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Osteotomy of the Patella in Chondromalacia

Preliminary Report

E. Morscher

Orthopaedic Department of the University of Basle, Felix-Platter-Spital, CH-4055 Basle, Switzerland

Summary. There are many factors involved in the aetiology of chondromalacia of the patella. If possible, the appropriate operative procedure should be chosen for each patient, hence attempting to eliminate the cause of softening of the cartilage. Increased pressure over the lateral facet, with or without reduced pressure over the medial facet of the patella, resulting from lateral positioning or tilting of the patella, the Wiberg/Baumgartl-types III and IV, and the 'Hunter's Hat' form are important causes.

With reduced pressure, the cartilage is inadequately stressed and consequently receives insufficient nourishment. As the medial facet is particularly thick and has little contact with the femoral condyle, nutritional disturbance is almost a normal occurrence. Longitudinal osteotomy of the patella has been found to improve the contact of the medial surface of the patella with the femoral condylar groove. The analgesic effect of this surgical procedure may derive from the resultant reduction in subchondral interstitial pressure, presuming that the pain in chondromalacia patellae, like that of osteoarthritis, is a manifestation of raised intramedullary pressure. To ensure an improvement in patellar tracking the osteotomy is combined with a lateral capsular release.

Zusammenfassung. Die Ätiologie der Chondromalacia patellae ist multifaktoriell. Die geeignetste Therapie muß deshalb individuell gehandhabt werden und nach Möglichkeit die Ursache der Knorpelerweichung ausschalten. Hyperpression im Bereich der lateralen Fazette mit oder ohne Hypopression auf der Medialseite der Patella infolge lateraler Subluxation oder Kippung der Patella sowie die Wiberg-Baumgartl-Typen III, IV und die Jägerhutform sind ursächliche Faktoren.

Durch die veränderten Druckverhältnisse wird der Knorpel ungenügend durchwalkt und damit ungenügend ernährt. Da die mediale Fazette physiologischerweise außerordentlich dick ist und auf weite Strecken mangelhaften Kontakt mit dem medialen Femurcondylus aufweist, sind Ernährungsstörungen hier fast als physiologisch zu bezeichnen.

Eine Längsosteotomie der Patella ist imstande, den Kontakt zwischen medialer Gelenkfläche und medialem Femurcondylus zu verbessern. Der unmittelbare analgetische Effekt dieses Eingriffes ist wahrscheinlich durch eine Reduktion des Druckes im Markraum der Patella bedingt, wobei angenommen wird, daß der Schmerz bei Chondromalacia patellae im wesentlichen wie bei Arthrosen anderer Lokalisation durch einen erhöhten intramedullären Druck bedingt ist. Zur Verbesserung des Patellakontaktes wird die Osteotomie in der Regel mit einer lateralen Kapseldiscision kombiniert.

Chondromalacia of the patella has attracted increasing interest in recent years. It is found to be the cause of pain in 90% of patients with painful but clinically normal knee joints and is thus a very common complaint. According to Silverskiöld (1938) there is a 35% incidence in 30 year olds. Malacic changes of the patella are apparently present in almost all over the age of 30 (Wiberg, 1941; Wiles et al., 1956, 1960). Baumgartl (1964), de Montmollin (1951) and others find softening of the cartilage on the patella to be just as common as meniscus lesions. In 1936, Øwre observed chondromalacia in 96 out of 109 patellae removed at autopsy. There appear to be racial differencies, however; with chondromalacia of the patella being extremely rare in the Chinese (Marar and Pillay, 1975). This is also true for osteoarthritis of the hip (Gunn, 1964).

Although we now have a clear concept of the nature of chondromalacia of the patella, there is some

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Table 1. Aetiology of chondromalacia of the patella

1. Trauma and mechanical overloading
2. Anatomical variations — Wiberg types III, IV and 'Hunter's Hat' form — Outerbridge ridge — Bipartite patella, high riding patella, etc.
3. Disturbances in alignment of the patella — Luxations and subluxations of the patella — Increased Q-angle (Insall)
4. Alteration of the gliding path of the patella
5. Nutritional disturbance of cartilage
6. Hormonal factors

doubt as to its significance. There is no question that it is most important as a cause of knee pain and as a predisposing factor in patello-femoral osteoarthritis (Rössler, 1966; Bandi, 1972).

However, a large proportion of chondromalacias are asymptomatic and are found incidentally at arthrotomy. In addition, it is very questionable as to whether every chondromalacia of the patella should be regarded as a prearthrotic condition, as is assumed by Wiles and co-workers (1956, 1960). In our experience the most common form, namely a chondromalacia which occurs during puberty particularly in girls, heals in time without treatment. By definition, this is never the case in true prearthrosis. Considerable progress has been made in recent years concerning its aetiology. The percentage of cases designated as "idiopathic" has fallen considerably. We now know that there is a number of factors, alone or in combination, which may predispose to chondromalacia patellae of different degrees. The aetiology of chondromalacia of the patella is thus multifactorial (Table 1) from which it can be deduced that under no circumstances can a uniform therapy be tenable in all cases.

1. Aetiology of Chondromalacia of the Patella

1.1 Trauma

Nowadays it is indisputable that trauma is a frequent cause of chondromalacia of the patella (Chaklin, 1939; Rohlederer, 1964; Morscher, 1970, 1971; Bandi, 1977). Certain competitive sports and occupations which result in overloading of the patello-femoral joint can also lead to chondromalacia (Pfeil, 1966; Schneider, 1968; Viernstein and Weigert, 1969; Bandi, 1977).

Insall and co-workers (1976) found that direct or indirect trauma triggered chondromalacia in the patella in 40 out of 105 cases and designate trauma as 'the usual cause.' In our series of 68 children and adolescents between the ages of 6 and 17 (50 girls and 18 boys) trauma was considered to be causative in 24 cases (35%) (Steinbrecher, 1975).

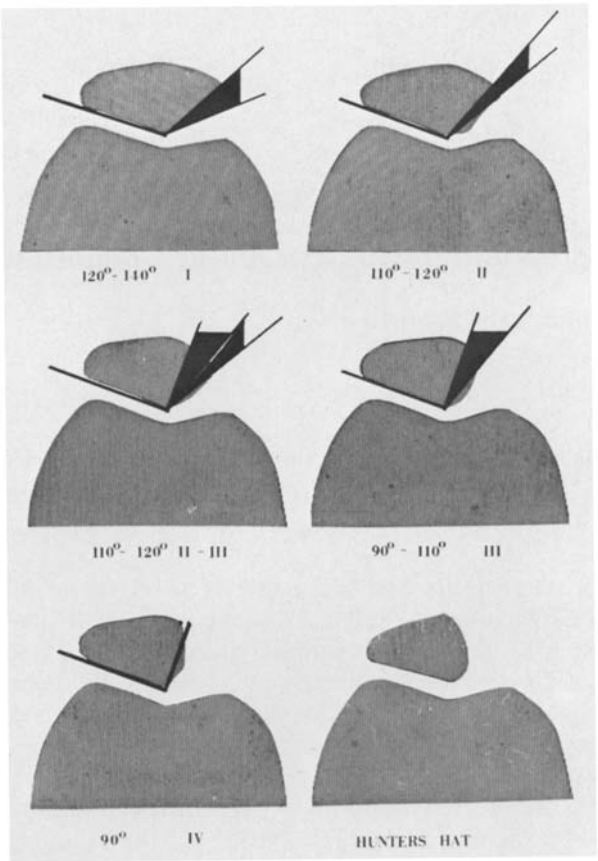

Fig. 1. Wiberg's types of the patella

1.2 Anatomical Variants

In 1941 Wiberg described three patellar types which have since been named after him. Baumgartl (1964) added a fourth variety (Fig. 1). How far these variations play a role in chondromalacia is still a matter of debate. Outerbridge (1964) as well as Marar and Pillay (1975) found no correlation. However, among the 68 children and adolescents examined by us, 35% belonged to the Wiberg types III, IV and the 'Hunter's Hat' form. According to Baumgartl (1964) the Wiberg type III is found in 11% while the other two forms (IV and Hunter's Hat) are very rare.

Outerbridge (1961, 1964) implicated the ridge at the ventral or proximal end of the trochlea of the medial femoral condyle as a frequent cause of chondromalacia of the patella. In his opinion, the medial location of the ridge is also responsible for the tendency of chondromalacia to occur medially.

McKeever (1951) in particular drew attention to the frequent association of chondromalacia with a high riding patella. In turn, a high riding patella

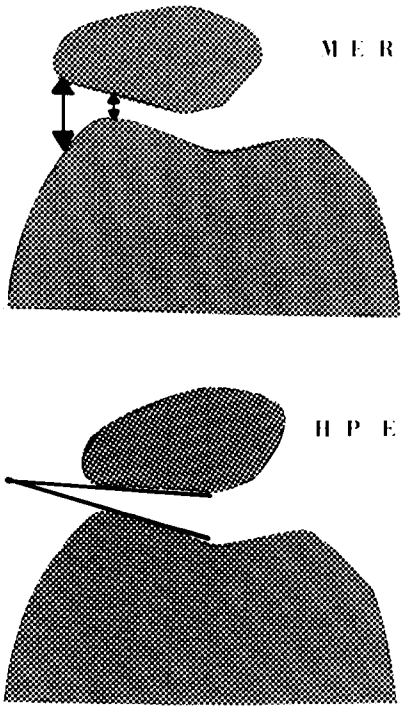

Fig. 2. Two types of defective positioning of the patella: Lateral malpositioning of the patella (French: malposition externe de la rotule = MER). Tilting of the patella (French: Syndrome de l'hyperpression externe de la rotule = HPE)

predisposes to recurrent dislocation. Thus, in patella alta, chondromalacia could just as well develop secondarily as a result of this 'disturbance in balance' (Insall et al., 1976). We have often observed an isolated chondromalacia in the region of the 'small fragment' of a bipartite patella and in painful cases successfully excised the same (Dick and Morscher, 1977).

2. Disturbances in Alignment of the Patella

In recent years, so-called imbalance of the patella has been considered, particularly by Ficat (1973), to be a cause of chondromalacia of the patella. Ficat and Bizou (1967) and Villiger (1976) have laid down guide lines to improve the definition of defective positioning of the patella. The French distinguish two types:

1. The so-called external malpositioning of the patella *(malposition externe de la rotule)* (MER), i.e. the classical subluxation which is generally recognised as a cause of chondromalacia (Macnab, 1952; Langston, 1958; Insall et al., 1976; Mansat et al., 1977).
2. The lateral overloading or tilting without lateral displacement of the patella *(syndrome de l'hyperpression externe de la rotule)* (SHPE) (Ficat, 1973; Ficat et al., 1975).

Both forms of imbalance of the patella can be diagnosed in axial X-rays made in 30° of flexion. MER is represented as a lateral shifting. In SHPE, the joint surfaces of the lateral component of the patello-femoral joint are no longer parallel (Fig. 2).

Lateral displacement of up to 3 mm and an angle below 12° are, however, frequent and are not to be regarded as pathological (Lesquene et al., 1976).

In combination of chondromalacia with meniscus lesions is well known (Smillie, 1970). Insall et al. (1976) found it in 15 out of 105 cases. Medial meniscectomy results in a weakening of the capsule and leads to lateral subluxation and damage to the cartilage. In the same way, an exaggeration of the so-called 'Q-angle' also tends to cause lateral dislocation (Insall et al., 1976).

The 'Q-angle' is the angle formed between the line extending from the anterior superior iliac spine to the center of the patella and a line from the center of the patella to the middle of the tuberosity of the tibia when the leg is lifted and extended (Larson, 1975).

3. Alteration of the Gliding Path of the Patella

The fact that incongruity or irregularity of the femoral condyle in the region of the patello-femoral gliding path can lead to cartilagenous damage on the patella hardly needs emphasising. For example, an osteochondritis dissecans may manifest for the first time through secondary chondromalacia of the patella.

There are, however, incongruities of the joint surfaces between patella and lateral femoral condyle which are not to be regarded as pathological and are due to irregularity in thickness of the joint cartilage. Such variations should not be regarded as a predisposition to osteoarthritis (Lesquene et al., 1976).

4. Nutritional Disturbance of Cartilage

Although disturbances in cartilaginous nutrition generally represent secondary rather than primary pathology, they are grouped together here. Their causes are manifold.

A disturbance in nutrition of the cartilage as a result of insufficient loading of the cartilage is probably a frequent cause of chondromalacia of the patella. To begin with, the medial facet, which is particularly affected, is covered with the thickest layer of cartilage in the entire body. Stougård (1975) measured the cartilage thickness in 118 knees and found values up to 4 mm at the medial facet of macroscopically normal patellae, and of up to 6 mm in abnormal patellae. The fact that diffusion problems arise particularly easily at this site was commented on by Øwre in 1936. In addition, the medial facet does not come into contact physiologically with the medial trochlea of the

Fig. 3. Axial view of the patella in arthrography: medial facet of the patella is not in contact with the medial femoral condyle and is covered by a fold of synovial membrane

femoral condyle during the first 30° of flexion. The poor contact over considerable areas of the patello-femoral gliding path is evident in MER and SHPE as well as in the Wiberg-forms III and IV (Wiberg, 1941; Baumgartl, 1964). The greatest pressure of the medial patellar facet first occurs when flexion of the knee joint exceeds 90° (Bandi, 1977).

In addition it should be noted that the cartilage on the medial facet which is not in contact with medial femoral condyle is covered by a fold of the synovial membrane (Fig. 3). This by itself can lead to damage of the cartilage surface.

5. Hormonal Factors

The fact that the first symptoms of chondromalacia of the patella occur during puberty and are often found in combination with slipped upper femoral epiphysis suggests that underlying hormonal factors contribute to the cause of this complaint.

Distribution of the Chondromalacia Lesion

The location of chondromalacia on the posterior patellar surface reveals, to a certain extent, the aetiology and pathogenesis of this disease. The medial facet is more frequently affected than the lateral one. Grueter (1959), Janssen (1974), Stourgård (1975) and Wiberg (1941) assumed that the convex form of the medial facet exposes it to a greater wear and tear. Outerbridge (1961, 1964) thought that it was due to the fact that the ridge described by him is situated medially. Marar and Pillay (1975) and others found that chondromalacia occured preferentially on the medial facet. Insall et al. (1976) regarded the medial ridge as most commonly affected and in their material, chondromalacia was found medially in 21% and laterally in only 7% of the cases. Overall, however, there was a preference for the medial facet, namely the part that is loaded least and not more, as was assumed by Wiberg. Unfortunately, even today, there are no reliable data concerning the distribution of loading over the patello-femoral joint during flexion-extension.

Bandi (1977) measured the areas of contact, finding them to be: 4.6 cm^2 at 10° flexion, 1.87 cm^2 laterally and 1.32 cm^2 medially at 50° of flexion and 1.57 cm^2 laterally and 1.03 cm^2 medially in 90° of flexion. In the Wiberg-types III and IV, and the 'Hunter's Hat' form, conditions may favour the lateral contact surface.

When the chondromalacia is located medially, therefore, reduced loading appears to be responsible for the softening. We know from the observations of Harrison et al. (1953) on the hip, and Goodfellow and Bullough (1967) on the elbow that fibrillation and softening of the cartilage occur particularly in areas of the joint which are not loaded. Reduced loading ('hypopression' according to Ficat) occurs, together with a reduction or even an absence of intermittent compression of the cartilage of the medial patellar facet, leading to nutritional disturbances at this site. Sobler (1977), Wiles et al. (1960), and Simon et al. (1976) were able to show that altered nutrition of the cartilage leads to death of the chondrocytes. Lysosomes are released as a consequence, resulting in chondrolysis, and the initiation of a vicious circle.

Stougård (1975) has already refered to Harrison's theory of lack of weight-bearing (Harrison et al., 1953) as a possible cause of cartilage degeneration. This may explain the common occurrence of cartilaginous changes around the extreme periphery of the patella which does not take part in normal articulation.

The Causes of Pain in Chondromalacia of the Patella

The cause of pain in arthritis in general and in chondromalacia of the patella in particular is a problem that is much discussed but in no way solved as yet. It is well known that there are no pain receptors in cartilage. The synovial capsule with its rich nerve supply is therefore regarded as the source of pain. The concept of 'synovitis chondrodetritica' arose from the assumption that desquamation of cartilage leads to mechanical and chemical irritation of synovium. The hypothesis that synovitis causes pain could very well explain the painfree intervals which are so characteristic of traumatic chondromalacia patellae (Morscher, 1974; Dick et al., 1975). However, the typical pain of chondromalacia produced by passive patello-femoral compression and the fact that marked chondromalacia can be present without pain still remain unexplained (Outerbridge, 1961, 1964; Smillie, 1970). In addition, Insall et al. (1976) found no signs of inflammation on histological examination of the synovial capsule in chondromalacia of the patella.

Table 2. Operations for treatment of chondromalacia of the patella

1. Operations to improve the cartilaginous layer of the patella:
   1.1 Shaving.
   1.2 Drilling.
2. Correction of anatomical variants:
   2.1 Removal of the Outerbridge ridge.
   2.2 Excision of the small fragment in bipartite patella.
3. Restoration of the gliding path of the patella:
   3.1 Transposition of the tibial tuberosity according to Roux, Goldthwaite or Hauser.
   3.2 Splitting of the retinacula or lateral capsular release.
4. Relief of pressure within the patello-femoral joint:
   4.1 Operations described by Maquet and Bandi.
5. Patellectomy or facetectomy.
6. Improvement of congruity and reduction of intramedullary pressure by osteotomy of the patella.

Numerous examinations and observations suggest an increase in the patellar intramedullary pressure as the cause of osteoarthritic pain. Increased pressure in the proximal end of the femur was recorded in coxarthrosis by Philips (1966), Arlet and Ficat (1968), Arnoldi et al. (1972), and in the proximal end of the tibia in gonarthrosis by Lynch (1974). In addition, a decrease in venous back flow is also observed regularly in osteoarthritis (Arlet and Ficat, 1965, 1968; Morscher and Fridrich, 1970). According to Lynch (1974) there is a direct relationship between the severity of pain at rest and the increase in intramedullary pressure in osteoarthritis.

Apart from these hypothetical considerations, clinical observations also support the idea that intraosseous pressure is mainly responsible for osteoarthritic pain:

1. The effectiveness of an intertrochanteric osteotomy in relieving hip pain from osteoarthritis is well known (Osborne and Fahrni, 1950; Philips et al., 1967; Morscher, 1971; Arnoldi et al., 1971). McMurray (1935) and Pauwels (1959) were of the opinion that the analgesic effect of osteotomy was mechanical. However, Nissen (1963) was able to show conclusively that this effect also occurs without changing the mechanics of joint (Deliss, 1977). Philips et al. (1967) and Arnold et al. (1971) were able to measure directly the fall in intramedullary pressure brought about by osteotomy. Termansen and Okholm (1976) found a reduction in pressure 11.5 to 33.5 months after osteotomy if the initial pressure had been very high. The analgesic effect of simple fenestration of the greater trochanter in osteoarthritis of the hip (Åström, 1975; Hietala and Åström, 1977) and of the tibia in osteoarthritis of the knee (Renard, 1969) supports the idea that 'drainage' rather than alteration in the mechanics leads to relief of pain.

2. Any increase in the intramedullary pressure leads to pain, as we were able to show 20 years ago on the basis of intraosseous phlebography under local anaesthesia. For this reason we were soon forced to perform this examination exclusively under general anaesthesia. Analogous observations have been made by Philips et al. (1966), Arnoldi et al. (1972), and Hietala and Åström (1977). From this evidence it appears most probable that pain in chondromalacia of the patella is also caused by increase in pressure in the marrow cavity of the patella. The analgesic effect of several operations can be best explained on this basis.

Operative Therapy of Chondromalacia of the Patella

The operations employed up to the present to treat chondromalacia of the patella are aimed primarily at achieving symptomatic relief. Thus in general, most authors use only one surgical technique, independent of aetiology, degree and extent of the malacic area. The operations most frequently employed can be classified as follows (Table 2).

1. Operations to 'Clean Up' the Cartilaginous Layer

1.1 Shaving

Shaving removes the malacic, and in particular the loose material from intact hyaline cartilage. It should, therefore, smooth the surface and interrupt the vicious circle caused by chondrolysis and the liberation of proteolytic enzymes (particularly cathepsin D). As there is no cartilage regeneration, at least in adults, we combine shaving with drilling.

1.2 Drilling

The purpose of making multiple drill holes in the subchondral bone (Pridie, 1959) is to stimulate the vessels and connective tissue from the marrow cavity to grow towards the surface and to be converted under functional adaptation into a fibrocartilaginous layer.

In 60 adult patients from our department, a good result was achieved in 30% and a satisfactory result in 70% of the cases after shaving and drilling. However 14% of the patients are still under treatment (Henche, 1976). In a further study of adolescent patients with chondromalacia, pain relief occurred within a year in 63% of the operative group (mainly treated by shaving and drilling) but only in 23% of the conservatively treated patients.

2. Correction of Anatomical Variants

2.1 Levelling of the Outerbridge Ridge

In cases in which the ridge described by Outerbridge is actually responsible for the chondromalacia, its removal may be beneficial (Outerbridge, 1964; Crooks, 1967). However, the cartilage damage that is present will not heal. In our experience the Outerbridge ridge is a rare finding and was far less frequently encountered than the incidence reported by Outerbridge. Bandi (1977) found an abrupt step of 6—12 mm in height in some 3% of cases.

2.2 Removal of the Small Fragment in Bipartite Patella

We have repeatedly observed chondromalacia localised to the small lateral fragment lying superiorly in cases of a painful bipartite patella. Pain relief followed excision of this fragment (Dick and Morscher, 1977).

3. Restoration of the Gliding Path of the Patella

3.1 Transfer of the Tibial Tuberosity

Dislocation of the patella occurs almost exclusively in a lateral direction. The treatment of this lateral subluxation usually involves transposition of the patella ligament medially by one of the many modifications such as those described by Roux et al. (1938) and others.

Seventy-six cases of chondromalacia of the patella, 70% with dislocation of the patella, were treated in our department between 1965 and 1971 by the method of Roux with transposition of the tibial tuberosity medially and distally with concomittant lateral release and medial plication of the capsule. The results were good in 63 cases (83%) (Henche, 1974).

3.2 Lateral Capsular Release and Splitting of the Retinacula

Transposition of the patella functions in the same fashion as lateral capsular release. The latter operation is, however, less traumatic. A partial denervation probably explains the good analgesic effect which is usually obtained as the nerve supply of the patella comes from the side. Favourable results from this simple operation are reported by Viernstein and Weigert, 1968; Ficat, 1973; Villiger, 1976; and Dobler, 1977. In 115 cases treated by this operation *('section de l'aileron externe')*, Ficat et al. (1975) achieved a result which was excellent in 38.5%, good in 45.1%, moderate in 12.5% and poor in 6.9%.

4. Relief of Pressure within the Patello-Femoral Joint by Anterior Displacement of the Tibial Tuberosity (Maquet/Bandi)

The concept that osteoarthritis, and thus also chondromalacia of the patella, developes and worsens because of excessive mechanical loading led Maquet (1963) and Bandi (1972 and 1976) to try to reduce the patello-femoral pressure by shifting the tibial tuberosity anteriorly. Ventralisation of the tibial tuberosity increases the lever arm of the extensor musculature, and hence the angle between the tangents of the quadriceps tendon and patellar ligament. Ventral tilting of 10 mm results in a reduction in pressure within the patello-femoral joint of between 20 and 40% (Bandi, 1977).

5. Patellectomy

Excision of the patella is recommended by various orthopaedic surgeons in patients with excessive pain and destruction of the cartilaginous layer. Thus Bentley (1970) advises patellectomy if the diameter of the lesion exceeds 1.3 cm. However it is many years since we have seen an indication for patellectomy, even in the severest cases of chondromalacia or osteoarthritis.

O'Donoghue (1972) suggested a so-called 'facetectomy' when possible in the more severe chondromalacias located on the medial or lateral facet.

In one compares the results of the operations enumerated above, it is remarkable that the percentages of satisfactory results reported in the literature are very similar and are independent of the aetiology of the chondromalacia. In view of the various aetiologies and the success that attends osteotomy for osteoarthritic symptoms at other sites, we have been encouraged to apply the principles of osteotomy to the patella.

6. Osteotomy of the Patella

The removal of the aetiological factors is the aim of any logical procedure. This should be largely possible in chondromalacia of the patella, where its causes are mechanical. An attempt can be made, therefore, to alter the loading conditions on the patella both quantitatively and qualitatively.

Overloading can be of a general nature, for example as a result of certain types of sport which involve the patello-femoral joint (such as skiing and weight lifting). In the so-called *'syndrome de l'hyperpression externe,* a disturbance in balance results in overloading of the lateral, and too little loading of the medial facet of the patella. A dysplastic patella is exposed to increased surface pressure on account of its small size.

Apart from excessive compression, reduced pressure over the medial facet probably also plays a causal role in many cases. This reduced medial compression is allied to excessive lateral compression in MER and SHPE. Reduced contact of the medial facet with the medial femoral condyle is also present in the Wiberg types III and IV, and the 'Hunter's Hat' form (Fig. 3). The physiological thickness of the cartilage also predisposes toward deficient loading of the cartilage of the medial patellar facet and resultant nutritional impairment. In addition, the medial contact is considerably less than the lateral one.

By longitudinal osteotomy, approximately at the junction of the medial and middle thirds of the patella, it is possible to enlarge the contact surface of the

patello-femoral joint. This should improve the kneading action on the cartilage and hence its nutrition.

Osteotomy of the patella may produce the following effects:

1. An improved use of the patellar cartilage by enlarging the area of surface contact taking pressure.
2. 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.
3. Immediate reduction in intramedullary pressure and thus reduction or elimination of pain as a result of the osteotomy itself.

Operative Technique

The operation is carried out under general anaesthesia and exsanguinating tourniquet control. Information concerning the extent, severity and especially the joint congruity is essential in assessing the aetiology. Inspection of the patellar gliding path should be as complete as possible and therefore we recommend a medial parapatellar approach opening the joint capsule in the direction of the incision some 0.5—1.0 cm from the medial edge of the patella. Careful assessment of the knee joint with correction of any pathological condition is carried out as far as possible, such as removal of an Outerbridge ridge, shaving of malacic tissue from the cartilage of the patella, drilling and revision of the menisci.

When considering the congruity of the medial patellar facet and the trochlea of the femoral condyle, the slight lateral tilting of the patella due to the medial parapatellar arthrotomy should naturally be taken into account. The degree of congruity is, of course, assessed over the entire extent of flexion of the knee joint.

Osteotomy of the patella is carried out longitudinally in the region of the ridge between lateral and medial facets, i.e. seen from the front, at the junction between middle and medial thirds (Fig. 4). For this purpose, the aponeurosis over the patella is split longitudinally down to the bone, and reflected medially and laterally with a periosteal elevator. The osteotomy is then carried out with the power saw through approximately two-thirds of the patella and completed with an osteotome without cutting through the cartilaginous layer. The osteotomy is then opened up and wedged with a bone sliver. Osteosynthesis is not necessary. The aponeurosis over the osteotomy is closed with a few sutures. The fragments are held together sufficiently by the sutures as well as by the intact quadriceps tendon and patellar ligament.

Lateral capsular incision is carried out in addition if there is an SHPE or MER. The medial capsule is sutured very tightly, generally by overlapping. Intra-articular and subcutaneous Redon drains are applied before closing the wound.

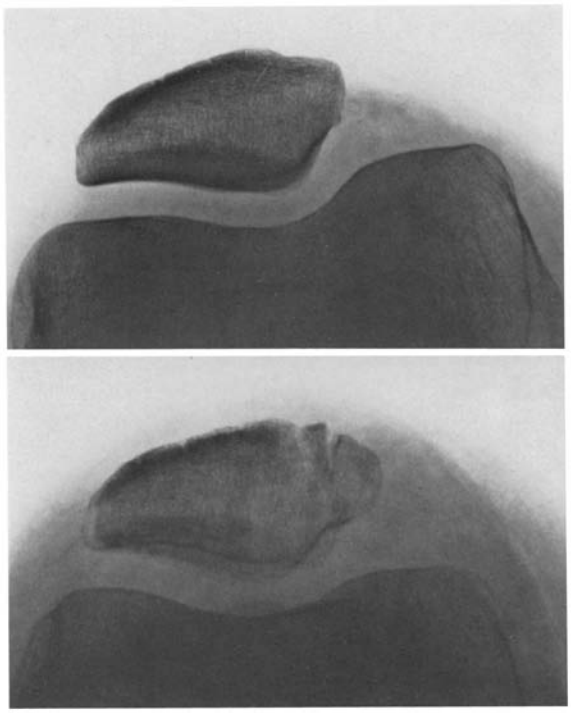

Fig. 4. Osteotomy of the patella before and after operation in a 22-year-old woman. Note the better contact of the medial facet of the patella with the medial femoral condyle

Postoperatively, the joint is immobilised in 20—30° of flexion. Isometric quadriceps exercises are commenced on the first postoperative day, with passive supported flexion-extension exercises from the fourth postoperative day. Flexion must not be forced under any circumstances. In general, it increases progressively up to the third postoperative week as far as a right angle. Weight bearing or the operated leg is not allowed for six weeks.

Results of Patellar Osteotomy in Chondromalacia of the Patella

Up to the present, we have restricted patellar osteotomy to very severe cases, some of which have undergone several previous operations. It is therefore too early for an accurate assessment but some interesting conclusions can be drawn:

1. In all cases reduction or even elimination of the pain was observed immediately after operation.
2. The observation that crepitation vanished or was remarkably reduced in all cases, even when no additional operation on the bone itself was performed (shaving, drilling), was noticeable and unexpected.
3. As far as could be judged, improved congruity of the patello-femoral joint was observed in those patients in whom axial X-rays of the patella were taken at control examination (Fig. 5).

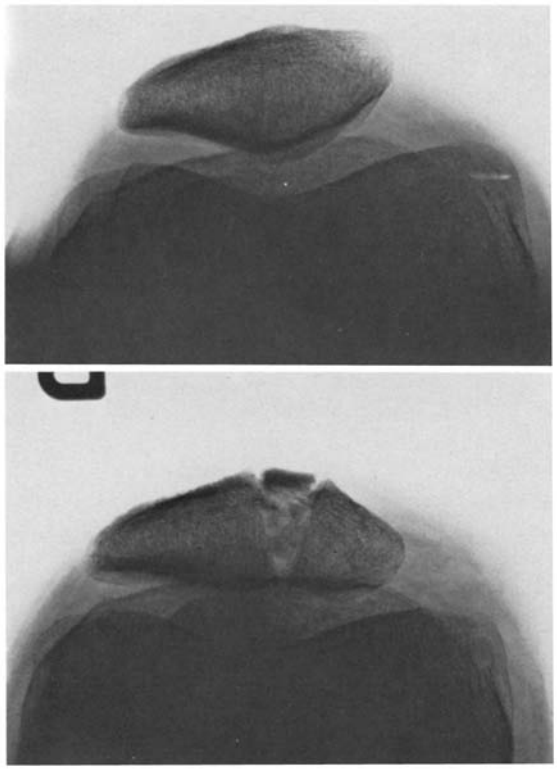

Fig. 5. Osteotomy of the patella before and after operation in a 24-year-old woman. Immediate elimination of pain and disappearance of crepitation

Discussion

Longitudinal osteotomy of the patella is a new method of the treatment of chondromalacia based on the experience with osteotomy on other joints. Recently, Deliss (1977) suggested osteotomy of the patella in the frontal plane. He was also able to achieve a favourable effect on pain by this method without altering the congruity of the patello-femoral joint.

Patellar osteotomy is mainly indicated when reduced compression of the medial facet is seen to be the main cause of the chondromalacia. This loss of contact pressure over the medial facet is generally combined with increased compression over the lateral facet, so that in such cases osteotomy of the patella should also be combined with a lateral capsular release. If there is subluxation, or even dislocation of the patella, then transposition of the tibial tuberosity by the method of Roux is still to be preferred as it includes capsular lateral release and medial reefing.

The observation period is too short for a conclusive assessment but experience has shown that failure of an operation for chondromalacia of the patella is revealed relatively soon and no further improvement can be expected after six months (Wiles et al., 1956; Insall et al., 1976). Disturbance in blood supply as a result of a longitudinal osteotomy is unlikely. Scapinelli (1967) has shown that the blood vessels of the patella run from distal to proximal pole. This is the reason why there is a risk of avascular necrosis of the proximal fragment after a transverse fracture.

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