tissues. The ideal solution of the problem demands some material which, whilst it is not absorbed, is so far assimilated by the tissues as to become an integral part of them, providing a scaffolding around which fibrous tissue may be laid down, but preventing the stretching to which such tissue is liable. I believe that we possess such a body in mercurialized silk.

This material was introduced by Lange some fifteen years ago for the construction of artificial tendons and ligaments. He directed that thick floss silk should be boiled for an hour in 1 in 1000 mercury perchloride, in order thoroughly to impregnate it with the salt. It was then dried and kept in sterile parolein, in which the salt is insoluble. The resulting material is hard and wiry, and I find it a great advantage to substitute mercury biniodide for the perchloride. As drying the silk under aseptic conditions is troublesome I transfer it for dehydration to a 1 in 1000 solution of biniodide in absolute alcohol, from which it is finally transferred to sterile parolein. Silk thus treated is perfectly soft and flexible, whilst it retains its full tensile strength. When introduced into the tissues it sets up no irritation, and it has the curious property that although it is not absorbed it is so absolutely assimilated that the resulting structure is a close imitation of normal tendon or aponeurosis, possessing, however, the great advantage that it will never stretch. Microscopic sections show the strands of silk impregnated with fibrous tissue cells, the whole forming substantially a single structure.

The method of darning hernias was, I believe, first suggested by Sampson Handley in 1918, and I can only attribute the limited use which has been made of it to the absence of a suitable material. The facility with which ordinary silk may become infected is notorious, and the introduction into the tissues of the many yards which may be required involves considerable risks, for if it should become infected its removal is a serious matter. In any case plain silk is in many cases not assimilated by the tissues, and we have all found knots of silk ligatures encysted in old wounds. I have now used mercurialized silk for several years, and in no case have I seen any sign of irritation, nor has it ever been necessary to remove the silk.

The closure of hernial orifices by this method is exceedingly simple. If a peritoneal sac existed the margins are drawn together, care being taken, if necessary, to retain a portion of the sac sufficient for the purpose. The method we are describing is quite satisfactory in the case of landslide hernias in which no true peritoneal sac exists. The surrounding tissues are so far defined as to provide an adequate attachment, and the opening in the muscular abdominal wall is now darned by means of interlacing strands of silk, running from side to side of the aperture, through the margins of which they pass. These strands are so arranged

as to form a net with meshes perhaps a quarter of an inch square, every opportunity being taken to bury the strands in any tissue which may be available. No attempt is made to close the aperture by dragging the sides of the opening into apposition, only such tension being applied as will bring the margins to their normal anatomical position. It will usually be possible to cover the net with some remnant of the fibromuscular structures of the wall, but if this is impossible a substantial covering of skin and subcutaneous fat will suffice. In most cases of this description the latter tissue at least will be present in sufficient quantity.

I have closed very large apertures by this method, a defect six inches in diameter being in one case filled. The advantages of the method are its extreme facility, the avoidance of extensive dissection and of traction, with a resulting absence of shock, its applicability to every conceivable form of hernia, and the security of the result. A remarkable feature is the normal appearance of the abdominal wall. After several months the aperture has become so perfectly obliterated that in more than one case it has been difficult to convince oneself that it ever existed.

From a series of large hernias so treated I should like to describe two as typical of the results one may expect to obtain:

CASE I.

A woman of 55 had six years previously been operated upon at another hospital, a large ventral hernia resulting. For five days she had had severe abdominal colic, vomiting, and absolute constipation. She was a very stout woman, with a gigantic, tense, irreducible ventral hernia. On operating, two large sacs were opened containing large and small gut, the latter distended and obstructed. With a good deal of difficulty the gut was freed and returned, and the peritoneum closed. There was a gap of fully six inches between the recti, the wall consisting of scarcely more than skin and peritoneum, with a little fat between. The whole space was darned in the manner described. Seven months later there was a sound abdominal wall between the recti. There was no sign of a hernia, she was in perfect health, and had no discomfort of any kind.

CASE II.

A man of 64 had a gigantic bilateral inguinal hernia of ten years' standing. The scrotum hung down almost to his knees, and as he was a vagrant it will be understood that he was not an attractive surgical risk. Under spinal anaesthesia the hernias were reduced by open operation, the chief difficulty in reduction being the lack of room in the abdominal cavity to accommodate the contents. The sacs were closed in the usual way, and the large apertures remaining in the abdominal wall darned with mercurialized silk, no attempt being made to bring the margins into actual approximation. The man made a normal recovery, and five months later he was perfectly well and the abdominal wall was absolutely sound.

These cases are merely illustrations of a method of wide application. It is difficult to imagine a hernia which could not by these means be brought under control.

THE BACTERIA OF THE TONSILS AND ADENOIDS.

BY

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The results recorded in this paper were based on an examination of the tonsils and adenoids removed by operation on children under 16 years of age at the out-patient department of the Royal Hospital for Sick Children and the school clinics.

The specimens were collected by the observer, and examination was begun generally within one hour of collection. All the specimens showed hyperplasia, but no evidence of acute inflammatory or any other special pathological conditions visible to the naked eye. The object of the investigation was to determine the bacterial flora of the tonsils and adenoids in ordinary hyperplasia, and to estimate the frequency with which they are infected by *B. tuberculosis*.

A culture was first made from the surface, then, after cauterization with a hot scalpel, a second culture was made from the bottom of the crypts by means of the platinum loop.

Cultures were made on (1) nasagar slopes, (2) nasagar smeared with human blood, and (3) blood serum slopes. The remainder of the specimen was then minced as fine as possible with scissors, pounded in sterile normal saline and completely macerated. This mixture was treated with 33 per cent. antiformin and incubated for two hours at 37° C.,

centrifuged for half an hour, and the supernatant fluid poured off. Sterile saline was next added and centrifuged again. This process was repeated two or three times to eliminate all traces of antiformin. The fluid was then inoculated subcutaneously into the groin of a guinea-pig. At the end of six weeks the animal was killed and examined for enlargement of glands at the site of inoculation, for any other glandular enlargement, and for evidence of *B. tuberculosis* in these glands or in any of the organs. Films were made from the enlarged glands and stained by the Ziehl-Neelsen method and examined for acid-fast bacilli. Sections in paraffin were made from the remainder of the glands and examined for any evidence of infection with *B. tuberculosis*. If nodules were found to be present in any organ they were also examined histologically.

Bacillus tuberculosis.

The inoculations made from tonsils or adenoids numbered 170 (120 patients). Three of these inoculations revealed the presence of *B. tuberculosis*; in each case the examination was tonsillar, and the examination of the adenoids gave a negative result. The percentage of positive cases was 2.5. In the positive cases there was no clinical evidence or history of tuberculosis.

Forty-three adenoids and 37 tonsils were examined for other bacteria with the following results.

Diphtheroids.

Blood serum was used as the culture medium, and films from these cultures were stained with methylene blue, Neisser's stain, and Gram's stain. Bacilli which were Gram-positive and which showed the presence of granules with Neisser's stain and with methylene blue were classified as diphtheroids. The pathogenicity was tested in many cases by inoculations into guinea-pigs. None

of those tested were pathogenic to these animals. Diphtheroids were present in 30 per cent. of the cases. They were obtained from the superficial surface of 24 per cent. of the tonsils and 9 per cent. of the adenoids, and from the depths of the crypts of 15 per cent. of the tonsils and 11 per cent. of the adenoids.

Streptococci.

Nasgar smeared with human blood was used as the culture medium. The colonies were examined with reference to the following properties: solubility in bile, fermentation of inulin, and haemolysing power. They were all insoluble in bile and did not ferment inulin. The haemolytic property was tested by direct examination of the plate and again by adding a pure broth culture of the streptococcus to the washed red blood cells of the sheep. They were classified according as they gave complete haemolysis, partial haemolysis, or no haemolysis.

Group I was found in 84 per cent. of the cases, and was obtained from the superficial surface of 37 per cent. of the tonsils and 11 per cent. of the adenoids, and from the depths of the crypts of 89 per cent. of the tonsils and 58 per cent. of the adenoids.

Group II was found in 34 per cent. of the cases, and was obtained from the superficial surface of 13 per cent. of the tonsils and 9 per cent. of the adenoids, and from the depths of the crypts of 16 per cent. of the tonsils and 27 per cent. of the adenoids.

Group III was found in 92 per cent. of the cases, and was obtained from the superficial surface of 75 per cent. of the tonsils and 90 per cent. of the adenoids, and from the depths of the crypts of 64 per cent. of the tonsils and 67 per cent. of the adenoids.

The streptococci giving complete haemolysis were more frequently present in the depths of the crypts of the tonsils and adenoids than on the surface. This strain is usually considered to be the most pathogenic, hence the removal of this organism by swabbing alone is difficult, and its appearance on swab culture would be relatively infrequent. Streptococci giving no haemolysis are of frequent occurrence, being present in nearly all the specimens examined.

Pneumococci.

Nasgar smeared with human blood was used as the culture medium. The colonies were examined as regards bile solubility, haemolytic properties, or inulin fermentation. They were found to be bile-soluble and capable of fermenting inulin, and showed no power of haemolysis. They were not classified further. Pneumococci were present in 56 per cent. of the cases, and were obtained from the superficial surface of 46 per cent. of the tonsils and 44 per cent. of the adenoids, and from the depths of the crypts of 40 per cent. of the tonsils and 41 per cent. of the adenoids.

B. influenzae (Pfeiffer's Bacillus).

Nasgar smeared with human blood was used as the culture medium. Small greyish-white colonies were found in some cases. Film examination showed that these consisted of short Gram-negative bacilli. They showed no power of haemolysis, and were considered to be the *B. influenzae*. They were present in 18 per cent. of the cases and were obtained from the superficial surface of 10 per cent. of the tonsils and 13 per cent. of the adenoids, and from the depths of the crypts of 8 per cent. of the tonsils and 9 per cent. of the adenoids. It was further noticed that those colonies present were usually adjacent to the more closely packed colonies of streptococci.

Dr. Shri Kent, working independently in this laboratory, made similar observations. At the time of examination the city was free from an epidemic, hence normally the *B. influenzae* does not frequently inhabit the tonsils and adenoids of children.

Meningococcus.

Nasgar smeared with human blood was used as the culture medium. Minute transparent colonies were obtained in a few cases which, on examination by a Gram-stained film, had the appearance of meningococci. They were further inoculated into sugars, and gave acid in glucose and maltose, but did not ferment galactose and saccharose. Subcultures on nasgar showed no growth. These colonies were considered to be meningococci and were found in 8 per cent. of the cases. They were obtained from the superficial surface of 5 per cent. of the tonsils and 2 per cent. of the adenoids, and from the depths of the crypts of 5 per cent. of the tonsils and 2 per cent. of the adenoids. Hence the meningococcus is rarely present and is a more frequent inhabitant of the tonsils than of the adenoids.

Bacillus coli.

Nasgar was used as the culture medium. The greyish-white colonies were subcultured on to bile salt, neutral red lactose agar, red colonies being formed. They were further examined as regards motility, production of indol, and fermentation of certain sugars. They were found to be motile and produced indol. They gave acid and gas in lactose, saccharose, maltose, glucose, and mannite, and acid and clot in litmus milk. They were considered to be *B. coli communis*, and were present in 8 per cent. of the cases. The bacillus was never obtained from the adenoids. It was obtained from the superficial surface of 10 per cent. of the tonsils and from the depths of the crypts of 6 per cent. of the tonsils.

The remaining organisms found were *Micrococcus catarrhalis*, *Staphylococcus aureus*, *Staphylococcus albus*, *Micrococcus flavus*, *Pharyngus sicus*. They were classified by means of their cultural characteristics, Gram stain, and fermentation of sugars.

Micrococcus catarrhalis was present in 94 per cent. of the cases, and was obtained from the superficial surface of 97 per cent. of the tonsils and 90 per cent. of the adenoids, and from the depths of the crypts of 64 per cent. of the tonsils and 72 per cent. of the adenoids.

Staphylococcus aureus was present in 56 per cent. of the cases, and was obtained from the superficial surface of 54 per cent. of the tonsils and 41 per cent. of the adenoids, and from the depths of the crypts of 27 per cent. of the tonsils and 16 per cent. of the adenoids.

Staphylococcus albus was present in 50 per cent. of the cases, and was obtained from the superficial surface of 35 per cent. of the tonsils and 11 per cent. of the adenoids, and from the depths of the crypts of 16 per cent. of the tonsils and 11 per cent. of the adenoids.

Micrococcus flavus was present in 66 per cent. of the cases, and was obtained from the superficial surface of 43 per cent. of the tonsils and 44 per cent. of the adenoids, and from the depths of the crypts of 24 per cent. of the tonsils and 30 per cent. of the adenoids.

Pharyngus sicus was present in 28 per cent. of the cases, and was obtained from the superficial surface of 10 per cent. of the tonsils and 23 per cent. of the adenoids, and from the depths of the crypts of 11 per cent. of the adenoids.

It was observed that in every case fewer colonies were obtained from the adenoids than from the tonsils, and fewer varieties of organisms.

The observer wishes to express her indebtedness to Professor Beattie, in whose laboratories the work was done, to Mr. Leathart, honorary surgeon to the Children's Royal Infirmary, to Mr. Courtenay Yorke, honorary surgeon to the Northern Hospital, and to Mr. Horace Mather, honorary surgeon to the Birkenhead Children's Hospital, for their kindness in placing specimens at her disposal.

THE CLINICAL THERMOMETER IN THE PREVENTION OF PULMONARY TUBERCULOSIS.

BY

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DISEASE as we see it in great hospitals is, in a majority of the cases, incurable. To go forward we must go back—behind the physical signs which, until recently, have been almost the sole criteria of disease, to the realms of early symptoms, whose importance the pioneer work of Sir James Mackenzie is impressing upon discerning minds. To no disease do these principles apply with greater force than to pulmonary tuberculosis.

Much thought and ingenuity have been expended upon the problem of how to scotch the invader before it has had time and opportunity to pass our defensive systems and entrench itself in the pulmonary tissues. The stethoscope, even in the ears of the expert, has had to go. To realize its impotence to detect the first inroads of the disease we need but to remember that the lung may be the seat of an extensive pneumococcal infiltration without producing physical signs, if the disease be deeply placed.

Unfortunately, efforts in other directions have introduced elements of risk without eliminating uncertainty. My purpose is to urge the claims of the clinical thermometer, understood and properly used.

At the outset let me emphasize two elementary facts: (1) a distinctive characteristic of active tuberculous infiltration is fever of varying degree; (2) the vast majority of civilized persons is infected with the disease at some period, commonly in early life.

It appears reasonable, therefore, to assume that a very large number of cases of anomalous feverish attacks both in children and adults are due to infection by the tubercle bacillus. How often do such cases occur in the experience of every medical man! Fever, headache, nausea, malaise, perhaps some cough; no physical signs: diagnosis, "influenza"—a word probably responsible for more deaths than the disease itself—or "an anomalous feverish attack due to some toxin." The commonest, the universal toxin is that of tubercle. It is argued that the patient recovers in a week, and that tubercle is a chronic, persistent affection. But does the patient recover in a week, and is tuberculosis so obstinate in its first manifestations? If it were the whole population would be in bed. Tubercle is, perhaps, of all diseases the most amenable to treatment in the great majority of cases, if promptly recognized and dealt with. But what it lacks in initial severity it compensates for by subtlety. It can appear in many guises, and may relax its grip sufficiently to convey the impression that the illness is over; but each successive attack is a little more obstinate than its predecessor, each intervening period of comparative health a little more difficult of attainment, until suddenly comes the knock-out blow and the ensuing struggle, either hopeless from the start, or resulting, at best, in comparative restoration of health after a weary fight of months or years. This tragedy the thermometer,