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SAGITTAL OSTEOTOMY OF THE PATELLA AFTER MORSCHER

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ABSTRACT

The aim of this strudy was to present long-term results of sagittal osteotomy of the patella after Morscher. The study included 70 patients treated for patellar dysplasia with a postoperative follow-up from nine to 20 years. There were 59 females and 11 males with an average age of 21 years at the time of operation. Results were evaluated for the entire group of 70 patients and then presented separately for the 30 patients in whom sagittal osteotomy of the patella was performed as a single procedure and 40 patients in whom in addition to sagittal osteotomy of the patella, medialisation and ventralisation or distalisation of the tibial tuberosity were also performed. The mean value of the Wiberg patellar angle was 112 degrees preoperatively and 140 degrees postoperatively. In the whole group of patients excellent results were obtained in 24 (35 %), good results in 30 (42 %), fair results in 13 (19 %) and poor results in three (4 %) patients. In 30 patients with sagittal osteotomy as a single operation excellent results were obtained in 13 (43 %), good results in 14 (47 %) and fair results in three (10 %) patients while in the 40 patients with sagittal osteotomy and additional surgical procedures, 11 (27 %) excellent, 16 (40 %) good, ten (25 %) fair and three (8 %) poor results. Sagittal osteotomy of the patella after Morscher is an enrichment of the spectrum of the secondary-causal and preventive procedures for the treatment of patello-femoral disorders.

Key words: patella, osteotomy, chondromalacia , anterior knee pain

Introduction

When discussing osteotomies around the knee joint, it is rarely appreciated that this term also encompasses patello-femoral osteotomies. Furthermore, it is necessary to differentiate between osteotomies of the distal femur and trochlea, osteotomies of the tibial tubercle in procedures used to correct biomechanical malalignment of the knee extensor apparatus and the osteotomies of the patella.

Osteotomies of the patellofemoral joint date back to 1891 when Pollard (21) chiseled out the lateral wall of the trochlea and imbricated the medial joint capsule. In patients with femoral torsional deformities. Graser (21) described in 1904. a rotational supracondylar osteotomy of the femur for the correction of habitual patellar dislocation. To prevent lateral dislocation of the patella Luxembourg (16) reported in 1914 a bone barrier procedure where a fibular strut was placed in a trough created on the antero-lateral trochlea. Albee (1) performed an open- wedge osteotomy of the antero-lateral condyle in patients with patello-femoral dysplasia and recurrent dislocation in 1915. Albee's procedure has been extensively modified over the time, but is still used in clinical practice. In 1960 Brissard (21) described a more proximal osteotomy of the femoral cortex aiming to give the patella more stability in full extension and he termed this procedure Albee Superior osteotomy. Kuroda et al (15) indicated that a 6 to 10-mm anterior osteotomy of the lateral condyle significantly elevates patello-femoral contact pressures. Keene and Marans have presented the indications for osteotomy of the patella and the femoral sulcus (14)

It is debatable whether it is semantically correct to classify Dejour's trochleoplasty (6) as osteotomy, but it is unequivocally true that this procedure aims to increase patellar stability and increase the patello-femoral joint congruency.

Osteotomies of the patella may be classified with respect to the plane of osteotomy as sagittal (longitudinal) and coronal (frontal). In1977 Dellis (7) suggested that coronal osteotomy of the patella should be used in order to decrease thickness of the patella as well as to decrease intraosseous pressure within the patella. Changing these biomechanical (patellar thickness) and biological (intraosseous pressure) parameters would eventually result in a decrease in pain within the patellofemoral joint. The coronal osteotomy and some of its variations have been advocated or questioned by several authors (7,17,22,28,29). The senior author of this article (M.P.) has used a procedure which combines lateral release and coronal osteotomy in a lateral to medial direction using an oscillating saw with excision of approximately a 7 mm slice cancellous bone and fixing two fragments of the osteotomised

patella with four transosseous sutures at the corners of the patella. Vaquero and Arriaza (29) described an original procedure, the patella thinning osteotomy, as an alternative to advancement of the tibial tuberosity or patellectomy in cases of severe anterior knee pain. This technique decompresses the patello-femoral joint, and produces the biological effect found after other osteotomies.

Sagittal (longitudinal) osteotomy of the patella was introduced in clinical practice by Morscher (18). In 1978 he published preliminary results of the application of this technique in the treatment of patellar chondromalacia and subsequently presented the pathophysiological explanation and developed the indications and possibilities for its application (13,19,20). There are two distinct types of saggital osteotomies: Morscher's saggital or "plus" osteotomy which uses insertion of osseous wedge into the patella, and saggital "minus" or "reduction" osteotomy (5). The later procedure is indicated in cases where "patella permagna" (enlarged patella) is present, and consists of osseous wedge excision followed by osteosynthesis of the fragments with a single screw. Morscher's saggital osteotomy was introduced in the Department of Orthopaedic Surgery, School of Medicine University of Zagreb from 1980 and the preliminary, mid-term and long-term results have been reported in numerous articles and conference talks (24, 25, 26, 27). By the use of the sagittal osteotomy of the patella it is possible to enlarge the contact surface of the patello-femoral joint and improve the kneading action on the cartilage and hence its nutrition. Osteotomy of the patella according to Morscher (1978) may produce the following effects:

- an improved use of the patellar cartilage by enlarging the area of surface contact taking pressure (Fig . 1)

- improvement in nutrition of the cartilage due to the fact that there is a greater area of contact between the medial facet of the patella and the medial femoral condyle

- immediate reduction in intramedullary pressure and thus reduction or elimination of pain as a result of the osteotomy itself.

Indications for longitudinal osteotomy of the patella include patellar dysplasia (Wiberg type II/III, III and IV) as well as "hunter's hat" shaped patella. Longitudinal osteotomy of the patella can be combined with other surgical procedures such as realignment of the knee extensor apparatus or transposition of the patellar ligament insertion, including ventralisation, medialisation and distalisation of the tibial tubercle (24). The technique of Paar combines an

open-wedge longitudinal patellar osteotomy with deepening of the femoral trochlea in patients with patello-femoral dysplasia (23). All osteotomies require careful preoperative planning and should always include preoperative drawing which should match the postoperative radiograph (Fig. 2). In our experience the best principle to follow during the preoperative planning is to aim for equalization of Wiber's patellar angle and the angle of the femoral trochlea.

The purpose of this article is to present our results of the application of sagittal osteotomy of the patella after Moerscher in the treatment of anterior knee pain in patients with patellar dysplasia Wiberg III and IV (30).

Materials and methods

The study included 70 patients treated for patellar dysplasia from 1980 to 1990, with a postoperative follow-up from nine to 20 years. There were 59 females and 11 males with an average age of 21 years at the time of operation. Sagittal osteotomy of the patella was carried out according to the procedure originally described by Morscher (18). Osteotomy was carried out longitudinally in the region of the ridge between the medial and lateral facet of the patella. After severing the aponeurosis, the osteotomy was performed with an oscillating saw through approximately two thirds of the thickness of the patella. Subsequently, osteotomy was continued carefully, using an osteotome, down to the cartilage. The patella was then gently opened to the width of the previously calculated bony wedge. A bony wedge was fashioned from homologous bony graft from the bone bank. The wedge must be well sharpened in order to prevent cracking of the patellar cartilage when it is firmly driven into the osteotomy. Postoperatively the knee joint was immobilized in a Robert Jones bandage over a period of 12 days, during which isometric contraction of the quadriceps and flexion of the knee up to 30 degrees was practiced. Subsequently, flexion was increased to 60 degrees until the 30th postoperative day, and by the 45th postoperative day flexion of the knee to 90 degrees should be possible. Ten to twelve weeks after operation full range of motion of the knee should be possible. The results have been evaluated on the basis of the Bandi and Ficat criteria as excellent, good, fair and poor (3,8).

Results

Results were evaluated for the entire group of 70 patients and then presented separately for the group of 30 patients in whom sagittal osteotomy of the patella was performed as a single procedure and 40 patients in whom in addition to sagittal osteotomy of the patella, medialisation and ventralisation or sometimes distalisation of the tibial tuberosity were also performed. The mean value of the Wiberg patellar angle was 112 degrees preoperatively and 140 degrees postoperatively (Fig. 2).

In the whole group of patients excellent results were obtained in 24 (35 %), good results in 30 (42 %), fair results in 13 (19 %) and poor results in three (4 %) patients. In 30 patients with sagittal osteotomy as a single operation excellent results were obtained in 13 (43 %), good results in 14 (47 %) and fair results in three (10 %) patients while in the 40 patients with sagittal osteotomy and additional surgical procedures, 11 (27 %) excellent, 16 (40 %) good, ten (25 %) fair and three (8 %) poor results. Radiographs on Fig. 3, 4 and 5 show excellent or good long -term results in the group of patients with sagittal osteotomy as a single operation .

Out of all the osteotomies of the patella, 16 were done in top-level athletes or ballet dancers, 12 females and three males (in one female both knees were operated on) with an average age 19 years (15 – 28). Among the operated athletes there were five basketball players, two handball players, one volleyball player, two track and field athletes, one gymnast, one karate fighter with both knees operated on (Fig. 6) and three ballet dancers. Successful application of the sagittal osteotomy of the patella has been confirmed by the fact that all, i.e. 16 of the operated athletes except one (karate fighter) returned to competitive sports and three ballerinas returned to professional ballet dancing.

We have had no intraoperative or postoperative complications in surgically treated athletes. However, in the entire group of 70 surgically treated patients we did have some complications. Among the complications encountered we have to mention that in five cases manipulation of the knee under anesthesia was needed some six weeks after the initial operative intervention. In one patient osteosynthesis of the patella had to be carried out. The ultimate result, however, was good because the patient consented to undergo surgery of the other knee.

Discussion

Sagittal (longitudinal) osteotomy was advocated by Morscher (20) and in his report of four year follow-up only one patient had a poor result and underwent a second procedure. Subjectively, the patients were enthusiastic and satisfied. Hejgaard and Arnoldi (12) reported that 92 % patients had highly significant relief of pain five to 19 months following this procedure.

At first sight it seems inappropriate to claim that no poor results have been obtained in treatment. We had 13 patients in whom only a fair result was obtained, and only three patients with a poor result. In 30 patients with sagittal osteotomy as a single operation (without additional procedures) no poor results were obtained and fair results only in three patients. In 30 patients with sagittal osteotomy performed as a single surgical procedure the cause of the chondromalacia (anterior knee pain) was obviously dysplasia of the patella without any other biomechanical disorders in the patello-femoral joint. To obtain optimal results in the treatment of patellar chondromalacia, it is necessary to tailor surgical procedures in accordance with the aetiological factors. It would then be possible to avoid complications such as lateralisation of the patella following sagittal osteotomy as mentioned by Goymann in 1980 (9). A question also arises in this case on the necessity of modifications in the application of patellar sagittal osteotomy (10). According to Biedert (4) skeletal geometry, soft tissues, and neuromuscular control influence the patello-femoral gliding mechanism. Osteotomy with soft tissue repair might be the best treatment depending on the primary pathology. Surgery aims to eliminate the underlying pathomorphology.

Numerous examinations and observations suggest an increase in the patellar intraosseous pressure as the cause of the pain (2, 11, 12, 18, 21) and all the authors concluded that relief of pain following osteotomy is attributable to a reduction in elevated intraosseous pressure. Attempts have been made in the past to calculate the compression forces and contact pressures in patello-femoral joint mathmatically. Apart from these studies, experiments have been designed to provide information on the pressure and contact areas in the joint (13). Hehne et al (11) experimentally measured contact area after sagittal osteotomy of the patella on 11 cadaver knees of the types II, II/III and III according Wiberg They concluded that less incongruence is present, as can be expected, from the bone cross-section of the patella. In our experience the most important aspect of planning sagittal osteotomy of the patella is to follow the principle that, postoperatively, Wiberg's angle of the patella and the angle of the femoral

trochlea notch should be approximately equal. This is necessary to avoid so-called bridging of the patella over the trochlear groove.

This article presents the results of the treatment of patellar dysplasia using the classical medial parapatellar surgical approach. The length of the incision was dependent on whether additional procedures, such as transposition of the tibial tubercle were used in addition to saggital ostetotomy. After 1990 the authors modified the original procedure to an arthroscopically assisted procedure. Arthroscopy was used to inspect the knee joint and perform lateral release, followed by saggital osteotomy. After the osteotomy, the articular cartilage of the patella was checked for congruency. If transposition of the tibial tuberosity was necessary, the incision was extended distally. None of the observed complications with open procedure (patello-femoral adhesions or fractures of the joint surface) were present after the arthroscopically assisted procedure. Nagel and Scuderi (1995) concluded: "Osteotomy remains an alternative; however, we feel that more controlled long-term studies with greater numbers are needed before its true value can be measured" (21).

Conclusion

In conclusion it should be emphasised that the results achieved by the application of sagittal osteotomy of the patella are very good. Depending of the malalignment of the extensor mechanism of the knee and the extent of damage of the cartilage of the patella, sagittal osteotomy of the patella should be applied in combination with medialisation and ventralisation or distalisation of the tibial tuberosity. Sagittal (longitudinal) osteotomy of the patella after Morscher is an enrichment of the spectrum of the secondary-causal and preventive procedures for the treatment of patello-femoral disorders.

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FIGURE CAPTIONS

Fig. 1 Photoelasticimetric model of sagittal osteotomy of the patella constructed according to the pre-(left) and postoperative roentgenograms of a treated knee.Preoperatively an unequal isochromatic distribution was visible. Following sagittal osteotomy of the patella the stresses were uniformly distributed throughout the patello-femoral joint.

Fig. 2 The mean value of Wiberg's angle preoperatively and postoperatively

Fig. 3 Radiographs of the female patients V.G. 28 years old at the time of surgery. a postoperative, b 5 years after surgery, c 14 years postoperatively

Fig. 4 Male patients T.P. 18 years old at the time of surgery. a preoperative radiograph, b and c radiographs 12 years postoperatively

Fig. 5 Female patient D.P. 26 years old at the time of surgery. a preoperative radiographs, b,c and d radiographs 20 years postoperatively

Fig 6 Radiographs 9 years postoperatively in female karate fighter with both knee operated on.

Figure 1.

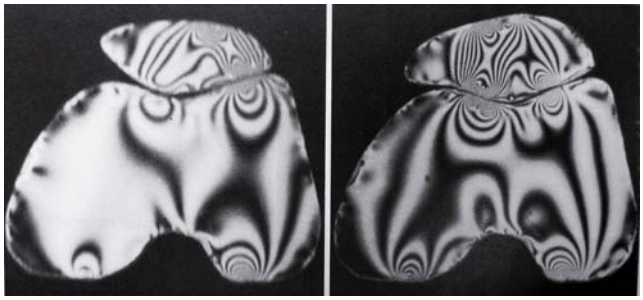

Figure 2.

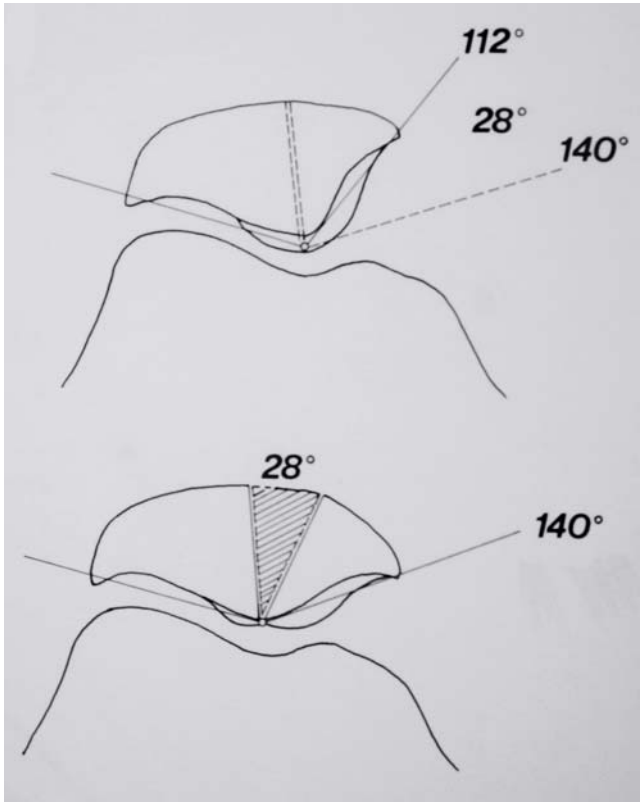

Figure 3.

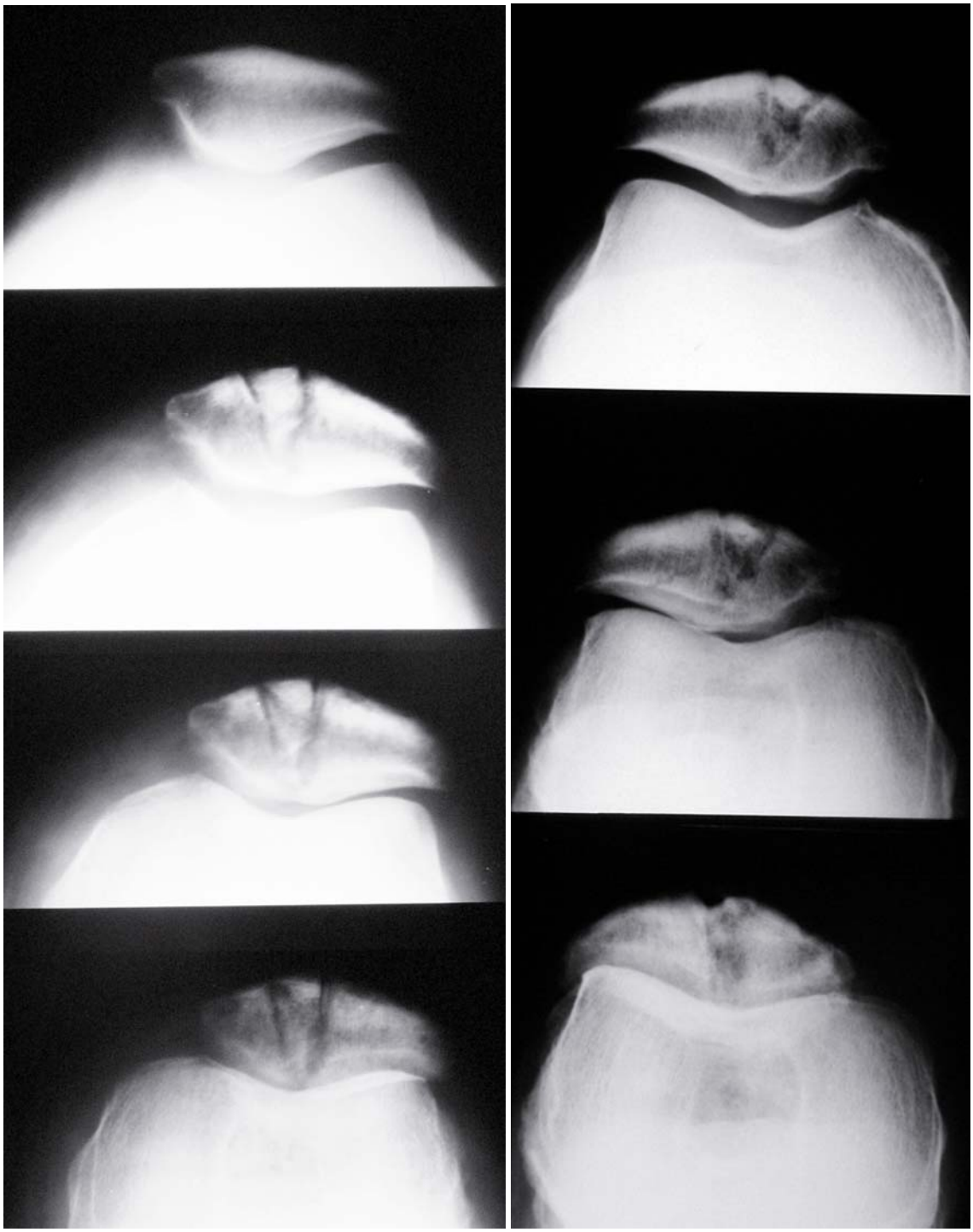

Figure 4.

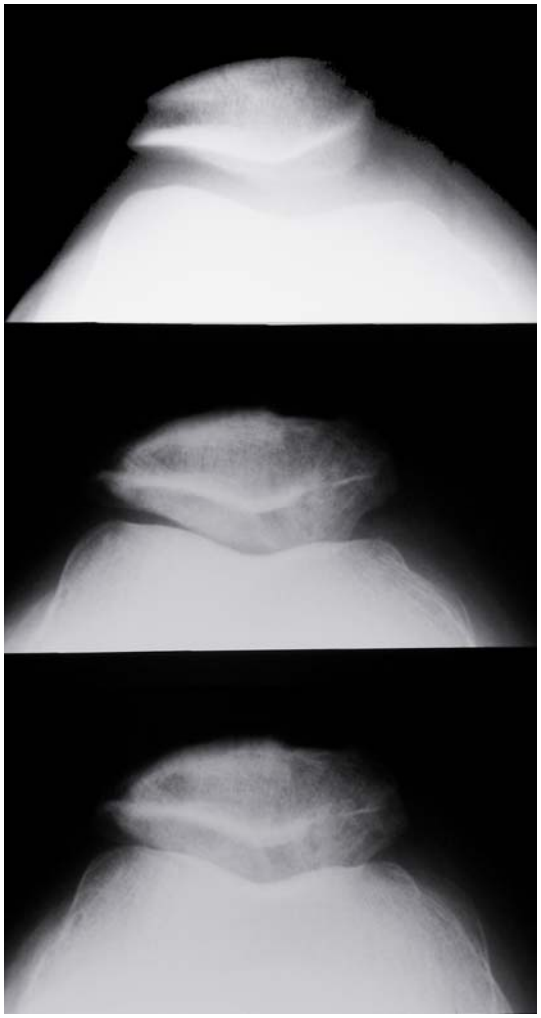

Figure 5.

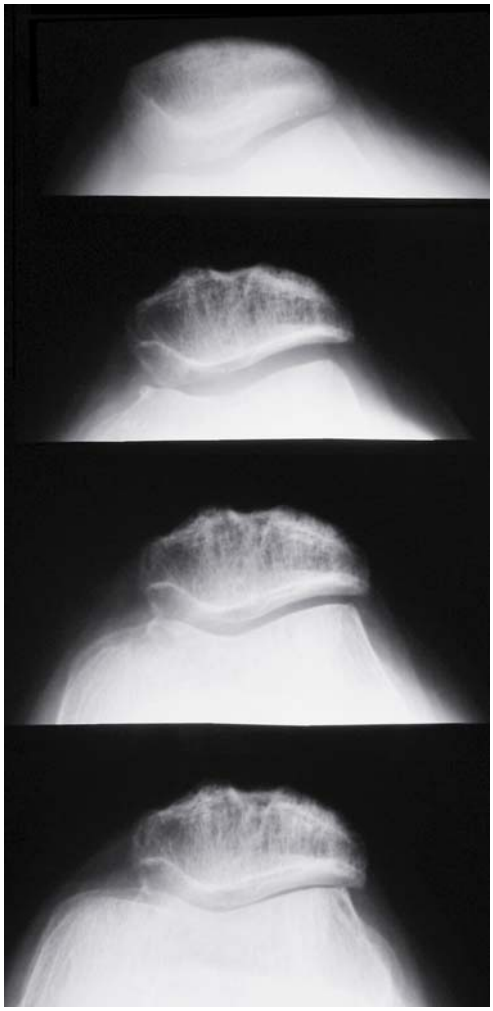

Figure 6.