Arch Orthop Traumat Surg 97, 207–211 (1980)

Archives of Orthopaedic and Traumatic Surgery

Chondral and Osteochondral Fractures After Luxation of the Patella and Their Treatment

C.-P. Hammerle and R. P. Jacob

Orthopaedic Department, Inselspital, University of Berne (Director: Prof. Dr. M. E. Müller), CH-3000 Berne, Switzerland

Summary. The traumatic luxation of the patella is the most frequent cause of osteochondral or chondral fragments in the knee joint. A precise case history most often provides the necessary reference concerning the occurrence of a luxation. The hemarthrosis and the painful reduction of the mobility after a closed spontaneous reposition hint towards the possibility of a chondral or osteochondral fracture requiring an emergency arthrotomy.

If large chondral or osteochondral fragments are found intraoperatively, then a refixation of these fragments should be attempted. The following methods can be used:
- a fixation with ASIF-mini screws
- a fixation with Smillie pins
- a fixation with cortical nails or
- the removal.

We will report about these methods being used at our clinic and will discuss the results.

Many differing surgical methods are available for a causative treatment of the patella luxation. The application of the necessary method is dependent upon the age of the patient as well as on the pathological-anatomical circumstances. The differing methods will be described.

The successful results of a refixation using a fibrin glue cannot be judged finally.

Zusammenfassung. Die traumatische Patellaluxation ist die häufigste Ursache osteochondraler oder chondraler Fragmente im Kniegelenksbereich. Die Anamnese gibt meist einen Hinweis auf eine stattgefundene Luxation. Das Hämarthros und die schmerzhafte Bewegungseinschränkung nach geschlossener Reposition lenken den Verdacht auf eine chondrale oder osteochondrale Fraktur und geben die Indikation zur notfallmäßigen Arthrotomie. Werden intraoperativ große chondrale bzw. osteochondrale Fragmente gefunden, so sollte versucht werden, diese zu refixieren. Es bieten sich die Möglichkeiten
- der Fixation mit AO-Minischrauben
- der Fixation mit Smillie-pins
- der Fixation mit Kortikalis-Nägel oder
- der Entfernung.

Alle diese Verfahren sind an unserer Klinik angewendet worden. Über die Erfahrungen wird berichtet.

Zur kausalen Therapie der Patellaluxation stehen mehrere Operationsverfahren zur Verfügung. Diese werden in Abhängigkeit von Alter und der pathologisch-anatomischen Verhältnisse angewendet. Die verschiedenen Verfahren werden kurz besprochen.

Die Erfolge der Refixation mit Fibrinkleber können noch nicht beurteilt werden.

Offprint requests to: Dr. C.-P. Hammerle, Orthop. Abt. des BwKrhs, Romanstr. 91, D-8000 München 19

The traumatic luxation of the patella is the most common cause for chondral and osteochondral fractures in the knee joint. The classic form of the accident occurs when under maximal tension of the quadriceps the patella is laterally torn out of the grooved gliding track of the femur. This injury is common in team and contact sports like handball, football, soccer and rugby, but it can be observed in other sports as well.

The luxation of the patella can be facilitated by pathological conditions in the knee joint. These include a dysplasia of the patella with a small or a convexed lateral facet, a dysplasia of the sidefacet of the femoral condyle and a laterally open angle between the quadriceps tendon and the patellar ligamentum of over 15° (O-angle) as well as an incorrect alignment of axes in the knee joint such as in cases of increased valgus or external rotation.

0344-8444/80/0097/0207/$ 1.00

The luxation of the patella occurs during the flexation movement itself or during fixed flexion between 10° and 50° (Bandi). At an angle greater than 50°, the enormous tension of the quadriceps and the high femoral-patellar pressure prevent a lateral shifting of the patella.

The luxation of the patella is always due to a shifting movement of the patella over the lateral condyle under extremely high local pressure, so that not only osteochondral but also pure chondral fragments can be chipped out of the patella or femur. The pathomechanism can be understood as the shoving of the cartilage from the lateral condylus in front of the laterally shifting patella. During surgery lesions can be observed ranging from transverse superficial lesions of the cartilage of the patella or of the lateral femoral condylus to chondral or osteochondral fragments of the distal and medial joint area of the patella and last but not least, fragments of all sizes in the area of the lateral femoral condyle. If cartilage fragments can be seen on the patella as well as on the lateral condyle, then usually the defects are congruent and lie in the 40°–50° flexion position, a phenomenon which we call "kissing lesion". It is also possible that fragments will be split off of the lateral side of the femoral condyle under a spontaneous and vigorous reposition of the patella.

Split-off and free chondral fragments are mecanically interfering factors that can cause blockage and damage to the cartilage and menisci. They potentially may show an appositional groove and thus provocate increasing complaint. Damaged cartilage tissue often shows a very minimal tendency towards self-healing. Substantial defects increase through a diminution of the articular surface and leed to an increase in force transmission of the pressure of contacting joint surfaces. These factors can be considered as promoting the development of an arthrotic joint degeneration. The main clinical symptoms accompanying painful movement are an atrophy of the muscles (caused by limited use), the feeling of insecurity and episodes of giving way.

Treatment

The aims of treatment must be

1. to remove the mechanical interference,
2. to normalize the trophic of the cartilage,
3. to prohibit an inactivity of the joint.

In young patients we take into consideration the refixation of larger osteochondral or chondral fragments. For fixation we can choose among the following:

- ASIF mini-screws
- Smillie pins
- nails of cortical bone.

Patients

In the last years we have seen 16 patients with chondral or osteochondral fragments after a traumatic luxation of the patella. In 10 patients the split-off fragments were removed since they were either to small or not considered suitable for a refixation. 2 osteochondral fragments were refixed by ASIF mini-screws. In 4 cases of pure chondral fragmentation a refixation by the methods described above were tried. We prefer to anchore the fragments into bleeding cartilage, which had been preliminary prepared with some drill-holes.

A $2 \times 4\,mm^2$ large pure chondral fragment of the lateral condyle was refixed with mini-screws (Figs. 1–3). Upon removal of the metall after $3\frac{1}{2}$ months we could observe an adjunction to the nutritional supply. These screws were partially covered by new cartilage. After 14 months an arthroscopy showed, that former fracture lines were barely recognizable. The cartilage of the former fragment was optically identical to the surrounding cartilage.

In another case, the pure chondral fragment in the weight bearing zone of the lateral femoral condyle was refixed with Smillie pins (Figs. 4–6). The arthrotomy after 5 months showed the fragment in an unchanged position and healed in completely, so that we refrained from removing the metall.

With autologous corticalis nails out of the tuberositas tibiae, we refixed a large chondral fragment of the lateral femoral condyle (Figs. 7–10). After 5 months, the patient had no more complaints and only a slightly restricted mobility. The knee was slightly swollen. Radiologically the fragment appeared to have healed in perfectly according to the position of the corticalis nails. It was most astonishing when the arthroscopy showed that the cartilage shell in situ had a gating protuberance of 3–5 mm.

Our results confirm the experience of other authors that larger osteochondral fragments of the femoral condyle and the joint surface of the patella should be refixed. In cases of pure chondral fractures, the fragment should measure at least $1\,cm^2$ and should also not be split in order to allow for a sutureless re-implantation. Before refixation, the bony bed should be pierced with Pridie-holes. For refixation the use of Smillie pins has shown good results—an experience that we could confirm several times by refixation of osteochondral fragments in other joints. Due to the minimal defect in substance, their use in cartilage is most sparingly and is the simplest method for re-implantation. The fixation of the chondral fragments is mechanically sufficient, so that early mobilization without weight-bearing is possible, a fact which enhances a perfect healing of the damaged cartilage. If the head of the pin can be counter-sinked, we prefere not to

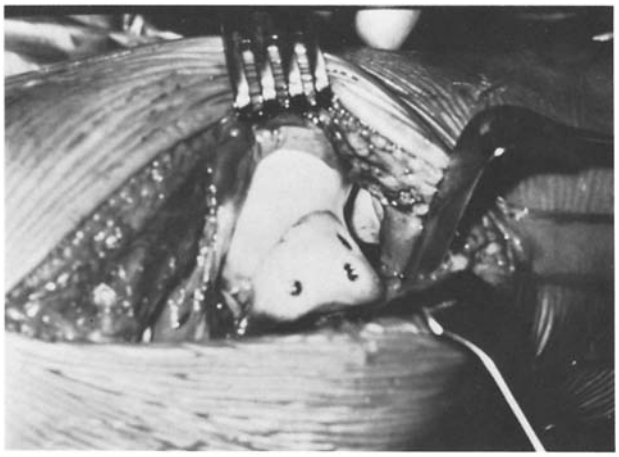

Fig. 1

Fig. 4

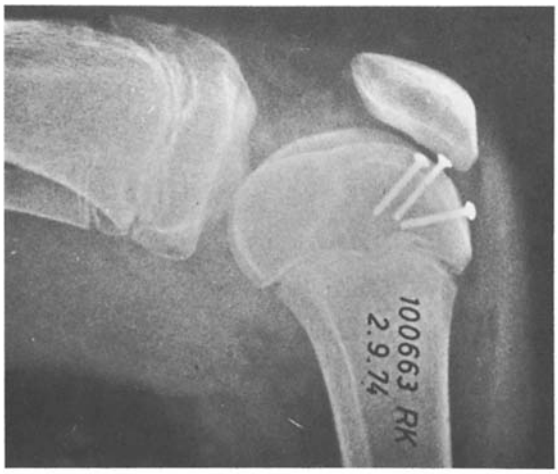

Fig. 2

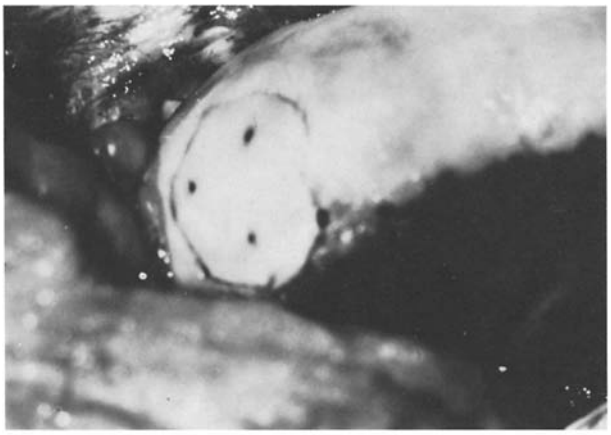

Fig. 5

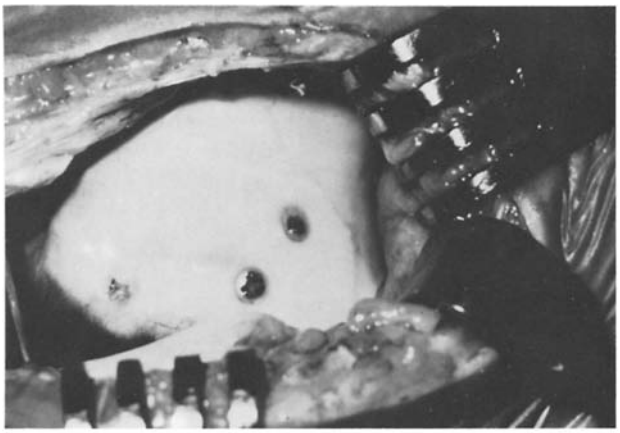

Fig. 3

Figs. 1–3. A $4 \times 2\,cm^2$ large pure chondral fragment of the lateral femoral condylus is refixed with ASIF mini-screws (Figs. 1 and 2). After 15 weeks the cartilage nearly covers the screws (Fig. 3)

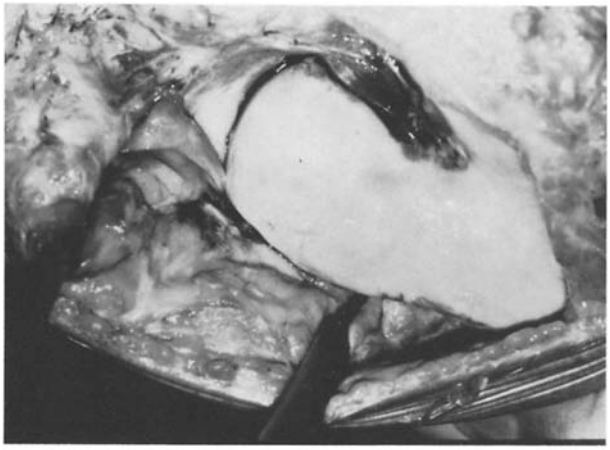

Fig. 6

Figs. 4–6. A $4 \times 2\,cm^2$ large chondral fragment of the lateral femoral condyle (Fig. 4) is refixed with Smillie pins (Fig. 5). After 15 months the fragment is healed in perfectly. The metal is almost completely covered by newly built cartilage (Fig. 6)

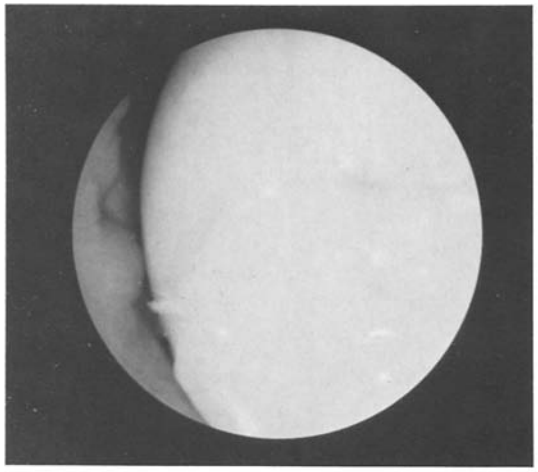

Fig. 7

Fig. 8

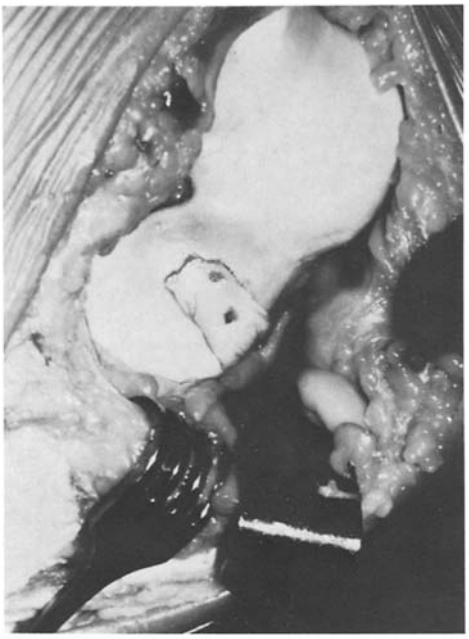

Fig. 9

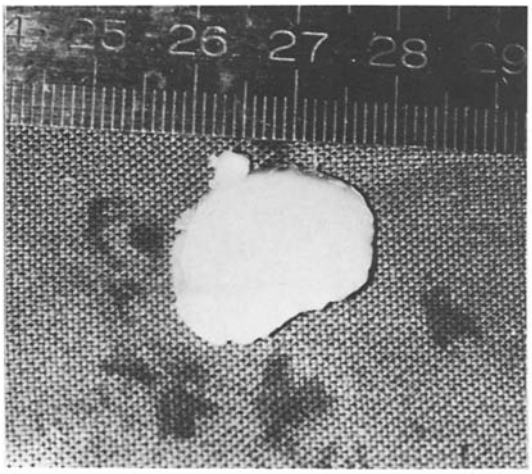

Fig. 10

Figs. 7–10. A $2 \times 1.5\,cm^2$ large chondral fragment from the condylus (Figs. 7 and 8) is refixed with autologuos corticalis nails (Fig. 9). After 5 months the arthroscopy shows that the cartilage shell has protuberated (Fig. 10)

remove the metal since this will cause new defects in the cartilage surface.

For larger osteochondral fragments, we prefer counter-sinked ASIF small fragment screws since they guarantee a high mechanical stability and allow for early mobilisation. Corticalis nails as a substitute for Smillie pins enable sufficient fixation in small fragments.

For a macroscopical evaluation of the healing process an arthroscopical control 3–5 months postoperatively has prooved to be most reliable in our study.

References

Ahstrom JA (1965) Osteochondral fracture in the knee associated with hypermobility and dislocation of the patella. J Bone Jt Surg 47-A

Bandi W (1977) Die retropatellaren Kniegelenksschäden. Akt Probleme Chir Orthop 4

Bandi W (1972) Chondromalacia patellae. Helv Chir Acta Suppl 11

Bandi W (1974) Zur Frage der traumatischen Auslösung einer Chondromalazie. Orthopädie III:20

Ganz R, Jakob RP Verletzung des Gelenkknorpels. Therapeut Umschau
Ganz R (1972) Isolierte traumatische Knorpelläsionen am Kniegelenk. Hefte Unfallheilk 11:146
Ganz R, Burri C, Rüter A (1976) Knorpelschaden am Knie. Isolierte Knorpelabscherungen am Kniegelenk. Hefte Unfallheilk 127:79
Helfert AJ (1963) The management of internal desarrangements of the knee 19
Kehr H, Hierholzer G (1977) Diagnostik und Therapie von Knorpelverletzungen des Kniegelenkes. Unfallheilkunde 80: 95–99
Kunitsch G, Moore G, Oesten HJ Röntgenuntersuchung des Knorpelschadens am Kniegelenk. 4. Reisenburger Workshop
Mercer Range: Children's fractures. JB Kippincott Company
Tachyian MO: Pediatric orthopedics. WB Saunders Company
Morscher E (1976) Traumatische Knorpelimpression an den Femurkondylen. Hefte Unfallheilk 127
Muhr G (1976) Der frische Knorpelschaden. Hefte Unfallheilk 1927:59–70
Müller-Färber J (1978) Die Patellaluxation. Unfallheilkunde 81:6–13
Wagner H (1972) Traumatische Knorpelschäden und Behandlung. Unfallheilkunde 110:140
Wagner H (1974) Traumatische Knorpelschäden des Kniegelenkes. Orthopädie 3:208

Received March 20, 1980