object of search must be for a specific remedy capable of destroying or counteracting the virus. Quinine in malarial fever, and salicylic acid and its congeners in rheumatic fever, were of this nature, and their claim to be antipyretics rested largely on their specific action. In other fevers such specifics remained still to be found, though some steps in this direction had been made; and though there was much promise of greater progress in the future, we were at present obliged to be content with less radical and more symptomatic remedies. The ideal febrifuge would allay fever by restoring to healthy function the disordered thermotaxic mechanisms, thrown out of gear, like other mechanisms, by the action of the morbid poison. Such a true febrifuge had not yet been found. The next best thing was to discover a mode of treatment which should act vicariously for the thermotaxic mechanism, compensating for its lost control over the thermal functions. A drug might conceivably act by checking thermogenesis simply, or by greatly increasing the inadequate thermolysis of fever. The former might be called an active antipyretic; the latter was properly a refrigerant.

To give a concrete turn to the discussion, it would be well to consider in some detail the physiological properties of a particular drug, as far as they were known, and inquire to which of these classes it might best be referred. Antipyrin had attracted so much notice, and had been so largely used and so closely investigated, that it would serve well as an example. Some of the effects of antipyrin on the thermolytic processes were then dealt with. It was shown by the data of an actual experiment that a full dose of antipyrin had a marked effect in increasing the rate of radiation from the unexposed skin, as measured by Masje with Eichhorst's radiometer. For example, in a case of febrile phthisis, while the temperature fell in two hours from 101° to 97.7° under antipyrin, the radiation increased rapidly, and was twice as great at the end of the second hour as just before taking the drug. The rate of radiation from the cheek, which, as mentioned in the first lecture, was pretty nearly constant in normal circumstances, increased in the same time from 57 units to 133 units. Antipyrin so modified the physical and chemical properties of the skin as to produce this protracted and steadily rising loss of heat by the single channel of radiation. Nothing but radiant heat was measured, and so nothing would be inferred as to the total heat-discharge.

Next as to the effect on peripheral temperature as determined by Schwarz. In fever the peripheral temperatures underwent from time to time extremely marked oscillations. If at the time antipyrin was given the peripheral temperature was not very different from the central temperature, no marked differential effect was produced in the former by the drug. After some oscillations, both central and peripheral temperatures began to sink, and at not dissimilar rates. But if the peripheral temperature happened to be low (under 95°F . or so) a remarkable effect was produced. A sudden ascent of its curve was almost invariably observed until it approached or overshot the central curve, and then after some oscillations the two again began to fall together.

On thermogenesis also the effect of antipyrin had been much investigated, both by directly physical and by chemical or indirect methods. Dr. Girard of Geneva, whose investigations on the thermogenic function of the corpus striatum had been mentioned, had induced pyrexia by stimulating that body, and found that a subsequent dose of antipyrin was able to reduce the temperature and to keep it down for a time. He had also first given antipyrin and then stimulated the thermogenic region, and found that the temperature still rose, but to a less extent. These results, though suggestive and interesting, were not conclusive as to the effect of the drug on heat-production, for in the first place the rise of temperature obtained was never very great, and in the second the experiments were thermometric only. The calorimeter must be used to determine whether the heat actually produced in fever was diminished by antipyrin. Dr. Wood and Dr. Hare had turned their attention to this point, and though their results were at present somewhat incomplete, and laboured under certain outstanding difficulties of interpretation, they appeared to show that heat-production was lessened by the drug. The fever they had tested was that induced by injecting a "pyrogenic" agent, especially an albumose derived from certain specimens of pepsin. Dr. Hare had tested antifebrin on animals suffering from this artificial fever with a similar result. It should be added that in the experiments in which they obtained a reduction in the rate of heat-production they also observed

a diminution (though a smaller one) in the rate of heat-loss. Dr. Wood had, moreover, assured himself that the result was apparently unaccompanied by any measurable effect on the circulation, at least when the antipyrin was given in therapeutic doses.

Lastly, two out of many inquiries into the effect of the drug on metabolism, as evidenced by the excretions, were considered. One by Robin, communicated to the French Academy, was vitiated by faults of method, inasmuch as it did not appear that any precautions were taken to secure nitrogenous equilibrium in the patients observed. Still the results, taken for what they were worth, were suggestive. Robin found, by examination of the urine of healthy and diseased persons before and after taking antipyrin, that the drug in health always diminished the urine, the total urinary solids, the urea, and the chlorides, and that it increased the uric acid. In acute febrile diseases these effects were less marked than in health, and varied somewhat with the particular disease. The conclusion he derived from his chemical examination was that antipyrin acted directly on the nervous system, lowering its excitability, and diminishing the catabolic and oxidative changes in the tissues.

A far more careful investigation had been carried out in 1886 by Riess of Berlin on typhoid patients. He chose patients in the height of the fever, and their diet and other circumstances being so regulated as to make the successive days comparable, he measured the entire excretion of nitrogen during nine consecutive days. During three days the fever was left untreated, for the next three the temperature was kept down by antipyrin, and for the last three it was allowed again to rise. The result was, briefly, that the nitrogen excreted during the days under antipyrin, when the fever was suppressed, was less by 15 to 30 per cent. than during the days before and after, when the fever was allowed free course.

ON THE ELEMENTS OF SUCCESS IN THE OPERATION FOR CLEFT PALATE.

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It is generally agreed that the plan of operating for cleft palate which Mr. Thomas Smith has introduced, and which includes the administration of chloroform and the use of the special gag which he has invented, is, in the hands of those who are familiar with it, one of the most satisfactory of all plastic operations. Cases, however, sometimes present themselves which show that there are certain particulars which still require to be advocated. Patients are not rarely admitted into the hospital in whom a previous operation has failed, apparently from the omission of some essential point, while in other instances the opinion has been expressed that the condition of the palate was so unfavourable that no operative treatment ought to be undertaken, and yet these cases presented no feature of unusual difficulty, and were subsequently cured by a single operation. I think, with these examples in view, it may be useful to state the circumstances upon which success mainly depends.

1. In the first place the age of the patient is very important. The mistake sometimes made is that of operating too early. No doubt it is possible to cure the slighter forms of cleft of the soft palate in children who are only a few months old. But even in the most favourable cases failure will be more frequent than success. Even when the cleft is limited to the soft palate the operation had better be postponed till the child is between two and three, or older still, unless he is well grown and strong. In cases in which the hard palate is involved operative treatment should be deferred till the child is at least three and a half. In the average run of cases it is better not to operate till the patient is between four and five. No doubt the sooner the operation can be performed with success the better, especially because the improvement in articulation will then be most marked. The fact is, however, that when done earlier than the time I have mentioned there is a great chance that the operation will fail, and then future cure will be rendered much more difficult. Besides, the operation is so considerable that in very young children it is by no means free from

danger to life. In instances in which the local conditions are very unfavourable (these are mentioned below) the operation should be delayed even beyond the fifth year, for, as growth proceeds, the fissure will tend to become narrower and the soft parts more fleshy and firm. Several cases have come under notice in which, though when the children were three years old the possibility of closing the fissure seemed very doubtful, all the conditions had become favourable when the patients had reached the age of six. Indeed, were the mere closure of the palate the only question, there is no doubt that the best age for operating—I mean the age at which the risk of failure would be least—would be between nine and twelve. Of course, there are many reasons for operating earlier; but the fact remains that in difficult cases the chance of success steadily increases as childhood advances.

2. Care must be taken to see that the patient is in good general health before the operation is performed. The temperature should be taken morning and evening for two or three days before it is proposed to operate, and if it is not absolutely normal the operation should be postponed. Care must also be used to ascertain that the child has not been exposed to any of the exanthemata, especially scarlet fever. Should the patient have a cough, no matter how slight, or diarrhoea, the operation ought to be postponed.

3. After the age and health of the patient come the width and the shape of the fissure and the conformation of the bones at the roof of the mouth. The mere antero-posterior extent of the cleft is immaterial. It is quite as easy to close a fissure that involves the whole length of the hard palate, as it is to close one of similar width that involves only the posterior part. Indeed, it is sometimes easier, because the closure of the anterior part removes tension from the sutures posteriorly, where union is most likely to fail. The really important points are the width of the fissure, the shape of its anterior end, and the height or pitch of the arch of the hard palate. As to the width of the cleft, it is obvious that, other things being equal, the wider the cleft, the more difficult it will be to close it. As to the anterior end of the cleft, when this is pointed like a thin wedge (Fig. 1) the shape is favourable; but when the anterior end is rounded like the bow of a hairpin (Fig. 2), even though the cleft

further back is not very wide, the difficulty of closure will be considerably increased. As to the height of the palate and the shape of the arch, the higher the arch and the more it approaches the perpendicular—the width of the cleft remaining the same—the easier will the closure be; while the lower the arch the more difficult does closure become. This is shown in Fig. 3. Supposing that in each of two cases the cleft is half an inch wide, and that in one the arch takes the direction of ABCD, and in the other the direction of AEFD: when the soft parts are brought down, the flaps AB and CD will be too short to bridge over the gap; but when the much longer flaps AE and FD are brought down, they will meet easily, and even overlap.

Supposing that the operation is performed in accordance with Mr. Smith's published directions, there are several points that have a considerable effect on the result. The first is that when the edges of the cleft have been pared, the soft parts on either side should be freely separated, not only from their general connexions with the bones which they cover, but especially from their line of attachment to the posterior border of the horizontal plate of the palate bone—that is, along the transverse line of junction of the soft with the hard palate. As this line of attachment is very firm, separation must be effected by the free, though careful, use of blunt-pointed curved scissors, employed first to divide the structures along this line, and then, their blades being closed, as an elevator to complete the separation further forward, if this has not been already done. When this proceeding has been thoroughly carried out, the palate

will hang in a flaccid state in its whole length, and in favourable cases its edges will admit of easy approximation. Another point is that when the cleft is extensive the soft parts should be detached from the bones, not only along the borders of the cleft, but outwards and forwards nearly to the teeth. Unless this is done, the rapid reunion that takes place between the soft parts and the bones will tend to restore the former to their original position, and will thus produce mischievous traction on the line of sutures. This wide detachment of the soft parts—varying, however, of course, with the extent of the cleft—will do no harm, for as blood reaches them chiefly from the sides (the branches of the posterior palatine artery running not far from the alveolar border) their mere separation does not materially injure their vascular supply. Another point is the relief of tension on the line of sutures by making lateral incisions. Those who operate only occasionally are a little uncertain as to the length to which the cuts should extend and the exact way in which they should be made, so that they are apt to cut either so freely as to endanger the vitality of the palate, or so sparingly that tension is not sufficiently relieved. The rule is that the incisions should run from before backwards and a little outwards, midway between the sutures and the alveolar border of the palate. The whole thickness of the palate should generally be divided only in the anterior half of the incision. In the posterior half it will be enough to divide merely the mucous membrane without cutting deeply into the other layers. By this course the large branches given off from the posterior palatine artery are preserved to supply the tissues, and the possible danger of injuring the posterior palatine artery itself is avoided. The relief of tension obtained by this proceeding is shown by the extent to which the edges of the divided mucous membrane immediately retract. The precise length of the lateral incisions will vary in different cases; the guide must be the amount of tension that has to be relieved. This can best be ascertained by examining the palate, after the edges of the cleft have been brought together, with the tip of the finger; and the operator must prolong the incisions until he finds that the parts have become distinctly flaccid, and that they no longer give the sensation of a tense dome, and that none of the sutures have the appearance of dragging. When the soft parts are scanty, and it is found that as the sutures are passed there is considerable tension, or even that the edges cannot be brought together, it will be best to make the lateral cuts at once, and then, except in cases in which the operation had better not have been attempted, the parts will come together. As to the sutures, these should be of silver for the hard palate, and of horse-hair, mainly or exclusively, for the soft; and the first to be passed should be a fairly deep silver suture, obtaining a secure hold, at about the junction of the hard with the soft palate. Then the soft palate should be closed to the tip of the uvula; and, lastly, the hard from behind forwards. If the sutures in the hard palate are producing marked tension, they should be only loosely twisted for the moment, and should be tightened with torsion forceps only after the side-cuts have been made.

For four or five days after the operation the child should be fed exclusively upon milk and beef-tea, with a little brandy added to the milk if this seems necessary. From the sixth day to the fourteenth he may have, in addition, fine bread crumbs well softened in gravy; bread sauce, made by scalding finely-grated bread crumbs in milk; potato finely minced in gravy or beef-tea; corn-flour, or ground rice puddings made with milk and eggs, or soft custard pudding. Only when the palate has healed, and the sutures have been removed should solid food be allowed. As harm may be done by asking the child to open his mouth to show how the palate is getting on, it is best to follow the plan of requesting that no one should look at the palate for the first week. Looking can obviously do no good; for even if union is failing to take place nothing can be done. The best chance always is to keep the palate at complete rest. Should the child flag, or look pale, or not take his food, he should, even on the second or third day, if the weather is warm, be sent out for a drive—if this can be done—twice a day; or he should be allowed to be up and walking about, for this will do no harm if he is carefully watched. Several times I have followed this plan with advantage. When children are evidently doing well, they may be kept in bed, where they are most easily managed, for a week, and then allowed to be up. As a rule, no local appli-

cation should be made to the palate. Certainly there should be no syringing. Sometimes, however, chlorate of potash may be usefully added to the milk, in which it is nearly tasteless, or the mouth may be rinsed with a 2 per cent. solution of boroglycerine. The sutures are sometimes, I believe, removed much too soon. As a rule, they should not be taken out till the tenth day. It will do no harm to leave them in for a fortnight. It is remarkable how much closure may occur by granulation in cases in which primary union has partially failed. In several cases, though at the end of a week only a narrow bridge remained between the two edges of the cleft, complete union has subsequently occurred by the gradual extension of granulations.

But little assistance, in regard to prognosis, in particular instances, can be derived from statistics in such an operation as staphylorrhaphy. Each case must be judged upon its own merits. It may, however, be said that in instances in which the patient has reached an appropriate age, and is in good health; in which the soft parts are fairly abundant; and in which the details alluded to above receive attention, failure will be so rare that operative interference may be confidently recommended. I have made no reference to other forms of operation that have been recommended by different writers, for, so far as I have been able to judge, the proceeding devised by Mr. Smith is by far the best with which I am acquainted.

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A CASE OF IDIOPATHIC SUPPURATION OF THE SPINAL DURA MATER.

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THE existence of an idiopathic inflammation of the spinal dura mater has been very generally doubted. In the majority of cases the inflammation is produced by extension of disease from neighbouring parts. Caries of the vertebræ, extension of a bed sore, and rupture of an abscess into the spinal canal are the most usual causes. The question of deciding whether the suppuration is idiopathic or not is complicated by the fact that the pus, when formed inside the canal, may make its exit amongst the muscles of the back or beneath the thoracic pleura, as in a case recorded by Mueller, and another by Dr. Spencer.¹ The external abscess may then be considered as the primary cause of the disease, and was so considered by Mueller. Dr. Spencer showed that in his case the arguments were strongly in favour of the meningitis being primary. In the instance I have to record, the disease, as will appear, was certainly primary in the spinal canal, and, as no cause whatever could be discovered before or after death, must be considered as of idiopathic origin. The rarity of the affection renders it desirable that each individual case should be recorded. The notes from which the clinical account is reported were carefully taken by Mr. Roberts, house physician to St. Mary's Hospital.

C. W.—, aged seventeen years, a groom, was admitted into St. Mary's Hospital on Nov. 27th, 1887. On Nov. 13th he had slept in damp sheets, and a few days afterwards complained of pain in the lumbar region, but kept at his work until Nov. 20th, when the pain became much worse and almost prevented him moving. The patient was at this time treated at home for rheumatism, by salicylate of soda and counter-irritation of the loins. The pain increased in severity, and on the 23rd the patient was quite unable to move his legs, and could move the arms only with great difficulty. At this time it was noticed that there was actual paralysis, and that it was not merely pain which prevented movement. On Nov. 24th the arms were entirely paralysed, the motions were passed involuntarily, and the urine was retained. There had been no shooting pains, rigidity, twitchings, or hyperæsthesia of the limbs, and no rigidity of the spine or retraction of the head. The patient had, however, complained of numbness in the feet and legs, and his medical attendant had noticed a blueness of the lower extremities. There had been no previous disease,

and there were no other points of consequence in the history. It may be mentioned, however, that the patient had suffered no injury.

On admission into hospital the patient was fairly well nourished, but looked exceedingly ill. The face was pale and somewhat cyanosed; the lips were blue. The legs and feet were flaccid, showed no wasting, and were of a bluish tint. There was total absence of voluntary movement and of all forms of sensation. The knee jerk was entirely absent on both sides, and no ankle clonus could be elicited. The plantar reflex was very feeble, if present at all, and the cremasteric reflex on each side was absent. The arms were flaccid, the hands and fingers bluish, and showed absolute loss of voluntary motion and sensation. There was no loss of sensation over the chest or abdomen. The respiratory movements, both abdominal and thoracic, were good. None of the trunk reflexes could be produced. There was no retraction of the head. The movements of the eyeballs were perfect. The pupils were moderately dilated, and contracted perfectly on exposure to light and on accommodation. There was no paralysis of the face, and the movements of the tongue and lips and of deglutition showed no abnormality. There was also no anæsthesia of the head and neck. The motions were passed involuntarily. The urine was retained. Some pain was complained of in the lower part of the abdomen, which was relieved by drawing off thirty-eight ounces of urine from the distended bladder. There was slight pain in the vertebral region on moving the patient, and severe pain was complained of when pressure was applied to any part of the vertebral column. There was no pain when the patient was completely at rest. No œdema or puffiness was observed in the skin of the back, nor were there any bedsores. The skin generally perspired freely. The patient was quite conscious, and answered questions intelligently. The temperature on admission was 100·6°; pulse 100, regular and soft. Heart normal. The respirations were shallow; a few moist râles were heard at both bases, but there was no dulness. The urine was normal.

During the night after admission the patient's breathing became more laboured, and the thoracic movements less observable. The skin of the trunk became anæsthetic. The patient was able to swallow nourishment, and was perfectly conscious. At 4 o'clock in the morning both thoracic and abdominal respiratory movements were very slight, and the patient was becoming very cyanosed. During the night the temperature had risen, and at 6.15 A.M. was found to be 110° in both axillæ. At this time the pulse-rate was 140 in the minute, small and weak; the respirations were 80 in the minute, and very laboured. The skin was perspiring profusely, and the patient was still conscious. An ice-bag was applied to the nape of the neck, and ten grains of quinine were administered. The temperature was taken at frequent intervals up to noon, and varied from 103° to 106°. During this time the patient perspired freely. He was quite conscious and rational, and swallowed nourishment. Nevertheless he gradually became weaker, and died soon after noon.

A necropsy was made about twenty-four hours after death. On removing the skin and muscular layers from the spine, a large quantity of somewhat thick pus was found infiltrating the muscular planes in the lumbar and lower cervical regions, though much more marked in the former part. The pus was seen on both sides of the vertebral column, and in the lumbar region was most copious on the left side. On careful examination it seemed to proceed from near the arches of the vertebræ. There was no pus found in the muscles of the dorsal region. On opening the vertebral canal, pus was seen lying between the dura mater and the bone from the sacral termination of the canal to about the level of the second cervical vertebra. The pus was similar to that found outside the canal, somewhat thick, and of no particular odour. It was limited almost entirely to the posterior part of the dura mater, and was most copious in the lumbar region and at the upper part of the dorsal and lower part of the cervical regions, corresponding to the cauda equina and the two enlargements of the cord. On opening the dura mater, the other membranes of the cord were seen to be congested, but presented no sign of inflammatory exudation. The cord itself showed no abnormal appearance whatever. A careful examination was made of the bones of the vertebral column, but no disease was found. Similarly no abscess formation, other than those described, was discovered in the tissues adjacent to the

¹ THE LANCET, vol. i. 1879, p. 836.