

TOMOGRAPHY AS AN AID IN EVALUATING THE RESULTS OF SURGERY IN EPIPHYSIOLYSIS

By

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The surgical treatment of epiphysiolysis basically consists in fixation of the epiphysis by means of one or more nails or screws of varying types. Both the simple method of osteosynthesis used when there is only a negligible degree of displacement and the technique which includes open reduction and possibly osteotomy, adopted to correct more severe deformities, are based on this principle.

Generally two-plane roentgenograms are a satisfactory means of checking the position of the osteosynthetic material during and after operation. In a few cases, however, this photographic technique may not be adequate to determine the position of the fixation appliance with sufficient accuracy.

Billing, in his monography published in 1954, has made an extensive study of these problems. He observes that the roentgen examination should provide information on the following three points:

1) The position of the nail tip in relation to the epiphyseal cartilage.

It is generally accepted, at least in Sweden, nowadays that the nail must bridge the epiphyseal cartilage and be firmly anchored in the epiphysis if a reliable osteosynthesis is to be achieved. In order to make it possible to check this from the roentgenograms, it is necessary that the radiation be applied in a direction parallel to the plane of the epiphyseal cartilage.

2) The position of the nail tip in relation to the articular surface of the femoral head.

In order to permit a direct evaluation from the roentgenogram, the direction of the radiation should be tangent to the surface of the femoral head at the point nearest the tip of the nail.

3) The position of the nail in the femoral neck.

Billing states that a roentgen technique which satisfies these demands in all cases must be based on mathematically defined projections with due consideration given, among other things, to the angle formed by the axis of the femoral diaphysis and the so-called "epiphyseal axis". He describes a modified technique in which the roentgenograms of the head and neck are taken at right angles to each other with the radiation directed vertically in both cases. This assures that in the lateral view the direction of the radiation will be parallel to the epiphyseal plane. The method requires that the hip be rotated strongly outwards and the knee-joint flexed during exposure for the lateral view.



Fig. 1.

In a great number of cases—for instances if a plaster fixation is to be applied following open reduction—such a mobilization of the hip and knee joints is not feasible. Under those circumstances, as shown in figures 1–5, tomography offers a solution which satisfies all the demands specified above.

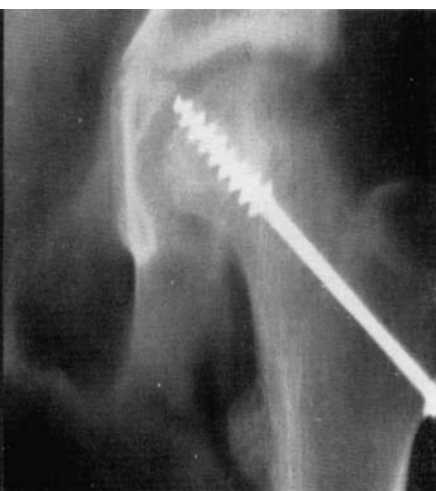
The advantages of the method are illustrated by figure 1. The epiphyseal line is clearly visualized and the picture confirms without a doubt that both nail tips are anchored in the epiphysis without touching the epiphyseal cartilage. Likewise, the position of the nails in the neck can be checked.

In the case illustrated by figures 2 and 3, the first picture (figure 2) was taken by routine methods. The direction of the radiation had not been parallel to the plane of the epiphyseal cartilage and "the epiphyseal line was not clearly delimited". The tomogram (fig. 3) made

*Fig. 2.**Fig. 3.*

some days later showed that both nails had penetrated the epiphyseal cartilage.

The patient in the other case, illustrated by figures 4 and 5, was a 13 year old boy treated by open reduction and fixation with a corkscrew bolt. When active motion of the leg was permitted, following removal of the plaster fixation applied after operation, considerable rigidity remained and attempts at forced mobilization were painful. On roentgen examination by routine methods (fig. 4), in which the radiation

*Fig. 4.**Fig. 5.*

had probably not been directed tangentially to the surface of the articular cartilage, the nail tip was shown to penetrate to the bone-cartilage junction. The tomogram (fig. 5) disclosed that the screw penetrated several millimeters into the joint space.

Tomography, therefore, offers a technically simple and reliable solution to the problem of checking the position of the osteosynthetic material. It is a suitable method in any case in which examination by routine methods proves inadequate. It, moreover, would seem that the method can be a valuable aid at a later stage in the postoperative course in determining the degree of ossification of the epiphyseal line that has resulted from the osteosynthesis.

SUMMARY

Based on the experience gained in 3 illustrative cases, which are described, the author calls attention to the value of tomography as a technically simple solution to the problem of checking the position of the osteosynthetic material in the surgical treatment of epiphyseolysis. The method is particularly useful in cases where X-ray examination by routine methods is inadequate.

RESUME

En se basant sur l'expérience de 3 cas qui sont décrits, l'auteur attire l'attention sur la valeur de la tomographie comme solution technique simple au problème du contrôle du matériel ostéosynthétique dans le traitement chirurgical de l'épiphyséolyse. La méthode est particulièrement utile dans les cas où l'examen aux Rayons X par les méthodes routinières n'est pas approprié.

ZUSAMMENFASSUNG

Auf Grund der Erfahrung in drei typischen Fällen, die beschrieben werden, leitet der Verfasser die Aufmerksamkeit auf den Wert der Tomographie als eine technisch einfache Lösung des Problems, der genauen Feststellung der Lage von osteosynthetischem Material bei der chirurgischen Behandlung der Epiphyséolyse, hin. Die Method ist besonders wertvoll wenn sich die gewöhnliche Röntgenuntersuchung als unzulänglich erweist.

REFERENCE

Billing, L.: Roentgen examination of the proximal femur end in children and adolescents. *Acta Radiologica. Suppl.* 110, 1954.