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*SURGICAL EXPOSURES
SURGERY OF THE KNEE*

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A surgeon should be familiar with several approaches to the knee region since each exposure has advantages and disadvantages. Adequate exposure, a minimum of retraction and intraoperative X-rays are important. Current techniques recommend early mobilization of the knee which means that soft tissue damage should be minimized, muscle splitting avoided wherever possible with accurate, strong repair of all tissues.

LATERAL APPROACH TO THE DISTAL FEMUR AND KNEE

This approach is most useful for internal fixation of supracondylar and transcondylar fractures permitting wide exposure of the distal femur in spite of limited exposure of the femoral condyles.

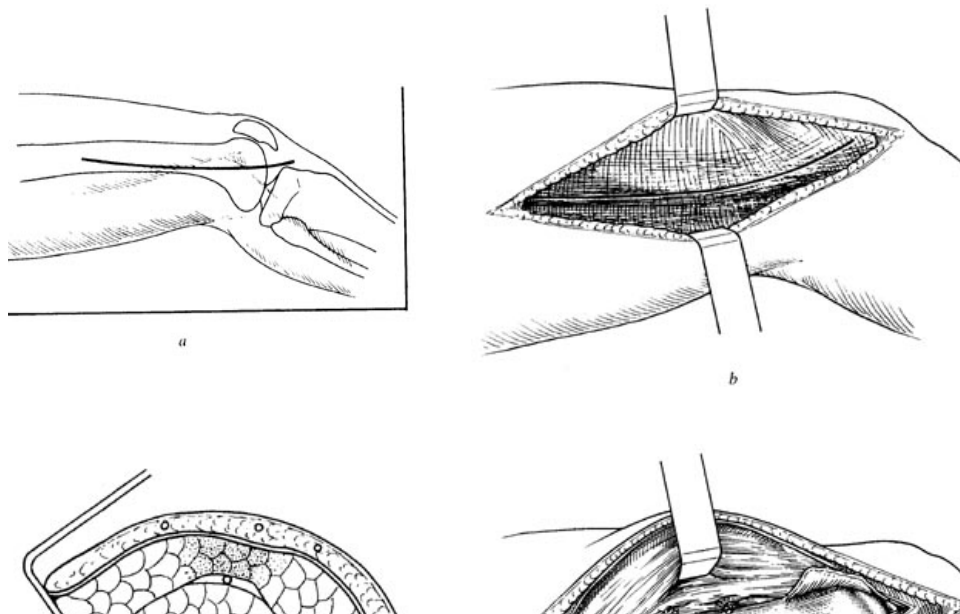
The patient is supine on a regular operating table with a roll under the ipsilateral buttock permitting up to 90° knee flexion. A sterile tourniquet may be used.

The skin is incised laterally along the anterior margin of the iliotibial band as far proximal as necessary, extending distally beyond the knee joint and curving anteriorly towards the tibial tubercle (Fig. 10-1 a).

The fascia is split along the anterior border of the iliotibial band down to its attachment to Gerdy's tubercle. The fibres, which form the patellar retinaculum, are thus cut and can be retracted anteriorly (Fig. 10-1 b).

The intermuscular septum is identified and the vastus lateralis, detached and retracted anteromedially, ligating the blood vessels which penetrate the septum (Fig. 10-1 c and d).

Lateral approach to the distal femur and knee



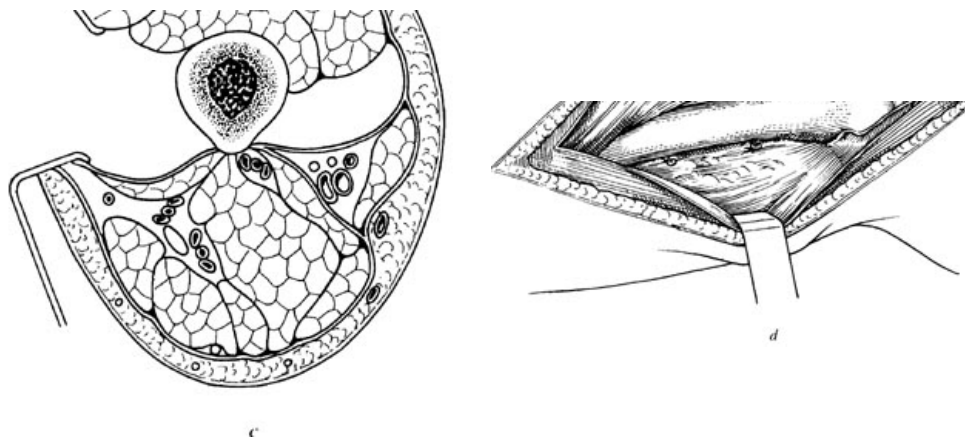


Fig. 10-1. - Lateral approach to the distal femur and knee.

- a) Distal lateral skin incision.
- b) Skin incision held apart by retractors. The enveloping fascia of the thigh and iliotibial band are shown.
- c) Cross section through lower thigh.
- d) Exposure of distal femur and knee capsule; division and ligation of vessels.

Retraction of the vastus lateralis and intermedius exposes the supracondylar region. The capsule of the knee joint is incised anterior down to the femoral attachment of the collateral ligament. The superior lateral geniculate vessels are identified and ligated.

Self retaining retractors are useful to provide adequate exposure for insertion of internal fixation devices for uncomplicated supra and intercondylar fractures.

Closure of the capsule and fascia restores the deep anatomical relationships and permits early mobilization of the knee.

EXTENSILE LATERAL APPROACH TO THE DISTAL FEMUR, FEMORAL CONDYLES AND KNEE JOINT

This approach, although infrequently needed, is most useful for internal fixation of comminuted distal femoral fractures with extensive femoral condylar disruption. It permits a complete and comprehensive view of the entire distal femur as well as of both femoral condyles.

The patient is positioned with a tourniquet in place and a large roll under the thigh to permit 90° of knee flexion. The skin is incised along the anterior border of the iliotibial band, oriented anteriorly over the femoral condyle and extending over the tibial crest just distal to the tibial tubercle (Fig. 10-2 a).

The fascia is split along the anterior border of the iliotibial band from Gerdy's tubercle as far proximally as needed. Identify the intermuscular septum, dissect the vastus lateralis from it and then retract the vastus anteriorly exposing the distal femoral shaft, after ligating perforating vessels as encountered (Fig. 10-2 b).

Open the knee joint capsule and synovium laterally as far down as the tibial tubercle. Expose the tubercle and the patellar tendon.

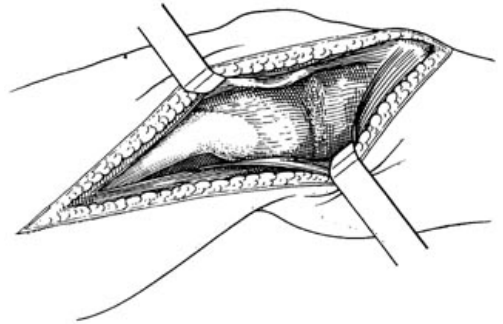
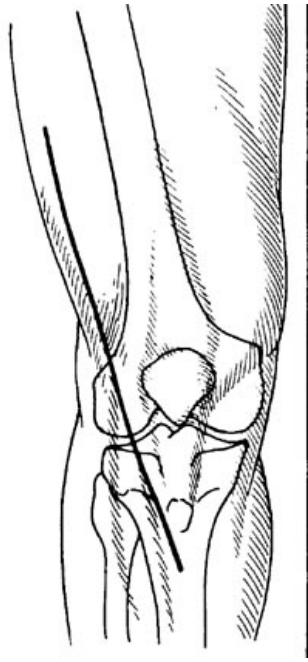
By freeing proximally and distally, it is sometimes possible to gain adequate exposure by dislocating the patella medially. If not, it is necessary to osteotomize the tibial tubercle (Fig. 10-2 c).

If more complete exposure is needed, especially of the medial femoral condyle, make small drill holes at the margins of the tibial tubercle. Overdrill the center hole for later lag screw fixation (Fig. 10-2 d).

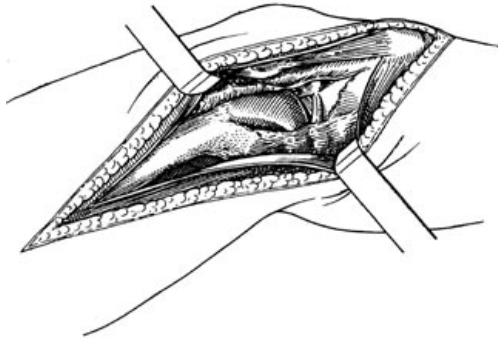
Join the outer drill holes inserting a small osteotome rather deeply, in order to remove a substantial block of bone along with the tibial tubercle. When this is removed, free the tendon from the infrapatellar fat pad and make a medial parapatellar capsular incision to retract the patellar mechanism proximally and medially (Fig. 10-2 e).

Closure is effected by replacing the tubercle block and fixing it with a single cortical screw (usually with a washer) which engages the posterior cortex. Soft tissue closure is achieved with interrupted sutures and early mobilization of the knee is recommended (Fig. 10-2 f).

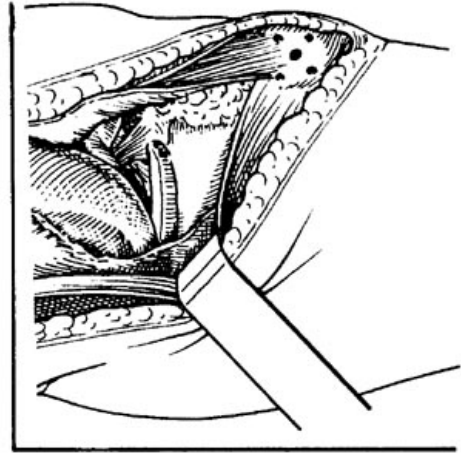
Extensile approach to the distal femur, femoral condyles and knee joint



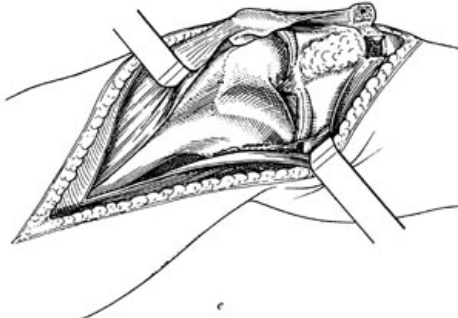
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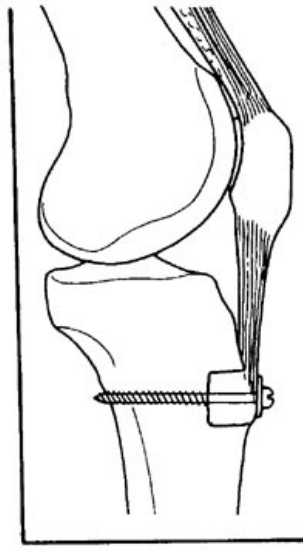
c



d



e



f

Fig. 10.2. - Extensile approach to the distal femur, femoral condyles and knee joint.

- a) Skin incision.
- b) Fascia opened along anterior edge of iliotibial band. Capsule not yet opened.
- c) Oblique view with exposed distal femur, patella, patellar tendon, and proximal tibia.
- d) Preparation of the osteotomy of the tibial tubercle with drill holes at the 4 corners of the tubercle. A central, slightly larger, drill hole is prepared in the middle of the tubercle.
- e) Retractors holding extensor mechanism medial to femoral condyles. The patellar tendon and tibial tubercle elevated and detached from tibia.
- f) Lateral view with tubercle in place, held by a cortical screw and a washer.

Alternately, Henry recommended to approach the distal femur and femoral condyles by dissecting between the vastus lateralis (which is reflected posteriorly) and the quadriceps tendon to facilitate medial patellar dislocation without osteotomizing the tibial tubercle.

LATERAL APPROACH TO THE KNEE AND PROXIMAL TIBIA

This approach is used for open reduction of the lateral tibial plateau and for repair or reconstruction of lateral collateral and capsular ligaments.

The patient is supine with a roll under the ipsilateral buttock and the knee flexed to 90° with a tourniquet in place. The skin incision starts at the lateral femoral condyle, extends obliquely distal and anterior, curves posteriorly 1 cm behind the patellar tendon, for a distance of 5 cm. When required, the distal limb can be extended (Fig. 10-3 a).

The retinaculum is opened in the line of skin incision. Flexion of the knee to 90° may permit preservation of the iliotibial band attachment to Gerdy's tubercle. More complete visualization is possible by dividing this attachment. Elevate the muscles from the flare of the upper tibia taking care not to injure the anterior tibial artery which passes from posterior to anterior between the proximal tibia and fibula (Fig. 10-3 b).

Intra-articular visualization is possible by transversely dividing the meniscotibial ligament from anterior to posterior as far posterior as the lateral collateral ligament. Varus stress on the knee provides good articular visualization (Fig. 10-3 c).

Should posterior articular exposure be insufficient, the lateral collateral ligament can be divided obliquely and later resutured (Fig. 10-3 d).

At closure, the lateral meniscus is first resutured to the tibia; all of the divided structures must then be firmly reapproximated with interrupted sutures.

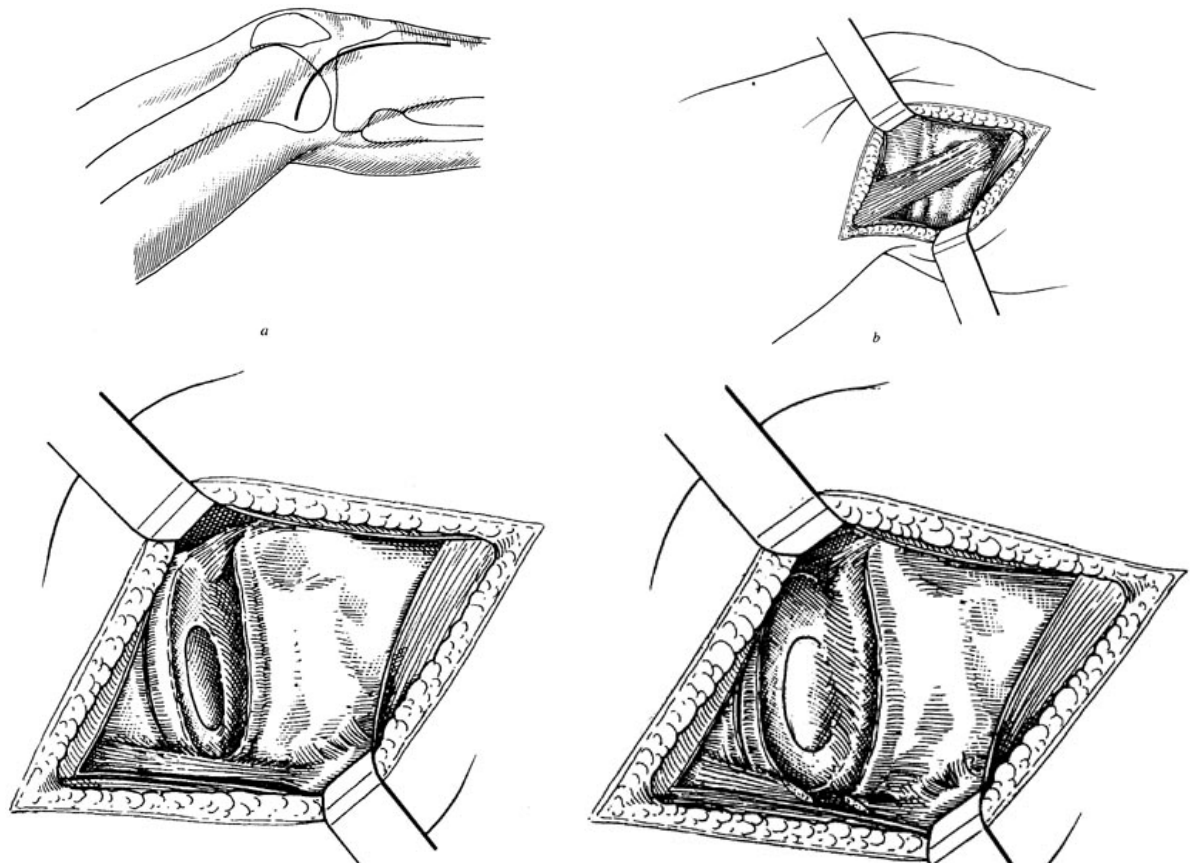




Fig. 10-3. - Lateral approach to the knee and proximal tibia.

- a) Skin incision.
- b) Muscles and periosteum elevated from proximal tibia preserving the iliotibial band attachment to Gerdy's tubercle.
- c) Varus stress to open the knee joint after the meniscotibial ligament has been cut. Lateral meniscus is reflected proximally with lateral femoral condyle. Lateral tibial plateau is thus exposed.
- d) Wider posterior exposure following section of the lateral collateral ligament.

ANTEROMEDIAL APPROACH TO THE DISTAL FEMUR AND KNEE

This approach is most frequently used for knee arthroplasty or tumor resection.

The patient is positioned to permit at least 90° of knee flexion during the procedure. A tourniquet is usually applied to expedite the procedure and is deflated prior to closure.

The skin is incised at the anterior midline from about 12 cm above the patella curving slightly medially around the patella and extending to below the tibial tubercle (Fig. 10-4 a), exposing the quadriceps tendon and fascia (Fig. 10-4 b). Alternately the skin incision is straight and midline.

The vastus medialis is separated from the quadriceps tendon and the patellar retinaculum is divided near the patella leaving enough tissue for later re-attachment. Make certain that the retinaculum and capsule are divided distally as far as the tibial tubercle (Fig. 10-4 c).

Open the synovial membrane to expose the joint (Fig. 10-4 d).

Dislocate the patella laterally with the knee extended and flex the knee to 90°. This provides a comprehensive view of the femoral condyles and tibial plateau (Fig. 10-4 e).

For access to the femoral shaft, the vastus intermedius is also split.

Closure is by interrupted sutures, preferably with the knee partially flexed, testing the suture lines at 90° of flexion after closure of the fascial planes.

Anteromedial approach to the distal femur and knee

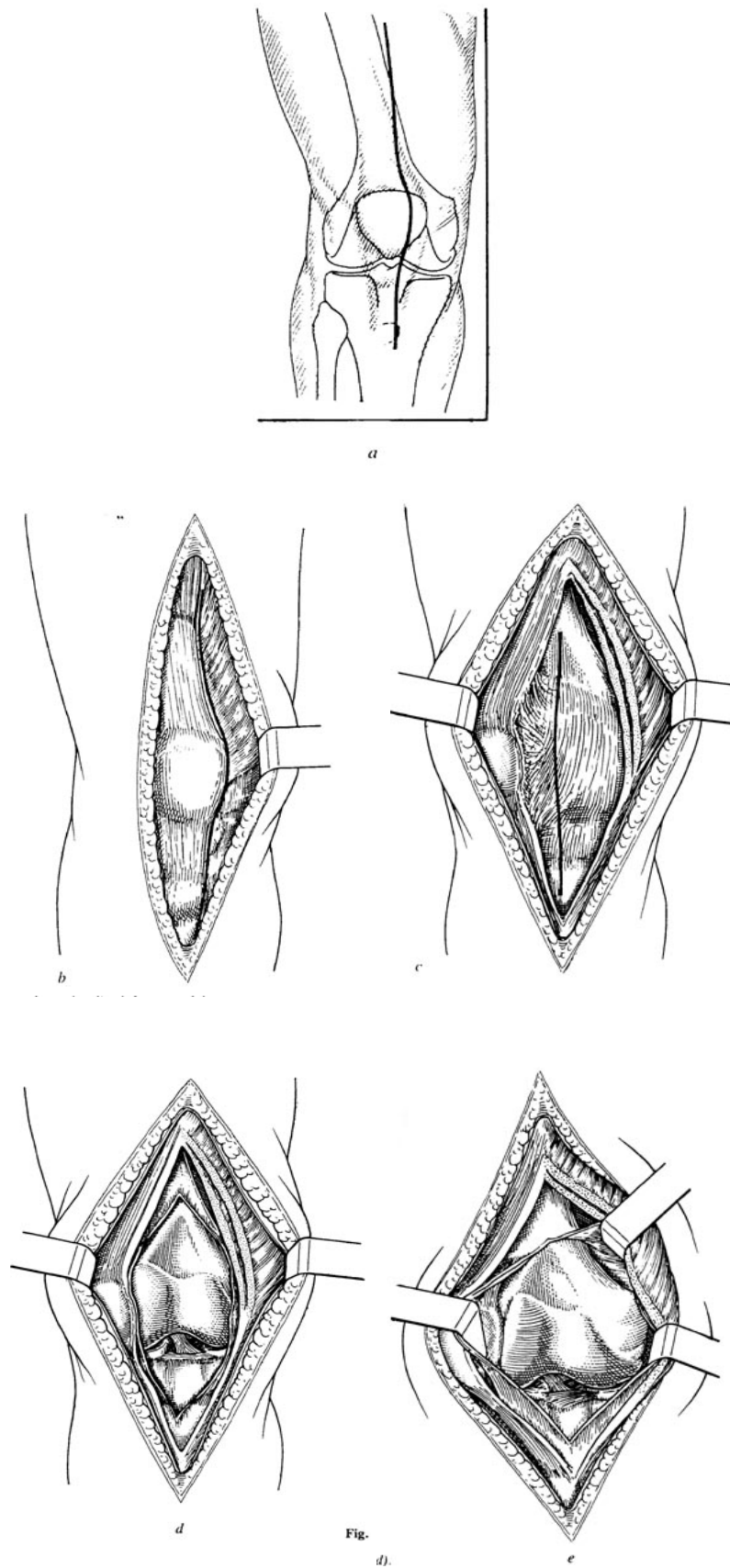


Fig. 10-4. - Anteromedial approach to the distal femur and knee.
a) Skin incision.
b) Exposure of the patella, quadriceps tendon, vastus medialis, knee capsule. Incision line of the deep structures.

- c) Cut between quadriceps tendon and vastus medialis then of the retinaculum, one centimetre from patella, as far distal as the tibial tubercle. Synovial membrane incision.
- d) Exposure of femoral condyles, distal femur and proximal tibia after incision of the synovial membrane.
- e) Knee bent to 90° with patella dislocated to the lateral side of the lateral femoral condyle.

MEDIAL UTILITY APPROACH TO THE KNEE

This is a useful approach for the repair of medial ligament injuries and fractures of the medial tibial plateau.

The patient is positioned with a roll under the opposite buttock and a tourniquet in place. The skin incision starts proximal to the medial femoral condyle, extends distally 2 to 3 cm medial to the patella and curves posteriorly at the level of the tibial tubercle (Fig. 10-5 a).

The retinaculum is incised creating a definite angle proximally (for more accurate closure). (Fig. 10-5 b).

Retraction exposes the superficial medial collateral ligament, the posterior oblique ligament (posterior capsule) and the pes anserinus tendons (Fig. 10-5 c).

Arthrotomy may be performed through an anteromedial capsular incision. If desired, the medial plateau may be exposed anteriorly. Knee flexion moves the collateral ligament posteriorly and facilitates the preservation of the semimembranosus attachments (Fig. 10-5 d).

The posterior aspect of the joint may be exposed by incising the attachments of the posterior oblique ligament to the medial collateral ligament. This exposes the posteromedial corner and the posterior aspect of the medial meniscus (Fig. 10-5 e).

Closure of the capsular structures should be with interrupted sutures taking special care to approximate the posterior oblique ligament to the medial collateral ligament.

Medial utility approach to the knee

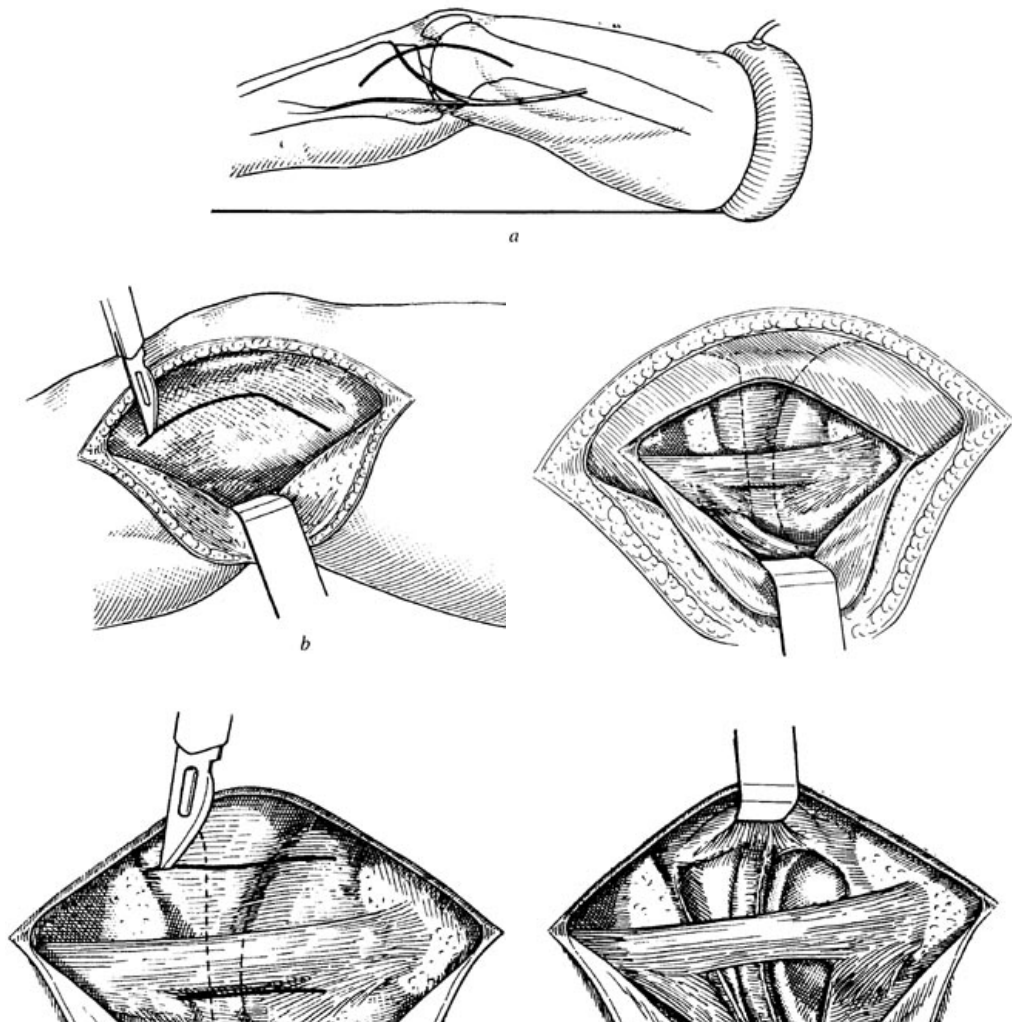




Fig. 10-5. - *Medial utility approach to the knee.*

- a) Skin incision.
- b) Line of retinacular incision.
- c) Retraction of retinaculum exposing medial collateral ligament, posterior oblique ligament, semimembranosus tendon.
- d) Incisions for anterior or posterior arthrotomy.
- e) Possibilities of anteromedial or posteromedial exposure.

POSTERIOR APPROACH TO THE KNEE

This approach is used for the removal of popliteal cysts or neoplasms, as well as for the repair or reconstruction of posterior cruciate ligament injuries.

The patient is positioned prone with a tourniquet in place. The skin is incised beginning a few centimetres proximal to the popliteal skin crease, along the semitendinosus tendon, then curves across the popliteal space and turns distally over the lateral gastrocnemius (Fig. 10-6 a).

Incise the fascia in the line of skin incision (Fig. 10-6 b).

Identify the medial sural nerve as it passes in the midline, superficial to the fascia (Fig. 10-6 c).

Trace the nerve proximally until it is seen to join the medial popliteal nerve. Then trace the medial popliteal nerve distally, across the back of the knee, until it becomes the tibial nerve. The popliteal artery and vein lie anterior and slightly medial to the tibial nerve (Fig. 10-6 c).

Retract these structures medially, and the lateral popliteal nerve, laterally to expose the posterior capsule of the knee and the two heads of the gastrocnemius muscle (Fig. 10-6 d).

Closure of the popliteal fascia, subcutaneous tissue and skin is with interrupted sutures.

Posterior approach to the knee

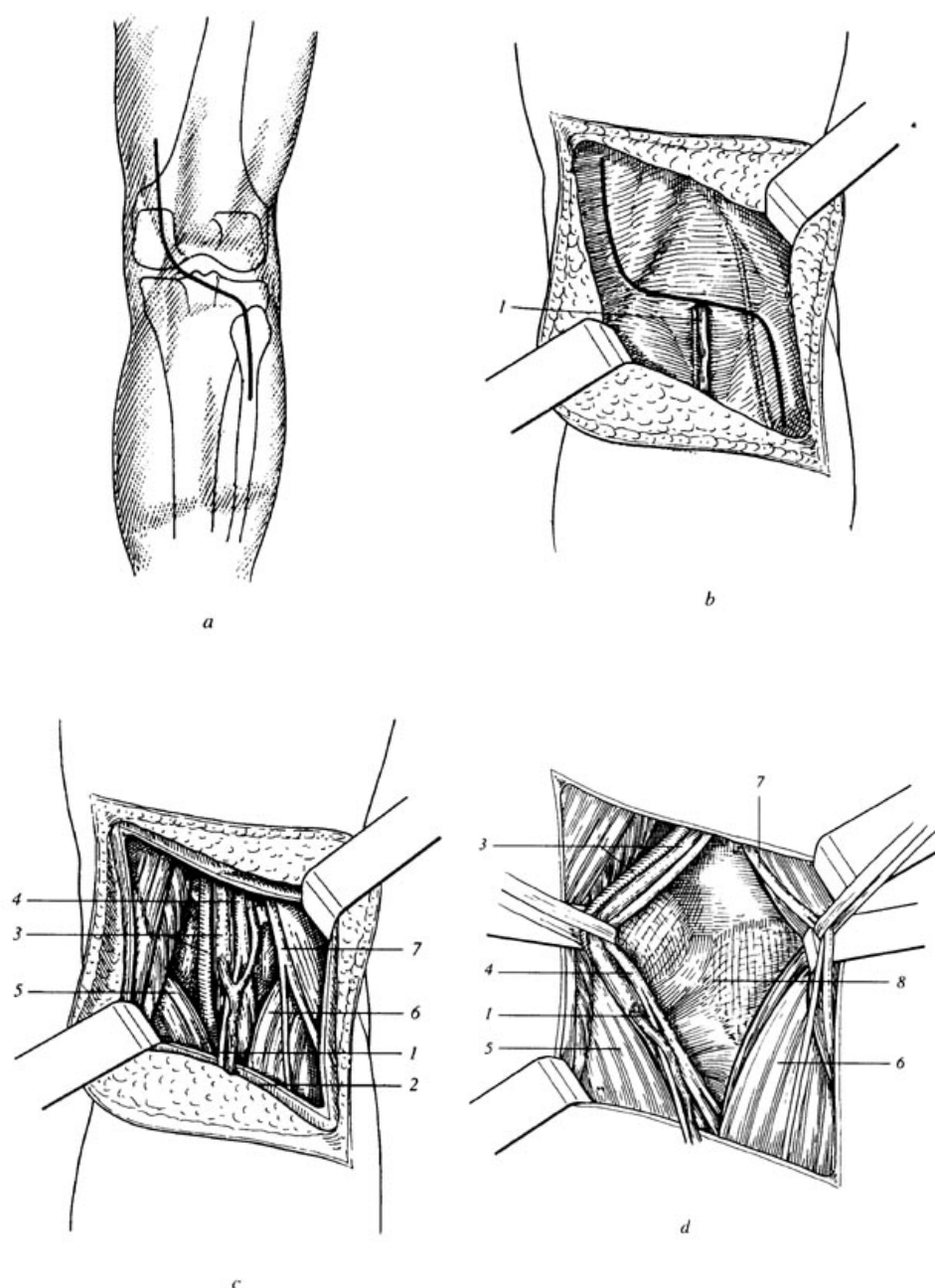


Fig. 10.6. - *Posterior approach to the knee.*

a) Skin incision.

b) Fascial incision.

c) Exposure of sural nerve (1) superficial to fascia, and of popliteal vessels (3) with medial popliteal nerve (4), slightly posterior and lateral, between medial (5) and lateral (6) heads of of gastrocnemius.

d) Sural nerve (1), medial popliteal nerve (4) and popliteal vessels (3) retracted medially and lateral popliteal nerve (7) retracted laterally to expose medial and lateral heads of gastrocnemius and posterior capsule (8) of knee joint.

ANTERIOR, TRANSVERSE APPROACH TO THE PATELLA AND KNEE

The approach may be used for reduction of patellar fractures, for patellectomy or for knee fusion. Many surgeons prefer a longitudinal incision.

The skin is incised transversely from the medial to the lateral femoral epicondyles curving distally at either end (Fig. 10-7 a).

The subcutaneous tissue is dissected widely from the retinaculum exposing the patellar tendon, patella and quadriceps tendon (Fig. 10-7 b).

Anterior, transverse approach to the patella and knee

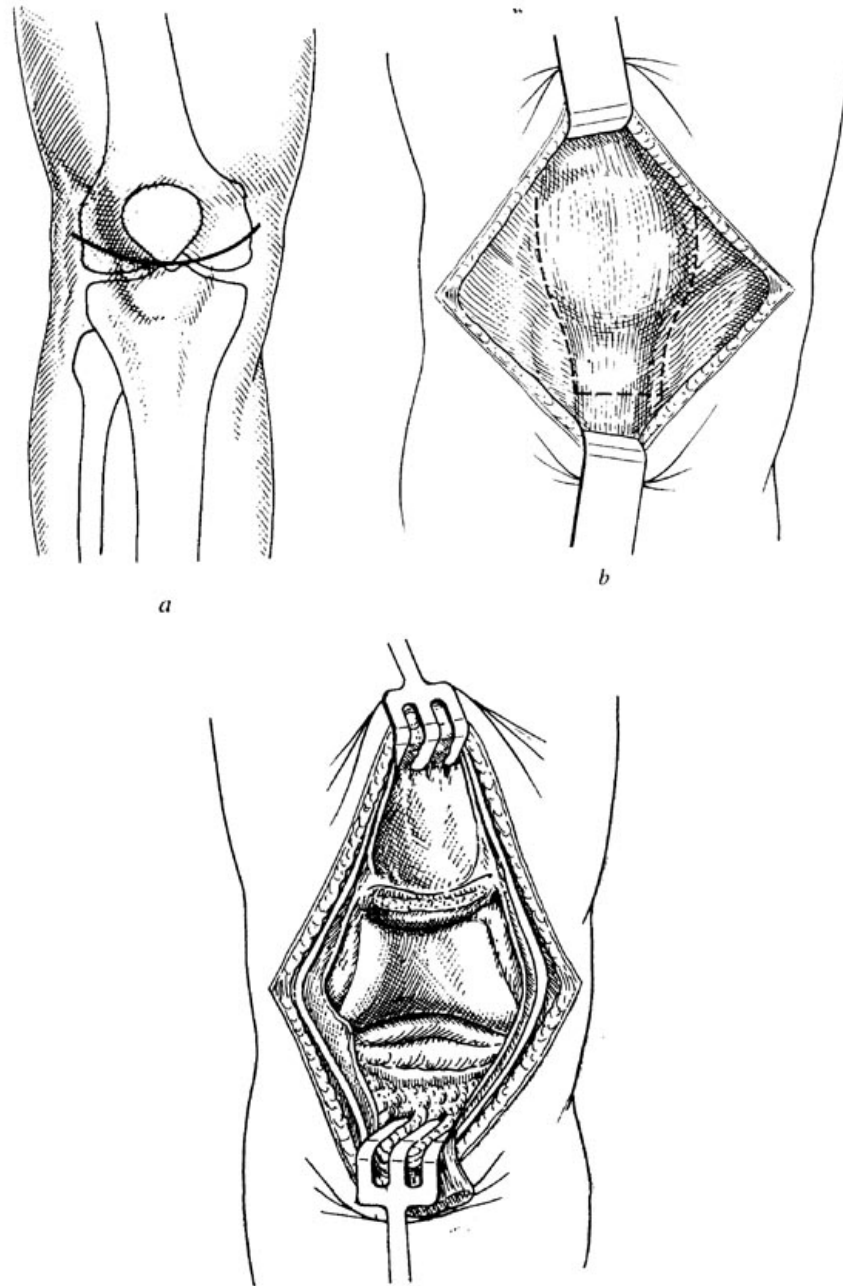


Fig. 10-7. - Anterior, transverse approach to the patella and knee joint.
a) Line of skin incision.
b) Subcutaneous tissues dissected and retracted to expose patella, quadriceps tendon, patellar tendon and patellar retinaculum.
c) Patellar tendon divided and retracted proximally exposing the femoral condyles and menisci.

The patella is retracted superiorly and the patellar tendon is divided inferiorly cutting the expansions to gain wider exposure (Fig. 10-7 c).

Closure requires suture of the patellar tendon and its expansions.

