TWO CASES
OF
KNEE TROUBLE WITH DIFFICULTY IN
LOCOMOTION,
DEPENDING UPON AN ELONGATION OF THE
LIGAMENTUM PATELLÆ,
TREATED BY TRANSPLANTATION OF THE TUBERCLE OF THE
TIBIA.
WITH REMARKS.

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CASE 1.—C. W—, a housemaid, æt. 21, was sent to the Orthopædic Department of St. Bartholomew's Hospital by Dr. Collins, of Sawbridgeworth, for trouble in the knee-joints and difficulty in locomotion. Whilst walking, some six years ago, her left knee, as she expressed it, suddenly gave way, causing her great pain, and subsequently swelling up. Three months later her right knee was affected without apparent cause in the same manner. The swelling of the joint soon subsided, but the knees remained weak and always painful on walking, especially

on uneven ground. Her patellæ suddenly and without warning would slip round on to the outer or inner condyle, locking the joint, and giving her great pain. At times she would actually fall, dropping whatever she might be carrying. She was thus quite incapacitated for her duties as a housemaid. The knees at first sight appeared normal, but on examination the ligamentum patellæ was found so elongated that the patella could be pushed much higher than natural on the anterior surface of the femur, and could be completely dislocated either inwards or outwards on to the corresponding condyle. When the knee was flexed the patella could be made to ride on the lower end of the femur, so that its anterior surface looked upwards instead of forwards. In other respects the knee-joints appeared normal. The patient had worn an elastic knee-cap without any benefit. As the disability in the knees appeared to depend upon this elongated condition of the patellar ligament, it was decided to shorten it by transplanting the tubercle of the tibia. On June 16th, the left leg having been previously prepared in the usual way for an aseptic operation, a longitudinal incision, four inches in length, was made over the ligamentum patellæ and tubercle of the tibia. The ligament at its insertion into the tubercle having been freed, a director was passed beneath it and left *in situ*. Two lateral incisions having been carried downwards through the periosteum on either side of the tubercle, a transverse incision with the saw was made immediately below the tubercle for about half an inch into the bone, and one inch below this a second incision was carried upwards and backwards obliquely through the bone into the bottom of the transverse incision as shown in the diagram. A triangular piece of bone was thus removed from the tibia below the tubercle. This enabled a keyhole saw to be applied below the tubercle and to be worked upwards through the bone towards the director beneath the ligamentum patellæ.

The tubercle with the ligamentum patellæ was thus

detached, leaving the periosteum on its anterior surface undisturbed. A bed was next made for the tubercle on the anterior surface of the tibia, one inch lower than its normal situation, by chiselling out and thus levelling sufficient of the bone from the already obliquely sawn surface.

The lines of incision for transplanting the tubercle of the tibia in the operation of shortening the patella ligament. A. Synovial membrane of knee-joint. B. Bursa under patella ligament. C. Transverse vertical incision. D. Oblique incision.

The tubercle was now easily drawn down into its new situation, and fixed by an ivory peg. To prevent any slipping upwards a ridge was left by slightly deepening the sawn surface of the tibia. The patella could now no longer be dislocated on to the outer and inner surface of the respective condyles, nor be pushed up as before on to the anterior surface of the femur. The skin-wound was united accurately without drain, and the knee well covered with sal-alembroth gauze, firmly bandaged, and immobilised in the extended position by a plaster-of-Paris bandage reaching from the ankle to above the middle of the thigh.

The patient had no bad symptom ; the plaster case was not removed nor the wound dressed till July 19th, when the wound was found soundly healed. A leather splint

was moulded firmly to the limb, and the patient left the hospital for her home on July 18th. When last seen in October, 1892, she had free movement of the joint, and the patella could no longer be dislocated laterally or pushed upwards. She had no pain or inconvenience of any kind. She is to come into the hospital to have the other leg operated on when sufficient time has elapsed to show that the benefit she has received is permanent.

CASE 2.—M. G—, æt. 17, a nursemaid, was admitted to Sitwell Ward, St. Bartholomew's Hospital, on October 14th, 1892, from the Orthopædic Department. She first came under notice in May, 1892, but was kept waiting before any operation was advised till it was seen how the operation in Case 1 succeeded. The history was similar to that of the first patient. Six years ago she had a fall through stepping on a stone when running down a hill, her right patella appearing to slip over to one side. She subsequently had a series of falls, and noticed that her knee-cap appeared very loose. About three years ago she found that her left knee was in a similar condition. She complained of pain and disability, and of sudden falls without warning if she attempted to walk without a bandage on the knees; but she said she could walk with a bandage three or four miles on level ground, as a rule without trouble. On examination there was found a general laxity of tissues around both knee-joints. The patellar ligament was lengthened, allowing very considerable displacement of the patella to either side, and in the left knee the bone could be pushed so far inwards and outwards as to uncover almost completely the condyles. The patellæ were somewhat smaller than normal. On October 20th the tubercle was transplanted on the left side, three quarters of an inch lower down the tibia, in a manner similar to that described in the first case, the tubercle with the patellar ligament being drawn down till the patella could no longer be laterally displaced. It was then fixed as in the first operation with an ivory peg.

On November 12th the plaster-of-Paris case and dressings were removed for the first time after the operation, and the wound was found to have healed by the first intention. On November 20th the patient left the hospital, wearing for precaution's sake a poroplastic splint. The patella could no longer be displaced, and the knee was to all appearance in a normal condition. She too, like the first patient, is to come back to the hospital later to have the ligament of the opposite knee shortened.

Remarks.—I have ventured to bring these cases before the notice of the Fellows of the Royal Medical and Chirurgical Society; in the first place because, as far as I know, this condition of the knee-joint depending upon an elongation of the ligamentum patellæ has not come prominently under the notice of surgeons; and secondly, because I believe that the operation for shortening the ligament by transplanting the tubercle of the tibia has not previously been described. I find no account of the affection in the text-books on surgery, nor in the special works on joint disease that I have been able to consult. I am under the impression, however, that the condition is not so rare as I at first imagined it to be. Since the first case came under my notice last May I have met with two other similar cases—the one here described as Case 2, and a third a few weeks ago, in which, however, the elongation of the ligament was not so great, and the knee trouble less marked. I find, moreover, that Dr. Shaffer, of New York, in the fourth volume of the 'Transactions of the American Orthopædic Association,' has described seven cases of elongation of the ligamentum patellæ in which the patient had similar symptoms to those mentioned in my cases, and he says that he has met with other cases in which there was knee trouble due to a lengthened anterior patellar ligament. A condensed description of Dr. Shaffer's published cases is appended to this paper. No operative treatment was undertaken by him in any of them. He proposed in one

case the shortening of the ligament, but the patient would not consent. As in my own cases, except in one in which the elongation followed the breaking down of adhesions for stiff knee, no cause for the elongation of the ligament could be discovered. In three there was slight knock-knee; in one marked knock-knee. In none of mine was this condition of the knee present. In one of Dr. Shaffer's cases, and in the right knee of one of my own, the patient attributed the trouble to a fall. I think, however, that the fall was rather the result of the elongation of the ligament allowing the patella to be dislocated, than that the stretching of the ligament was due to the dislocation, since this appears to have been evidently the case as regards the left knee, and in my first case the patient seemed clear that her first fall was the result of the laxity of the ligament, the knee giving way, as she expressed it, before she fell.

In three of Dr. Shaffer's cases a peculiar outgrowth of bone was felt at the intercondyloid notch in the position in which the patella would normally rest. There was no sign of such an outgrowth in any of my cases. The length of the elongated ligament when measured from the top of the tubercle to the lower border of the patella, with the knee bent at an angle of 90° , varied from $2\frac{3}{4}$ to $3\frac{1}{2}$ inches. The normal ligament when measured in a similar way was found by Dr. Shaffer to vary in the adult from a little over 1 inch to $1\frac{1}{2}$ inches, and in a few tall persons to 2 inches. These measurements agree with my own tables in a similar state of the joint. From the consideration of my own and Dr. Shaffer's cases I think we may generalise as follows:

1. That no efficient cause for the condition is known.
2. That generally one knee first, and the other subsequently, becomes affected.
3. That the affection is more common in women than in men.
4. That it is attended with disability and weakness in

the joint and sometimes pain, especially on walking on rough and uneven ground; difficulty in going up and down stairs; sudden, partial, or complete dislocation of the patella without warning and without apparent reason, generally causing the patient to fall; and recurrent slight attacks of synovitis of the knee.

5. That the patella during extension of the leg can be dislocated on to the outer and inner surface of either condyle respectively, and, with the leg bent at an angle of 90° in the sitting posture, can be pushed up on to the condyles of the femur, so that its anterior surface looks almost directly upwards instead of forwards and slightly upwards.

6. That instrumental treatment is of practically little service, though in some cases it appears to have given relief.

7. That shortening of the patellar ligament satisfactorily deals with the affection.

I was led to transplant the tubercle of the tibia rather than to excise a portion of the ligament and suture the divided ends: in the first place because by doing so there was practically little danger of opening the knee-joint; in the second place, it avoided any risk of the ligament after division failing to unite; and in the third place, because with the tubercle detached the ligament could be drawn down till on manipulation the patella could no longer be dislocated over the condyles, and thus the amount of shortening necessary could be accurately gauged. The ridge cut in the bone immediately above the upper border of the tubercle effectually prevented any subsequent slipping upwards of the tubercle, and consequently of the ligament. The technique of the little operation is described in detail in the notes of the case. I may say in passing that transplantation of portions of bone with ligaments or tendons attached is applicable to several other deformities: for example, I have recently transplanted the tuberosity of the os calcis with the tendo Achillis for overcoming the elongation of the calf

muscles in paralytic talipes calcaneus; and Poncet¹ has also transplanted the tubercle of the os calcis for the purpose of approximating the ends of a ruptured tendo Achillis, and the tubercle of the tibia for bringing together the fragments of an old fracture of the patella. Other examples of cases in which transplantation of like portions of bone might with advantage be undertaken will no doubt present themselves to the Fellows of the Society.

ADDENDA.

Cases published in the Fourth Volume of the 'Transactions of the American Orthopædic Association' by Dr. Shaffer, of New York.

CASE 1.—A man, æt. 25, complained of difficulty of locomotion, and especially of great difficulty in going up and down stairs. He was at first believed to be suffering from some form of paralysis. He had to walk very carefully, or he would upon the slightest lateral jar dislocate one of his knee-caps laterally and fall suddenly to the ground. There was slight knock-knee on either side, and there was present at the intercondyloid notch a very perceptible tumour—an apparent exostosis, which occupied the position in which the patella would normally rest. The patellar ligament measured $3\frac{1}{2}$ inches. With the knees flexed the patellæ were drawn above the condyles of the femur. The patient knew of no cause for his trouble. Several attempts, but without avail, were made to relieve the condition by an apparatus. He finally obtained some comfort by the use of an elastic knee-cap with a lateral rubber pad.

CASE 2.—A lad, æt. 14 years, who had had hip disease and had of late grown rapidly, showed signs of knock-knee. His patellar ligaments were found to measure

¹ 'Revue d'Orthopédie,' July, 1891.

3½ inches on the left side and 3 inches on the right. The upward displacement of the patella was marked during flexion of the knee. There was a distinct tumour on the intercondyloid notch on either side, more marked on the left, and the patient moved up and down stairs with an awkward gait, and fell at times without apparent cause. On one occasion he fell and dislocated his right patella, on another occasion his left. The left patella was not reduced by the surgeon who saw him, and on his return to New York all attempts to reduce it failed. By the use of a leg brace giving lateral support he could walk well, although the left patella remained unreduced.

CASE 3.—A lady, æt. 35, was unable to walk except with great difficulty, and was always in danger of falling. The least irregularity of the pavement would cause a fall. She had never dislocated her patella. There was slight knock-knee. She had great difficulty in going up and down stairs. She was treated by light lateral leg braces which prevented lateral movements of the knee and rotation of the tibia during flexion. From this apparatus she received great relief.

CASE 4.—A girl, æt. 13, two years ago fell on a piece of orange peel and dislocated her left patella. She subsequently dislocated her right. She now falls frequently and easily. After each fall the knee swelled and there was great pain, which gradually disappeared. A knee-cap did no good. The patellar ligaments measured 2½ and 2⅝ inches respectively. The patellæ were freely movable, and in full extension with the knees at rest lay above the condyles. There was no knock-knee. There was an evident exostosis at the sulcus between the condyles of the femur. She was fitted with leg braces limiting the rotation at the knee. She obtained some relief, but was lost sight of.

CASE 5.—Miss X—, age not stated, had had both knees

for a long time immobilized in plaster-of-Paris dressing, with consequent fibrous ankylosis. The ligament was stretched by the force required to break up the sub-patellar adhesions. The right ligament measured $2\frac{3}{4}$, the left $2\frac{1}{2}$ inches. "An express disability exists in this case, occasioned partly by the reduced quadriceps power in knee-use, and partly by a disagreeable 'click' which occurs when the patella, especially on the right side, slides into its supra-condyloid position."

CASE 6.—A young man found difficulty in playing lawn tennis; his knees, as he expressed it, "gave out very quickly." He had pain after use of the knee, and heat and swelling were sometimes present. He wore knee-caps without relief. He declined to submit to an operation.

CASE 7.—A lady found difficulty in going up and down stairs. The elongation of the patellar ligaments was very marked. Nothing was done, as the patient rejected the remedies proposed.

Table of Cases of Knee Trouble from Elongation of Patellar Ligament.

Case.	Surgeon.	Sex.	Age.	Cause.	Ligament measured.	Signs and symptoms.	Knock-knee.	Exostosis between condyles.	Treatment.	Result.
1	Shaffer	M.	25	None known	3½ inches	Difficulty in going up and down stairs. Sudden falls each side from dislocating patellæ	Slight, each side	Yes, very perceptible	Apparatus, knee-cap with rubber pad	Some relief.
2	"	M.	14	None known	3½ inches, L. 3 inches, R.	Walked up and down stairs with awkward gait. Fell several times without apparent cause, dislocating patellæ	Considerable, left side	Yes, on each side	Leg brace giving lateral support	Great relief. Left patella remained unreduced.
3	"	F.	35	None known	—	Walked with great difficulty. Least irregularity of pavement caused fall. Difficulty in going up and down stairs	Slight, each side	No	Light lateral leg braces	Great relief.
4	"	F.	13	Fall on orange peel; dislocated left patella afterwards right	2½ inches, L. 2⅝ inches, R.	Falls frequently; knee swells; pain	None	Yes	Knee-cap did no good; leg braces gave relief	Lost sight of.
5	"	F.	—	Breaking down adhesions in joint	2½ inches, L. 2½ inches, R.	Disability in joint; click on movement	None	No	Not stated	Not stated.
6	"	M.	—	No cause	3 inches	Difficulty in playing tennis; knee soon gave out. Pain after use of knee, and sometimes heat and swelling	None	No	Knee-caps	No relief; refused operative treatment.

Case.	Surgeon.	Sex.	Age.	Cause.	Ligament measured.	Signs and symptoms.	Knock-knee.	Exostosis between condyles.	Treatment.	Result.
7	"	F.	—	No cause	Elongation very marked	Difficulty in going up and down stairs	None	No	Refused treatment	Not stated.
8	Walsham	F.	21	Knee gave way suddenly whilst walking	3 inches, about	Frequent falls. Pain in knees on walking. Frequent dislocations	None	No	Shortening of ligament by transplanting tubercle	Perfect relief.
9	"	F.	17	Slipped on stone?	2½ inches, about	Constant falls. Looseness of the knee. Could not walk without a bandage	None	No	Ditto	Good; still wearing splint.
10	"	F.	21	None known	—	Knee slips out on slightest provocation, such as treading on loose stone	None	No	Had worn a knee-cap with no benefit; expectant treatment at present	Waiting to see ultimate result in two former cases.

(For report of the discussion on this paper, see 'Proceedings of the Royal Medical and Chirurgical Society,' Third Series, vol. v, p. 63.)