TREATMENT OF ADOLESCENT COXA VARA*

BY

GEORGE PERKINS, M.C., M.Ch., F.R.C.S.

ASSISTANT ORTHOPAEDIC SURGEON TO ST. THOMAS'S HOSPITAL

Adolescent coxa vara needs little introduction to this Section. Briefly, it is a condition arising about puberty, in girls and boys, in which from some unknown cause the head of the femur becomes separated from the neck of the femur. This separation takes place at the epiphyseal line, and is thus different from the so-called displacement of an epiphysis due to trauma, in which the line of cleavage does not entirely follow the epiphyseal line, but passes for some distance through the metaphysis. This separation may be complete or incomplete, and may occur rapidly or gradually, causing a variety of clinical types demanding a variety of treatments. We may consider the following types.

MINOR: INCOMPLETE SLIPPING

With strenuous use of the hip-joint—for example, during a game or a romp—the epiphysis may slip just a trifle. The patient has some pain and a limp. These symptoms may be transient, lasting a day or two, and insufficient to bring the patient under the observation of a doctor. If, however, the doctor does make an examination, he finds at the hip-joint some limitation of movement in all directions, and would diagnose the condition as a sprain of the joint but for the radiogram. The radiogram reveals the diagnosis, a fact which emphasizes the importance of taking a radiogram after every suspected injury and of comparing the damaged joint with that of the opposite side. This incomplete separation it is impossible to reduce; nor is reduction necessary, as the slight anatomical abnormality gives rise to no disability. Treatment consists in resting the hip-joint until the head of the femur has become firmly re-attached to the neck. It goes without saying that this treatment must be efficient, and if reliance is placed on a weight-relieving calliper care should be taken that weight is indeed relieved.

REPEATED INCOMPLETE SLIPPINGS

The original slipping may be neglected by the patient, or its importance may not be appreciated by the doctor. The patient resumes his normal life, and may have no further trouble. There may, however, be a recurrence of symptoms, and after several such the *x*-ray change becomes unmistakable. This displacement is incomplete, and it is not possible by manipulation to reduce an incomplete displacement. I repeat this statement, for emphasis and to challenge contradiction. It is not possible by manipulation to reduce an incomplete displacement; for, although an excessive force can be exerted on the neck fragment via the leg, the capital fragment cannot meanwhile be held immobile, and the force is expended on the capsule of the hip-joint and not on the epiphyseal line. This is an important fact, and its lack of appreciation accounts, in my opinion, for much faulty treatment. It is true that under anaesthesia it is possible internally to rotate the leg fully and to abduct the leg fully, but only at the expense of damaging the capsule and with subsequent loss of movement at the hip-joint. This accounts for the paradoxical statement,¹ based on follow-up reports, that untreated cases of adolescent slipped epiphysis do better than treated cases.

Treatment for an incomplete slipping should therefore be to rest the hip-joint, until the head and neck have consolidated in their new position. Then, if the subse-

quent coxa vara deformity due to the malunion between the head and the neck warrants, an osteotomy of the femur should be undertaken. Attempts have been made by surgeons, who have recognized the impossibility of reduction by manipulation, to reduce the displacement at open operation by osteotomizing the neck close to the epiphyseal line after exposing the hip-joint and opening the capsule. Wilson² of Boston advocated this. We have done it once: the result was complete destruction of the joint following an aseptic necrosis of the head of the femur. The necrosis was surely due to the surgical intervention, but whether preventable or not I do not know. This one experience has precluded for us a further trial of the method.

RAPID: COMPLETE SLIPPING

It sometimes happens that the separation takes place rapidly and is complete. The symptoms then resemble those of a fracture of the neck of the femur, and immediate complete loss of function is usual. In this type closed reduction is possible and is the correct treatment. The closed reduction may be done gradually or rapidly. The rapid method is associated with the name of Whitman. Under anaesthesia, traction is exerted on the leg to pull it down, then the leg is forcibly internally rotated and finally abducted, and is held by a plaster spica in that position. My own preference is for the gradual method of reduction by means of prolonged traction on the leg, and I prefer skeletal traction to skin traction. A Kirschner wire or a Steinmann pin is inserted through the tibia or the femur; two cords, extending from it, run over pulleys fixed to the end of the bed and are attached to 20 lb. weights. Countertraction is by body weight, the foot end of the bed being raised 12 in. or more. This method is simple to apply, even in a private house. The hip is not held rigidly immobile, and the muscles of the knee and the ankle can be exercised hourly to prevent stiffness at those joints. The leg may be cradled in a Thomas knee splint, but that is a refinement. The traction is sufficient of itself to reduce the displacement; no additional and complicated splintage is necessary to overcome the adduction and external rotation of the leg.

Apart from its simplicity the gradual traction method of treatment has another and more important advantage. I have stated that if the slipping is gradual no method of reduction is of avail, but that, if the slipping is rapid and complete, reduction should be attempted. Now while as a rule it is possible to allocate without hesitation every patient to one or other of these groups, difficulty sometimes arises and one is uncertain whether reduction should be attempted or not. In such a quandary the gradual traction method has the advantage that an attempt at reduction can be made, which, even if a failure, will not damage the hip-joint. Seven days' trial is sufficient; an *x*-ray photograph at the end of that time will show whether the pull is taking place at the line of separation between the head and neck or is being exerted solely on the capsule. If reduction is not taking place the traction is discontinued and the patient treated as in Type 2 (incomplete slipping).

COXA VARA: THE RESULT OF SLIPPING

The slipping may be so gradual that it at no time gives rise to symptoms, and there develops the deformity of coxa vara, as insidious in its origin and as painless, perhaps, as a genu valgum. The patient then comes under observation for the loss of function consequent to the deformity. The condition may be considered as a fracture of the cervical neck which has united in faulty alignment; and this faulty alignment has altered the arc

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of movement at the hip-joint—that is, increasing the external rotation and adduction, and diminishing (even abolishing altogether) internal rotation and abduction. Should the diminution in abduction and in internal rotation be sufficient to cause disability, then the arc of movement at the hip-joint can be restored to its normal by a subtrochanteric osteotomy of the femur—that is, the malunion at the junction of the neck and head, brought about by nature, can be counterbalanced by a second malunion of the femur in its upper third, brought about by the surgeon.

In this group come not only those patients who present themselves with a coxa vara without previous symptoms, but also those patients seen at or soon after the occurrence of slipping and in whom closed reduction by gradual traction has failed or has been deemed inadvisable.

PERSISTENT ARTHRITIS OF THE HIP-JOINT

Yet a final group remains, in which persistent arthritis of the hip follows a slipping of the epiphysis. In these patients one assumes that the blood supply of the head has been permanently damaged, so that the head of the femur undergoes partial or complete necrosis. We are familiar with this in the case of a transcervical fracture of the neck of the femur, in which it happens more commonly, because the blood channels in the ligamentum teres are more likely to be still patent in the adolescent than in the adult. Complete separation of the epiphysis must, one argues, cause necrosis of the head, unless the ligamentum teres vessels are still patent and escape damage. The importance of preserving this remaining source of blood supply is a further argument in favour of the gradual method of reduction in preference to the rapid. I have said that persistent arthritis of the hip may follow a slipping of the epiphysis. Perhaps it would be more correct to say that it may be the sequel to a slipped epiphysis that has been treated; for it is just as likely that the remaining vascular supply to the isolated head is damaged by the forcible man-handling of the limb by the surgeon at the attempt at its reduction, as that the damage is done at the time of the slipping. The slipping can only destroy the blood supply originating from the neck; the forced manipulations of the surgeon may destroy in addition the vessels of the ligamentum teres.

Persistent arthritis of the hip is easy to recognize clinically, and the *x*-ray photograph shows an old slipped epiphysis, with consolidation between the epiphysis and the displaced head, diminution of the joint space, and increasing deformity and destruction of the head of the femur. Arthrodesis of the hip-joint is recommended as the best treatment.

SUMMARY

Treatment for a slipping of the upper epiphysis of the femur may be summed up as follows:

1. When the slipping is gradual and incomplete, relief of weight bearing must be maintained until the new position has been consolidated.
2. When the slipping is rapid and complete, gradual correction should be done by skeletal traction, followed by relief of weight bearing until the new position is consolidated.
3. When the sequel to the consolidation in the new position is an alteration in the arc of movement at the hip, leading to loss of function, a subtrochanteric osteotomy is necessary.
4. When the sequel is a persistent arthritis of the hip, the hip-joint should be arthrodesed.

REFERENCES

- ¹ Key, J. A.: *Journ. of Bone and Joint Surgery*, January, 1926, p. 53.
- ² Wilson, P. D.: *Journ. Amer. Med. Assoc.*, November, 1924, p. 1749.

A CASE OF BRACHIAL EMBOLECTOMY

BY

A. GRAY BANKS, M.D., F.R.C.S.ED.

SURGEON, EAST SUFFOLK AND IPSWICH HOSPITAL

A general labourer, aged 66, was admitted to the East Suffolk and Ipswich Hospital with a double hydrocele. His cardio-vascular condition previous to operation was noted as unsatisfactory. The apex beat was in the sixth interspace outside the nipple line; a soft systolic mitral murmur and occasional extrasystoles were present; at the aortic area a systolic murmur and prolonged second sound. Marked arterio-sclerosis; Corrigan pulse. Blood pressure: systolic 220, diastolic 85. The patient said he had been under treatment for heart trouble several years before, but had not noticed anything wrong lately beyond slight shortness of breath, although his work was strenuous.

Radical operations were done under spinal anaesthesia. On the morning of the ninth day he complained of numbness and loss of power in the right forearm and hand, with pain just above the bend of the elbow. The hand and distal two-thirds of the forearm were pale and cold, with a dusky ring of injected capillaries at the upper end. The radial pulse was absent, but normal pulsation could be felt in the brachial artery, just above the elbow.

Operation.—Under local anaesthesia a four-inch incision ending at the elbow crease was made along the line of the artery, and the vessel gently mobilized, two small lateral branches being carefully preserved. A light intestinal clamp was placed on the artery two inches above the bifurcation, and an opening one centimetre long was made, one inch above the latter. There was no flow from the lower end. A pair of fine curved sinus forceps was passed down into the distal end, and an embolus three-quarters of an inch long, with rounded ends, was fished up. A little leakage then occurred from the lower end of the vessel, which was gently milked upwards in case any further clot were present, although this seemed unlikely from the character of the embolus and the short time elapsing between onset and operation. The artery was sutured with fine thread soaked in liquid paraffin; interrupted sutures piercing all the coats were used. On releasing the clamp, excellent pulsation was immediately felt in the radial at the wrist, and under the suture line. During the operation the parts were soaked with 1 per cent. citrate solution from time to time. The wound was closed with one layer of silkworm-gut sutures in the usual way, and a light splint applied to immobilize the elbow, the hand being left free.

The radial pulse remained full and regular, and the arm warm and of normal colour. The splint was removed in a few days, and the elbow gently moved only after the tenth day. When seen two months later the hand and arm were normal, and pulsation could be clearly felt along the whole of the exposed length of artery. Beyond a little shortness of breath, his heart was not giving any trouble, and he was doing his ordinary work.

SOME GENERAL REMARKS

Arterial emboli are less common in the upper than in the lower extremity, fewer than half of the recorded cases being axillo-brachial. In Danzis's¹ collected series of twenty-eight embolectomies, five were brachial and five axillary. The proportion is much the same in a series of cases published by Einar Key,² to whom, and his Swedish colleagues, we owe the pioneer work on this subject. Two interesting cases of brachial embolectomy are described by Lerman, Miller, and Lund,³ illustrating some special points in connexion with this operation in the arm.