Remarks

ON

BURSAL SWELLINGS ABOUT THE
KNEE-JOINT.

BY

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Of late years a good deal has been learnt with regard to bursal swellings about the knee which seems not yet to have become current, and which has not, I think, up to the present sufficiently influenced their treatment and our views as to their relations to troubles in the knee-joint.

The swellings which most commonly present themselves in this part of the body are: (1) Those of the prepatellar bursa; (2) those of the bursa upon the expansion of the semimembranosus tendon, between it and the inner head of the gastrocnemius; (3) under the expanded insertion of the sartorius muscle, between it and the tendons of the gracilis and semitendinosus; (4) under the gracilis tendon between it and the internal lateral ligament; (5) under the patellar ligament, between it and the front of the tibia; (6) between the bifid insertion of the biceps cruris and the external lateral ligament of the knee-joint.

Enlargements of the last two bursae are in my experience uncommon, and may, therefore, be puzzling when met with. It must be remembered also that the semimembranosus bursa and that under the ligamentum patellae often, if not invariably, communicate with the knee joint, and may be enlarged in common with it by synovial distension. Those bursae about the inner and outer hamstring tendons rarely, if ever, primarily communicate with the knee cavity, and if enlarged the change is, therefore, due to abnormal conditions in themselves.

It has been held by some (Baker, Koenig, and others) that certain large bursal tumours round the knee are derived from hernial protrusions of the synovial membrane through weak spots in the capsule (so-called Baker's cysts). But we must remember that the views on these structures were put forward at a time when it was considered very imprudent to investigate them by operation, owing to the dangers of sepsis spreading to the knee-joint, and consequently a minute examination of their relations could rarely be made during life, and they were seldom dissected after death. Since then we have learnt how to operate on them without risk, and my own experience of a considerable series of cases leads me to the conclusion that the swellings here alluded to are always enlargements of pre-existing bursae and not hernial protrusions due to overstrain. I have never seen anything to support the hernial hypothesis in the case of the knee.

The first point we have to bear in mind in regard to all synovial bursae is that they may be regarded as rudimentary joints. Their structure is the same except for the absence in some of bony constituents. They have the same fibrous capsule and the same lining of secreting cells as joints proper. As might be expected, then, they show the same morbid changes as the ordinary articulations, and from the same causes.

Simple synovitis of the knee, bursitis of the prepatellar sac, and teno synovitis, or of a bursa underlying a tendon, are essentially the same disease. In all there is distension by hypersecretion, due to subacute inflammation, the result, it may be, of overuse or strain; again, all may also be the seat of septic infection through the blood or from without, and the effect is the same pathologically in all. But it has taken us a little longer to realize that just as we find gouty, tuberculous, gonorrhoeal, and so-called pyaemic affections of joints, so we may meet with the same in separate bursal structures or tendon sheaths, while the joints remain unaffected. This will sometimes explain the presence in certain obscure toxic blood conditions of painful spots or swellings in situations out of the line of the more commonly named bursae and sheaths, but in which we know that smaller or larger bursae do exist which otherwise rarely attract attention. I believe I have seen cases in which some of the deeper

bursae among the dorsal spinal muscles have been thus affected, and those in the deeper parts of the foot.

Again, it is most important to remember that just as disease—for example, tuberculous—may spread from a joint to extra-articular bursae and tendon sheaths, so conversely extension may take place from the latter to a joint if neglected. This general observation is, perhaps, better illustrated in the case of the wrist than by that of the knee. Here it is not infrequently seen that an apparently simple ganglion (say, on the dorsum) reveals itself on excision to be tuberculous, and, unless thoroughly extirpated, often shows its nature by involving the articulations of the carpus in typical tuberculous caries. And I have known a patient, previously healthy, die of general tuberculosis within a couple of years of the first appearance of a single tuberculous teno-synovitis in one finger. Numerous instances of primary infection of bursae and tendon sheaths with tubercle in various parts of the body might be cited. The same might be said of gonorrhoea and many other less definite blood infections attacking deep-seated and, so to speak, "out of the way" synovial tracts. Why only a certain joint, bursa, or sheath should be singled out for this infection to the exclusion of others is only one of the many difficulties which beset the whole study of the clinical history of tubercle. Blows or strains causing effusion of blood or lowering the vitality of the part may be found to account for some of the determining causes, but we can obtain no evidence of either in other cases.

Turning now to a more particular study of each of the half-dozen bursal swellings round the knee in our list, a few words only need to be said about the prepatellar bursa, for it is certainly the commonest of all bursae to require surgical treatment, and has received most attention. We see it so frequently the seat of enlargement from chronic inflammation due to pressure and from effusion of blood, the result of injuries, that we are perhaps rather inclined to overlook the fact that it may be the seat of tubercle, of gummata, and of septic infection. Indeed, I have seen several cases in which large rounded masses have been removed from the front of the patella on the supposition that they were bursae enlarged and thickened by chronic inflammation, which on examination afterwards proved to be gummata more or less encapsuled. Fortunately, the treatment by operation was not improper. The clean dissection of a hard gumma would give better results than those following internal treatment, which would still leave fibrous material, or possibly adherent scars, over the bone if softening occurred instead of the loose tissue produced after an aseptic operation, so that it may be said that all solid, or semisolid, tumours in or about the prepatellar area, if chronic, should be carefully dissected out, whether simple, tuberculous, or gummatus. But in the case of more acute inflammatory swellings, whether simple or infected, it is better to employ milder measures than excision, inasmuch as extirpation cannot take place in healthy tissue, and painful adherent cicatricial material will be left. In these cases aspiration, or a small lateral incision followed by Bier's cupping glasses or bandages, will usually give a very satisfactory result. If later, when all active inflammation has subsided, a thickened mass is left in place of the bursa this can be removed, and, if done aseptically, the skin will not be long adherent to the patella but will soon slip over it as usual, a new bursa being formed. The best incision for all these operations, in my opinion, is a curved one, above the patella, with the convexity upwards. The scar of this is out of the way in kneeling, and it gives the freest access to the whole of the swelling.

Very acute inflammations of the bursa patellae must always be regarded as serious, and treated very promptly. This is especially the case if the sac has never before been in trouble. In such cases the capsule is usually very thin, and if distended by septic pus is very easily softened and bursts, the result being widespread cellulitis of the leg and thigh, which may even extend into the knee-joint, often with disastrous results. I have seen a neglected case of the kind leading to large abscesses in the popliteal space and high above this in the thigh. No time should in such cases of acute bursitis be lost, but the sac should be freely incised on its lateral aspect, and freely drained after being well flushed out with normal saline solution. When the joint has been unfortunately involved it must

also be freely opened as for other suppurative conditions, and I have seen many cases in which free flushing this way has been followed by recovery of all the movements of the joint.

The next bursa in order on our list is that between the semimembranosus expansion and the inner head of the gastrocnemius muscle. This is subject to the same diseases as all others, but the commonest form is subacute or chronic synovitis which results in distension of the sac to a greater or less extent. The effect of this distension is to produce an aching pain with a sense of weakness in the joint. The swelling can usually be recognized when the limb is fully extended as an ill-defined elastic mass almost directly behind the knee which is soft during flexion and tense during extension. As this bursa usually communicates with the knee-joint its contents in slight flexion can sometimes be squeezed into it when abundant, and can be felt to distend the synovial pouches of the knee. When small this cannot be felt, but in advanced cases is quite demonstrable. In very extreme forms the knee-joint is also much distended with fluid which can be made to fluctuate easily from the joint to the bursal sac and *vice versa*.

In such cases the bursal sac may be enormously distended and reach far down the leg. In a case recently under my care it reached half way down to the ankle, and at the same time the knee-joint was hugely distended in all directions, the fluid passing easily into the bursa on pressure and back again into the knee. In another, operated on recently in private, the same conditions were present, though to a smaller extent. In both of these cases the diseased process appeared from the history to have started in the bursa and furnished fluid to the joint, and not conversely. In most cases when the patients first consult us the swelling behind the knee is very moderate in size, and the symptoms described above are not very marked, but can be easily diagnosed from popliteal aneurysm. But the sense of weakness and dull aching are worrying and disabling. Here the use of discutients and rest will often be enough to remove the fluid and relieve the patient. But when the condition has lasted long and is increasing, it becomes a question whether the morbid process has started in the bursa or the knee-joint. In both the cases referred to the bursa seemed to have been the starting point. This has an important bearing on the treatment of enlargement of semimembranosus sacs. If the conclusion is just—that they may, when neglected, lead to distension and disablement of the knee-joint—early removal is called for. But if their enlargement is only secondary to distension of the articulation, it would be only rational to give our first attention to it. One of the cases just alluded to left little doubt in my mind that the changes in the semimembranosus bursa were the primary cause of very considerable disablement of the knee-joint from secondary distension occurring and recurring for years.

The patient was a gentleman over 50, and very active. Ten or twelve years before I first saw him he began to have discomfort from swelling behind the knee. This yielded to rest and counter-irritants. But of late all exertion was followed by a great enlargement of the sac and a subsequent filling up of the knee, but without pain or heat in the joint. Weakness and uncertainty as to how far he could trust his weight to it were the most marked troubles. The condition of late always yielded to hot-air baths, the fluid disappearing from both situations but returning on very slight overuse. I was requested to remove the semimembranosus swelling, and though it could not be definitely promised that this would certainly relieve the chronic or recurring effusion into the knee, I undertook the operation, hoping that it would do so. The sac was completely dissected out until the posterior surface of the inner condyle was exposed, at which point the communication with the knee-joint was found. The result was an entire disappearance of the periodic filling up of the knee. This seemed to furnish a proof that the fluid in the joint was fed by an excessive secretion in the semimembranosus bursa. The sac removed was thickened and hyperaemic in patches but smooth.

The last case on which I operated for the condition in question gave, I think, further evidence as to the part played by morbid conditions in the semimembranosus bursa in causing distension of the knee-joint.

The patient was a man about 40, recently in our hospital for a distension of the knee-joint which I have never seen equalled. The condition was painless, and there were no signs of inflammation in or around the knee. But not only were all the pouches of the articulation hugely increased in area and very tense with fluid, but the semimembranosus bursa was also enormously enlarged, and reached more than half-way to the ankle. On pressure it was clear that the fluid in it passed into

the joint, and pressure on the latter forced it back easily into the bursa. Through a long vertical 8-in. incision a little to the inside of the middle of the popliteal space the whole sac was dissected out unbroken except at one thin spot. It started above behind the inner condyle of the femur, and reached, as stated, for about five or six inches downwards beneath the gastrocnemius. Its walls were thickened generally, in some places very much so, but there were thin patches in it besides. In dissecting it up it narrowed down to a neck as thick as the index finger, and terminated over the posterior curve of the inner condyle of the femur, where it was continuous with the lining of the knee-joint. Here it was cut away. It contained about a pint of thickish yellow synovium, and from the opening over the condyle a large quantity of the same fluid was squeezed out of the knee-joint. When laid open the sac after removal was seen to be covered in large patches with folds and villous processes of synovial membrane of a deep pink colour. These were quite analogous to those folds and fringes frequently found in the knee-joint itself in cases of chronic inflammation. Whether the synovial membrane of the joint was in a similar condition we cannot yet tell, as the man was very anxious to take up his employment, and left the hospital as soon as our wound was soundly healed *per primam*, though the joint still contained a large amount of fluid and I was anxious to operate on it directly if the removal of the large bursal tumour did not relieve it. But the state of the lining of the bursa was quite sufficient to account for the large amount of synovium both in it and in the joint. The thickened synovial membrane was hyperaemic and very largely increased in area. What the nature of the irritant which produced the hyperaemia was we are unable to say. The patient seemed fairly healthy; no organisms were found in the fluid, which also looked normal, and sections of the lining membrane showed no tubercle.

Of course it is conceivable that there may have been undiscovered toxins in the blood, but in the absence of these we are thrown upon the theory of overuse or strain. But the more carefully the studies of joint inflammation are prosecuted the more probable does it appear that many are of bacterial origin even where no organisms can be found in the fluids of the joint. A very careful search in the synovial tissue will sometimes discover them when the fluid is sterile. This and other clinical facts seem to me to suggest the conclusion that synovial tissues possess some powers strongly resistant to bacterial growth, that the hyperaemic reaction to their presence evokes this power and leads to their destruction, but that sufficient of their toxins remain behind to keep up the irritation for a shorter or longer time. What is known now of gonorrhoeal affections of joints, for instance, seems to prove this. We find in a gonorrhoeal joint the specific gonococcus by aspiration. We treat it, say, with a Bier's bandage and aspirate again some days later and find the fluid sterile. But it usually requires considerable time before the joint becomes quite normal again. And yet it does so in many cases so treated. Here there can be no pretence that we have by our aspirations withdrawn every single colony of organisms. There must be some antagonistic process going on in the cavity itself which not only is capable of destroying the organisms themselves, but of ultimately eliminating their toxins. This same clinical experience is seen in the case of synovitis due to other infections than that by the gonococcus—for example, the pneumococcus. But the resistance may be feeble or the organism of more than ordinary virulence, and in either case the process of repair may be prolonged unless we interfere by surgical help. This help may be given to the joint in several ways. The production of increased hyperaemia in it by painting with iodine, by fomentation, or by Bier's bandage, are among these. On opening the cavity, evacuating its contents, and presumably their toxins, and washing out with various fluids, which mildly stimulate without destroying the vitality of the lining cells, may be effectual. But in the case of a bursa such as that over the semimembranosus expansion which is becoming chronically distended and thickened, the best treatment is to dissect it out cleanly provided there are no signs about it of recent acute inflammation. In this way we may ensure that the knee-joint will not be damaged by frequent overflow from the bursa into the joint and gradual distension of its capsule.

Chronic inflammation of the semimembranosus bursa may also give rise to loose bodies within the sac. I have before me now several which were removed some years ago from this sac. They are about as large as small beans. They may probably have several different modes of origin as is the case in other similar cases of loose bodies. They may be cartilaginous and be derived from cartilage cells which are often normally present in synovial fringes. They

may be fibrous and derived from hypertrophied fringes or villous excrescences such as were present in the case just related. They may be fibrinous from inflammatory exudations of the sac which have been rolled up into pellets in the movements of the part. Finally, they may be due to blood clots decolorized and inspissated in the course of time and moulded by movement. Obviously, the removal of the whole sac would be the best treatment in such cases, as not only would the bodies themselves be taken away but also the diseased tissue, which might reproduce similar ones if they were simply evacuated. So far I have not come upon primary acute infective bursitis in this sac. Nor have I met with tuberculous disease of it, though frequently a tuberculous disease of the knee has involved it secondarily. The possibility of such infections with tubercle must, however, be always kept in mind when the semimembranosus sac is enlarged, and if the swelling resist all of the usual remedies, there is an extra reason for its extirpation in this suspicion. This operation calls for very great care and deliberation on account of the anatomical relations of the bursa. A long skin incision a little to the inside of the mid-line of the popliteal space is quite safe. But in the deeper dissection a very close watch must be kept to avoid the internal popliteal nerve and the artery and its branches. But, by keeping close to the wall of the sac after reaching it (which is usually an easy matter, if it be enlarged) on the inner side of the internal head of the gastrocnemius, it can usually be shelled out of the loose tissue in which it lies without much difficulty. It should be preserved unopened to the last moment, as it is easier if this be done to make out its boundaries and deal with the synovial sac, all of which ought to be removed. Behind the inner condyle, where the sac has a communication with the synovial membrane of the knee-joint, it will, of course, require to be eventually opened. But all the dissection should be finished before the narrow neck of communication is severed. The opening into the knee-joint requires no attention in the way of stitching up, and may be left to itself. If carefully carried out there is little or no immediate bleeding or subsequent oozing, and the wound can be completely closed without any drainage, as was done in the two cases referred to. Flawless primary union followed in both cases. There was some difficulty in the last case in dissecting out the large sac from beneath the gastrocnemius. But as it was thickened and tough it was quite distinguishable from the tissues around, and no damage was done to any structure of importance.

Next in order of frequency of occurrence is enlargement of the bursa under the expanded insertion of the sartorius muscle. Of this swelling I have seen several instances. The tumour has been well defined—oblong in shape and elastic. In the cases in which I have excised it it was about the size of an average sausage, and could be extirpated unbroken. The lining was smooth and looked like ordinary healthy synovial membrane. I have never seen it affected with tubercle primarily, but recently there has been a case in our hospital operated on by one of my colleagues, which showed, I am told, a distinctly tuberculous infection. A specimen which can be found in the museum of University College Medical School shows another variety of enlargement of this bursa. It is flattened, and fibrous, like a prepatellar sac. Apparently it was due to chronic inflammation, or possibly to organized blood clot.

I am not sure that an enlargement of the gracilis bursa has ever come in my way nor of that between the biceps near its insertion and the external lateral ligament. But I have seen and operated on a case where the bursa under the ligamentum patellae was enlarged and painful, and required evacuation. This did not in this case communicate with the knee-joint, as is often the case, but was completely shut off. As well as I can recollect, it was a septic infection of the bursa through the blood, and the fact that it did not communicate with the knee-joint was fortunate.

In this brief sketch of the enlargement of bursal cavities about the knee my wish has been to direct attention not only to recognized swellings which have received more or less study, but also to suggest that in some obscure conditions in this region an explanation may be found in enlargements of synovial tracts which are sometimes forgotten. What these may be due to I have also hinted, and

how they may ultimately seriously affect the knee-joint proper if neglected. In the case of enlargement of some of them I have strong grounds for the belief that they are the origin of those large cystic swellings which have been, I think erroneously, believed to be due to hernial protrusions of the synovial membrane of the knee-joint. As to treatment, we are safest when we regard them as rudimentary joints, and deal with them as such. And as it is now recognized that joints may be dealt with freely by operation with a good prospect of the preservation of their functions, so may these bursal sacs.

SOME PHARMACOLOGICAL EFFECTS OF THE STRONG SULPHUR WATER (HARROGATE).*

SECOND PAPER.

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HARROGATE.

(Abstract.)

DR. DAVID BROWN, after giving a brief account of the results detailed in the first paper of the series, which was published in the BRITISH MEDICAL JOURNAL of August 20th, 1910, went on to say that those results important for all interested in Spa treatment generally, and in Harrogate in particular, needed further tests for their complete establishment: first in the way of direct verification by repetition, and secondly, from the point of view of obtaining more complete data, ultimately embracing observations on all the excreted substances so far as at present they are known.

The points taken for confirmation were:

1. The reality of the diuresis and its amount.
2. The rise in the excretion of total nitrogen in the urine.
3. The rise in excretion of body tissue (or endogenous) uric acid during treatment.
4. The rise in excretion of uric acid arising from the food (exogenous) as shown by the ingestion of measured amounts of pure hypoxanthin in regularly repeated doses.
5. The rise in excretion of body tissue (or endogenous) kreatinin as an index of muscle metabolism.

The new points observed were the following:

6. The fate of the sulphur water as regards the urinary and bowel excretions, and the ascertainment of any relationship, direct or inverse, between the amounts of the two excretions.
7. To ascertain if any change occurred in the excretion of phosphates as an index of tissue change.
8. To ascertain whether any change in the amount of indican (indoxyl sulphuric acid) took place as a result of the course of sulphur water.
9. To examine the blood pressure at frequent intervals and to register any variations in the same.
10. To ascertain whether the amount of potassium sulphocyanate in the saliva altered during the course of sulphur water.

The most exact biochemical methods of analysis were used, and the personal equation was eliminated as far as possible by observing the rule of awaiting the termination of the whole of the experiments before attempting to calculate, even in the roughest way, any of the data obtained in the laboratory.

The subject, the same as that of Case I of the previous paper, took the following diet on each of twenty-one successive days:

- 14½ oz. bread (white).
- 25 oz. milk.
- Five eggs.
- 8 oz. rice pudding.
- 8 oz. macaroni cheese.
- 2½ oz. butter.
- 20 oz. distilled water (aërated).

On the morning of the twelfth day of the experiment, between 8 and 9 a.m., 580 grams (20 oz.) of the strong sulphur water was taken, and this was repeated each day up to the nineteenth day. On the twentieth and twenty-first days 18 oz. were taken, and on the twenty-second, 16 oz.

All the doses of sulphur water were taken fasting.

On the eighteenth, nineteenth, twentieth, and twenty-first days a dose of 0.3 gram of hypoxanthin was taken after 5 o'clock in the afternoon.

On the twenty-first, 10 oz. extra of distilled (aërated) water were taken to relieve thirst. On the twenty-second and twenty-third days the diet consisted of

- Milk, 40 oz.
- Bread, 14 oz.
- Aërated distilled water (unlimited in quantity).

* The paper was read before the Section of Balneology and Climatology of the Royal Society of Medicine.