

substance into monkeys. Since this will take some time it was considered advisable to report these cases while the disease was still prevalent.

Summary and Conclusions

1. That these are cases of polio-encephalitis.
2. That there is a definite association between the course of the disease and the presence of a raw tonsil bed, even although it was completely healed up when the symptoms of the disease arrived.
3. That the incubation period in these cases was about four days, presuming that the infection took place at the time of tonsillectomy.
4. That the route of the infection was from the raw tonsil bed to the dorsal nuclei via the peripheral fibres of the glosso-pharyngeal nerve.

HAEMORRHAGE FOLLOWING TONSILLECTOMY

BY

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The purpose of this paper is to discuss a subject which is of the utmost importance not only to all oto-rhino-laryngologists but to all surgeons, house-surgeons, and general practitioners who may be faced with the problem of haemorrhage following tonsillectomy. It is a very real problem and one, moreover, to which only scanty reference is made in even the largest and most authoritative of textbooks. Such haemorrhage is terrifying enough for the patient, and may be even more alarming for the medical man unaccustomed to dealing with such cases.

For the efficient treatment of haemorrhage following tonsillectomy a thorough knowledge of the factors concerned in its production is necessary, and careful consideration of these factors will do much to minimize the occurrence of this distressing complication. I propose to discuss this subject under the following headings:

I. *Factors influencing the occurrence of haemorrhage following tonsillectomy: (a) pre-operative; (b) operative; (c) post-operative.*

II. *Types of post-operative haemorrhage.*

III. *The management of a case of haemorrhage following tonsillectomy.*

FACTORS INFLUENCING ITS OCCURRENCE

Pre-operative

Although tonsillectomy may be indicated in any particular patient, certain precautions must be taken before operation is decided upon, and many factors remain to be considered before the actual time of operation is arranged. In taking a history of the case and during examination of the patient particular attention should be paid to the following points.

1. *Severe Tonsillitis or Peritonsillar Abscess.*—Recent acute local infections increase the risk of haemorrhage both during and after operation, and for this reason tonsillectomy should not be performed within a period of a few weeks following either of the above conditions. No hard-and-fast rule can be laid down as to the time which should be allowed to elapse before operation is undertaken, but I am of the opinion that, following such acute local infections, tonsillectomy should be

deferred for a period of not less than four weeks in the case of children and not less than six weeks in the case of adults.

2. *Infections of the Nose or Nasal Accessory Sinuses.*—Acute sinusitis, whether associated with a sore throat or not, is a contraindication to the immediate performance of the operation. A common cold comes under the same category. The presence of chronic sinusitis should not be overlooked. Adequate measures for its efficient treatment should be instituted before tonsillectomy is considered.

3. *Bleeding.*—Inquiry should be made as to whether there is any susceptibility to bleeding on the part of either the patient or any member of his family. The occurrence of prolonged haemorrhage following cuts or abrasions, or after dental extraction, demands the investigation of the patient's coagulation time and bleeding time. Normal limits for these are: coagulation time (Lee and White), 4 to 7 minutes; bleeding time (Ivy), 1 to 4 minutes. If these times are found to be prolonged it is possible that they may be brought within normal limits by the administration of calcium and alkalis or by blood transfusion. If these limits cannot be attained, then the question of operation, the risks of which should be explained to the patient, must be reconsidered. Unless it is absolutely necessary tonsillectomy should be deferred.

4. *Menstruation.*—On account of the psychological upset and the delayed coagulation time of the blood, operation should be avoided just before or during the first few days of a menstrual period.

5. *Jaundice.*—Tonsillectomy is contraindicated in the presence of jaundice due to any cause.

6. *Anaemia.*—In any severe anaemia operation should not be undertaken without preliminary treatment or even a blood transfusion.

7. *The Type of Patient.*—It is interesting to note the physical characteristics of any patient, for it is in those of the plethoric type, with short thick necks, that haemorrhage is most prone to occur. Heavy smokers, chronic alcoholics, and patients with highly excitable and emotionally unstable temperaments also suffer in this same respect. (All sandy-haired children are suspect.) Again, red-haired females and the subjects of thyrotoxicosis show a tendency to bleed excessively following operation.

As a routine, adult patients should be given 10 grains of calcium lactate thrice daily for three days before tonsillectomy, and be asked to abstain from alcohol and tobacco for a similar period.

Operative

Consideration of the various methods of tonsillectomy does not come within the scope of this paper, but the type of operation performed, however, does influence the incidence of severe post-operative haemorrhage. In a large series severe bleeding occurred in 2.6 per cent. of cases after guillotine enucleation, as compared with 0.7 per cent. of cases following removal by dissection (McNally, 1927). The figures will depend to some extent, of course, on the care and discrimination exercised by the individual surgeon in his selection of cases for operation.

It is a significant fact that patients who have been subjected to guillotine enucleation of tonsils nearly always vomit after operation, and the vomitus always contains blood. Douching the face and neck with ice-cold water at the end of the operation induces considerable reflex vasoconstriction and is usually sufficient to cause cessation of the haemorrhage, but it must be remembered that although bleeding may *apparently* have ceased, in that blood is not trickling from the mouth, a lightly anaesthetized patient may be swallowing the blood. It is important, therefore, that the actual tonsillar fossae should be inspected at the end of the operation and that the patient should not be sent back to bed until all bleeding has been controlled. In cases in which the adenoids have

been removed at the same time care should be taken to ascertain that no tags are left behind, for such tags are a potent source of post-operative haemorrhage.

Removal of tonsils by dissection has for most surgeons now become the operation of choice. Whatever method of dissection is employed the important point is that the *tonsillar fossae must be dry before the patient leaves the operating theatre*. The subsequent maintenance of haemostasis is influenced by the following factors.

1. *Anaesthesia*.—Chloroform anaesthesia, or very deep anaesthesia produced by any agent, results in a fall of blood pressure. Later, when this pressure regains its normal level, haemorrhage may recommence owing to separation of a clot in the mouth of a blood vessel divided, but overlooked, at the time of operation.

2. *Imperfect Clot Formation*.—This is most likely to occur in the larger veins in the bed of the tonsillar fossa. If a vein has been "button-holed," but not completely divided, any obstruction to respiration may cause dilatation of the vein and consequent instability of the clot. Complete division of a large longitudinal vein results in continuous bleeding from its upper end at the time of operation, and for this reason the upper end is usually ligatured. The lower end, however, is collapsed and its contained clot is small. Subsequent dilatation of this lower end renders the clot unstable, and haemorrhage is likely to recur. It is important, therefore, to search for, and tie, the lower end of a completely severed longitudinal vein.

3. *Obstruction to Respiration*.—The maintenance of a clear airway is of the utmost importance following tonsillectomy. Before the patient leaves the operating theatre an artificial airway should be very gently inserted in the mouth after all the blood clot has been removed from the nose and nasopharynx.

4. *Ligatures*.—The slipping of insecurely tied ligatures may be responsible for the occurrence of post-operative haemorrhage.

5. *Artificial Means employed to Control Bleeding at Operation*.—The use of vasoconstricting agents—for example, adrenaline hydrochloride solution—is not to be recommended at the time of operation because subsequent reactionary vasodilatation occurs and may result in capillary oozing. The same objection, however, does not apply to the use of haemostatic sera and snake venom, for these are purely coagulating agents.

Post-operative

Any conditions which tend to cause congestion after operation should be rigorously avoided. The following measures are calculated to minimize the risk of post-operative haemorrhage.

1. On return from the theatre the patient is placed in bed in the "lateral" position. This position allows of free respiration and consequently minimizes congestion. It also permits any blood which may collect to run out of the nose and mouth and so be seen rather than remain concealed. Further, the risk of inhalation of blood or blood clot is considerably reduced.

2. The artificial airway should be removed when the cough reflex has returned.

3. If the patient is becoming restless soon after operation, and provided there is no bleeding, a sedative should be given. For adults, 1/6 grain of omnopon is recommended, and for children an enema containing bromides (up to 120 grains) and aspirin (up to 30 grains), combined with a little citric acid, will be found most useful.

4. No hot fluids or food should be allowed during the first twenty-four hours. The diet should be restricted to cold fluids or semi-solid food for the first day, and then gradually increased. Hard or irritating articles of food should be avoided until the tonsillar fossae have healed completely.

5. The patient is allowed out of bed for the first time on the evening of the third day following operation.

6. Hot baths are inadvisable for the first ten days after tonsillectomy.

7. For a week after leaving hospital the patient should avoid any strenuous exercise and should go for short walks only towards the end of the week. During this week he should also refrain from taking any stimulants and should be careful to avoid infection. It is unwise to go to cinemas or theatres during this period.

8. A mixture containing potassium chlorate, sodium salicylate, and sodium bicarbonate is given thrice daily throughout the period of convalescence. The potassium chlorate, after absorption, is secreted in the saliva, and, as is well known, its antiseptic properties are due to the fact that it is a powerful oxidizing agent. It also increases the alkali content of the plasma and is credited with haematinic properties. The sodium salicylate, in addition to its usual antipyretic properties, possesses an almost specific action in cases of infection of a rheumatic-nature. Further, it increases the number of leucocytes in the circulating blood.

TYPES OF HAEMORRHAGE

Haemorrhage following tonsillectomy may be divided into three types.

(a) *Reactionary haemorrhage*, or haemorrhage occurring within the first twenty-four hours after operation.

(b) *Haemorrhage during Convalescence*.—This commonly occurs on the fifth night after operation, and is associated with the aseptic separation of the primary slough from the bed of the tonsillar fossa. It is not the result of infection, for it usually occurs in the absence of signs of local inflammatory reaction and in patients whose post-operative temperature is normal. The fact that catgut ligatures also tend to come away at this time again favours the occurrence of haemorrhage on or about the fifth day.

(c) *True Secondary Haemorrhage*.—This differs essentially from the type just described, in that it is associated with damage to the muscular tissue in the bed of the tonsillar fossa and is due to consequent sepsis, which results in sloughing of part of the wall of an artery. Examination of the throat in these cases usually reveals considerable redness and oedema of the faucial pillars and uvula, and sometimes an offensive slough in the tonsillar fossa. The local inflammatory reaction is reflected in the patient's temperature chart. True secondary haemorrhage may occur at any time from the third to the twelfth day after operation.

MANAGEMENT OF A CASE OF HAEMORRHAGE

Reactionary Haemorrhage

Slight oozing, which should be of insignificant amount, usually takes place during the first hour after operation but ceases at the end of this time in the vast majority of cases. If free oozing occurs after the first hour, or if there is vomiting of freshly swallowed blood, the patient must be considered to be suffering from *reactionary haemorrhage*. This is treated according to the following routine procedure:

If a sedative has not been needed, or has not been given already, one should be given now. For this purpose there is no more efficient drug than morphine hydrochloride, which not only lowers the blood pressure but also diminishes the tendency to post-operative vomiting. I am of the opinion that, in the case of adults, an initial dose of one-quarter of a grain administered by hypodermic injection is far more effective than a dose of one-sixth of a grain repeated at the end of half an hour. One-eighth of a grain may be given to a child aged

10 years, but in younger patients morphine or any of its derivatives should be avoided. A mixture containing potassium bromide and chloral hydrate is a safe and efficient sedative for these children under the age of 10.

Unless the haemorrhage is so free as to necessitate urgent attention it is now wise to wait for twenty or thirty minutes before examining the throat. At the end of this time the examination is usually accomplished without difficulty, for the morphine has minimized pain, diminished the throat reflexes, and allayed to some extent the nervous anxiety of the patient.

Whenever morphine or one of its derivatives has been given, the *tonsillar fossae must be inspected* half an hour after the administration of the drug. The surgeon should make this examination himself and not merely rely on the report of possibly indifferent observers. Careful search should be made to detect any oozing or trickling from the fossae, for, although a nurse may say that there has been no further bleeding, the patient may still be swallowing blood. This may accumulate slowly in the stomach to such an extent that the pulse rate may rise alarmingly immediately after a pint of blood has been vomited. It is not uncommon for a patient to go to sleep after morphine has been given and for the doctor to be informed that there is no further bleeding. Two hours later, however, the patient may suddenly waken and vomit a large quantity of blood.

DETAILS OF EXAMINATION AND TREATMENT

A good source of illumination is essential for this examination, and in order to leave both hands free a head-lamp or head-mirror should be employed. If it is thought that haemorrhage is still continuing, the patient is given a tumblerful of cold water and is asked to rinse out the mouth three or four times. The rinsings are voided into a basin. A final mouthful is then taken and swallowed. This renders the mouth fairly free from blood and facilitates inspection of the tonsillar fossae. If on inspection there is no bleeding, further action is unnecessary. If there is bleeding the tongue is depressed gently but firmly by means of a tongue depressor held in one hand and, with an instrument such as Luc's ethmoidal forceps held in the other, *all* blood clot is removed from the offending fossa. Another mouth-wash of cold water is then given. Total removal of the clot may be all that is necessary to terminate the bleeding. If haemorrhage continues a pledget of cotton-wool, soaked in peroxide of hydrogen and then wrung nearly dry, is inserted into the tonsillar fossa. The tongue depressor is then removed and the patient is allowed to close the mouth on the forceps, the pledget of wool still being pressed into the fossa. At the end of a minute the wool is removed and a fresh but similar pledget applied in the same manner as the first. If necessary, yet a third pledget is applied.

If at the end of three minutes haemorrhage is still occurring, this whole procedure is repeated, substituting a 1 in 1,000 solution of adrenaline hydrochloride for the peroxide of hydrogen. These measures usually suffice to control the bleeding. A warning may be issued at this point. On no account must a solution of *cocaine* and adrenaline be applied to the raw bed of the tonsillar fossa. The use of such a solution may rapidly prove fatal.

Other agents which may be employed in the treatment of reactionary haemorrhage are:

1. *Ice*.—The patient may be given small pieces of ice to suck. This is of questionable value from the haemostatic point of view, but it does allay thirst and also lessens the tendency to

vomit. An ice-pack (or cold-water pack) applied round the neck is sometimes of value in doubtful cases.

2. *Coagulating Serum*.—If available this may be applied locally or administered by injection. In the latter case the danger of anaphylaxis must not be overlooked, and the surgeon must not allow himself to be lulled into a false sense of security merely because haemostatic serum has been given.

3. *Clamps*.—If bleeding is brisk it may be controlled temporarily by the application of a suitably padded clamp of the Courtenay Yorke or Watson-Williams design. Clamps should be applied firmly, but not so tightly as to traumatize the tissue between the blades. If possible their use should be avoided altogether, as they are responsible for much discomfort to the patient.

If the measures taken appear to have stopped the bleeding, the patient is allowed to rest for a while in order that the morphine may be given a chance to complete its work. The pulse rate is recorded at fifteen-minute intervals and a careful watch maintained for further signs of haemorrhage. If haemorrhage does appear to continue, or if in spite of no apparent bleeding the pulse rate is rising, the tonsillar fossae should be inspected again. If the measures enumerated above have not been successful in controlling the bleeding, arrangements should be made for the return of the patient to the operating theatre without delay. I make this statement because I am convinced that it is better to give a second anaesthetic while the patient's general condition is still relatively good than to wait until his state is so precarious that the operative campaign must necessarily be hazardous to a degree. These remarks apply even more forcibly in the case of children and elderly people, who are particularly intolerant of continued haemorrhage and in whom any unnecessary delay in securing haemostasis may prove fatal. A steadily rising pulse rate, a pulse that is irregular or easily compressible, increasing pallor, a cold and clammy skin, shallow and rapid respiration, great restlessness, and the continued vomiting of blood are all danger signs to be avoided rather than treated when they occur.

As soon as the decision to take the patient back to the theatre has been made a hypodermic injection of 1/100 grain of atropine sulphate is given. The anaesthetic of choice on this second occasion is "open" ether, which is well tolerated by these morphinized and exsanguinated patients. On no account should chloroform be administered, for it not only exerts a toxic influence on the myocardium but lowers the blood pressure and consequently conceals haemorrhage. If an injection of coagulating serum has not been given already, it may be administered with advantage while the patient is under the anaesthetic.

A gag is inserted in the mouth and once more all clot is removed from the offending fossa in order to expose the source of the haemorrhage. Single bleeding points are clamped and ligatured. It may be necessary to underrun a bleeding vessel with a catgut stitch threaded on a small curved needle. If there is a general ooze a swab soaked in iced acriflavine (1 in 1,000) solution is inserted into the fossa and held there for three minutes. If this fails to control the bleeding a swab soaked in pure turpentine may be tried. The local application of haemostatic serum, or snake venom if available, may also prove effective in controlling a general ooze.

If all the above measures fail, the faucial pillars should be sutured together over a gauze plug or a gauze-covered pledget of wool soaked in the acriflavine solution. Two sutures suffice; they, and the wool, are removed after twenty-four hours. Recourse to suturing the faucial pillars is, however, rarely necessary.

Haemorrhage during Convalescence

In the vast majority of cases haemorrhage of this delayed type occurs on the fifth night following operation and is due to factors already enumerated. As a rule it is not severe, and may consist only in the patient coughing up a small bright red clot. It usually ceases after a gargle of weak hydrogen peroxide. Sometimes the haemorrhage, although not severe, continues during the course of an hour or more, and is associated with discomfort in the throat due to the presence of clot. The patient's efforts to dislodge the clot may then prolong the bleeding, in which case the treatment becomes exactly the same as that already described for reactionary haemorrhage. It will be found, however, that it is rarely necessary to give morphine, still more rare to have to remove the clot, and extremely rare to have to take the patient back to the theatre.

True Secondary Haemorrhage

Haemorrhage of this type is much more serious than that described under the heading of haemorrhage during convalescence. Fortunately, however, it is also more uncommon. When it does occur there is frequently a small "warning" haemorrhage on one day, followed by a larger one within the next twenty-four hours. In such a case it is likely that the patient will have to be taken back to the operating theatre. The control of this type of bleeding is often difficult, for it is seldom possible to clamp and ligate a single bleeding point on account of the friability of the sloughing and oedematous tissues of the bed of the tonsillar fossa. If the more simple measures already advocated for the control of bleeding are ineffective, recourse to suturing the faucial pillars will be necessary.

Ligation of the external carotid artery and the use of snake venom are measures of questionable value in the control of post-operative haemorrhage of this type. According to the literature ligation of the external carotid artery is of doubtful efficacy in any type of tonsillar haemorrhage on account of the extensive anastomosis of this vessel through the circle of Willis. Blood transfusion may be helpful—even life-saving—in cases of severe haemorrhage, but it is desirable that effective measures for the control of any bleeding should be instituted before transfusion becomes necessary.

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REFERENCE

McNally, W. J. (1927). *Canad. med. Ass. J.*, 17, 690.

The Fifth Biennial Conference on Mental Health will be held at the Central Hall, Westminster, London, S.W.1, from January 12 to 14, 1939. The conference luncheon will take place at the Hotel Victoria, W.C.2, on January 13. The subjects for discussion at the sessions of the conference are as follows: January 12, Is our national intelligence declining? Should mental treatment be practised solely by doctors? January 13: The psychological factor in sexual delinquency; The organization and staffing of out-patient mental treatment clinics; Mental hygiene and the Press. January 14: Education and emotional needs of the child; Problems of adolescent instability and of juvenile delinquency; The place of the social worker in mental health. Tickets and information can be obtained from the Secretary, The National Council for Mental Hygiene, 76/77, Chandos House, Palmer Street, London, S.W.1.

PERFORATED PEPTIC ULCER IN ORGANIC NERVOUS DISEASE

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The following two cases, in which death resulted from diffuse peritonitis due to perforation of a peptic ulcer, occurred within a little while of each other at St. Bartholomew's Hospital. Both patients were suffering from an organic disease of the nervous system, which masked the symptoms and signs of perforation, so that the complete condition was recognized only at necropsy.

Case I

A woman aged 41 was admitted to a medical unit on February 21, 1938, complaining of a pain in the shoulders. Ten years previously a diagnosis of disseminated sclerosis had been made, following some loss of the use of her legs. Similar attacks and remissions had occurred since. Two months previously she again lost the use of her legs, felt unwell, and vomited for a few days. She had experienced vague abdominal discomfort since. Three days before admission she developed sudden severe pain in both shoulders. Her bowels had not been opened subsequently.

On admission she was collapsed, clammy, cyanosed, and dyspnoeic. She complained of pain and tenderness of the shoulders, and she looked moribund. Her temperature was 98° F., pulse 160, and respirations 36. She showed no nystagmus. Her tongue was furred. There were no abnormal physical findings in her chest beyond the tachycardia and the tachypnoea. Her abdomen was distended and tense, but not rigid, and there was slight tenderness on deep palpation. The percussion note was resonant all over, and the area of liver dullness was reduced. There was spasticity of the left lower limb with increased knee-jerk and extensor plantar response. The temperature and pulse showed no marked variation, and she died the following day.

Post-mortem Examination.—The typical grey translucent scars of disseminated sclerosis were found throughout the cerebral hemispheres and, to a lesser extent, the cerebellum and spinal cord. The largest was 1 cm. in diameter and occupied the greater part of the right side of the pons. The heart was moderately dilated. Both pleural cavities contained small serous effusions, and the lungs showed emphysema and terminal congestion. The greater sac of the peritoneal cavity was distended with much gas and two pints of foul turbid fluid. The lesser sac contained an abscess cavity surrounded by dense fibrous tissue, but anteriorly the abscess had perforated through the gastro-hepatic omentum into the greater sac. This perforation was 1 cm. in diameter, and was situated midway between the cardia and pylorus. In the stomach a chronic peptic ulcer was discovered on the posterior wall immediately proximal to the pylorus. Its floor was completely deficient, and this hole communicated directly with the abscess cavity in the lesser sac. Just proximal to this perforation there was also a subacute ulcer 2 cm. in diameter.

Case II

A man aged 55 was admitted to a medical unit on March 18, 1938, complaining of feeling weak. One hour previously, while walking in the street, he had suddenly "come over queer" and felt some pain in the back of the shoulders. He passed a loose motion, his vision became dim, and he collapsed, though he was never unconscious.