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The Classic

On the Formation of Synovial Cysts in the Leg in Connection With Disease of the Knee-Joint

W. MORANT BAKER

William Morrant Baker (1839–1896) (Fig. 1) was the son of a prominent lawyer who died when his son was only ten years old. Baker became interested in medicine very early and worked as an apprentice with his local doctor until he was able to enter St. Bartholomew's Medical College. After his graduation in 1861, he became an assistant to James Paget. His medical interests were very diverse, and he wrote papers on many subjects, including the first description of erysipeloid and other dermatologic conditions. He was known for his ability, ingenuity, and diagnostic acumen. It is interesting that although his career was cut short by the onset of locomotor ataxia (neurosyphilis), he was characterized in a posthumous tribute as being "physically and morally an English gentleman."

The paper, "On the Formation of Synovial Cysts in the Leg in Connection with Disease of the Knee-Joint," indelibly attached Baker's name to this condition. The paper is reproduced in full because of the interesting description of the patients, the treatment, the complications, and the pathologic findings.

LEONARD F. PELTIER, M.D. PH.D.

My attention was first drawn to the diseased condition which forms the subject of the present paper by the following case, which was under the care at different times of my colleagues, Mr. Callender and Mr. Marsh, and of myself. For the notes of the case I am indebted to the records of the Surgical Registrar, Mr. Butlin.

CASE I

LARGE CYST IN THE CALF OF THE LEG—OSTEO-ARTHRITIS OF KNEE-JOINT—AMPUTATION

A woman (M.S.), 38 years old, was admitted into St. Bartholomew's Hospital, under the care of Mr. Howard Marsh, July 22, 1873, with a large swelling in the calf of the right leg. The right leg was about twice as large as the left, from just above the knee to the ankle. There was slight ædema, and the superficial veins looked tortuous and dilated. There was no great pain or tenderness, and no hardness or swelling could be felt in the track of the popliteal vein. The swelling was generally uniform, but especially marked in the calf, where deep-seated fluctuation could be felt. A slight pulsation was also perceptible, but was apparently only transmitted. There was also some effusion in the knee-joint.

The patient was thin, but otherwise in fair health, and complained only of numbness and very slight pain in the leg.

The history given by the patient was that five months ago the right leg began to swell, and had continued since slowly increasing. She thinks that, as she stooped one day, something cracked in the knee, and from that time it began to swell. She has had swelling of the leg after each confinement.

From Baker W. M.: On the formation of synovial cysts in the leg in connection with disease of the knee-joint. St. Bartholomew's Hospital Report 13:245, 1877.

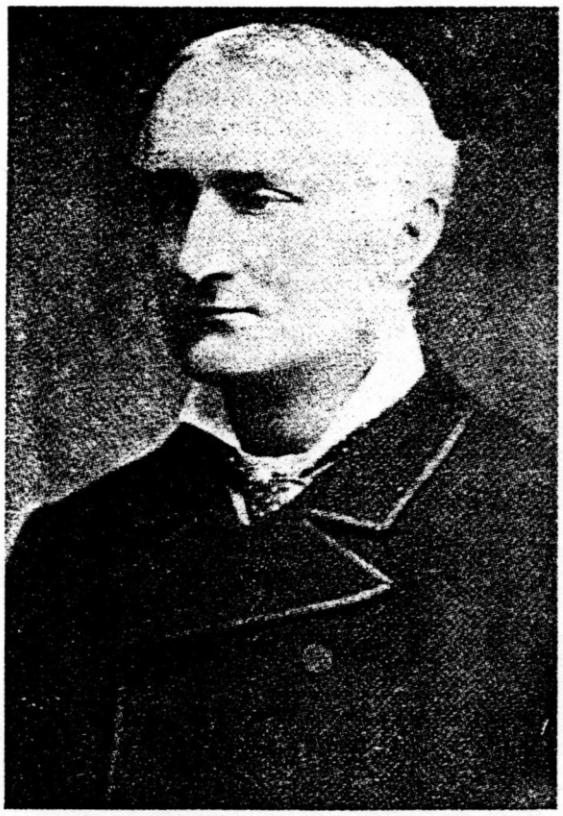

FIG. 1. William Morrant Baker (1839–1896).

At a consultation which was held on the case, it was generally agreed that there was a quantity of fluid, perhaps pus, beneath the superficial calf-muscles, with probably thrombosis of the deep veins.

A day or two after the patient's admission into the Hospital, the swelling in the calf was punctured by Mr. Marsh with a very fine trocar, and several ounces of fluid were drawn off, leaving behind a considerable amount of thickening. Much to the surprise of those present, the fluid was not purulent, but apparently cystic. It was translucent, pale red, viscid, slightly turbid and alkaline. It contained a large amount of chlorides, and was almost soliditied by heat and nitric acid. Microscopic examination failed to detect more than the presence of blood corpuscles; there were no pus-cells.

July 28.—The fluid has apparently collected again. The measurement of the right calf is 13⅝ inches; that of the left, 9⅝ inches. There is no enlargement of the femoral or inguinal glands. The swelling and thickening of the leg seems to be chiefly in the upper part of the gastrocnemius, especially in front of the muscle, and in its external head, and between the two heads, as well as some three or four inches lower.

The swelling below the calf is probably only ædema, on account of the pressure above.

July 31.—The swelling in the lower part of the leg is much diminished.

Since her admission the patient has been unable to retain either urine or fæces, which all pass involuntarily. This has been so, it is said, for some time past. An examination of the vagina and rectum, however, has discovered no abnormal condition, and throws no light on the condition of the leg.

August 4.—The leg is generally much smaller and less painful. Measurement of the calf is 12 inches. The condition of the knee is not changed.

August 16.—The thickening in the upper part of the calf is much less. The knee is bandaged.

September 5.—There is still some thickening in the upper part of the calf. The knee, in spite of careful and constant bandaging, is gradually increasing, apparently on account of fluid in the joint. The leg is now abducted and slightly everted.

September 17.—The thickening in the upper part of the calf is apparently permanent, but not manifestly increasing. The knee is still enlarging. The patella is now much displaced outwards, and the leg is still more abducted and the foot everted. It seems as if there were some enlargement of the upper end of the tibia or the lower end of the femur. Measurement around the knee is 15½ inches, and around the lower end of the femur, 16 inches.

Soon after the last note the patient left the Hospital, but was readmitted in August 1874, under the care of Mr. Callender, on account of the condition of her knee-joint. In his absence she was for a time under my care, and I had many opportunities of observing the state of her limb.

Since she had left the Hospital, the swelling of the knee had to a great extent subsided. About two months, however, before her readmission she fell down, and from that time the leg has been "out of place," and dangling loose and useless. There has not been very much pain. At the time of her readmission the right tibia was found dislocated outwards and backwards, and the leg hung loose and flail-like. It could be twisted easily in all directions, and even replaced in fair position, from which, however, it at once reverted to its mal-position when restraint was discontinued. The bones grated at the knee-joint, as if they had lost their cartilage. The synovial membrane was not now very much thickened, and there was no pain or tenderness, even on free movement.

The whole of the extremity was atrophied. No trace of the cystic disease of the calf, or even of thickening in this part, could be detected.

Attempts were made to improve the position of the dislocated bones, and to give such mechanical

support as would enable the limb to be used, but without success, and amputation of the thigh was performed by Mr. Callender in January 1875.

Examination of the limb after removal.—The joint-surfaces were found in great part denuded of cartilage, smooth and eburnated, having nodules of bone growing out from their edges. Portions of the cartilage remaining were soft, vascular, and pulpy. The ligaments had been almost wholly destroyed. The synovial membrane was thickened, many of its processes standing out on its interior like small firm fibrinous nodules. A considerable quantity of viscid fluid was in the joint.

No trace of the cyst in the calf could be discovered.

On thinking over this case, it seemed to me more than probable that the supposed cyst in the calf of the leg was formed really by a collection of fluid which had escaped from the interior of the knee-joint. The character of the fluid, the progress of the case as it developed, and the total disappearance of the cyst so that even on examination of the limb after removal no trace of it could be discovered—all seemed to favour this view of its nature.

The following case, which I met with not very long afterwards, confirmed me in this idea.

CASE II

Osteo-Arthritis of Right Knee-Joint, With Cystic Tumour at Upper and Inner Part of the Calf of the Leg

October 1875.—The patient, a man (J.S.), 52 years old, came to my Out-Patient Room at St. Bartholomew's Hospital on account of disease of the right knee. There were the usual symptoms of chronic rheumatoid arthritis, with a considerable amount of fluid in the joint; and the tissues seemed very tight, as if the fluid were under considerable pressure. The leg could be extended almost completely, but it could not be flexed beyond a right angle with the thigh. At the upper and inner part of the calf, and quite distinct from the swelling in the knee-joint, was a circumscribed oval swelling, measuring about two inches in length by three-quarters of an inch to an inch in breadth. Its long axis corresponded with that of the leg, and beginning four inches below the lower border of the patella, it extended along the inner edge of the gastrocnemius, slightly posterior to the inner border of the tibia. It felt elastic, as if from the presence of fluid rather tightly confined within it, and seemed seated in the subcutaneous tissue, the skin over it not being altered in any way. By firm pressure the fluid could be pressed apparently along what seemed a narrow prolongation of the tumour, leading off like a small canal in the direction of the knee-joint, but I could not trace this prolongation of the cyst quite to the joint, nor could I feel fluctuation distinctly transmitted by finger-pressure from the fluid within the knee-joint to that in the cyst. The contents of the cyst could not, moreover, be pressed out of it; the only effect of even firm pressure being to squeeze a certain amount of fluid along the small channel just referred to. The sensation given to the fingers was quite that of a closed cyst or cavity. Little or no pain was caused by the manipulation.

The patient first noticed a swelling of his right knee six months ago. The knee ached, especially on exertion, and has done so ever since. It was also stiff, and the stiffness has increased. About a fortnight after the first appearance of the disease, he came to the Hospital, and had a bandage applied, but did not apply for relief again until the present date. He used his leg up to this time.

About a week ago he first noticed the swelling on the inner side of the calf. It has not given him any pain or inconvenience, but has considerably increased in size.

The knee not improving under treatment in the Out-Patient Room, I admitted him for a short time into the Hospital. At this time (November 3) the right knee measured 14 inches round, and the left, 12½ inches. Under the influence of rest, strapping of the knee, and bandaging, the condition of the joint improved, and he was discharged in about a month.

December 20.—The patient came to the Out-Patient Room to-day. The knee was still swollen and rather tender; the general condition of the joint resembling that characteristic of chronic osteo-arthritis.

The cyst on the inner side of the calf was still present, but it seemed much more lax than heretofore, so that on firm pressure it could be nearly flattened out; but this seemed to occur rather from the laxity of its walls than from the pressure driving the fluid elsewhere. The popliteal space felt more full than that of the opposite leg; but I could not detect, on pressure, any fluctuation between either the popliteal space or any part of the knee-joint and the cyst.

The knee was again strapped and bandaged.

June 1876.—At this date I again saw this patient, and found that the cystic swelling of the leg had disappeared, and, he said, for a long time past.

The knee was still stiff, and the subject of chronic osteo-arthritis.

Taken in connection with Case I., I did not doubt that in this case the cystic tumour of the leg

was caused by the escape of synovial fluid from the distended knee-joint.

I am indebted to my colleagues, Mr. Holden, Mr. Callender, Mr. Thomas Smith, and Mr. Willett, under whose care the following cases occurred, for permission to record them. The details of Cases III., V., and VI. are quoted from the notes of Mr. Butlin, whom I have also to thank for informing me of their admission into the Hospital.

CASE III

Cystic Tumour of Calf of Leg—Puncture—Subsequent Acute Inflammation and Suppuration of the Knee-Joint

A man (J.H.), 53 years old, a surgical instrument-maker, was admitted into St. Bartholomew's Hospital, under the care of Mr. Holden, November 27, 1875, with the following history:—About a month ago he first noticed a swelling in the calf of the leg, which has been slowly increasing ever since. The redness, which was for some time present, has now passed off.

On admission, there was found a considerable tender swelling of the calf of the right leg, especially prominent at the upper and inner part, three or four inches below the knee-joint.

Under the impression that it was an abscess, it was punctured by the House-Surgeon, when there escaped a greasy fluid containing a number of flakes and masses of lymph, but no pus. It was thought at the time, in the absence of any other suggestion, that the disease might be a hydatid cyst; but a diligent microscopic search failed to find any evidence of this.

November 29 (two days after admission).—There is no discharge from the opening, which is surrounded by a wide area of superficial inflammation. The calf is generally much swollen, very painful, and tender.

November 30.—Suppuration has commenced within the cyst. Temperature, 101.2°. There is also now slight effusion into the knee-joint. No affection of the joint was noticed until to-day; and the patient states that there was nothing wrong with his knee before his admission into the Hospital.

December 3.—The knee-joint has been very tight during the last day or two, on account of effusion within it; but the inflammation of the calf has passed off. There is free discharge from the wound. Temperature normal.

December 6.—Pus mixed with synovia-like fluid escapes now freely, and can be made to issue from the wound in the calf by making firm pressure for a second or two on the knee-joint. The knee is rather less swollen and tense; but it cannot be straightened, nor can any attempt be made to do so without causing severe pain. The patient's general condition is good.

December 28.—Nothing worthy of special remark has occurred since the last note. It has been evident that there is a tolerably free communication between the cavity of the knee-joint, and the interior of the cystic swelling in the calf. Now there is scarcely any discharge from the opening, and what passes is like synovia. The leg has been bandaged, and is now much reduced in size, but the knee remains much swollen and somewhat flexed. A weight of 4 lb. has been applied to the leg in order to straighten the knee.

January 8, 1876.—The wound is soundly closed. Knee to be strapped with Ung. hyd. co.

January 19.—The joint is strapped as before, and the swelling is much diminished, although the knee is still contracted. The weight has been left off.

The patient was discharged from the Hospital, January 29.

I saw this patient again about a month after he left the Hospital. At this date (March 2) the knee was still somewhat swollen, but it seemed more like the swelling of rheumatoid arthritis than that of simple chronic synovitis. It was not hot or specially tender. Movements of flexion and extension could be performed over a considerable range. There was grating like that of rheumatoid arthritis when the joint-surfaces were pressed together, and some pain at the same moment. The ligaments seemed weakened or in part destroyed, so as to permit too free rotation of the tibia. The knee is still somewhat flexed. The patient said the joint was still too weak for walking, and he had not yet returned to work.

The scar of the puncture in the calf was soundly healed. It was about four inches below the knee-joint, on the inner side of the leg.

There was no swelling of the calf, nor the slightest indication of any connection of this part of the leg with the interior of the knee-joint. The integuments were also perfectly normal in every respect.

CASE IV

Cyst in Upper Part of the Calf of the Leg—Insertion of Seton—Inflammation of Knee-Joint—Amputation

This case, it will be seen from the dates, occurred some years before either of my own; but I was not aware of the facts until Mr. Willett kindly

offered me the notes for addition to those which I had previously collected.

The patient (J.M.) was a man 23 years old, who was admitted from the Out-Patient Room into St. Bartholomew's Hospital, under Mr. Willett's care, February 8, 1869, on account of a prominent swelling situated at the upper portion of the calf of the left leg, where the two heads of the gastrocnemius unite.

The history given by the patient was that two years ago he sprained the left knee, which has remained weak and slightly swollen. The popliteal swelling commenced eight months ago. It was not painful, but caused inconvenience by its size.

"On examination, the synovial membrane of the left knee-joint was found thickened, but there was no excess of fluid in its sac, and the joint was in a perfectly quiescent state. The tumour lay precisely at the lower angle of the popliteal space, overlapping the united gastrocnemius muscle, and was of the size and shape of a Tangerine orange. It was tense and fluctuated. Pressure did not reduce its size."

"A suspicion naturally arose in my mind," Mr. Willett continues, "as to a possible communication between the synovial membrane of the knee and the popliteal cyst, but it seemed negatived for these reasons—(1) By their relative positions; (2) the apparent complete isolation of the cyst; and (3) the absence of fluid in the knee-joint. The conclusion I came to was that the cyst was of a bursal character, and as a precautionary step I tapped the swelling with a trocar. A clear, slightly viscid fluid was drawn off, and the cyst was emptied so completely as to disappear. The patient kept about, the knee being unaffected; but at the end of ten days the swelling was nearly as large as before. I therefore resolved to attempt a radical cure, and with this object introduced, as a seton, a couple of silk threads. This measure was almost immediately followed by rapid synovitis of the knee-joint, with acute local inflammatory symptoms, and violent constitutional disturbance, excessive pyrexia, and delirium. The threads were removed at the end of twenty-four hours; but the febrile symptoms did not abate until the cyst was laid open, while diffuse suppuration in the calf and popliteal space followed, with, in the end, complete disorganisation of the knee-joint. Amputation through the thigh was performed on the 14th of April, and the patient made a good recovery.

"The limb was carefully dissected, but it was impossible to trace the track of the communication, which evidently must have existed, between the knee-joint and the cyst, on account of the disorganisation of all the structures concerned."

CASE V

Osteo-Arthritis of Right Knee-Joint, With Large Cystic Swelling of the Calf of the Leg—Amputation

A man (G.R.), 56 years old, was admitted into St. Bartholomew's Hospital, under the care of Mr. Thomas Smith, June 2, 1876, on account of disease of the knee of three years' duration. The knee had become much worse during the last three or four months. The calf of the leg also has become swollen, and the swelling has extended to the foot.

At the time of admission into the Hospital, it was evident that there was extensive disease of the right knee-joint. The leg lay bent almost to a right angle with the thigh, and could not be straightened, and only slightly flexed. All movement was painful. The patella was scarcely movable. There was evidently effusion into the joint, with thickening of the synovial membrane. Fluctuation was distinct on each side of the patella, and there was a large bulging and fluctuating swelling above the patella, on the outer and front aspect of the thigh. Fluctuation was distinct, extending from this part across to the front and inner aspect of the joint, beneath the common extensor tendon. There was some tenderness about the joint, but no marked increase of temperature.

In the upper part of the calf of the leg, and in the popliteal space, projecting markedly on the inner side, was a large, tender, irregular, and fluctuating swelling. Fluctuation could not, however, be communicated to the fluid in the knee-joint by pressure on this swelling in the calf. The lower part of the leg and foot were also much swollen and œdematous. The tibia was a good deal displaced backwards, but could be drawn forwards, with the occurrence, at the moment, of a sharp jerk or snap, as if the ligaments had been destroyed.

The patient's health was but little, if at all, interfered with.

At a consultation which was held on the case, it was generally agreed that the only hope of relieving the patient lay in amputation of the thigh, and this operation was performed by Mr. Smith, July 1st.

Examination of the limb. —On examining the leg after removal, the cavity of the knee-joint was found much increased in size, and containing several ounces of curdy purulent fluid. The cartilage was ulcerated, especially over the head of the tibia. The synovial membrane was thickened and pulpy. The bones were slightly softened beneath the diseased part of the cartilage. One or two small excrescences, similar to those usually found in cases of osteo-arthritis, were discovered; and there was

eburnation of the articular surface of the femur, characteristic of the same disease.

The fluctuating tumour of the calf of the leg, which lay beneath the gastrocnemius, was formed by a large cavity, containing a precisely similar fluid to that which distended the knee-joint. This cavity communicated with the joint through a narrow sinus, which extended upwards along the back of the tibia.

CASE VI

Chronic Disease of the Knee-Joint—Large Cyst in the Calf

January 6, 1877.—A woman (S.A.S.), 47 years old, was admitted into St. Bartholomew's Hospital to-day, under the care of Mr. Callender, with the following history:—

She has suffered from slight disease of the left knee-joint for the last five years; but although it has been sometimes better, sometimes worse, she has been able to get about without much discomfort, or even a stiff knee. Five weeks ago she was attacked with rheumatism in the right shoulder, then in the left, and in the left knee. Since that time the affected knee has been much swollen and painful.

Three weeks ago a swelling began to form in the left calf, and has been very painful, but without any corresponding change for the better or worse in the condition of the knee-joint.

She has been "bodily ill" during the last five weeks.

There is now swelling of the left knee-joint, which is apparently the seat of old-standing chronic inflammation. The synovial membrane is thickened. The knee is slightly flexed, and cannot be extended. There is pain on movement, but not at other times. There is some increase of temperature of the affected joint, and tenderness on firm pressure.

There is a large fluctuating swelling in the calf of the leg; the fluid seeming, on palpation, to be just beneath the integument. The swelling is not more prominent on one side of the limb than the other, and is not painful or tender. On pressure, no fluctuation can be felt extending from this swelling to the knee-joint, or *vice versâ*.

The patient is sallow, and evidently much out of health. Tongue coated; breath foul; acid perspirations.

January 12.—To-day the calf was punctured with a grooved needle, and some clear viscid fluid, apparently synovia, was let out. There was no pus.

January 13.—There is some pain and swelling about the right ankle.

January 16.—The patient's general condition is much worse than the condition of the knee and calf of the leg seem to warrant. Her breathing is quick and jerky; there is frequent cough, and great prostration.

On examination of the chest, Dr. Southey found signs of slight lobular pneumonia in the subscapular region, with some impaired resonance beneath the left clavicle. T. 100.6°.

January 19.—An incision was made in the calf, and the cavity washed out with a lotion of carbolic acid (1 to 30). The fluid which escaped on making the incision consisted apparently of synovia, mixed with a little thin pus, and some curdy matter. The injection did not apparently pass into the interior of the knee-joint. Temperature before the operation, 100.2°.

January 20.—T. 99°.

January 25.—No discharge of fluid takes place from the cavity in the calf of the leg, but an ounce of carbolised lotion can be injected into it.

January 29.—The cavity is again discharging.

February 9.—The quality of the discharge, which still continues, varies from time to time, being sometimes purulent, sometimes clear.

February 15.—The patient has been worse to-day, and has suffered much pain in the knee during the last few days. Temperature in the morning 99.8°; in the afternoon, 102.6°. An erysipelatous blush was noticed over the calf and back of the knee.

After a sharp attack of erysipelas, which nearly proved fatal, the patient is reported (March 1st) to be better; the integuments of the leg wrinkling, and losing their red colour.

March 12.—All signs of erysipelas have now passed off.

March 21.—During the last few days the patient has had some ascites. The opening in the calf is now quite closed. The knee is in much the same condition as at the time of her admission into the Hospital.

On March 26 the patient was transferred to a medical ward.

November 5, 1877.—I saw the patient again at this date. She was looking healthy and strong, and was able to walk well with the aid of one stick or crutch. The knee-joint was still some-what swollen, bulging as if from thickened synovial membrane rather than from much fluid within. The leg could be flexed and extended, but a good deal of creaking and fine crepitus could be felt by the hand at the same time. The joint seemed, the patient said, to "go in and out."

Except some slight firmness in the calf, as if the tissues were condensed by past inflammation, no trace of the large cystic swelling could be found. All seemed soundly healed, and only a small scar remained to show where the puncture had been made.

CASE VII

Effusion into the Knee-Joint With Fluctuating (Synovial?) Tumour in the Popliteal Space and Calf of the Leg

A man (W.M.), aged 49, came to my Out-Patient Room, December 4, 1876, with an enlarged and very tense knee-joint, from thickening of the synovial membrane, with effusion. The popliteal space seemed also tense and swollen, and the calf of the leg was affected in a like manner. When pressure was made on the calf, there was a sense of fluctuation, at the same time that a marked swelling on the inner side was produced, resembling that which was present in some of the cases previously narrated.

The disease in the knee began about three and a half years ago, from no assignable cause, the joint reaching its present size in about a year and a half, and not altering much since that date. The calf had been swollen about twelve months.

October 1877.—I did not see this patient again: and on inquiry at his address at this date, found that he had died of "general debility" in June or July last. Since attending at St. Bartholomew's Hospital, he had been admitted into Guy's Hospital, under the care of Mr. Howse; and to him and to Mr. Frederic Durham I am indebted for the following additional particulars of his case.

"He was in Guy's Hospital from April 28 to May 23. At this time there was an enormous amount of effusion into the knee-joint, extending for some distance (nearly half-way) up the thigh. It was tapped twice by Mr. Howse, 12 oz. and 8½ oz. of fluid being drawn off. The fluid contained flakes of caseous material.

"There was also a large fluctuating swelling below the knee, extending more especially over the inner surface of the tibia, and later on down the inner side of the calf.

"The case was looked upon as one of very advanced chronic osteo-arthritis."

CASE VIII

Cyst in the Leg of Uncertain Nature

The following case, which I have found among my notes, may be here inserted for the sake of the accompanying drawing, which was made at the date of my seeing the patient. It doubtless belongs to the present group of cases; but the note is too fragmentary to be of much service. So far as I can remember, or gather from my notes, the patient was seen only once; and nothing is stated regarding the condition of the knee-joint.

W.T., aged 62, came to my out-patient room November 4, 1872, with pain in the outer part of the thigh. While examining his leg my attention was accidentally drawn to a cyst-like swelling at the upper part of the calf, just below the knee. It was tense, and evidently contained fluid, and from its lower part was a short and slightly tortuous cord, somewhat like an obliterated varicose vein. The skin over the parts was not at all altered in colour. The patient had noticed the swelling for above ten weeks.

The route which is taken by the fluid, when making its way out of the knee-joint to form an artificial synovial cyst in neighbouring tissues, is probably one determined by definite anatomical conditions. What anatomical arrangement is, however, most often concerned in guiding the fluid on its way, I cannot at present say.

In the only one of the cases already related in which there was an opportunity of examining with reference to this point, Mr. Butlin could only find a sinus running up to the back of the joint, and could not determine precisely its relations.

In the case of a little girl, whose leg was amputated by Mr. Callender in December 1875, on account of acute inflammation and suppuration within the knee-joint, and in which a large abscess had formed in the upper part of the calf, I found on subsequent careful examination of the limb that the abscess-cavity in the leg communicated with the interior of the joint by a narrow channel, which seemed to track by way of the tendon of the semi-membranosus muscle and its bursa; and there can be little doubt that the abscess, like the synovial cysts here described, owed its origin to fluid, doubtless in this instance puriform, which had escaped from the joint.

The late Mr. Wormald taught that the synovial membrane of the knee-joint was thinnest, and, therefore, most likely to give way under distension at the spot at which it partially encircles the tendon of the popliteus muscle; and Mr. Holden[1] states that there is a bursa under this tendon which generally communicates with the interior of the joint. It is quite possible, therefore, that the tendon of the popliteus may form sometimes a guide for fluid which is making its way out of the knee-joint; but further experience is necessary before a positive opinion could be expressed on this point.

In some cases, probably, there is a communica-

tion between the interior of the knee-joint and a bursa, the walls of which, having been first distended from the joint as far as they can bear, give way and permit their fluid contents to track along the limb.

It is somewhat curious, however, that in neither of the cases here related has the position of the cyst corresponded exactly with that of any normal bursa. It might have been expected that, at least in some instances, there would have been a special enlargement of one of those connected with the tendon of the semi-membranosus muscle; but such a condition was not observed, unless Case VIII. be an exception; a swelling in the situation of the bursa being either not perceptible, or, if present, being merged in a much more extensive swelling, which involved neighbouring parts also. At an earlier stage of the disease it is quite possible that a noticeable enlargement of one of the normal bursæ might have been found to precede the larger or more distant artificial synovial cyst, which alone was manifest when the patients came under observation.

What connection, if any, the cases here related may have with the herniæ of the synovial membrane, described by some authors, it is impossible to say. It may be assumed, perhaps, that the production of synovial herniæ may sometimes be the first step in the production of artificial synovial cysts of the leg, and that the fluid which tracks from the joint may escape by rupture of one of these hernial sacs, as it might from the ruptured wall of an over-distended normal bursa. But this is a mere suggestion. I have at present no facts wherewith to support it.

In an interesting article on popliteal cysts, which I had overlooked until this paper was in type, M. Foucher refers to the occasional co-existence of hydrarthrosis of the knee with enlarged popliteal bursæ, and records six examples. In one of these the enlarged bursa was on the outer side of the popliteal space; in three on the inner side; and in two the position was median. The description of one of his cases corresponds to some extent with Case VIII. here related. M. Foucher considers it to have been an instance of enlargement of the bursa, common to the semi-membranosus and inner head of the gastrocnemius muscles. He refers to one example only of escape of fluid from a bursa into the tissues of the limb. The case was that of an officer, who first noticed a small swelling in the inner side of the popliteal space, three days after a forced march on a rough road. The tumour only very gradually increased. About eighteen months after its first appearance a sudden effort at extending the leg caused a rupture of the wall of the cyst; the tumour disappearing at the moment, at the same time that the calf of the leg began to swell. A bandage was applied, but the patient was not laid up. Two years afterwards the cyst was larger than ever; and for a short time the patient was obliged to lay up, as a part of the fluid contents of the cyst, after a tight bandaging, had extended on both sides of the knee. Ultimately the disease disappeared. The knee-joint appears to have been unaffected; and the case therefore has only an indirect bearing on the subject of the present paper.

M. Foucher appears not to have met with any instance of extension of fluid from the knee-joint beyond the limits of distended bursæ, and, indeed, seems to doubt the existence of any close relationship, in regard to cause and effect, between hydrarthrosis and popliteal cysts, in the examples of the combination of the diseased conditions which he records. "Quant à l'hydrarthrose, considerée comme cause efficiente," he is speaking of the etiology of popliteal bursæ, "nous ne lui accordons pas la moindre importance." In two of the six cases, moreover, which he relates, the enlargement of the bursa preceded that of the knee; and in the remaining four the articular synovial membrane was but slightly distended. "We must therefore conclude," he adds, "that the presence of hydrarthrosis is but a coincidence, although its appearance preceding that of the tumour lends some little probability to the opinion that a synovial hernial cyst may occasionally be present."

The passage of fluid from the interior of the knee-joint into the bursa beneath the inner head of the gastrocnemius muscle, in cases of chronic osteo-arthritis, is referred to by Athol A. Johnstone.

Abscesses in the calf, as the result of the escape of pus from the knee-joint are much less rare than artificial synovial cysts. The comparative rarity, however, of their occurrence in connection with disease of the knee makes the following note, kindly written to me by my colleague, Mr. Howard Marsh, especially interesting in connection with the cases which are more particularly the subject of the present paper:—

"*December* 15, 1875.—There is a child now under my care, who, I believe, is an example of the class of cases you were mentioning the other day, in which fluid, originally formed in a joint, tracks away, and seems unconnected with the articulation. The child is about three years old. Some few weeks ago the knee was distinctly swollen, and hot, and lame, and a doctor who was consulted said it was the seat of disease. I saw it a few days ago, and then it had a distinctly circumscribed chronic abscess in the calf, just below the insertion of the Sartorius and its neighbouring tendons, with no

sign of joint-mischief except a slight degree of puffiness, and very slight heat. I opened the abscess, and now the joint seems quite normal."

The following are the conclusions deducible from the foregoing cases:—

1. That in cases of effusion into the knee-joint, and especially in those in which the primary disease is osteo-arthritis, the fluid secreted may make its way out of the joint, and form by distension of neighbouring parts a synovial cyst of large or small size.

2. That the synovial cyst so produced may occupy (*a*) the popliteal space and upper part of the calf of the leg, or may (*b*) be evident in the calf of the leg only, projecting most, as a rule, on the inner aspect of the leg, or (*c*) may be perceptible only at the upper and inner part of the leg as a small defined swelling, not approaching within three or four inches of any part of the knee-joint.

3. That however large the synovial cyst may be, fluctuation may not be communicable from it to the interior of the knee-joint; but the absence of such fluctuation must not be taken to contra-indicate the existence of a connection between the joint and the cyst.

4. That the synovial cyst may be expected to disappear after a longer or shorter period, without leaving traces of its existence, even on dissection of the limb.

5. That the cyst should not be punctured or otherwise subjected to operation, unless there appear strong reasons for so doing; inasmuch as interference may lead to acute inflammation and suppuration of the knee-joint.

6. That most often the disease in the knee-joint will be found to have begun some time before the appearance of the secondary synovial cyst; but sometimes the patient's attention may be first drawn to the latter, or the cyst may seem for a long period the more important part of the disease.