(FROM THE ORTOPAEDIC CLINIC, LUND. HEAD: PROFESSOR G. WIBERG)

WEDGE OSTEOTOMY IN SERIOUS SLIPPING OF THE UPPER FEMORAL EPIPHYSIS

By

GUNNAR WIBERG

Early diagnosis of a slipping of the upper femoral epiphysis is extremely important: it simplifies primary treatment and increases the prospects of a good functional end-result.

In the early stage, when the displacement is slight, it is now the rule to treat the condition surgically, attempts being made to hasten the fusion of the epiphyseal line by drilling (*Kiaer*) or by the insertion of bone pegs (*Howorth*) or by fixation of the epiphysis by means of a metal nail (*Wilson*).

We know, however, that when the displacement is serious, the secondary arthrosis deformans changes are also severe. It must therefore be desirable to reduce the epiphysis, which implies that the methods mentioned above cannot be used. Formerly it was the rule to secure such reduction by the closed method, until it was gradually realized that such manipulative reduction was not infrequently followed by necrosis of the femoral head. Of the statistical surveys of this complication, mention might be made of *Waldenström*'s, in which the incidence of such necrosis following closed reduction was given as 15 to 25 per cent. This risk of capital necrosis gradually resulted in the abandonment of closed reduction except for those cases where the slipping was acute and where gradual reduction by traction was regarded as permissible. Manipulative reduction has now been superseded by various surgical methods.

Subtrochanteric osteotomy is still practised, and it can undoubtedly correct the position of the epiphysis in the acetabulum with a good functional result. However, the general trend now is to correct the position of the epiphysis by surgical intervention at the neck of the femur. Two methods are available: separation of the epiphysis, which is then fixed in correct position by means of a nail or screw, or wedge

osteotomy of the neck. It is difficult to say which method is the better. The latter has been used for more than 20 years in various countries, and the problem was discussed at the American Congress of Orthopedic Surgeons held in 1947. *Badgely* and co-workers described 34 cases operated on by this method with poor results in 32 per cent. These included 1 case of capital necrosis, 10 with degenerative arthritis probably due in the main to capital necrosis. *Martin* reported 8 operated cases, in 1 of which partial capital necrosis was later demonstrable. The subsequent discussion revealed that the main disadvantage of the method is that it involves a risk of postoperative necrosis. It was also stressed that the operation must be performed with meticulous care with special attention to the periosteum on the posterior and inferior surfaces of the neck. The periosteum must be preserved, because the vessels there are extremely important for the blood supply of the epiphysis.

Friberg (1948) reported a series of 12 operated cases. In some of them the operation had consisted of replacement of the epiphysis; in the others, of a wedge osteotomy, followed in both groups by osteosynthesis with a three-flanged nail. Only in one case did partial necrosis occur, which, however, healed without impairing the functional end result.

On the assumption that the results obtained by wedge osteotomy of the neck might be of general interest, a report is given below of 13 hips treated by this method.

The series consisted of 4 girls, aged 11 to 13, and 8 boys, aged 15–16. One of the boys was operated on bilaterally. As to the operative technique and the after-treatment, suffice it here to mention only a few details.

In most cases the field was approached by a Langenbeck incision (Gibson incision), in the remainder by an Ollier incision. Both approaches are widely used but personally I prefer the former. Care was taken to spare the periosteum of the posterior and inferior surfaces of the neck. The head was fastened to the neck by means of a screw and after operation the hip was fixed in abduction and inward rotation for five to ten weeks, usually (10 cases) only 6–7 weeks. Weight-bearing was permitted 8–14 weeks after operation. Where good apposition of the osteotomy had been obtained and good callus formation was present weight-bearing was commenced 8 weeks after operation but where apposition was not quite complete weight-bearing was delayed for a further 4–6 weeks (Fig. 1).

These cases have now been followed up for 1–5 years and a review of the material can provide answers to at least some questions. A

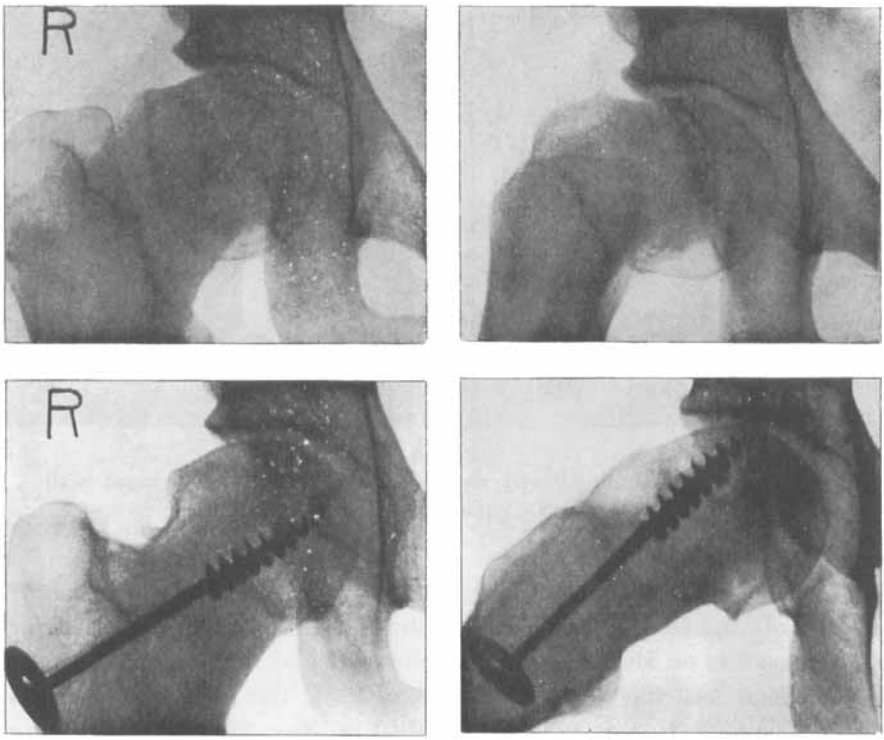

Fig. 1.
Girl, aged 12. Frontal- and axial-views 21.3.1950, Operation 22.3.1950. Check-radiograph 19.6.1951.

question that first presents itself is: What primary complications have occurred? The following cases may illustrate this problem.

Case 1.—The patient was a boy, aged 16, admitted on Oct. 22, 1952, with moderate slipping of the upper femoral epiphysis on the left side. He underwent operation on Oct. 30, 1952. Partial necrosis of the upper and central part of the caput developed. The patient was treated with traction and was afterwards allowed to walk on crutches. The necrosis has now healed with a certain deformation and subluxation of the caput (Fig. 2).

The radiographic appearance does not fit in with that of sequelae of spontaneous cartilaginous necrosis in epiphyseolysis capitis femoris, and everything suggests that the necrosis was due to the surgical intervention. As the necrosis was only partial, it appears less likely that the vascularised periosteum was damaged, but rather that the screw had injured the vessels in the epiphysis.

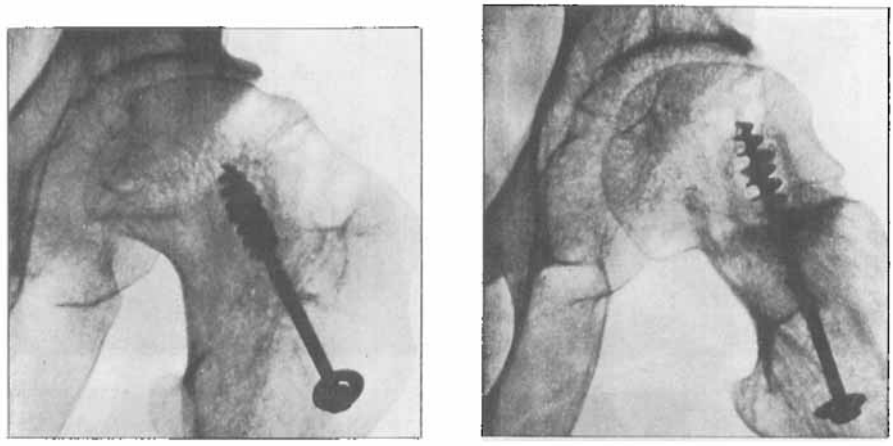

Fig. 2.
Case 1. Roentgenograph 7.9.1954, showing subluxation of the femoral head because of partial capital necrosis.

Case 2.—The patient was a boy, aged 15, admitted on Febr. 26, 1951, because of slipped upper femoral epiphysis on the right side. He underwent operation on March 1, 1951. The plaster was removed on April 13, 1951. Weight-bearing was started in May 1951. The primary functional result was good. He met with an accident on Nov. 22, 1951. He was readmitted and a fracture near the screw was demonstrated. The boy underwent re-operation on Nov. 16 with removal of the screw. The surfaces of the osteotomy were freshened up and a tibial graft was inserted. When reviewed on Nov. 9, 1954, the functional result was found to be good. Roentgenography showed slight varus of the head. The complication did not impair the functional results, and the operation can hardly be blamed for the complication, but it shows that consolidation may sometimes require a fairly long period.

The next question is: What primary functional result can be expected?

In the cases just described and in the remaining 11 hips, improved range of mobility was achieved throughout, in some of them full movement was restored. Calculation of a functional quotient can hardly be of any value in these cases, because many of the patients were admitted with symptoms of acute irritation and consequent markedly decreased range of movement, which can hardly be taken as a measure for comparing the functional value long after the operation.

Provided no complications occur, the primary results obtained by this method must be regarded as satisfactory.

It is still too early to say anything about the end-results of wedge osteotomy. It is known from a review of an *unoperated* series of slipped upper femoral epiphysis (*Jerre*) that arthrosis deformans occurs in most cases and that it is most pronounced in those cases in which the slipping is advanced. Whether a.d. occurs in operated cases is not known. It is true that operation gives the caput a more normal position, which, theoretically, should decrease the risk of arthrosis deformans, but on the other hand, the operation is intra-articular and in the margin of the osteotomy surfaces, *i.e.*, relatively close to the juncture of the neck with the head, callus forms, which might favour the development of arthrosis deformans.

Should follow-up studies show a relatively high frequency of necrosis or of arthrosis deformans following wedge osteotomy, the value of the method would be seriously questioned.

Reports of series treated by wedge osteotomy are desirable in order that an opinion may be formed of the risks the operations may involve. The results obtained must also be compared with those achieved by other operative procedures such as subtrochanteric osteotomy.

SUMMARY

The author reviews 12 cases of advanced slipping of the upper femoral epiphysis where wedge osteotomy was performed together with osteosynthesis employing a wing screw.

In one case partial necrosis of the epiphysis occurred with a poor end-result. In the other cases good results were obtained.

The author points out that if the incidence of capital necroses is high with the employment of this method, its value must be seriously questioned.

RESUME

Compte-rendu de 12 cas de glissement prononcé de l'épiphyse de la tête fémorale dans lesquels il avait été pratiqué une ostéotomie du col en forme de coin, ainsi qu'une ostéosynthèse avec vis à ailettes.

Dans un cas il s'est produit une nécrose partielle de l'épiphyse avec mauvais résultat final. Dans les autres cas, le résultat a été satisfaisant.

L'auteur souligne que si les nécroses de la tête devaient se produire fréquemment après l'application de cette méthode, sa valeur en deviendrait très problématique.

ZUSAMMENFASSUNG

Bericht über 12 Fälle von fortgeschrittener Abgleitung der Kopfepiphyse des Femurs, in welchen eine keilförmige Osteotomie samt Osteosynthese mittels einer Flügelschraube ausgeführt wurde.

In einem Falle trat eine teilweise Nekrose der Epiphyse mit schlechtem Endresultat auf.

Der Verfasser hebt hervor, dass der Wert dieser Methode äusserst fragwürdig erscheinen würde, wenn es zu häufigen Epiphysennekrosen bei ihrer Anwendung kommen sollte.

REFERENCES

Badgley, C. E., Isacson, A. S., Wolgamot, J. C. and *Miller, J. W.:* Operative therapy for slipped upper femoral epiphysis. An end-result study. J. Bone and Joint Surg. vol. XXX A: 19, 1948.

Friberg, S.: Open reduction for slipping of the upper femoral epiphysis. Acta Orthop. Scand. vol. XVII: 189, 1948.

Howorth, M. Becket: Slipping of the upper femoral epiphysis. J. Bone and Joint Surg. vol. XXXI A: 734, 1949.

Jerre, T.: A study in slipped upper femoral epiphysis. Acta Orthop. Scand. suppl. V, 1950.

Kiaer, S.: Epiphyseolysis capitis femoris treated with inforation. Acta Orthop. Scand. vol. XVII: 81, 1948.

Martin, P. H.: Slipped epiphysis in the adolescent hip. A reconsideration of open reduction. J. Bone and Joint Surg. vol. XXX A: 9, 1948.

Waldenström, H.: Om epifysglidningen i höftleden, Stockholm, 1939.

Wiberg, G.: Pinning for slipping of the epiphysis of the femoral head. Acta Orthop. Scand. vol. XVIII: 4, 1948.

– Behandlung der Epiphyseolysis Capitis Femoris mittelst "Nagelung". Acta Orthop. Scand. vol. XII: 179, 1941.

Wilson, P. D.: The treatment of slipping of the upper femoral epiphysis with minimal displacement. J. Bone and Joint Surg. vol. XX: 379, 1938.