who had had a submucous resection of the nasal septum. During the following week he began to have rises of temperature up to 102° F., accompanied by headache and pain on moving the eyes. These symptoms increased in severity, showing definite signs of meningeal irritation by the twelfth day, when, incidentally, a septal abscess was discovered and drained. The following day the classical signs of cavernous sinus thrombosis became apparent. Treatment by blood stream therapy was considered preferable to operation, and 20 c.cm. of polyvalent antistreptococcal serum was administered intramuscularly, to be repeated intravenously the following day and again five days later. The patient made an uninterrupted recovery.

Spontaneous Recovery

There is one case which appears to have made a spontaneous recovery without treatment of any kind, and which certainly belongs to the chronic compensatory type.

CASE VIII

Seale³ in 1929 reported the case of a native African woman aged 30, with a history of pain and swelling in the left eye following a severe confinement; there was definite proptosis. This lasted some months, and was followed by a

similar train of symptoms in the right eye. This on admission was markedly proptosed, and there was swelling of lids and chemosis. Ciliary vessels showed no fullness; the pupil was semidilated and insensitive to light. The eyeball was fixed, disk somewhat pale, field of vision diminished—R.V. 6/36; L.V., can count fingers at six feet. The swelling of the eyelids and chemosis gradually settled down. When seen four months later the cornea was hazy, visual field much reduced, and she could count fingers at two feet only. Four years later the right eye was shrunk into the orbit and was quite blind. The left eye was normal.

Chronic Cases

The remaining cases represent the type in which invasion is slow in onset, and in which any operation has been incidental—dealing with the primary focus and route of invasion or formed abscess, but not with the cavernous sinus itself.

CASE IX

Logan Turner and Reynolds¹³ in 1931 published their conclusions based on the exhaustive examination of fifty-five cases of intracranial pyogenic infection. Of these, twenty-two deal with thrombosis of the cavernous sinus, either by blood stream infection or by direct extension through bone (for example, sphenoidal sinus infection) and of this number one ended in recovery.

This case, previously published by Dr. J. S. Fraser and J. K. Milne Dickie, was that of a male aged 61, admitted to the Royal Infirmary, Edinburgh, with a nine-weeks history of acute suppuration of the middle ear. The following day a Schwartz operation disclosed a generally infected process, which was drained. For a week the temperature would not settle, and the swelling below the mastoid process necessitated further operation. Pus was found beneath the sternomastoid sheath. The lateral sinus was normal. The day after this operation the right eye became painful and the conjunctiva swollen. Two days later there was marked chemosis, and vision was practically lost. Examination of the fundus showed thrombosis of the retinal veins. Oedema of eyelids and proptosis and fixation of the eyeball followed. During this period the temperature was normal and the patient's general condition good. Pus continued to drain from the wound in the neck, and during the following week the swelling, chemosis, and exophthalmos began to subside, but the ulcerated condition of the cornea necessitated enucleation of the eyeball, and an uninterrupted progress led to his discharge from hospital.

CASE X

Agnello⁴ in 1929 reported the case of a boy aged 5, admitted with a history of onset of pain in the left side of the face eight days previously, followed almost immediately by swelling of the eyelids and proptosis of the left eye. A few days later the right eye became similarly involved; chemosis was extreme, the cornea clear, and the pupils reacted to light. The temperature was 106° F., with delirium, restlessness, and incontinence. The orbital swellings were explored with a needle, and thick pus was found in the left side; an incision was therefore made, and an abscess cavity containing a quantity of offensive pus was evacuated in the posterior ethmoidal region. After this procedure a gradual improvement set in, first with regard to the cerebral symptoms, temperature, etc., and later of the eye condition, with a temporary check due to the formation and drainage of a subperiosteal abscess in the superior maxillary region. The patient was eventually discharged at the end of four months.

CASE XI

C. E. Benjamins⁷ in 1931 reported the case of a 15-year-old boy admitted with a history of three years' otorrhoea and ten days' pain and fever, followed by swelling behind the right ear and upper part of the neck. Operation disclosed the presence of cholesteatoma, and the lateral sinus was covered with granulations and thrombosed. The radical operation was completed. Exploration of the swelling in the neck revealed no pus. Bacteriological examination showed Gram-negative diplococci, streptococci, and fusiform bacilli. Later an abscess formed on the neck; this was opened and drained. The

internal jugular vein was inspected and found normal. Oedema appeared in the right upper eyelid, to be followed shortly by chemosis and proptosis; the left eye became similarly affected. Both orbits were explored and pus liberated; a parotid abscess made its appearance, likewise one in the parapharyngeal space—this was opened and drained. At one stage violent headaches and vomiting suggested intracranial complications. A small flow of pus from the depth of the mastoid wound necessitated exploration of the middle and posterior fossae, but no abscess was located. Eventually the case progressed to complete recovery with the exception of total loss of vision in the left eye.

CASE XII

Larsen⁹ in 1932 recorded the case of a boy of 4 years admitted with a history of an acute right middle-ear suppuration of four weeks' duration, with headaches and rigors during the last week. On admission the patient was pale and cyanosed. The right eyelids were swollen, and the pupils were equal and reacted to light. The right mastoid was explored and pus evacuated. Thirteen days after operation, after a sudden rise in the temperature, the mastoid was reopened. Puncture of the lateral sinus showed blood, and exploration of the middle and posterior fossae was negative. The temperature became intermittent, with rigors, sometimes lasting half an hour, dyspnoea, and a feeble pulse. The oedema of the eyelids began to subside and then swelled up again, with intense chemosis and proptosis. On the forty-seventh day of illness there was a spontaneous rupture of an abscess through the temporal side of the right orbit, after which the patient's condition began to show an uninterrupted progress to recovery.

The Author's Case

The following case from my own experience completes this category.

CLINICAL HISTORY

The patient, a married woman aged 26, was admitted to the Worcester Royal Infirmary on November 1st, 1934, with the following history.

She had been slightly deaf in the left ear as long as she could remember. Four weeks earlier she noticed an offensive discharge from this ear, accompanied by malaise and a rise of temperature, but there was no pain or tenderness. Her doctor suspected a mastoid infection, but the condition appeared to settle down and the discharge ceased. There were two attacks of "shivering" during this period. Three days before admission she had an occipital headache followed by swelling in the right orbit. Examination showed considerable swelling of the right upper and lower eyelids with some proptosis. There were no nasal symptoms suggestive of disease in the accessory sinuses and the nasal mucosa was normal in appearance. X-ray examination showed no opacity in any of the accessory sinuses.

Ears: Both tympanic membranes were thickened and showed a large central perforation. In the left side there was a small amount of thick offensive discharge, but no granulations or cholesteatoma.

Hearing: 36 inch watch.	A.C.	B.C.	Rinné	C.V.
Right, 1 ft. 6 in.	—	+	—	6-8 ft.
Left, light contact.	—	+	—	1-2 ft.

Weber's test referred to left side.

There was no nystagmus and no tenderness over the mastoid. The temperature was 102° F., pulse 104, respirations 24.

Blood count: Red cells, 3,800,000 per c.mm.; colour index, 0.52; mean diameter of red cells, 7.17 μ . White cells, 39,000 per c.mm.: polymorphs, 92 per cent.; lymphocytes 7 per cent.; mononuclears, 0 per cent.; basophils, 0 per cent.; eosinophils, 0 per cent. Haemoglobin, 40 per cent.

November 2nd.—Blood culture: Sterile after five days' inoculation. Left eye beginning to swell. Swelling of left temple, and complains of pain in the left side of face and neck.

November 5th.—Ophthalmologist's report: "Marked chemosis and injection of conjunctiva. Swelling of right lids. Proptosis of right eye. Pupil reactions normal. Disks pale. Case strongly suggestive of early cavernous sinus thrombosis." Expectant treatment was adopted.

November 8th.—A large, tense swelling appeared in region of left lateral lobe of thyroid. This was incised, under gas, and about two ounces of thick offensive pus were evacuated. A rubber dam drain was inserted deeply into the wound. At 6.30 p.m. there was a severe rigor lasting twenty minutes. Temperature 104° F.

November 10th.—Ophthalmologist's report: "Both pupils react to light. Proptosis of right eye has increased during the past five days, and there is now definite proptosis of left eye. The veins of the fundi are tortuous, but within the limits of normality. Both disks show a lack of vascularity, and there is some swelling of the upper pole of the left disk. The ophthalmoscopic signs strongly suggest cavernous sinus thrombosis."

November 11th.—Neck wound draining freely.

November 12th.—Large brawny swelling has appeared in the left posterior triangle of the neck. Temperature 101° F.

November 13th.—As the patient's general condition was improved, it was decided to explore the left mastoid and neck wound. The mastoid process was small, acellular, yet markedly vascular. The lateral sinus exposed far forward was obviously thrombosed. This was opened and a solid clot was found but no pus. Radical operation was completed. The anterior triangle of the neck was opened up by extending the incision for draining the abscess; a large abscess cavity was extending up to the base of the skull. The internal jugular vein was found collapsed and was ligatured at either end. The swelling in the posterior triangle was incised, but no pus was found.

November 16th.—Ophthalmologist's report: "The proptosis of the right eye is subsiding, but there is some exposure keratitis."

November 18th.—A small abscess pointing in the left upper lid was incised and some thick pus evacuated.

November 20th.—The patient was making steady progress. The temperature and pulse had settled to normal, and the wounds were draining and healing satisfactorily.

November 30th.—Ophthalmologist's report: "The right proptosis has completely subsided, but there is still some in the other eye. Engorgement of ciliary veins on nasal side of left eye; wrinkled appearance of retina around disks. Relative pallor of left disk. Limitation of left adduction. Engorgement of all anterior ciliary veins except in the upper and outer quadrant. ? Thrombosis of superior ophthalmic vein."

December 12th.—Patient was discharged from hospital.

January 16th.—Ophthalmologist's report: "Eyes normal except for relative pallor of left disk and some contraction of field. Vision 6/6."

Commentary

Although there has been no opportunity of verifying the facts in this case, there would appear to be little reason to doubt that this represents a genuine case of cavernous sinus thrombosis of the subacute or chronic compensatory type, and that the course of infection was as follows. A primary infection of the left middle ear, or a flare-up of a latent chronic infection in that region, led to an infection and thrombosis of the lateral sinus and jugular bulb. An extension of the thrombosis via the inferior petrosal or the internal carotid plexus to the posterior part of the cavernous sinus gave rise to signs of venous stasis, first in the orbit of the opposite side, and, later, to that of the same side. This upward extension of the thrombosis was probably not septic, or at any rate not sufficiently so to precipitate the infection of the meninges, which is the usual sequel to such cases. The centre of the infective process in the vein would appear to have been in the jugular bulb, or below that level, terminating in the large abscess which pointed in the neck and was evacuated. The collapse of the internal jugular vein and an aseptic thrombus at a lower level saved the patient from the grave results of a descending generalized blood stream infection.

The surgical measures adopted in this case would appear to have had little share in what proved to be practically a self-limiting infection. A well-formed abscess was

opened in the neck and another in the orbit, and a radical mastoid operation, which disclosed the thrombosed lateral sinus and the primary source of infection, was completed, but otherwise the patient herself had limited and overcome what might have proved a fatal infection.

Prognosis and Treatment

As may be expected, the acute fulminating type of cavernous sinus infection holds out the least hope of response to any form of treatment, and this is certainly borne out by the very small number of recoveries which have been recorded. Such cases appear to have responded as well to general blood stream therapy as to surgical operation on the cavernous sinus itself, and it is probable that a combination of these two methods of treatment may lead to better results in the future in dealing with this desperate condition. In the more chronic types of cavernous sinus invasion of aural origin it would appear that there is nothing to be lost and much to be gained by adopting an expectant attitude. The thrombosis in these cases is of a protective nature and is sometimes aseptic; to interfere with this process by a direct attack on the sinus itself would be to court disaster.

It must be remembered that the clot itself is not the embodiment of the disease, but is the natural protection, *par excellence*, against the fatal spread of the infection. The primary focus in the middle ear, or mastoid, should, of course, be dealt with surgically at an early date, and any abscess which has formed due to local necrosis or breakdown of clot, whether in the orbit, lateral sinus, or jugular vein, must be given adequate drainage. By far the majority of recoveries from cavernous sinus thrombosis of this type have been treated in this way, and these results must be regarded as the due reward of restrained and conservative surgery directed at assisting the natural efforts of the body without incurring any undue risks in a grave condition by more heroic measures.

Surgical Methods

As regards the surgical treatment of the cavernous sinus itself there are several methods of approach:

1. Through the sphenoidal sinus. The restricted field and the difficulty of illumination, even by Cushing's technique, render this method unpopular.
2. Through the floor of the middle fossa. This is an extensive undertaking, and in none of the recent cases has this method been adopted.
3. Through the orbit, by opening the outer wall by an osteoplastic flap and removing the eye. This appears to be the method of choice, though often a sound eye has to be sacrificed; Christophe considers that this should not always be necessary.

Eagleton was the first to insist upon not only the eradication of the primary focus and drainage of the route of invasion, but also the necessity of putting the inflamed cavernous sinus at rest by ligation of the internal or common carotid artery, thereby eliminating those currents and eddies which are set up within the sinus itself by the transmitted pulsation of this artery. This analogy with the treatment of phlebitis in any other region of the body would appear most rational, but it does not seem to have become a regular procedure in the cases studied since his publication. Lauwers¹¹ and Christophe² adopted this measure in conjunction with exposure of the sinus by the external orbital osteoplastic flap. Although Eagleton decries the proposed dangers of this procedure, he quotes three cases resulting in severe cerebral complications, hemiplegia, etc., attributing these, however, to other factors; but such possibilities should make the surgeon tend to reserve this procedure for the more desperate type of case.

Transfusion and Vaccine Therapy

The importance of both a daily blood culture and a daily differential blood count is stressed by this author in discussing the all-important question of diagnosis and subsequent treatment. His experience has convinced him of the value of using for transfusion blood from immunized donors. These are injected from time to time with minimal doses of a mixed stock vaccine prepared from the organisms usually responsible for infections of the ear, nose, and throat. Just prior to transfusion a larger dose should be given intravenously, either of the mixed vaccine or, when possible, of an autogenous one from the patient's own organisms. In this way both agglutinins and bacteriolysins are increased in the donor's blood, and this is of the greatest importance in treating the desperate type of acute case.

Summary

1. A review of the cases of recovery from cavernous sinus thrombosis shows no more than seven which might be described as the acute infective type.
2. Of this number three were treated by direct operation on the sinus itself and four by general blood stream therapy.
3. A combination of these two methods, together with ligation of the internal or common carotid artery, is indicated if better results are to be obtained in future.
4. Approximately thirty cases have been reported of the chronic compensatory type, and of these two have been treated by operation on the sinus itself, one by blood stream therapy, and the majority of the remainder, including a case of the author's, by expectant treatment and by accessory surgical measures for the eradication and drainage of the primary focus, channels of invasion, and formed abscesses.
5. A very few cases have recovered spontaneously.

I should like to express my indebtedness to Dr. Sinclair Roberts and to Dr. Patten for their helpful co-operation with regard to the ophthalmic condition, and to Dr. Stewart for his assistance in presenting the pathological reports.

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M. K. Öke (*Deut. med. Woch.*, April 10th, 1936, p. 577) discusses the differential diagnosis of ovarian haemorrhage and acute appendicitis in the light of five cases, recorded in detail, and of the literature. He concludes that the escape of blood into the free peritoneal cavity gives rise to a peritoneal reaction simulating so closely that of acute appendicitis that it is difficult to distinguish between them. In all his five cases acute appendicitis was diagnosed by the physicians first seeing the patients and by himself. It seems that in such cases gynaecologists think first of an ovarian haemorrhage, presumably due to an extrauterine pregnancy, while the first thought of surgeons is appendicitis. A leucocytosis of more than 30,000 is held by some to suggest ovarian haemorrhage, but opinions are not unanimous on this point. To clinch the differential diagnosis by an exploratory puncture of the pouch of Douglas is not always warrantable, and may not yield decisive information. The author believes that only laparotomy can establish the differential diagnosis, and that the physicians and surgeons concerned should concentrate on the clinical indications for or against it.