The knee joint is that most commonly rendered unstable as a result of injury; this is not surprising when we consider the enormous leverage brought to bear on it, and that the principal support of a knee-joint is the muscular structure of the thigh. All the muscles in direct control of the knee join in the wasting, and not merely the extensor femoris. Any person having recovered from an acute synovitis of the knee, if attention has not been paid to the inevitable muscle wasting, is liable to get into a vicious circle. The knee joint gets overstrained from want of proper muscular support and swells, with the result that the wasting is accentuated during the abatement of the synovitis. Once more the patient proceeds to get about normally, and there is recrudescence of the trouble until the possibility of some internal trouble of the joint is suspected. Many a man has had his knee-joint opened on the supposition that the cartilage was defective when the whole trouble was due to the weak muscles being unable to support the weight of the body on a joint rendered flabby by repeated attacks of synovitis. Every case of recurrent traumatic synovitis is not necessarily due to internal derangement of the knee.

The exercises suitable for this class of weakened limbs must, to commence with, be of the lightest variety, and so arranged that no heavy strain is thrown on the joint. This can best be accomplished by means of one of the pulley and weight machines, as the amount of weight used can be regulated. Swedish and general gymnastics, though highly beneficial in other conditions of weak muscles, throw too much direct strain on joints to be made use of at the commencement where the joint itself is weakened.

In no circumstances should exercises be started till all signs of the acute condition have passed. For the first few days a certain amount of pain may be experienced after exercising in the whole limb, due to the waking up of lethargic muscles; this will pass off in the course of a short time, and may be ignored. Proper attention to the performance of these daily exercises will eventually restore soundness, even in cases of years' standing, where, in order to counteract the joint weakness, reliance has been placed on artificial support.

Most of the ingenious contrivances habitually worn as a support tend to accentuate the atrophy of the controlling muscles, and their use is to be deprecated. Of course, some of the knee trusses are of great value when the condition is one of slipping cartilage, but too often do we find people wearing elastic knee-caps, and even heavy mechanical contrivances, when proper attention to the muscle tone is all that is necessary.

Radiographs should always be obtained in all cases of severe sprains or injuries of joints, as the presence of some fracture will often be seen which might not be detected by ordinary methods of examination. For example, in sprains of the ankle-joint a small crack is often found in the lower end of the fibula which, though unimportant, somewhat prolongs recovery. Fractures of the scaphoid and "Bennett's stove" are often discovered in cases of alleged sprained wrist. Heavy falls on the shoulder sometimes cause an impacted fracture of the head of the humerus which is not infrequently mistaken for severe traumatic synovitis. If a large amount of extravasated blood be observed on the inner surface of the arm running from the axilla to the elbow, this condition should be suspected.

Radiographs should also be obtained in all cases where, for lack or in spite of more active treatment, stiffness of the joint remains behind, in order to eliminate the presence of any morbid condition. If treatment by radiant heat baths and massage fails to effect a cure, manipulation under an anaesthetic should be carried out provided the case is otherwise suitable. Properly performed, with attention to certain broad rules, this method of treatment gives excellent results.

Doubtless many have read in the press impassioned appeals for the admittance of bonesetters into the R.A.M.C. This is due to a belief that the medical profession are ignorant of this line of work. Attacks on the medical profession in the lay papers by advocates of bonesetting have been going on from the time of Mrs. Mapp of Epsom in 1787. The greater part of this recent outcry is undoubtedly biased, as, for instance, the article in the *English Review*, which implies to anyone not cognizant of the facts that no surgeon of to-day understands or practises these methods. References are made to statements

uttered by well-known surgeons to the effect that there is something to be learnt from the handiwork of bonesetters, but no allusion is made to the many surgeons who have written descriptions of these manipulations, and who practise this line of treatment in private as well as in the military hospitals. At the same time it must be admitted that hitherto *brisement forcé* has never been generally popular amongst medical men.

Nowadays, however, there are special departments attached to practically every command, where surgeons not only habitually break down adhesions when necessary, but superintend the massage, gymnastics, and other adjuncts so important to the after-care of ankylosed joints.

Lectures

ON

DISEASES OF THE MALE URETHRA.

BY

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LECTURE V.—TREATMENT (*Continued*).

THE URETHROSCOPE.

THOUGH a fair percentage of cases can be cured by irrigations and prostatic massage alone, yet a certain number will be found which remain uncured, and which, if left alone, will relapse. These relapsing cases need for their cure an intelligent use of the urethroscope. Some of them will thus be seen to have soft strictures, and these will need for their cure dilatations by means of bougies and the Kollmann's dilators. Others will be found to have infected glands of Littre. These infected glands can be most quickly and easily cured by their destruction through the operating urethroscope.

The position I maintain with regard to the urethroscope is this: You can cure many cases without the urethroscope, but you can only cure all your cases if you are expert in the use of the urethroscope. But quite apart from the question of cure is the immense value of the urethroscope in training the eye in the clinical pathology of urethritis. It is a curious fact that, backward though the study of urethritis has been in England, yet the English urethroscopes are far in advance of any I have seen abroad. In this branch of the subject we have little to learn from foreign practitioners.

For some reason or other, foreign authorities have not taken kindly to the aero-urethroscope. They are content to use some modification of Valentine's or Luys's urethroscope, with which no air is used to distend the canal. In this way they have missed many refinements in diagnosis which are of great importance. In my experience the best urethroscope is that invented by my friend, Mr. Wyndham Powell, after years of patient study, and I cannot too warmly recommend it to your notice. There is not space in these lectures to deal with other instruments, and in what follows I shall assume we are using a Wyndham-Powell instrument.

The Posterior Urethroscope.

I shall not discuss the posterior urethroscope in these lectures. The best posterior urethroscope is the irrigating urethroscope of Goldschmidt and Wassidlo. Such an instrument should be in the hands of all specialists, but its chief value is to teach the clinical pathology of the deep urethra. It is seldom required in routine treatment, as the large majority of cases of posterior urethritis can be cured without its use.

The Wyndham Powell Urethroscope.

A source of illumination suitable for small electric lamps is required, such as an accumulator or a rheostat working off a transformer. Do not use the direct current from the main, as it is dangerous. The instrument contains an electric lamp attached to a short vulcanite handle. In front of this is placed an adjustable focussing lens, and on top of this comes down a folding hood, which holds an adjustable pierced mirror, resembling the mirror of the ophthalmoscope. The mirror can be adjusted by a screw so as to direct the focussed light straight down the centre

of the urethroscope tube. The eye looks through the aperture of the mirror and is aided by a little telescope which is inserted at the top of the hood. Attached by an adjustable metal arm to the bottom of the lamp holder is a cone of metal, the top end of which is closed in by a glass window and the bottom end of which is moulded to fit the urethroscope tubes. Into the side of the cone runs a small tube, to which can be attached the rubber ball which acts as an air bellows. Another cone is supplied, into which can be screwed the various instruments required for operations, such as a probe, a curette, and a knife.

When the instrument is used for inspection the cone is attached direct to the urethroscope tube. When the instrument is used for operating a rubber chamber, rigid or collapsible at will by means of two screws, is attached by one end to the cone and by the other end to the urethroscope tube. By this ingenious device it is possible when the instrument is in place to collapse the rubber chamber and to bring the probe out of the urethroscope tube into the urethra and to direct it into the mouths and bodies of the infected follicles. Before use the probe is heated and run through a solid stick of silver nitrate. In this way the probe can be run into an infected gland and be made to destroy it completely. This can best be understood by referring to the diagrams.

The practitioner should practise the use of the probe on the palm of his own hand until he thoroughly understands the mechanism of the performance. Some months' practice is needed to obtain a mastery in the use of the silvered probe, but I believe there is no simpler or more satisfactory method of destroying infected follicles. I could publish dozens of cases cured by this means when all else has failed.

The curette and the knife are seldom required. The curette is used for warts and the knife for opening small urethral abscesses.

As regards choice of urethroscope tubes I advise as follows: A No. 24 and 26 Charrière 3 in. tube. A No. 24 and 26 Charrière 4 in. tube, and a No. 18, 22, and 24 5 in. tube. These will be found sufficient for most eventualities. Operations are performed with 3 in. and 4 in. tubes, so that two sets of instruments are required of a length suitable to these tubes.

The great advantage of an aero urethroscope is that the air drives in the walls of the canal away from the urethroscope tube. Air distension enables you to observe accurately whether any part of the canal is dilating properly or not. This is the most vital fact you want to know. In the second place, it helps you to determine whether the urethral follicles are infected or not; and, more important still, it helps you to operate on and destroy the infected follicles rapidly and effectually. The instrument is not an easy one to master, and I shall assume that you are willing to give time and patience to practise its usage. It will take you at least six months to become any good at urethroscopy, and probably one to two years before you can be considered fitted to give a first-class opinion thereon. Do not be discouraged; persevere and you will find your reward in the added interest you will find in your cases, and in the great improvements in your results. The men who tell you that you do not need the urethroscope are men who have not had the patience to master the instrument. It is the same type of man who says there is no need for the cystoscope in the diagnosis and treatment of diseases of the bladder and kidney. Pay no heed to such false prophets. It stands to reason that if inspection by the eye is possible of any diseased portion of the body, then such inspection must be the best means for exact diagnosis and treatment, and must be mastered by the modern practitioner. It is the elaboration of such instruments of precision that has made necessary the development of specialities. Special instruments mean special doctors.

HOW TO USE THE WYNDHAM POWELL AERO- URETHROSCOPE.

Let the patient pass water and then recline upon the examining couch. Do not irrigate the urethra, as by doing so you spoil the pathological picture. See that the lamp is acting, and that the instrument is in focus. Attach the rubber bellows to the air tube, the tap being turned off, and blow up the bellows to full distension. Place the

instrument on the table between the patient's legs, and get him to hold the air bellows.

Select a No. 22 Charrière tube 5 in. long and see that the obturator is working smoothly. Lubricate the tube and pass it gently into the urethra up to the hilt. Slowly withdraw the obturator, attach the urethroscope to the tube, and turn on the air. You should now see the bulbous urethra blown out by the air with the external sphincter lying at the deepest part. Examine this portion of urethra closely, and then gradually withdraw the tube, noting the condition of the penile urethra and the fossa navicularis. Pay particular attention to the roof of the canal. Note particularly the dilatibility of the different portions of the canal, and the condition of the follicles.

Normal Appearances.

The external sphincter or compressor urethrae is seen in action at the extreme back of the bulb, alternately contracting and relaxing under the air pressure, and drawing up the mucous membrane into star-like folds. The bulb appears like a cavern viewed from the open end of the tube, the floor particularly bulging downwards away from the tube. The floor of the bulb is pale pinkish-yellow, with two longitudinal leashes of blood vessels running forward out of the deep urethra. The mouths of the ducts of Cowper's glands can seldom be distinguished. The floor of the bulb bulges downwards, so that this portion of the canal is ovoid in section. In the middle of the bulb the canal is more nearly circular in section, but still very dilatible. The rings of the involuntary circular muscles lying just under the mucous membrane are readily seen, specially under moderate air distension. They must not be mistaken for strictures. Pump in more air, which will flatten out the muscular rings so that they are no longer seen. The wall of the canal then appears perfectly smooth, glistening, and pale yellowish-pink in colour. The mouths of a few follicles may be seen on the roof of the bulb, but often there are none in this position.

The penile urethra is circular in section, and appears as a cylindrical tube much narrower than the bulbous urethra. Rings of muscle can be seen under low distension. Under high distension the wall is smooth, glistening, and a pale yellowish-pink. On the roof a large number of mouths of follicles or glands of Littre can be seen. They are usually arranged in a single row, longitudinally disposed one above the other. In some persons they are disposed in a double row. In a few persons they can be seen on the lateral walls, and even on the floor.

The fossa navicularis is lined by smooth pale yellow mucous membrane, and usually only presents one gland—the lacuna magna—which can be seen opening on the roof about one inch from the meatus. Rarely, large lateral or floor pits are seen. Having familiarized yourselves with the normal appearances of the urethra, you should then proceed to learn the appearances of disease.

The Urethroscopic Appearances of Diseased Urethral States.

As a general rule it is not wise to use the urethroscope in any given case till the urine is clear. That is to say, in early acute urethritis you wash out the urethra for five to ten days until all discharge is gone and the urine passed is clear. In subacute posterior urethritis with hazy urine, you wash out the deep urethra until the urine is clear, and then use the urethroscope. In chronic cases you can use the urethroscope at any time.

A. Early Acute Cases.

We will suppose that the patient came to you on the third day of a urethritis, that you irrigated daily for seven to ten days, and that all discharge has ceased and the urine is clear. You want to know if the case is cured. In such a case do not employ too great air distension for fear of driving disease, if still present, back into the deep urethra. You will probably find that the whole canal dilates properly, and that the mucous membrane is pale pink and glistening with mucus. In such a case you have obtained a cure. In other cases you will note that a tiny bead of yellow pus can be seen in the mouth of one or more of the glands of Littre, and that there is a red area round its mouth, and that the body of the gland is bulging into the lumen of the canal. This is the appearance of an infected gland of Littre (or follicle), and if left alone

the gonococci from the gland reinfect the urethra in a few days and set up a relapse of bright yellow discharge. Such an infected follicle must be destroyed (*vide infra*).

B. Later Subacute Cases.

We will suppose you are examining a case that has had a posterior urethritis, and that as the result of irrigations and prostatic massage at the end of six to eight weeks from the start you have rendered the urine clear and wish to know the state of the anterior urethra. Here you may find that the whole canal dilates well, and is pale pink, smooth, and glistening, or you may find a number of infected follicles as before. But in a number of such cases you will note that the walls of the bulbous or of the penile urethra do not dilate properly even under strong air distension, but that the walls bulge into the lumen of the canal, and are red, swollen, and oedematous. This condition is what I call a "soft stricture" or a "submucous infiltration." The pathology is that gonococci are lying in the submucous tissues of the canal at this place and are causing hyperplasia of the tissues, the tissue spaces being full of inflammatory fluid and inflammatory cells (pus cells, plasma cells, fibroblasts). Such a condition if untreated will keep up a discharge for a year or two, and eventually will become the site of a tough fibrous tunnel stricture. If treated at once by dilatation with Kollmann's dilators, not only is the urethritis soon cured, but no fibrous stricture can possibly follow.

C. Early Chronic Cases.

Suppose that you are examining a patient who has had urethritis for some six months, and that he still has a constant gleet with a tendency to relapse of bright yellow discharge. In such a case you may find on examining the urethra that a portion of the canal does not dilate properly, yet its walls are quite smooth and pale pink in colour. There is no longer any oedema or redness of the wall, yet a fibrous edge has not yet appeared. This is the intermediate type of stricture, and it is the one most liable to be missed by a careless observer. It needs for its treatment and cure dilatation by the Kollmann's dilator.

D. Late Chronic Cases.

Suppose that you are examining a patient who has had a gleet for two or three years and who passes threads in a clear urine. In such a case you are likely to find the beginnings of a fibrous stricture. Fibrous or hard strictures can be followed by the urethroscope in their varying stages from their birth to their death at the hands of a Kollmann's dilator. You can learn more about strictures with the urethroscope than by any other method. I teach that there is only one proper way by which to diagnose stricture, and that is by the aero-urethroscope. The old methods of diagnosing the stricture by means of a bougie should be relegated to a scrap-heap. Why trust to the sense of touch when it is possible to employ the sense of sight, especially as it is so easy to mistake spasm for stricture when using a bougie. Just as the cystoscope has relegated the sound to the scrap-heap in the diagnosis of stone in the bladder, so the urethroscope should entirely supersede the use of the bougie in the diagnosis of stricture. The urethroscopic picture of a stricture as presented by the aero-urethroscope is unmistakable, and the veriest tyro cannot fail to detect it. Yet in most of our hospitals the diagnosis of stricture is still made by the bougie, and there can be no doubt that the operation of internal urethrotomy is performed yearly on dozens of cases in these hospitals in which no stricture is present at all, but merely spasm. Another advantage gained in the diagnosis of stricture by using the urethroscope is that you can at once get a fair idea as to the calibre of the stricture, and as to what size of instrument it is likely to take when you start dilatation treatment.

TYPES OF FIBROUS STRICTURE.

The simplest type of stricture is seen as a small crescent or fibrous tissue forming an arc about a quarter the circumference of the canal, and in the centre of which can be seen the open mouth of a follicle. Undoubtedly these arise from long-standing inflammation of a gland of Littre.

The next type is seen as a white fibrous crescent taking in about two-thirds of the circumference of the canal.

G

This is the so-called bridle stricture, and it arises from a small submucous infiltration which involved originally only a part of the circumference of the canal.

The third type of stricture is seen as a complete circle of white fibrous tissue, with a large lumen, represented in longitudinal section as a complete fibrous diaphragm with a large central aperture. This is the commonest type of stricture, and it progresses until only a narrow pin point opening can be seen.

The fourth type of stricture arises from an extensive submucous infiltration which originally involved an inch or more of the length of the urethral cylinder. The face of a dense mass of white fibrous tissue can be seen with a pin-point opening near the centre, and, in addition, there can be felt a thickened cylinder of fibrous tissue along the length of the corpus spongiosum. This type, therefore, can not only be seen, but can be palpated from the outside. I have named it the "tunnel" type of stricture. It is far more rebellious than any other kind, and usually needs urethrotomy before it will yield to dilatation.

RARE URETHROSCOPIC APPEARANCES.

In a few cases, but only in a few, you will find other lesions.

1. Warts.

These appear exactly like little septic warts which are so commonly seen under a septic foreskin. They must be curetted away through the operating urethroscope, and the bases touched with silver nitrate fused on to a probe.

2. Pouches.

Congenital pouches are occasionally seen on the floor of the bulb. I have several instances in my records. I believe they arise from maldevelopment of the ducts or glands of Cowper. They are of little pathological interest in keeping up a urethritis; but they may give rise to difficulty in the passing of an instrument unless their presence has previously been determined by the use of the urethroscope.

3. Leucoplakia.

I have seen typical leucoplakia, white patches of thickened epithelium, in chronic cases which have received prolonged treatment with strong caustics. The urine is usually loaded with threads like the wings of aeroplanes. The condition needs no treatment, and should not be irritated by further strong applications. In very rare cases I have seen it end in primary carcinoma of the urethra, one of the rarest of diseases.

4. Inflammatory Polypi.

These are very seldom seen in the anterior urethra, though they are not so uncommon in the deep urethra. They should be curetted and their bases cauterized with pure silver nitrate fused on a probe.

5. Multiple Millet Seed Bodies.

In a few cases that have received prolonged treatment an appearance is seen as if the whole canal were dotted over with tiny grey bodies, the size of a millet seed. These are, I believe, new growths of lymphoid tissue beneath the mucous membrane. The best treatment I have found in such cases is to use Kollmann's dilators for a time, then to paint the canal several times with strong silver nitrate (20 grains to the ounce of distilled water), and then to leave alone for some time, when the bodies will disappear.

6. Angiomas.

These are very rarely met with in the male urethra, but may prove very troublesome. I had one patient who developed urethritis, and one day he suddenly noticed that his boots were soaking wet. On examining his clothes he found his pants and socks soaked with blood, which was issuing from the urethra. Examination revealed an angioma on the floor of the penile urethra, with a tiny septic ulcer at one portion from which the blood was issuing. Under an anaesthetic I was successful in applying an electric cautery to the angioma, which I destroyed completely, and shortly after I was able to send the patient away completely cured of his urethritis and his angioma. This is the only occasion on which I have seen an actual ulcer caused by gonorrhoea.

In the vast majority of cases of urethritis ulceration of the urethra never occurs, and you will not be likely ever

to see an ulcer from this cause. Yet the textbooks and some books written by specialists are continually talking of ulcerated patches in the urethra as if they were of common occurrence. If you use gentleness in passing the urethroscopic tube I will vouch for it that you will not see a true ulcer in one case in a thousand.

The same holds true of "patches." I always know that a man has not really studied his urethroscope when he tells me he has seen a patch which he has painted. I do not recognize such a thing as a patch or a "granular patch" in the urethra. I can see a submucous infiltration, or a soft stricture, and perhaps this is what is meant when people describe having seen a patch. But if this is what is meant by a patch, then I can only say that the worst possible treatment for it is to paint it with strong chemicals. These only irritate it and make it worse. Treat such areas by means of dilatation, not by means of paints. I always distrust the "patch painter." There are many about. For instance, a student came under my care who for six months had attended a certain practitioner twice a week, and had had a patch painted through the urethroscope without any relief. When I came to examine the urethra I found that it was not at fault, but that the man had a chronic infection of his prostate. The prostate had never been examined by the patch painter. Two months' massage of the prostate twice a week completely cured the patient without any more urethroscopic treatment.

Summing up, I strongly urge you to lose no time in acquiring a good urethroscope and in using it constantly. Only by constant use can you train your hand and eye and obtain first class results.

THE CHARACTERS OF THE ENTEROCOCCUS.

BY

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DURING the present war reference has been made by one or two writers to the enterococcus which is so frequently met with in wounds and other infections. No mention of this organism is to be found in pre-war English textbooks, and its characters are perhaps little known to many who are at present engaged on laboratory work. Reference, however, to French and German medical journals will show that it has been frequently written about, while special mention is made of it in French textbooks of bacteriology. A summary of this literature and the bibliography will be found in a paper in the *Journal of Pathology and Bacteriology*.¹

While the organism would appear to be a saprophyte capable of assuming virulence under certain conditions, there is some divergence of opinion as to its constant presence in normal stools.

French writers hold that it is a constant inhabitant of the normal intestine, where its seat of election is the small gut. It is said to be specially common in the intestine of infants, where it has been found along with *B. coli* and streptococci as early as the third day after birth. On the other hand, one of the German workers, who examined the stools of 3,530 persons, found enterococci in fifteen cases only, and none of these were in normal health. Six of them were suffering from "enteritis," or were convalescent from typhoid or paratyphoid fever; two, from whom the organism was obtained from the gall bladder, were cases of suspected typhoid; from another case of suspected typhoid the enterococcus was obtained from the urine; in five the same organism was recovered from collections of pus in relation to the pelvic or abdominal viscera, and in one case labelled "sepsis" it was recovered from the blood. In order further to corroborate the French statement that this organism is fairly common in the mouth, he investigated the mouth flora of 321 cases without once finding the enterococcus. He suggests, therefore, that it is not usually found either in the mouth or in the gut of healthy adults.

Whether this be strictly true or not there can be no doubt of its frequent association with morbid processes, more especially in relation to the intestine. It is of interest to note that many of the cases from which it has been

isolated have been suffering from, or have had, typhoid or paratyphoid fever.

This is illustrated in a case of puerperal septicaemia of moderate severity which I investigated in 1913, the details of which are published elsewhere.¹ This patient had suffered from enteric fever in India, and had also had what was termed an attack of dysentery some years before. The enterococcus was obtained in pure culture from the interior of the uterus, and recovery followed the administration of a vaccine made from the strain isolated. It may be of some value at the present time to record again the characters of the strain isolated on that occasion.

Motility, Staining, and Morphology.

The organism was non-motile, stained easily with the usual dyes, and was definitely Gram-positive. It occurred as diplococci, or in short chains of two, four, or six pairs of cocci. In films made from the living tissues the cocci were surrounded by an unstained area suggestive of the presence of a capsule. In this respect they closely resembled pneumococci.

In shape the elements were somewhat pleomorphic—a feature which is said to be characteristic of the enterococcus. In films made from a twenty-four-hour-old agar slope the organism appeared mainly in the form of isolated diplococci, the individual elements of which were oval, lanceolate-shaped, or quite round. Capsules were absent. The two elements composing the diplococcus were frequently inclined to one another so as to form an obtuse angle.

In films made from a three-day-old glycerine agar culture pleomorphism was still more marked. Many appeared as elongated ovoids apparently linked together by a fine thread or filament. The outer ends were generally pointed. Others were more uniform in shape, and resembled short diplo-cocci-bacilli. The two elements of the diplococcus frequently varied in size.

Chain formation was more marked in broth than on solid medium, the chains being short, and resembling in this respect *Streptococcus faecalis*.

Cultural Characters.

Broth in twenty-four hours at 37° C. became turbid, and a slight deposit was found at the bottom of the tube. After longer incubation the broth became clear, and a whitish deposit was found to have settled at the bottom. On gently agitating the tube this deposit rose up spiral fashion.

In peptone water and in hydrocele fluid respectively, much the same appearance was found, but the turbidity was less marked, and even after several days' incubation the deposit was not so copious.

In peptone water, to which 1 per cent. glucose had been added the turbidity and the deposit were both very marked.

Neutral red broth showed no change, apart from a deposit, after three days' incubation.

Agar Slope.—In twenty-four hours minute, discrete colonies, very similar to colonies of streptococci, were seen. These were translucent and showed a greyish-blue sheen. In shape they were round, with sharply-defined edges, and in the centre of each a pin-point speck more opaque than the rest of the colony. With a low power the colony presented a somewhat granular appearance. In older cultures the colonies became rather more opaque. The water of condensation was turbid.

On glycerine agar the growth was more abundant, so that, instead of discrete colonies, there was a thin bluish-grey film along the needle track.

On blood agar the growth was still more copious, mainly confluent, but where isolated colonies were present these were larger and more opaque than on plain agar. No haemolysis was observed.

According to Besson, growth in liquid serum is very feeble.

On gelatine slopes incubated at 18° C. very minute, clear, transparent, discrete, round colonies were seen within thirty-six hours.

In gelatine stab culture at the same temperature, small discrete whitish colonies were found along the needle track within forty-eight hours.

No liquefaction was observed even after eight weeks' incubation.

Indol was not produced.

Milk became acid, but no clot was formed except in one tube, and that after eight days' incubation.

According to Besson, growth in milk is poor and coagulation is not a constant phenomenon. *Streptococcus faecalis*, on the other hand, generally produces clot in milk.

Sugar Reactions.—Acid production was found in glucose, lactose, maltose, saccharose, raffinose, glycerol, mannite, and inosite litmus peptone water. In dextrin there was only weak acid production, to judge from the feeble red colour resulting after incubation. In dulcitol litmus peptone water the colour was discharged, but no reddening occurred, while arabinose, inulin, and adonite remained unchanged. After the lapse of some weeks the sugar reactions were repeated with the same result, except that in the raffinose tubes the colour was simply discharged after three days' incubation without the red colour appearing. The acid-change, however, was found to be rather slow in appearing, not only in the raffinose tube but also in saccharose, inosite, and dextrin. No gas was formed.