A Paper

ON

RECOGNITION AND TREATMENT OF BIRTH INJURIES IN THE NEWLY BORN*

BY

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The infant in its passage through the genital canal probably experiences more severe trauma than at any future stage of its existence. Few adults could survive such an experience. It is small wonder, then, that some infants die forthwith from what is miscalled "asphyxia pallida," really from shock, and that others die in a few days as the result of birth trauma. The majority fortunately survive, but all are injured to a greater or less extent. From Cruickshank's¹ pathological work on neo-natal mortality, it appears that about 30 per cent. of all neo-natal deaths are due to birth injury. The minor injuries are complacently dubbed physiological, though an adult with a caput succedaneum or cephalhaematoma would certainly not consider his condition physiological.

There is a remarkable contrast between the recuperative powers of infants from sepsis and from injury. To the former they show little, while to the latter they show wonderful, powers of resistance. Injuries to the skin and subcutaneous tissue, in the absence of sepsis, usually heal without leaving either deformity or disability. Fractured bones nearly always unite with great rapidity and without deformity. Injuries to the viscera on the other hand are usually fatal, at least those that are recognized usually end in death, though there must be many minor injuries which pass unnoticed and leave no after-effects. Of all the birth injuries those to the nervous system are most likely to leave permanent disability, though here again a grossly paralysed limb may, within a few weeks, recover completely, and even intracranial haemorrhage may be absorbed without leaving any disability either mental or physical. Retinal haemorrhages always clear up within 10 days or a fortnight. Once the first critical days have passed, if infection be avoided, most infants make a rapid and complete recovery from the trauma of birth. Of the deaths from birth injury 68 per cent. occur in the first three days of life.¹ If the trauma is insufficient to kill rapidly the majority recover completely.

The present paper is based on the case records at the Royal Maternity Hospital, Glasgow, over a period of 3½ years. During that time all the infants who had received recognizable birth injuries were under my care. In this period approximately 8,000 infants were born alive, and from these I have records of 350 more or less severe birth injuries.

The birth injuries are best classified on an anatomical basis—injuries to the skin and subcutaneous tissues, to the muscles, to the bones, to the viscera, and to the nervous system.

INJURIES TO THE SKIN AND SUBCUTANEOUS TISSUE

Even in normal labour some injury to the skin and subcutaneous tissue always occurs. Many of the injuries are of minor importance and clear up so rapidly that in a few days no trace can be found. The caput succedaneum in vertex presentation may be said never to give rise to trouble. In face presentation, however, the oedema and swelling of the lips and buccal mucous membrane may interfere with sucking. In breech presentation the vulva

or penis and scrotum may be severely bruised and oedematous; in these cases danger of sepsis is considerable, for it is almost impossible to protect the damaged tissues from contact with the excreta. Cellulitis arising from this cause is not uncommon.

Severe bruising of the scalp with forceps or from pressure on the promontory of the sacrum may lead to sloughing of the soft tissues. This most commonly occurs when there is an abrasion of the injured scalp which becomes infected. The sloughing may extend down to the skull and a considerable area of bone may be laid bare. The greatest care should be taken to protect these abrasions from infection. Misapplied forceps may cause very extensive damage. I have seen a case in which, besides numerous fractures of the skull, one of the ears was almost severed from the head.

The cephalhaematoma only rarely gives rise to trouble. It can be recognized by the limitation of the swelling to the margins of one of the flat bones of the skull. Its edges are usually firm and the condition must not be mistaken for a depressed fracture. Meningoceles which may simulate this condition alter in tension with changes in intracranial pressure and are situated over sutures. Only on very rare occasions does the cephalhaematoma become infected, and in the absence of infection it is always absorbed, leaving no trace.

The subcutaneous tissues are sometimes damaged by pressure and the condition of adipo-necrosis neonatorum produced.² These lesions consist in round or elongated indurated swellings immediately under the skin. They are usually of a dusky red colour and are not tender. The upper parts of the neck, the back, and the shoulders are the usual areas affected. They disappear in 5 or 6 weeks after birth.

Bednar's ulcer, though strictly speaking not a birth injury, occurs so soon after birth that it is worthy of mention. It is an ulcer of varying size on the palate or fauces and is caused by the misguided efforts of the attendant in attempting to clear mucus from the pharynx of the newborn infant. In itself the injury is of minor importance, but it provides a portal of entry to infection, and on this account all procedures which are likely to damage the very delicate mucous membrane of the infant's mouth or pharynx should be avoided. The ulcers usually heal rapidly without treatment.

INJURIES TO MUSCLES

The only injury to muscle which calls for special comment is injury to the sterno-mastoid muscle. Sometimes the coincident swelling of the skin and subcutaneous tissues of the neck may prevent recognition of the muscular lesion for 2 or 3 days. It is almost always situated in the lower half of the muscle and may reach the size of a pigeon's egg. There is considerable difference of opinion regarding the nature and cause of the swelling. Some consider it to be due to rupture of the muscle in cases of difficult labour, while others think it is caused by ischaemic contracture of the muscle resulting from prolonged venous stasis either during labour³ or *in utero* before labour commences. There does not seem to be any sound reason why simple rupture of the muscle should result in extensive fibrosis and wry-neck, and it seems probable that the cases which show this deformity are due to venous obstruction and ischaemic contracture.

FRACTURES

Fracture of the Skull.—The most common fracture, as might be expected, is fracture of the skull. I have records of 16 cases, and it is probable that others occurred but were not detected owing to the displacement being of minor degree. Of these cases 14 were vertex presentations and 2 breech. There were five deaths. Three occurred

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within two days of birth, and in each case there was very extensive damage to the meninges and laceration of the brain. One child died when 10 days old and one when 6 weeks old from gastro-enteritis. Only one infant required operation; he made a good recovery. The commonest bone to be fractured was the frontal—9 cases in this series. In one, the orbital plate of the frontal bone was fractured and there was great haemorrhage into the orbital cavity. Recovery, however, was complete. The parietal bone was damaged in 5 cases, and the temporal and occipital bones each in one case. The fracture usually occurs in cases of difficult labour and is commonly caused by one of the forceps blades, though in women with deformed pelvis the sacral promontory may cause the damage.

Surgical intervention should as a rule be avoided. The infant's skull is so elastic that depressions in the skull are unlikely to cause symptoms from increased intracranial pressure. Symptoms may arise from damage to the underlying brain or from haemorrhage from a torn tentorium or falx, but surgical treatment cannot restore damaged brain substance, and the structures in the region of the brain stem are beyond its reach. Experimentally it has been shown that fracture and depressions produced by slow localized pressure do not cause damage to the brain or meninges.⁵ For these reasons it is only in those cases where there are definite signs of active mischief at the site of the fracture that operative procedures should be undertaken.

Fractured Clavicle.—Fracture of the clavicle occurred in 8 cases in this series. It was right-sided in 3 cases, left-sided in 4, and in one case double. In one infant, a breech presentation, there was a right-sided Erb's paralysis and a fractured left clavicle. In 4 of the cases the presentation was breech and in 4 vertex. In all the cases in which the presentation was vertex the infants were very large and the labour difficult. Manipulative interference with the delivery of the shoulders is thought by Hukewytsch⁶ to be a frequent cause of the fracture. There is seldom much displacement of the bone and on this account the condition is often overlooked, or owing to immobility of the arm it may be mistaken for Erb's paralysis. An early sign is swelling of the soft tissue over the affected clavicle,⁶ and the callus, which forms in a few days, makes the diagnosis plain. As the newborn infant habitually lies on his back elaborate methods of fixation are not necessary. A pad may be strapped between the shoulder blades in order to throw the shoulders back, and the arm of the affected side may be fixed to the trunk. The fracture almost always unites without leaving any deformity. This is said to be due to the fact that in early infancy the thorax grows so quickly that overlapping is naturally counteracted.⁷

Fracture of the Humerus occurred in 8 cases, 5 of which were left-sided and 2 right-sided; in one, both bones were fractured. In 7 cases the presentation was by the breech and in one by the vertex (occipito-posterior). The fracture usually occurs in the upper third of the bone and is probably always due to manipulative interference. The immobility of the arm, the swelling and the crepitus, which can usually be elicited, make the diagnosis clear. In newborn infants it is extremely difficult to fix a limb to an ordinary splint; the converse, to fix a splint to a limb, is possible, but useless. Probably the best and simplest method of splinting the humerus is to wrap a thin layer of gamgee round the arm and then encircle the limb from the shoulder to the elbow in a fairly firmly applied band of adhesive plaster. The arm may then be fixed to the side with the elbow bent at a right angle. In some cases the same type of splint as that used for Erb's paralysis is useful. By this means the arm is fixed in a position of

abduction and external rotation with the forearm flexed at a right angle. The results are almost always excellent. In one of my cases, however, there was damage to the musculo-spiral nerve with drop-wrist. This disappeared in two months.

Fracture of the Femur occurred three times, twice in breech presentation and once in a case delivered by Caesarean section. In the latter the fracture almost certainly occurred when the infant was being extracted from the uterus. The diagnosis is usually easy, but in one of the cases, in which the fracture was in the lower third of the bone, there was great swelling of the leg as well as the thigh, and the fracture was thought to be in the tibia. This was disproved by x-ray. The best method of fixing the bone is by vertical extension with the thigh at a right angle. A light bar of wood across the top rail of the cot provides a satisfactory fixture from which to suspend the limbs. This position is not uncomfortable and it has the great advantage of enabling the buttocks to be cleansed without disturbing the affected limb. In all the cases union was sufficiently firm in three weeks to permit us to dispense with the extension apparatus. The results in all cases were satisfactory. In fixing the limbs of newborn infants the greatest care must be taken not to cause damage to the skin from pressure. For this reason wooden or metal splints are not to be recommended. Even a sharp edge of adhesive plaster pressing on one of the folds of the axilla may produce a dangerous abrasion. It is therefore of great importance to inspect the fixation apparatus frequently and to reapply it if there is any suspicion of underlying damage.

INJURIES TO THE VISCERA

Injuries to the organs in the thorax or abdomen are not as a rule recognized during life. It is common in cases of asphyxia to find at necropsy pleural or pericardial haemorrhages. Cruickshank¹ found visceral haemorrhage 81 times in 800 neo-natal deaths (lung 28 cases, liver 18 cases, suprarenal 23 cases, kidney 20 cases and retroperitoneal tissue 1 case). In one case that came under my notice there was a large swelling in the region of the left kidney; the urine was normal. In 9 weeks the swelling had become much less but could still be detected; at the age of 5½ months no trace of the swelling could be found. I think this was a case of perirenal haemorrhage. The testicles may receive injury in breech presentation. I have seen several cases in which there was great swelling of one or both testicles probably due to haemorrhage into the tunica vaginalis. These swellings usually subside rapidly and leave no trace.

INJURIES TO THE NERVOUS SYSTEM

Of all birth injuries those to the nervous system are most likely to leave serious and lasting disability. Injury to peripheral nerves may result in permanent paralysis, while intracranial or spinal trauma is not only an important cause of neo-natal death, but may, in the infants that survive, give rise to most serious sequelae. In these injuries the remarkable recuperative power of the infant shows itself in the same way as is seen in injury to other tissues, but, none the less, damage to the nervous system gives rise to serious sequelae more commonly than any other birth injury.

Injury to the Peripheral Nerves

The two common lesions are injury to the facial nerve and to part or all of the brachial plexus. It is extremely rare to meet with damage to other nerves though paralysis from injury to the sciatic and peroneal nerves has been recorded.⁸ I have records of two cases of paralysis of the

anterior tibial muscles. One was a case of breech presentation; the presentation of the other is unknown as the child was born before admission to hospital. Both infants made good recoveries. In these cases it is extremely difficult to differentiate between paralysis from injury to peripheral nerves and paralysis from damage to the spinal cord. Retention of urine and loss of the anal sphincter reflex point to cord injury.

Facial Paralysis

This is usually caused by pressure on the 7th nerve in its course outside the skull, though the nucleus or the nerve trunk in its intracranial course may be damaged by fracture or haemorrhage. In the great majority of cases the paralysis is caused by pressure of a forceps blade on the nerve after it leaves the sterno-mastoid foramen. The paralysis may be complete or partial, the extent depending on whether the main trunk of the nerve or only some of its branches have been damaged. The condition is easily recognized; when the child cries the mouth is drawn to the sound side, the eye on the affected side does not shut and the face on that side remains impassive. There is usually some swelling and bruising in the region of the mastoid. Sucking is not interfered with. Treatment is unnecessary though the local bruising and excoriation may require attention. I have records of 66 cases. The presentations were as follows: 62 vertex (of which 6 were occipito-posterior); 2 face; 1 infant delivered by Caesarean section after labour had been in progress for two hours; the presentation was not recorded in one case. Sixty-three of the infants were delivered by forceps. The paralysis almost always passes off in 1 to 2 weeks. In one of my cases there was still slight paralysis after 8 weeks, but it is possible that in this infant the lesion was of central origin as there was a shallow depression in the fronto-temporal region on the contralateral side though there was no other paralysis suggesting an intracranial lesion.

Brachial Paralysis

Paralysis of the arm from injury to the brachial plexus is the most important peripheral nerve lesion as it is extremely common, though less frequent than facial paralysis, and produces grave crippling if recovery is incomplete. Two principal forms are recognized. In one (the Erb-Duchenne type) the paralysis is due to damage to the 5th and 6th cervical roots or the trunk formed by their union. In the other (Klumpke's type) the injury involves the 7th and 8th cervical and first dorsal roots. Atypical forms are also met with; the whole limb may be affected or single muscles such as the deltoid or supinator longus alone may be paralysed. There is considerable difference of opinion as to how the injury is produced. Some hold that it is caused by pressure on the brachial plexus from the forceps, the hand of the obstetrician, or the clavicle in cases where there is difficulty with the delivery of the shoulders; others think that stretching or even laceration of the nerve trunks or spinal roots is responsible. Probably over-stretching of the nerve trunks is the most common cause.⁹ In the Erb-Duchenne type the muscles most commonly affected are the deltoid, the supra and infra spinati, the teres minor, the biceps, the brachialis anticus and the supinator longus. There is probably little or no sensory loss. The signs are characteristic. The arm is internally rotated and held close to the side, the forearm is extended and pronated. Supination and flexion of the forearm is impossible and the arm cannot be abducted or rotated outwards. Klumpke's paralysis is much less common than the Erb-Duchenne type. In this condition the triceps and practically all the muscles of the forearm and the hand, except the supinator longus, are paralysed. The forearm is flexed at the elbow and supinated. The hand is flaccid. In this form of paralysis there may be

narrowing of the palpebral fissure and myosis on the affected side from damage to sympathetic fibres. In rare cases there is paralysis of the whole arm. In these the whole plexus has been injured. The recognition of the condition is as a rule easy, though fracture of the clavicle or humerus may at first be mistaken for true paralysis on account of the immobility of the arm. The pseudo-paralysis of osteochondritis is practically never present at birth; pseudo-paralysis from scurvy never occurs till about the age of 6 months; paralysis from poliomyelitis is never present at birth. Paralysis from cerebral lesions is of the upper neurone type. It is, however, not always easy to distinguish between upper and lower motor neurone paralysis in the newborn. I have found the embrace reflex¹⁰ of some assistance in this respect. If the infant is laid on his back on a table and this is suddenly struck with the hands on each side of the infant a normal child or one with an upper motor lesion will abduct its arms and then, with the forearms flexed, bring the limbs towards the middle line, going through the motion of an embrace. In lower motor neurone lesions the affected arm will remain immobile.

It is most important to recognize brachial paralysis early, for the earlier treatment is commenced the better the result. The guiding principle, as in the treatment of all lower motor neurone lesions, is to place the affected muscles in a position of relaxation and to maintain them thus for a prolonged period of time. For the first few days after birth, or at any rate till a satisfactory splint can be made, the affected arm should be fixed in an abducted and externally rotated position with the forearm flexed to a right angle and supinated. This can be done by fixing a band of adhesive plaster round the child's wrist and pinning this to the pillow with the arm suitably abducted and the forearm flexed and supinated. In the less severe cases recovery begins to show itself in a few days. Frequently, however, it is necessary to fix the arm in a splint. Plaster of Paris may be used, but this is heavy and liable to harbour dirt. Light pexaloid or vulcanized fibre splints are the most useful. The splint consists of a wide body-piece moulded to and partially encircling the thorax; from this the arm-piece springs at a right angle and from this the forearm and hand portion of the splint is set at a right angle; this section of the splint is set in a position to hold the forearm in full supination. By this means the arm can be fixed in an abducted and externally rotated position with the forearm flexed at a right angle and supinated. The arm should be kept fixed in the splint night and day for at least six months unless recovery takes place before then. Subsequently operative procedures may be resorted to. Good results have been claimed from nerve suture,¹¹ but I think the present opinion of most surgeons is that there are few cases in which this operation is advisable. Operation on the muscles of the shoulder joint to permit of external rotation of the arm are, however, of considerable value.

I have records of 28 cases of brachial paralysis. Twenty-seven were of the Erb-Duchenne type and showed considerable variation in the extent of the paralysis. In one other there was complete paralysis of all muscles of the right upper limb. Twenty-one of the cases recovered completely within 3 months of birth, 5 are still under treatment, and though 4 have made some recovery they still show more or less severe disability. In all of them fair abduction of the arm can be obtained, but this is chiefly achieved by scapular movement. The supinators are still paralysed and owing to unopposed action of the teres major muscle there is internal rotation of the arm. The case with complete paralysis of all arm muscles shows no improvement after 10 months. Two cases have been lost sight of.

Injury to the Spinal Cord

This is commonly produced during breech extraction. Probably many of the fatal cases pass unrecognized. Damage to the upper cervical region is necessarily fatal. Crothers and Putman¹² have reported 28 cases in which the child survived injury to the lower cervical, dorsal or lumbar regions. The symptoms are those of transverse myelitis, and depend on the site of the lesion in the cord. The diagnosis is often difficult, especially as sensory disturbances in young infants can only be determined in a very rough-and-ready way. Cerebral lesions and injuries to the brachial or lumbar plexus or their spinal roots are sometimes difficult to distinguish from injuries to the cord itself. The treatment consists in education of muscles and sphincters and orthopaedic measures to correct deformities and contractures.

Intracranial Haemorrhage

Haemorrhage within the cranium of the newborn is extremely common. Eardley Holland and Lane-Clayton¹³ found it present post mortem in 25 per cent. of stillbirths and neo-natal deaths, while Cruickshank¹ in a series of 800 neo-natal necropsies found gross haemorrhage in 20 per cent. Capon¹⁴ has emphasized the frequency with which it occurs in premature infants. The most common lesion is tear of the tentorium, though damage to the falx cerebri or to the tributary veins of the longitudinal sinus or to the veins of Galen may also give rise to bleeding, while haemorrhage from the choroid plexus may fill the ventricles with blood. Haemorrhage of any extent into the brain substance is probably not very common, though Schwartz¹⁵ holds that petechial haemorrhages into the brain substance are of frequent occurrence. Reuss¹⁶ does not consider these petechiae to be of pathological importance.

Unfortunately it is extremely difficult to diagnose intracranial haemorrhage with certainty during life, and for this reason it is impossible to estimate the proportion of infants who survive. The diagnosis even post mortem is not always easy. If the head is opened by the method of Beneke,¹⁷ and the dural septa thereby preserved, the brain must be removed piecemeal and only gross lesions in its substance can be detected, while if the brain is removed intact the membranes are damaged to such an extent that rents and subdural haemorrhages caused during birth cannot be recognized. By injecting the arteries of the brain and meninges through the carotid artery with opaque fluid and taking x-ray photographs (preferably stereoscopic) before the head is opened, haemorrhages can frequently be displayed and located. This method has been successfully used by Campbell¹⁸, Roberts,¹⁹ and Allen and McClure.²⁰ It seems to me that the difference of opinion among pathologists regarding the frequency of cerebral and meningeal haemorrhage is to some extent due to differences in method of examination.

The diagnosis during life is usually even more difficult. Some cases can be recognized without doubt, but I must confess that on numerous occasions I have been astonished to find at post-mortem examination a quite unsuspected intracranial lesion. I imagine others have had the same experience.

The signs pointing to intracranial haemorrhage are drowsiness, feeble cry, inability to suck, muscular rigidity, even at times simulating tetanus,²¹ convulsions, bulging fontanelle, intermittent attacks of cyanosis. Any or several of these signs may be present without intracranial haemorrhage, though Clein²² holds that intermittent attacks of cyanosis are diagnostic. Bulging fontanelle is not very common, and the other signs mentioned may arise from various causes. A definitely pigmented or uniformly blood-

stained cerebro-spinal fluid with crenated red cells is probably the most important manifestation available. Even this sign does not afford absolute proof. It is held by some that the cerebro-spinal fluid of all premature infants is tinged with yellow.²³ Possibly haemorrhage or capillary oozing occurs in a large proportion of newborn infants, especially in premature babies. Judging by the frequency with which haemorrhage into the retina (the only part of the central nervous system that we can see) occurs, it seems possible that capillary haemorrhage from the meninges may occur with equal or even greater frequency. In 349 infants without any other birth injury Dr. Morton and I²⁴ found retinal haemorrhage in 88 (25 per cent.). Other observers²⁵ have recorded an incidence of 23 per cent. In 81 cases with intracranial haemorrhage we found it in 38 (47 per cent.), while 23 patients of our series died before examination could be carried out; probably an even larger proportion of these would have shown retinal haemorrhage.

Certain fallacies must be guarded against in examining the spinal fluid. The spinal theca of the newborn infant is of such small calibre that veins in the spinal canal are very easily injured during the puncture, and blood may thus be introduced into the specimen. The fluid should always be centrifugalized as soon after withdrawal as possible; a definitely yellow supernatant fluid is strong evidence of haemorrhage. The presence of crenated red cells is also of significance, but here again a fallacy lurks. If the cells are exposed to any haemolytic agent, water, alcohol, etc., they become crenated. It will be seen, therefore, that there are many pitfalls, and even after exercising the utmost care it is impossible in some cases to be certain of the diagnosis.

Treatment must to a great extent be symptomatic. Careful and skilled nursing is essential. If the child is unable to suck, food should be given by the stomach tube; this is a much more satisfactory method than giving it by the spoon or pipette. Some think²⁶ that the condition is commonly associated with haemorrhagic disease of the newborn, and, if there is any suspicion of this, whole blood should be injected subcutaneously. I do not think, however, that this is a common cause. I have never seen symptoms of intracranial haemorrhage in a frank case of haemorrhagic disease. If there are signs of increased intracranial pressure lumbar puncture is of use, while, if the great fontanelle is tense and bulging and is not relieved by lumbar puncture, fluid should be withdrawn from the cerebral ventricles. Convulsions should be prevented as far as possible by giving chloral; 1-grain doses at two-hourly intervals will usually suffice. Good nursing is of more importance than any active therapeutic measures; it requires the greatest skill and experience, and unfortunately few nurses have the opportunity of acquiring a knowledge of this most important branch of their subject.

The sequelae of intracranial injury are of importance. The most common are mental deficiency, asymmetrical spastic paralyses and hydrocephalus; probably true spastic diplegia owns a different cause.²⁷ & ²⁸ In 33 cases which Morton and I²⁴ followed up for a year or more 5 were found to be mentally deficient, and in 4 of these there was spasticity of one or more limbs. One infant was hydrocephalic, and one of them presented the picture of true spastic diplegia. Munro²⁹ followed up 48 infants with intracranial birth injuries and found cerebral defects in 7 cases. Orthopaedic measures may do much for the paralyses, and removal of the appropriate sympathetic ganglia is yielding hopeful results.³⁰ Obstructive hydrocephalus has been successfully treated by operation,³¹ but the risks are great.

CONCLUSION

The prevention of birth injuries lies with the obstetrician, the treatment with the paediatrician. Obstetric manœuvres employed on behalf of the mother are frequently the cause

of injury to the child. The induction of premature labour may be essential for the wellbeing of the mother, while for the infant a Caesarean section at term would be a safer procedure. The use of anaesthetics and opiates may be necessary for the mother, but it cannot be advantageous for the infant to arrive in its new surroundings in a drugged state. Ante-natal treatment must prove of advantage to both mother and child. Treatment can sometimes be instituted so that pregnancy may be allowed to go to term and malpresentation can be rectified before labour commences. By ante-natal care there should be reduction in both the maternal and neo-natal death rates.

SUMMARY

The points in the recognition and treatment of birth injuries that I would emphasize are:

1. The prevention of sepsis in even the smallest superficial abrasion.
2. The recognition and treatment of fractures.
3. The recognition and early treatment of injuries to nerves.
4. The careful nursing of the infant with intracranial damage.

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SORE THROATS OF OTHER THAN TONSILLAR ORIGIN*

BY

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The aim of this paper is to emphasize the importance of the nose in the production of faucial and pharyngeal complaints. The way in which tonsils affect the nose is well recognized, but the converse is also true. There is nothing new in the idea—I find the connexion mentioned in the textbooks; but I think that this connexion is often missed to the detriment of the patient. I am assuming that dental sepsis has been eliminated in all the cases under discussion, and that the alimentary canal is healthy.

* Read in opening a discussion in the Section of Oto-Rhino-Laryngology at the Annual Meeting of the British Medical Association, Eastbourne, 1931.

Now it is unfortunately impossible for a laryngologist to follow up all his cases of tonsillectomy and see if the operation has always succeeded in stopping sore throats, but general practitioners have sometimes the thankless task of so doing, and I suggest that they have sometimes been disappointed in the results of tonsillectomy done for this purpose. One reason why this aspect of sore throats has to be examined afresh is a change that has arisen with regard to the skill displayed in tonsillectomy. Before the war, the explanation of the failure to cure symptoms was often that portions of the tonsils were still present after operation, especially during the period of enthusiasm that followed the demonstration by Sluder and by Whillis about 1910 that one could completely enucleate tonsils with the guillotine; and for ten or fifteen years the prevalence of tonsillar remnants and of scarred-up palates sufficiently explained the many failures to cure throats by tonsil operations. But although skill acquired by practice has led to a noticeable decrease in the number of incomplete operations, yet we not infrequently see cases, both in children and adults, of sore throats persisting in spite of careful removal of tonsils and adenoids, especially in certain years. This was the case in 1919 and 1929; and also this year—a point to which I will return later.

PHYSIOLOGY OF NOSE AND THROAT

It would be well here to consider for a moment some of the physiology of the nose and throat. Too little work has been done in this direction; and so difficult are the problems that there is not even yet a well-defined and generally held belief in the function of the tonsil and the rest of the lymphatic tissue in the nasopharynx. One has one's choice of beliefs, therefore; and I would range myself on the side of those who regard the tonsil as a sort of immunity-factory. Long after any nasopharyngeal infection, and often during epidemics in which the individual has escaped infection, one can find in the tonsillar crypts the epidemic organisms in the act of being ingested by white corpuscles. And having regard to the lack of epithelium at the bottom of the crypts and to their close relationship with the deep cervical lymphatics, it is reasonable to suppose that the endotoxins thus liberated are passed via the tonsillar lymphatic channels and the thoracic duct into the bloodstream, with a view to the production of antibodies against the organisms in question. Be the interpretation what it may, however, it does seem that it is the proper function of the fauces to inflame at the intrusion of micro-organisms. An illustration of this, more familiar to laryngologists than to practitioners, is the rare case in which the patient complains of sudden sore throat on one side, associated with the occurrence of secretion in the throat for which there appears to be no origin. I saw such a case in which the nose was demonstrably guiltless, and yet there was the pus whenever the throat was inflamed. One day a large discharge of pus was seen issuing from the mouth of the Eustachian tube, due to an overlooked otitis media in which presumably an infection had persisted long after the pharyngeal part of it had cleared up, and the cause of the sore throat was clear. While on the subject of what may be termed this "watch-dog" function of the fauces, it is illuminating to remark upon the absence of this property in the buccal mucous membrane. This mucosa takes little or no notice of dental sepsis, at a time when the fauces may be responding most actively to this very same insult. Some change, then, takes place in the function of the mucous membrane at the anterior pillar of the fauces; the faucial mucosa and the buccal mucosa are very different organs. I contend that one of the duties of the faucial mucosa is to register indignation at the arrival of strangers at the gates, in which case a sore throat may sometimes have to be regarded as a remedial effort—an