INFLAMMATION OF THE BURSA GASTROCNEMIO-SEMIMEMBRANOSA,

WITH A REPORT OF FOUR CASES OF ENLARGEMENT AND DISTENTION OF THIS BURSA TREATED BY EXCISION.

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INFLAMMATION of the bursa gastrocnemio-semimembranosa is doubtless of frequent occurrence, yet American literature does not appear to furnish any recorded cases. These facts, and the excellent results obtained by the method of treatment adopted in the four cases which form the basis of this paper, have led me to record the clinical features of this lesion, and to describe the details of the operative technique as carried out in the removal of these bursæ.

Anatomical Considerations.—Of the various bursæ situated in the vicinity of the knee-joint the one between the inner head of the gastrocnemius and the tendon of the semimembranosus muscle (the bursa gastrocnemio-semimembranosa) claims a fair share of our attention on account of its constant presence, and from the fact that it furnishes, when distended, a very large percentage of all bursal swellings situated in the popliteal region.

A glance at Fig. 1, drawn from a series of dissections made at the New York Post-Graduate Medical School by the author, will better help the reader to refresh his memory as to the exact location of this bursa than would pages of anatomical description.
Briefly stated, it lies in its normal situation to the inner side of the popliteal region, at the bottom of the so-called "internal popliteal sulcus." This sulcus or depression, which

![Diagram of the normal bursa between tendon of semimembranosus muscle and tendon of inner head of gastrocnemius muscle.](image)

has for its inner wall the shelving inner head of the gastrocnemius, and for its outer the cord-like mass of the inner hamstring tendons as they cross the back part of the knee-joint,
is best seen and felt when the patient is in the standing posture, with the full body weight borne on the lower extremities; the limiting muscles are thus made to stand out in bold relief, and so deepen this internal popliteal sulcus, at the bottom of which lies the bursa, its centre being about on a level with the upper articular surface of the tibia.

In shape, not unlike a saddle or the letter U, it rests astride the outer and tendinous border of the inner head of the gastrocnemius, at the point where the tendon of the semimembranosus muscle overrides this border on its way to its tibial attachment below, one of the limbs of the U resting on the anterior surface, the other on the posterior surface of the gastrocnemius in this position.

It is the only bursa common to these two muscles (gastrocnemius and semimembranosus); the smaller bursa, situated directly above it (the gastrocnemio-condylar bursa, see Fig. 2), being placed between the inner head of the gastrocnemius and the posterior surface of the inner condyle of the femur, the bursa situated directly below it (the bursa semi-
membranosa proper) being placed between the tendon of the semimembranosus muscle and that portion of the posterior surface of the inner tibial head around which the tendon glides as it runs to its bony insertion just below.

Like other bursae, its inner surfaces are normally everywhere in perfect contact and sufficiently lubricated by the so-called "synovial secretion" so that the apposed connective-tissue planes are both smooth and moist, permitting here, as elsewhere, the necessary gliding motions between adjacent structures without undue friction.

In size this bursa averages one to one and one-half inches in the long axis of the limb, and about three-quarters inch in the transverse. It is not unusual, however, to have it normally of much larger size (Gruber recording a dissection in a normal subject where the measurements were two and three-quarters by three-quarters inches).

Its size seems to correspond fairly closely with the degree of muscular development of the individual; the largest ones observed in my dissections were in extremely well-developed adults.

Though retaining proximately its U or saddle shape in most instances, it is seen to vary somewhat in this particular, being at times multilocular, with the various cavities communicating or occasionally separate from one another. It is not a rare condition to find the two limbs of the U separated from each other by a so-called "diaphragm" of varying thickness, often perforated at or near its middle, allowing more or less free communication between the two portions of which this bursa is composed. Bands are also seen occasionally in the sac crossing from one side to the other.

Normally the thickness of its walls is in the neighborhood of one-thirty-secondth of an inch.

In recent cases of inflammation with distention its walls do not seem to be much thicker than the above; in the chronic case No. 4, however, they were about one-eighth of an inch in thickness.

While consisting often of a closed sac, which has no
communication with the knee-joint, such occasional communication introduces a factor of supreme importance when we consider the various methods of treatment at our disposal for such an inflamed bursa.

Anatomists differ somewhat in their opinions as to the frequency of such communication.

Gruber estimates roughly that one-third of these bursae communicate normally with the knee-joint, that in children or embryos they never do, in women sometimes, and that such communicating bursae are usually found in well-developed male adults. Debierre and Poirier agree with the above as to young subjects, Debierre thinking such communication the rule in adults.

While not communicating directly with the knee-joint capsule, this bursa may communicate with the bursa directly above it (the bursa gastrocnemialis proper), which is found almost invariably either to lead into the knee-joint directly, or to have such a thin membrane interposed as would offer little or no resistance to the spread of infection in that direction.

My own dissections in this direction, which have been done principally on adult and middle-aged bodies, agree entirely with the facts as found by Gruber and cited above.

Etiology.—In many of the cases "overaction" of the muscles concerned seems to have been the starting point of the bursitis, such overaction consisting either of prolonged violent action after a period of comparative quiet (as in Case III, where the lad had skated for a long time, the first time he had worn his skates that winter) or of some sudden extreme action (as in Case IV, where the patient tried to save herself in her fall through a broken skylight), the resulting bursitis (not the synovitis of the knee) dating from this occurrence.

In others no distinct history of such an occurrence could be elicited. In such the possibility of a tubercular, rheumatic, or luetic infection should be kept in mind.

Suspecting the latter, we would of course carry out a
thorough course of antisyphilitic treatment before resorting to the methods to be advised later.

Two of the cases here recorded were adult women, the others were boys of nine and eight.

![Fig. 3.—Inflammation of the bursa gastrocnemio-semimembranosa.](image)

*From a drawing made of Case III.*

**Signs.**—When this bursa becomes enlarged through fluid accumulation in its interior, it follows in its growth the direction of least resistance (upward and inward), and appears first
at the bottom of the internal popliteal sulcus as an oblong cystic swelling. As the bursal contents increase the tumor is seen to project more and more into the popliteal space, until it occupies a large portion of it, the bulk of the swelling being, however, to the inner side. (See Fig. 3 and photograph, Fig. 4.)

A position of hyperextension of the knee causes the tumor to project to its utmost, and its characteristics can best be studied while the patient is standing in this position. The skin and fatty layers are felt to be freely movable over it (unless these structures have been involved secondarily by a spreading inflammatory process), the tumor itself revealing its origin by a characteristic sign, the firm attachment of its base to the cord-like mass of the inner hamstring tendons.

If there exists a free communication between the bursa and the knee-joint, the fluid contents of the bursa can often
be reduced into the joint, the position most favorable for this procedure being one of semiflexion at the knee. This sign, however, is not an absolute one, and should not be relied upon. Such a reduction seemed to have taken place, in part at least, in Case IV, and yet no communication whatever was found to exist between it and the knee-joint or the bursa directly above it.

Absence of this sign should not be taken as indicating that no communication exists, for the bursal contents may be so thick that they cannot readily be forced through a very small existing aperture, or one of the loose fatty bodies, so commonly found in the chronic cases, may block the opening.

Fluctuation can usually be elicited when the tumor has reached an appreciable size. In recent cases, where the sac-wall is thin, this is usually plainly felt, in the chronic ones with a much thickened sac and with almost semisolid contents (consisting in part of the so-called "loose fatty bodies") fluctuation is doubtful or absent. In some cases these movable bodies can be felt. This may happen when the cyst is not specially tense.

When associated with a more or less chronic inflammation of the synovia of the knee-joint (and in these cases probably secondarily to it) we may elicit in addition in the knee-joint itself the signs peculiar to that condition,—crepitation; relaxation with or without thickening of the ligaments, floating patella (if there be joint fluid in excess), stiffness, etc.

**Symptoms.**—Pain of an acute character seems rarely to have been felt even in the recent cases. The patients complain rather of a sense of discomfort and of pressure to the inner side of the knee and of an inability to move the knee-joint through the arc of usual motion, as in walking, running, climbing stairs, etc. They feel that the knee is weak and show an unwillingness to make any movement which obliges them to put their full body weight on that limb.

When the trouble is localized to this bursa, these are, as a rule, the only symptoms of which the patient complains. When secondary to a more or less chronic synovitis of the
knee, the symptoms referable to the two conditions naturally merge into one another.

Usually at first, when the tumor occupies the internal popliteal sulcus only, but few subjective symptoms are present, and the patient is not aware of its presence; later, as it encroaches upon the popliteal space and interferes with the function of the limb, the swelling is noticed and the patient seeks advice.

**Differential Diagnosis: Popliteal Aneurism.**—This is, perhaps, the most important lesion from which we should differentiate it. If the bursal swelling be seen at an early period, while still limited to the internal popliteal sulcus, the two conditions could hardly be confounded. Later, when the bursal cyst has crowded itself out of its original and characteristic position and has come to occupy the greater portion of the popliteal space (acquiring thereby, in some cases, a transmitted impulse from the artery upon which it lies) such differentiation can best be made by tracing the cyst to its point of origin, the bottom of the internal popliteal sulcus. It will be found intimately adherent to the tendinous mass of the inner hamstring tendons at this point. This is the most reliable sign. Thrill and pulsation may both be absent, and yet the tumor may be an aneurism. Either aneurism or bursa may present itself as a reducible pulsating tumor.

**Lipoma of the Popliteal Region.**—Soft fatty masses embedded in loose connective tissue often give rise to what may be described as an indefinite sense of fluctuation. We would not expect to find such a tumor attached to the bottom of the internal popliteal sulcus and to the mass of the inner hamstring tendons.

**Abscess.**—A cold abscess pointing in the popliteal region might be mistaken for an enlarged bursa; without previous osteocopic symptoms or periosteal changes to guide us the diagnosis might be “in suspense.”

**Sarcoma.**—If arising from any of the tissues in the direct vicinity of this bursa, such a tumor might well present difficulties in differential diagnosis, particularly if of the cystic
variety. If it started from a point above, there would be less likelihood of error.

Inflammation of the Popliteal Bursa, or of any of the other Bursae situated to the Outer Side of the Knee-Joint.—None of them have the characteristic position of this bursa. A popliteal bursa usually shows itself, when distended, as a deep elastic tumor situated farther down in the calf of the leg.

Distention of the gastrocnemio-condylar bursa alone (see Fig. 2) could hardly be diagnosed, it seems to me, apart from the accompanying knee-joint distention, on account of its deep situation under the gastrocnemial head, and from the fact that, as a rule, it either communicates with the knee-joint by a free opening, or is separated from it by such a delicate membrane that any increase of tension within the bursa would in all probability cause the bursal contents to gain access to the knee-joint. After this the contraction of the gastrocnemius would tend to keep the bursa empty at the expense of the knee-joint capsule.

Distention of the bursa between the semimembranosus tendon and the head of the tibia might present signs very similar to those under consideration. I have not been able to find a recorded case. In none of my dissections have I found this bursa to communicate either with the knee-joint or with the bursa which is under consideration in this paper.

Enlarged bursae are not infrequently found to coexist in both limbs. In the appended references will be found several cases of double gastrocnemio-semimembranosae bursae. This is a point which might help us in a doubtful case to rule out aneurism, sarcoma, lipoma, and abscess.

Treatment.—The following methods have been proposed.

Internal Medication.—No cases of cure by this method are recorded. The previous occurrence of any symptoms suggesting a luetic infection would justify us, of course, in pushing a course of specific treatment for several weeks before resorting to the other methods advised.

A bursitis seen in the secondary stage is usually associated with effusion into the sac; in the tertiary stage there is
gummatous infiltration with production of new connective tissue, giving (as is often seen in the case of the prepatellar bursa) a firm elastic tumor, to which the skin is not attached unless involved secondarily by a spreading inflammation.

Compress (alone), with or without Immobilization of the Knee-Joint either by a Plain or Elastic Bandage.—No cases of cure by these means are recorded.

Compression and Counterirritation.—A. M. Shield records a case of popliteal swelling which was much reduced in size by these means. Granting that the lesion here was an inflammation of this bursa, I would scarcely call this a permanent cure, for from the description the sac-wall could easily be felt after the disappearance of the contents (perhaps into the joint). In recent cases there can certainly be no harm in resorting to this method at first, where time is no object, in the hope of a possible absorption of the fluid contents. The most favorable cases for this method would seem to be those where no communication exists between the interior of the bursa and that of the knee-joint. In old chronic cases, with thickened sac-wall, this method would seem to be a mere waste of time and material.

Aspiration of the Sac (alone).—Whether for diagnosis or for treatment this is at best a dangerous procedure. If done in the most aseptic manner, it would be feasible only in the very recent cases, where the contents are sufficiently watery to be drawn through the needle. In all the four cases reported in this article, it would have required a needle of at least the size of a trocar to have gotten out the semifluid contents, and the loose fatty bodies contained in the sac could only have been removed through an incision. In the English literature on this subject are to be found several references to cases where the introduction of a needle was followed by a synovitis of the knee-joint, the inflammation later becoming purulent, and finally necessitating amputation of the thigh. Owing to the well-known tendencies of inflammatory processes to spread in the connective-tissue layers, when no outlet is provided for the exudation (the minute wound made by
the aspirating needle bringing about such a condition in a marked manner), and to the impossibility in every case, as seen by oft-repeated bacteriological tests, to make the patient's skin absolutely aseptic, such aspiration seems to me to be a procedure entirely unjustifiable, unless we are prepared to follow it up immediately by an open operation. It might help us to differentiate between an extensive bursitis with transmitted impulse and an aneurism of the popliteal artery, but even in that case I think it far wiser to establish the diagnosis through an open wound, and then to carry out the procedures necessary for the radical cure of whichever condition presented itself.

**Aspiration and the Injection of Irritant Fluids, such as Carbolic Acid, Iodine, etc.**—Such procedures are mentioned only to be condemned, on account of a possible and unrecognizable communication between this bursa and the knee-joint. It must also be evident that such an injection, made into any part of the semisolid, "starchy" contents, other than that directly in contact with the cyst-wall would fail to excite the desired adhesive inflammation upon which the cure would depend. This method has also been followed by suppuration of the sac.

**Incision of the Sac followed by Packing of the Cavity.**—While not open to some of the objections noted in connection with the two last-mentioned procedures, this method is hardly to be recommended, as the operation of choice, for several reasons. If no communication is found to exist with the knee-joint at the time of operation (the most favorable condition for this method), the after-treatment of such a granulating bursa would invariably be a tedious one, and there would always be a chance of a recurrence, necessitating a subsequent and much more difficult operation. If a communication be found with the knee-joint, it would be practically an impossibility to keep such a granulating area aseptic during the length of time required for the healing process to be completed, and a tying off of the opening without a removal of the sac itself would be a much more difficult pro-
procedure than the method about to be recommended,—the ex-
gonarthritis necessitating amputation above the knee.

To tie off the neck of the sac following a simple incision, where a communication is found to exist with the knee-joint, would require quite as deep and extensive a wound as that necessary for the removal of the sac, and would, in my opinion, be a much more difficult procedure.

*Excision of the Sac.*—This is certainly the operation *par excellence*, and the one which was adopted in all four cases here recorded. It should be the form of treatment for all cases (other than the syphilitic) where we wish to obtain a radical cure, after the method by compression and counter-irritation has failed.

I have been led to describe the operative technique somewhat at length, owing to the fact that in my last two cases (III and IV) I found the methods herein described to be those best adapted to a rapid and thorough dissection of the sac. The four cases were subjected to operation in the operating room of the Presbyterian Hospital Dispensary (Out-Patient Department), under the strictest aseptic precautions. They all united by primary intention, and there was not the slightest evidence in any case of inflammatory complication in the knee-joint or in the neighborhood. When last seen, they were all free from the troubles caused by the presence and growth of the bursæ.

*Details of the Operative Technique.*—The patient, placed in the recumbent position, is anaesthetized, and the field of operation made as aseptic as possible. The limb is held up vertically for several minutes and an Esmarch rubber bandage applied from the toes to the hip. A heavy elastic rubber band is then put on, compressing the femoral in Scarpa's triangle and the rubber bandage removed. The patient is now turned on the sound side, and the knee held in a position of forced extension by an assistant. The skin incision is made in the long axis of the limb, over the most prominent part of the tumor, curving, however, a little more to the inner side of the knee below so as to be over the origin of the bursa at this
point. The tissues are divided down to the popliteal fascia, and this is severed in the same line as the skin incision, exposing the upper portion of the cyst. It is very important that the various layers overlying the cyst-wall be all divided before dissection of the bursa is undertaken, as otherwise such separation is both tedious and unsatisfactory.

When the cyst wall itself is exposed it shows out in the recent cases as a bluish-green and more or less opalescent ovoid mass, crossed in various places by slender connective-tissue bands, which run off at the sides into the popliteal fat and inner hamstring tendons and below into the thin aponeurotic layer of the inner head of the gastrocnemius (see photograph); in the chronic cases, with thickened walls, it appears of a yellowish white color, due, apparently, to the fat contained in the meshes of its outer covering.

The edges of the wound being effectively retracted, the portion of the bursa occupying the popliteal fossa is carefully dissected away from its fatty surroundings from above downward until that portion is exposed which rests upon the inner head of the gastrocnemius, and is connected by tender fascial bands with the aponeurosis on its surface. In cases where the bursa has attained a moderate size only, encroaching but slightly on the popliteal space, the large blood-vessels and nerves contained in that space are not usually exposed in this dissection; in the cases, however, where the tumor in its growth has gradually filled up most of the popliteal space, crowding its other contents to the outer side, the internal popliteal nerve may be recognized as it courses downward to disappear under the gastrocnemius at the point where the two heads of this muscle unite. The popliteal vessels can be felt in the bottom of the wound, pulsation being absent, however, owing to the compression of the femoral above at this time.

As we proceed still farther downward in our dissection we encounter the attachments of the bursa to the semimembranosus tendon; these should be divided without opening into the tendon sheath, if possible. It is an easier and a much better procedure to carry on the dissection without opening
into the bursal sac until it has been freed from the semi-aponeurotic (superficial) surface of the gastrocnemius, on which it lies in part, and from the upper three-fourths of its attachment to the semimembranosus tendon. This brings the cyst down to a pedicle of moderate size; when we have reached this point it makes the dissection much easier and safer to immediately incise the sac, evacuating its contents with the least possible wound contact, and to explore its inner walls for openings communicating either with the knee-joint or with the bursa directly above (the bursa between the inner gastrocnemial head and the posterior surface of the inner condyle of the femur). Where no such openings are found to exist, the further dissection of the cyst-wall is best carried out by introducing a finger of the left hand into the cavity of the bursa and pulling the remaining pouch over it like a glove finger. In this way we may be sure that we dissect the whole bursal wall with the least damage to the tendinous structures at its origin, and with a minimum risk of opening into the synovia of the knee-joint, from which it is separated often at its deepest portion by a layer of connective tissue, a fraction of an inch only in thickness. Where we make out clearly a joint communication, or where such communication seems probable from the previous signs (it might be so small as to escape detection even with a fine probe), a catgut ligature should be thrown around the pedicle at this point and the sac cut away. If there be found an opening into the bursa above, it is to be similarly treated, on account of the usual communication of this latter bursa with the knee-joint; or such bursa may in turn be dissected out and its opening into the knee-joint also closed. Slight flexion at the knee-joint should facilitate this part of the work, relaxing the gastrocnemial fibres under which this second bursa lies.

The wound should now be thoroughly flushed with hot normal salt solution to float out the loose pieces of fat which have remained in the wound from the popliteal part of the dissection, and such stray germs as may have gained access to it in any way. The rubber band compressing the femoral
is gradually loosened, and after a careful hæmostasis the popliteal fascia is united by a buried catgut suture, the fat and skin being brought together with or without the addition of a small rubber tissue or gauze drain, as indicated. A sterilized gauze dressing is then applied and the limb put up, gently flexed, in a plaster-of-Paris bandage. The subsequent treatment is along the usual post-operative lines. Where the wound has healed aseptically, immobilization can be dispensed with after the fourteenth day, and active movements are to be gradually renewed.

Case I.—J. M., aged nine years. The boy cannot give an intelligent account of his trouble, he thinks he has had the swelling back of his right knee for two years. He has not much pain in the limb. There is an elastic ovoid tumor, about three by one and a half inches to the inner side of the popliteal region of the right knee, its deep portion attached to the bottom of the internal popliteal sulcus, non-reducible into the knee-joint. No impulse.

Operation, August 3, 1898. The cystic mass was found to be the distended bursa gastrocnemio-semimembranosa. Attempt to remove the bursa without opening into its cavity was not successful, owing to its intimate connection with the aponeurosis on the surface of the inner head of the gastrocnemius; all of the sac was, however, removed. No communication with the knee-joint or with the bursa above. Closure of wound without drainage. Plaster-of-Paris fixation in gently flexed position for two weeks; starch bandage for one week. Primary union.

Pathological Report.—Wall of dense connective tissue like a bursa, with slight inflammatory infiltration. One little spot of calcareous degeneration (G. A. Tuttle).

Case II.—L. McC., aged twenty-four years. Housework. Patient does not remember to have strained herself in any way. Swelling back of left knee for three months. Pain and inconvenience moderate. There is a swelling to the inner and back part of the left knee very similar to the one described in Case I,—deep attachment in internal popliteal sulcus.

Operation August 17, 1898. Bursa dissected out, but in so doing punctured near its base. Removed entire. No communication with knee-joint or with bursa above. Closure and after-treatment as in Case I. Primary union.
INFLAMMATION OF THE BURSA.

Pathological Report.—Wall of dense fibrous tissue with some inflammatory infiltration. Looks like the wall of a bursa (G. A. Tuttle).

Case III.—S. B., aged eight years. Parent thinks she noticed swelling back of his right knee after boy had been skating. Swelling subsided (?). Three days ago it returned (?). Pain slight, disability moderate. There is a cystic mass occupying internal popliteal sulcus and most of the popliteal space. Tension slight.

Operation, October 13, 1898. The bursa was found very adherent and its dissection was much facilitated, after its upper two-thirds had been freed, by opening it, introducing the finger as into a glove finger, then separating it from its deep attachments by careful strokes of the scalpel. Closure and after-treatment as in Cases I and II. Primary union.

Pathological Report.—Fibrous connective tissue and adipose showing very slight signs of inflammation (Thacher).

Case IV.—M. B., aged forty-seven years. Housework. Some time during the winter 1897–98 fell through a skylight, straining right knee. For some time previously had felt pain in that knee and there was some “creaking.” June, 1898, noticed lump back of right knee. Lump has gradually increased in size. There is considerable aching, a sense of fullness in knee, and flexion is interfered with to the extent that she has to drag her foot. She cannot put her weight on that leg. There is an ovoid swelling occupying the internal popliteal sulcus and a large part of the popliteal space. Fluctuation and synovial crepitation are distinct in the tumor. The contents seem reducible into the knee-joint, there is a slight transmitted impulse. Pulsation in both posterior tibials the same. Over the knee-joint anteriorly there are creaking sounds on motion and when the patella is moved from side to side.

Operation December 20, 1898. The bursal sac was found very much thickened. It contained several “fatty bodies suspended in a thick fluid which looked purulent. Cultures were made from this fluid. The sac was dissected out as in Case III. It was extremely adherent to all parts. A very careful examination failed to reveal any communication whatever either with the knee-joint or with the bursa above. Closure and after-treatment as in the three preceding cases. Primary union.
Pathological Reports.—Culture: No growth (Thacher).
Bursa: Simple inflammation; granulation tissue (Thacher).

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