THE DISK-SHAPED EXTERNAL SEMILUNAR CARTILAGE

BY

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The presence of a disk-shaped external meniscus of the knee-joint, sometimes associated with a definite lesion of the cartilage, is a rare cause of symptoms of internal derangement of the knee-joint, but one that should be borne in mind when such symptoms are referred to the outer side of the knee-joint, particularly if they are somewhat atypical or bilateral and occur in a young person.

Anatomy

Developmentally, a disk-shaped external semilunar cartilage is due to the persistence of the layer of mesoderm in the interior of the developing knee-joint, condensation of which at the periphery and liquefaction in the centre produces the normal characteristic shape of the semilunar cartilages. It is a curious fact that it is necessary to descend as far in the evolutionary scale as the Reptilia to encounter a somewhat similar condition.

In the majority of reptiles a simple disk-like interarticular cartilage, the meniscus articulare, is present, and this is not divided into external and internal elements as in man. In the *Sphenodon*, Osawa (*Ark. Mikr. Anat.*, 1895, li, 481) found a centre of ossification on the extensor aspect of this plate of cartilage, and Perrin (*Ann. Sci. Nat.*, 1895, xx (7), 33) found the plate of cartilage divided into two portions, one on the extensor and one on the flexor aspect of the joint. It appears, therefore, that even in reptiles there is some variation in the cartilage, but that when two portions are present these do not show the relationship of the menisci that is seen in man. In the lizard a single cartilage is the rule. In apes the external semilunar cartilage is in the form of a complete ring.

Finder,¹ in a recent article, tabulates the twenty-five cases of disk-shaped external semilunar cartilage recorded up to the year 1934. Of these cases thirteen were discovered in the dissecting room. According to Finder, the first anatomical description of the disk-shaped external semilunar was by Young² in 1889; he described three cases. Then followed Higgins³ in 1895 (two cases), Poirier and Charpy,⁴ 1911 (two cases), and Fick, 1911 (one case). In 1924 I⁵ described and figured a case which I discovered in an anatomical subject, but no history was obtainable. The specimen is now in the museum of the Royal College of Surgeons of England. Three further anatomical specimens have been described by Langer,⁶ 1928 (two cases), and Duncan,⁷ 1932 (one case, bilateral).

Clinical Features

The clinical aspect of this rare anomaly now became gradually manifest. Bristow⁸ in 1927 was apparently the first surgeon to record an operation for internal derangement of the knee-joint in which the condition was discovered. He described how, in opening the knee-joint of a girl of 13 who had complained of a "clicking knee" for a month with joint effusion, he found a normally placed and normally attached external cartilage which formed a complete disk across the outer half of the knee-joint. After removal the click disappeared, and the subsequent history was uneventful. This specimen is now in the museum of the Royal College of Surgeons.

Fairbank⁹ in 1930, in showing a case of "clicking knee" due to a lesion of the external semilunar cartilage in a girl aged 7½ years, mentioned that he had operated

upon two cases in children in which "the external cartilage formed a disk right across the outer side of the joint." No further particulars, however, were given.

Ellis¹⁰ in 1932 described two cases: the first in a girl of 13, in whom the condition was bilateral, and both external semilunar cartilages were removed; the second in a woman aged 26, in whom the left external cartilage was similarly affected, and was removed.

Lloyd¹¹ in 1933 described two cases, the first in a girl aged 12 (bilateral), and the second in a boy aged 12½ (side not stated). In both cases the external semilunar formed a complete disk, and was removed.

Naughton Dunn¹² in 1934 stated that he had seen the condition three times, in one of which it was bilateral, and described a case in a woman, aged 31, upon whose right knee operation was performed. In this case examination of the disk-shaped meniscus showed evidence that the attachments of the posterior two-thirds had been previously ruptured. This is the first record of any evidence of an actual lesion of the disk-shaped cartilage, as in the previous cases the cartilage, though disk-shaped, had apparently been intact.

Finder¹ in 1934 described three cases, occurring in girls aged 9½ (right knee), 14 (left knee), and 15 years (left knee) respectively. In the first of these the "rounded edges were attached except at the antero-lateral margin." In the others two large fat pads were attached to the disk-shaped cartilage, and were considered to contribute to the symptoms. These were the first cases to be described in American literature.

It will appear from this short summary that if we exclude the two cases mentioned by Fairbank and two by Naughton Dunn, of which clinical notes were not given, although one of Naughton Dunn's cases was stated to be bilateral, only nine cases of operation upon the disk-shaped semilunar cartilage have been previously reported.

Sex.—Of these, eight occurred in females and one in a male.

Age.—The ages of the females were 13, 13 (bilateral), 26, 12 (bilateral), 31, 9½, 14, 15, and the age of the male 12½.

In certain of the cases, however, symptoms had been present for some considerable time prior to operation. For instance, of the two cases described by Ellis, in the first there was a history of "giving way" of the knee for six or seven years, and in the second painful "clicking" on extension had existed for sixteen years. In the first of Lloyd's two cases the knees had "clicked" ever since the patient could remember. In Naughton Dunn's case there was a history of indefinite trouble with the knee as a child.

Symptoms

Symptoms appear, therefore, to fall into three groups:

- (a) No history of trauma, but a "clicking" knee has existed for some time.
- (b) Definite trauma superimposed upon a "clicking" knee. Author's Case I *vide infra*.
- (c) Definite trauma with no previous symptoms. Author's Case II *vide infra*.

The most typical symptoms occur in the first group, and an important and interesting feature that has been observed in these cases in addition to the "click" (which, indeed, may occur in other types of lesion of the semilunar cartilage, both in children and in adults) is what Lloyd has described as a "visible and audible bump." In his own words, "the sound is often the least conspicuous part of it, for as the limb passes towards extension the external tuberosity of the tibia is seen and felt suddenly bumping and jolting forward on the femur like the wheel of a train running over an obstacle." Ellis previously drew attention to this striking phenomenon, and stated

that on extending the knee, at a point when the leg makes an angle of 170 degrees with the thigh, there is a loud thud, the tibia rotates slightly on the femur, and the anterior part of the external semilunar cartilage becomes palpable. One of FINDER's patients, a girl of 11 years, amused her playmates by "popping her knee."

Apart from this curious phenomenon, other symptoms and signs are usually absent in this group, although occasionally slight effusion and tenderness over the external semilunar may be noted. In groups (b) and (c) more acute signs and symptoms are manifest, as may be seen by a perusal of the following case histories.

CASE I

This case came to my notice in 1929, but although it was shortly described to FINDER in a personal communication and included in his table, it has not previously been published. It is of interest as the condition was diagnosed prior to operation. A surgical colleague sought my opinion on the knee of an undergraduate, aged 20. One year previous to examination he noticed pain and effusion of the right knee after playing football. The effusion persisted for ten days, but recurred after tennis three months later, and was more marked. Rest and Scott's dressing were prescribed. On resuming football increased pain and effusion were noted. He stated that he had had a "snapping" knee as long as he could remember, and had never been able to extend the leg at the knee-joint completely.

Right Knee.—On examination synovial effusion of moderate degree. Full flexion of knee slightly restricted and painful. On full flexion a protrusion occurs on the antero-external aspect of the joint, which is tender, and is possibly either the external semilunar cartilage itself or a fatty mass attached to its outer surface. On flexion a definite click or snap is heard proceeding from the outer side of the joint. X-ray shows slight lippling of the external tibial condyle. A note was made: "Derangement of external semilunar cartilage of long standing, possibly the external cartilage in form of complete disk, followed by localized traumatic osteo-arthritis."

Operation was performed by my colleague shortly afterwards, and he reported: "The external cartilage formed a complete disk as suspected." As at that time only one previous case of operation upon the disk-shaped external semilunar had been described (Bristow, q.v.) it is curious that such a shot in the dark hit the mark.

CASE II

A professional footballer, aged 23, who had represented his country on several occasions, was brought to me on April 8th, 1935, owing to serious disablement of his left knee. Although he had played professional football for six years there was no history of any previous trouble in the affected knee. Ten weeks before reporting he kicked at and missed the ball during a practice game, and the knee locked. Acute pain was experienced on the outer side of the joint. The locking was reduced on the ground by the trainer, with a loud snap. It is a remarkable fact that he was almost immediately able to go on playing as if nothing had happened, and no effusion followed. On the four subsequent occasions on which he played (the last being an international match) there was a similar sequence of events.

On examination, two days after the last occasion, there was a complete absence of any physical signs beyond tenderness

on deep palpation over the external semilunar cartilage. X-ray examination was negative. A period of abstinence from play, with physiotherapy, was prescribed. Seven weeks later the patient was again brought for examination. He stated that when getting into a car on the previous day he twisted the knee and locking occurred. A mechanical block to full extension of the knee was still present and also more definite physical signs, for in addition to tenderness over the middle of the outer surface of the external semilunar there was a sensation of crepitus on deep palpation over this portion of the cartilage, and the outer portion of the cartilage could be rolled against the external tibial condyle with a distinct "snap." There was still no effusion in the joint. Operation was now advised, and was performed on June 1st, 1935. Dr. W. G. S. Pepper kindly assisted.

On opening the joint slight excess of dark-coloured synovial fluid escaped. The lesion was clearly a longitudinal tear of a disk-shaped external semilunar cartilage (see figure), or what in the case of a cartilage of the usual type would be designated a "bucket-handle" lesion. In this case, however, the "handle" or inner portion was prolonged internally in the form of a broad web-like extension, into which haemorrhage had occurred. The specimen has been accepted by the museum of the Royal College of Surgeons.

Subsequent progress was uneventful. The player played in his club's opening match on September 1st, and has since appeared regularly. He has now completely regained his form, and played for England in December, scoring a goal.

Treatment

In those cases in which acute symptoms supervene upon a clicking knee of long standing, operation should be advised without further delay. In the cases which are associated with an acute onset of symptoms, treatment is based upon the same lines as that of an ordinary cartilage lesion—manipulation if locking is present and palliative measures being usually tried in the first

instance, and operation reserved for cases in which such measures fail or in which special circumstances warrant an immediate operation.

One is faced with a more difficult decision in cases belonging to the first group. Should operation be advised in cases in which "clicking" or "bumping" is present, but no other symptoms? It will probably be wise in certain cases to advise operation, especially when the condition gives rise to anxiety or prevents participation in games. It must be remembered also that such an operation not only prevents the probable onset of acute symptoms, but is the best insurance against osteo-arthritic changes, which, as experience teaches, may occur in quite young persons in neglected cases of semilunar cartilage derangement.

It may perhaps be considered that the condition that has been described is so rare that it is of minor importance. However, the facts relating to cyst of the semilunar cartilage should be remembered in this connexion. As I have pointed out elsewhere,¹³ only five cases of cystic semilunar cartilage were recorded in the decade 1904-14. In the decade 1914-24 nineteen further cases were recorded, while in the succeeding eight years eighty-two cases were described in the surgical literature. Will history repeat itself, and will cases of disk-shaped external

semilunar cartilage be recorded in a similar surgical crescendo?

My thanks are due to Dr. H. L. Parker of the British Museum (Natural History) for kindly supplying me with information concerning the knee-joints of Reptilia.

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TREATMENT OF FAMILIAL ACHOLURIC JAUNDICE

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Familial acholuric jaundice, first described by Minkowski in 1900, is now recognized to be of widespread though not of common occurrence. Its peculiar characteristics have attracted an amount of attention in medical literature which the relative infrequency of its incidence scarcely justifies. Comprehensive reviews by Tileston,¹ Dawson,² and Cheney and Cheney,³ amongst others have made the general features of the disease well known. The pathogenesis, however, remains obscure in spite of Haden's⁴ illuminating work on the fundamental abnormality of the erythrocyte. These aspects of the subject will not, therefore, be dealt with in this paper, which will confine itself to a brief review of the results of splenectomy, and a discussion of some problems of treatment about which general agreement has not yet been reached.

The Clinical Material

Familial acholuric jaundice appears to be of relatively common occurrence in Victoria; during the past fifteen years I have seen thirty-three patients suffering from the disease. Seventeen of the cases have occurred amongst the members of the Hazel family, which has already been the subject of several communications. Springthorpe⁵ in 1904 described the clinical features presented by six of its affected members, on two of whom splenectomy had been performed successfully by Stirling. In 1908 he⁶ recorded the subsequent history of these patients, and drew attention to the lasting benefit which had followed removal of the spleen. Unfortunately Springthorpe used the term "splenic anaemia" in describing his cases; this error in nomenclature has prevented his pioneer work from receiving the recognition it deserves. In 1922 I brought the details of the family history as far as possible up to date.⁷ Since then some additional information has been obtained, and this is incorporated in the accompanying family tree.

Clinical evidence sufficient for diagnosis has been obtained in thirty-four individuals; of twenty-six who have come under my care seventeen have been shown to present the typical features of acholuric jaundice, and ten of them have been treated by splenectomy. In addition, sixteen other patients suffering from familial acholuric jaundice, representing eight affected families, have been seen in private practice, and ten of them have had their spleens removed. The series of personally observed cases on which this paper is based consists, then,

of thirty-three patients, twenty of whom have been subjected to splenectomy.

Results of Splenectomy

The results of splenectomy in this series bear out the generally accepted view that the operation brings about complete and lasting freedom from symptoms. One point which has not been sufficiently emphasized in the literature is the rapidity with which the more seriously affected patients improve after operation. The jaundice disappears almost immediately, and the anaemia improves so rapidly that within six weeks a bed-ridden child may be well enough to return to school. Because of the dramatic nature of the improvement pre-operative transfusion is seldom needed, and splenectomy may be undertaken without hesitation, even in patients who appear almost desperately ill.

The operative mortality is small. In this series no deaths have occurred from causes in any way related to the operation. Two patients have died, one from pulmonary tuberculosis three years after splenectomy, and one from lobar pneumonia eighteen years after. Experience in other parts of the world also shows that the risks of operation are slight. Pemberton⁸ reports from the Mayo Clinic 118 cases with four deaths in hospital, Vaughan⁹ nine cases with one death, Herfarth¹⁰ 176 with six deaths, and Beckman and Jäderholm¹¹ had eighteen cases with no primary mortality.

Operative morbidity also has been negligible in this series. One child, aged 10 years, and one adult, 42 years of age, developed purulent effusions in the left pleural cavity; both recovered rapidly after aspiration. The technical difficulties imposed by the presence of gall-stones will be referred to later. In several instances among the adult patients dense peri-splenic adhesions have rendered the operation tedious. But in general it may be said that few of the cases have given rise to any real anxiety.

The remote results of splenectomy have been equally satisfactory. Of the two patients operated on by Stirling in 1904 one bore four children and remained free from symptoms for eighteen years until her death from lobar pneumonia, and the other, who has had seven children, is still in good health. All the other patients who have been surgically treated have now remained well for a period sufficiently long to bear out the general statement that the relief afforded by splenectomy is permanent.

The Indications for Splenectomy

It is generally agreed that the administration of liver or iron, and the use of x rays or radium, has little or no effect on acholuric jaundice. The management of the individual case turns, therefore, on whether the spleen