

The Blind Spots in Arthroscopic Approaches

An Anatomical Study

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Summary. *Fifty-six knees from preserved cadavers were examined in order to compare the blind spots in different approaches to the knee during arthroscopy.*

After dissection of the skin pins were placed to define the main ligamentous structures of the knee, and arthroscopic examination was then carried out using a 30° Storz telescope.

The blind spots were defined for each approach.

The central approach gives a wide visualisation of the posterior compartment and has a smaller blind area than other approaches.

Résumé. *L'étude anatomique de 56 genoux de cadavre a permis de comparer les «angles morts» en fonction des différents points d'introduction de l'arthroscope.*

Après dissection des téguments, nous avons placé des aiguilles dans les ligaments du genou. Puis nous avons introduit l'arthroscope avec une optique Storz de 30°, ce qui a permis de repérer les «angles morts» pour chaque abord.

En conclusion, l'abord transtendineux nous a donné la meilleure vision des compartiments postérieurs en même temps que des «angles morts» plus petits que par les autres abords.

Key words: *Arthroscopy, Knee joint*

Each arthroscopic approach to the knee has a blind area which cannot be directly viewed [2, 4]. Manipulation with a Kirshner wire, needles or nervehooks is often useful in demonstrating lesions of the meniscal blind area [1], but does not help the identification of lesions situated in the parts of the capsular ligaments which cannot be visualised. The multiple puncture technique is usually used [6] but this inevitably involves leakage of the distending medium especially when a large bore arthroscope is used.

We have studied the main approaches used in arthroscopy in the cadaveric knee in order to determine the blind spots when viewing the capsular ligaments.

Material and Methods

We investigated the following approaches (Fig. 1):

1. anteromedial
2. central transtendinous
3. anterolateral
4. posteromedial
5. posterolateral
6. suprapatellar
7. lateral parapatellar

Fifty-six knees were used from preserved cadavers. After careful mobilization of the limb to eliminate postmortem rigor the knee was washed and then distended with tap water. The site of entry was located and careful dissection of the skin and subcutaneous tissue carried out. A preliminary arthroscopic examination was then performed using a 5 mm 30° Storz telescope. The principal structures of the capsular ligaments were identified and pins were passed into the joint to indicate the position of their main landmarks. A further arthroscopic examination was then carried out to establish the position of the pins within the joint. The blind areas were determined and arthrotomy was then carried out in order to accurately define the extent of these areas and the structures contained within them.

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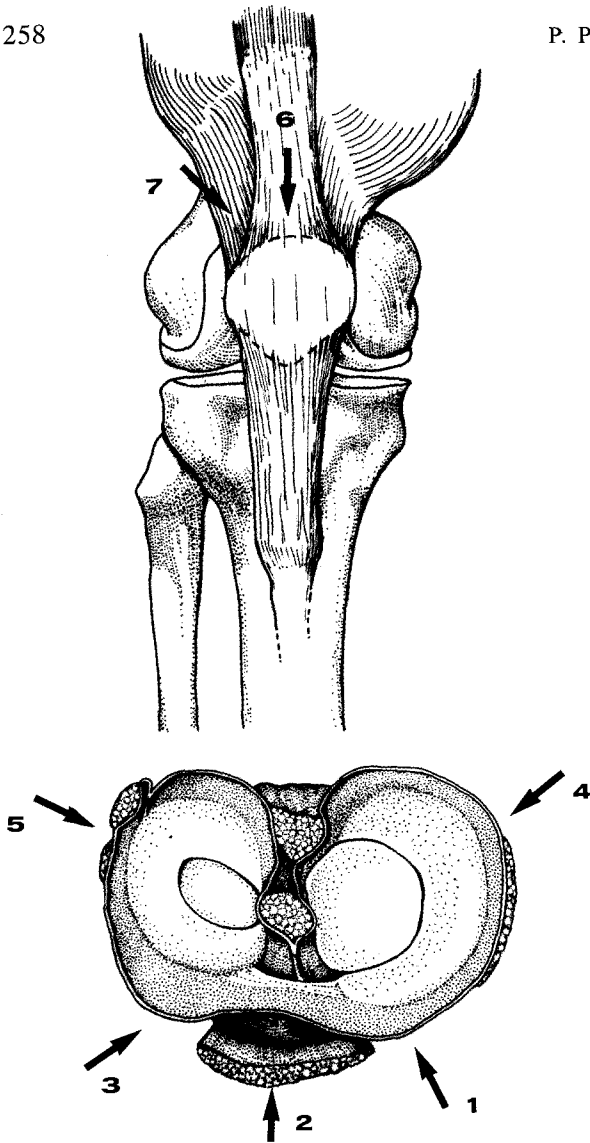


Fig. 1. The selected approaches. 1 Anteromedial; 2 Central; 3 Anterolateral; 4 Posteromedial; 5 Posterolateral; 6 Suprapatellar; 7 Lateral parapatellar

Results

Suprapatellar Approach

The site of entry was 2 cm proximal to the upper pole of the patella. This approach offered an optimal view of the patellofemoral joint, the fat pad and the intercondylar notch (Fig. 2b).

By sliding the arthroscope along the medial or lateral surface of the femoral condyle with the knee slightly flexed the femoral insertions of the collateral ligaments could be examined (Fig. 2a).

Lateral Suprapatellar approach

The site of entry was 3 cm proximal and lateral to the superior pole of the patella. The anteromedial capsule could not be seen but there was less risk of contamination of the drapes than in the previous approach.

Central Approach

The site of entry was 1 cm proximal to the surface of the tibial plateau, passing through the midline of the patellar tendon. This approach was first described by Gillquist and Hagberg [3].

When the joint was well distended a good view of the medial capsule was obtained beyond the posterior border of the medial collateral ligament (Fig. 3a). The lateral compartment could be

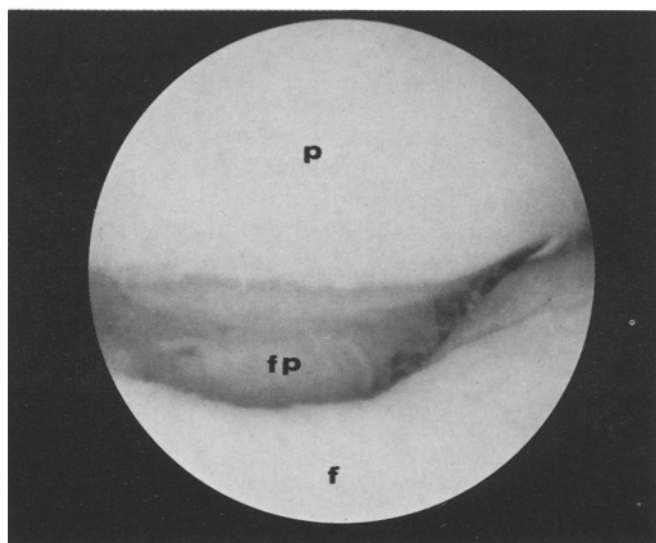


Fig. 2 a and b. Suprapatellar approach. **a** The medial collateral ligament is identified by pins. **b** Endoscopic view of patellofemoral joint. *p*: patella; *f*: femoral groove; *fp*: fat pad

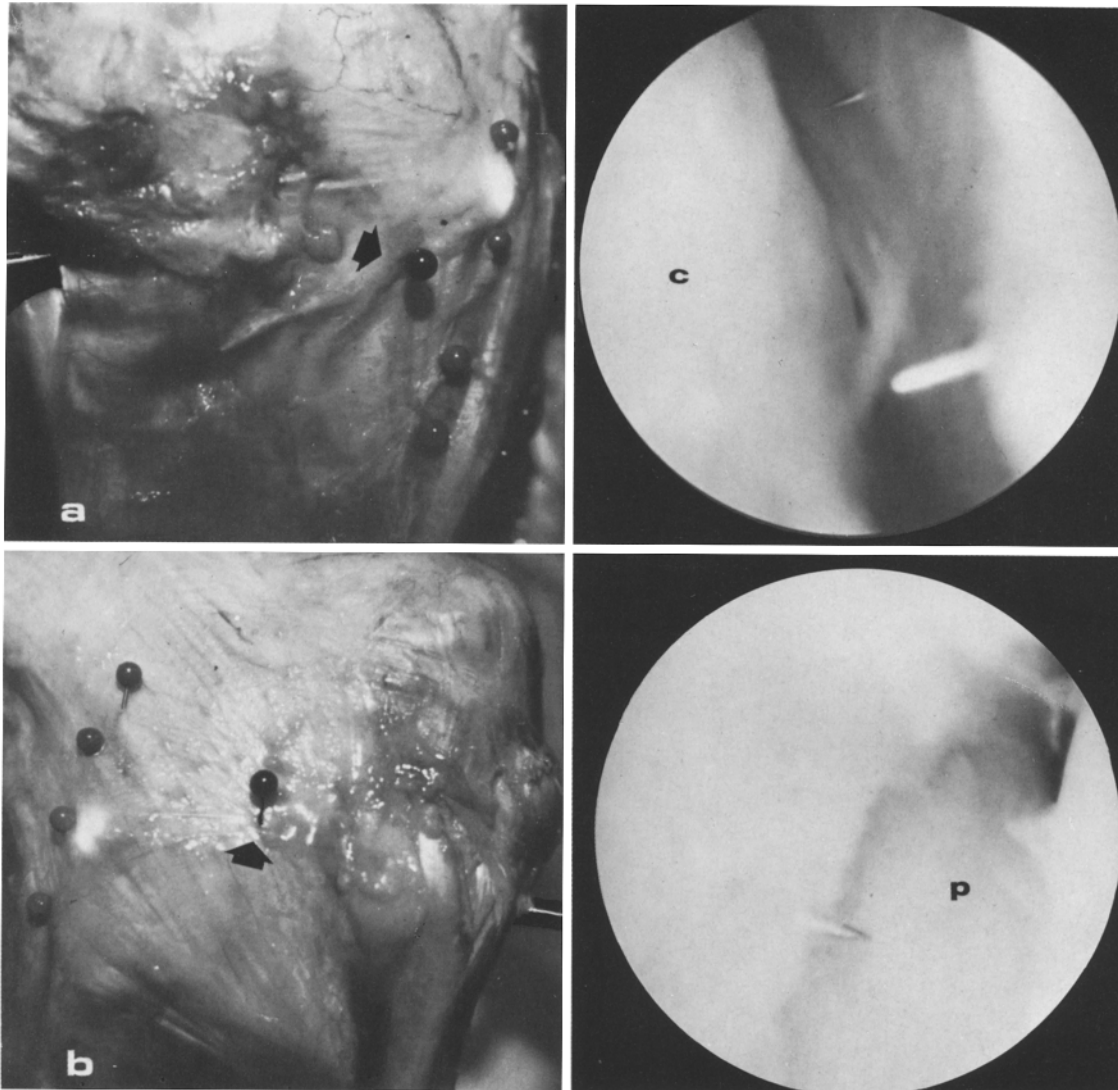


Fig. 3 a and b. Central approach. The *arrows* indicate the joint line
a Medial side: The posterior oblique ligament is visible beyond the pins which are placed in the edges of the medial collateral ligament. The endoscopic view is on the right. (*c* = femoral condyle); **b Lateral side:** The pins are placed in the fibular collateral ligament. The endoscopic view is on the right. (*p* = popliteus tendon)

visualised as far as the femoral insertion of the popliteus tendon and the fibular collateral ligament, which blocked further advancement of the arthroscope (Fig. 3b).

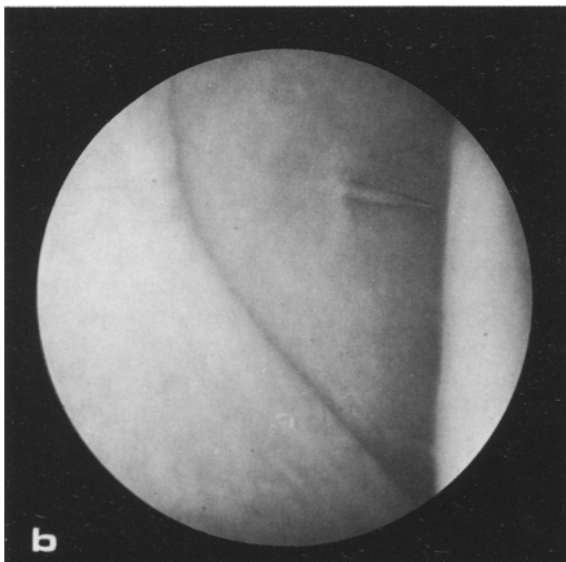
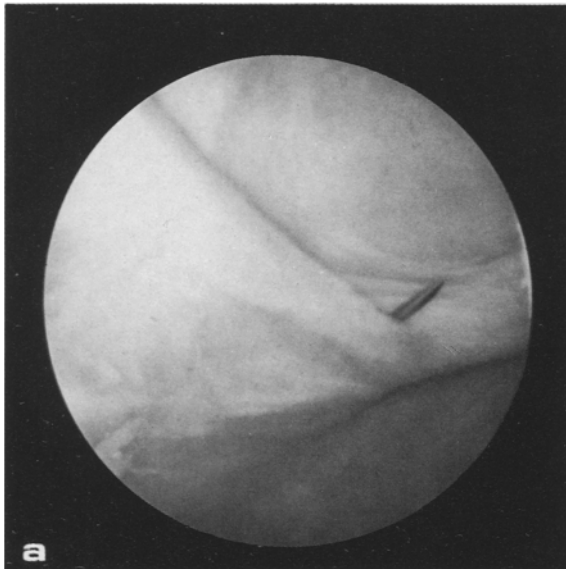
Passing under the posterior cruciate ligament the arthroscope easily reached the posteromedial (Fig. 4) and posterolateral compartments (Fig. 5 and 8a).

Anteromedial Approach

The site of entry was about 1 cm above the pal-

pable joint line and 1,5 cm medial to the patellar tendon. This approach allowed examination of the medial compartment as far as the posterior oblique ligament (Fig. 6a) but the curvature of the lateral femoral condyle prevented access to the medial third of the lateral capsule.

The fibular collateral ligament could only be examined from the joint line (Fig. 6b). The posterolateral and posteromedial compartments were reached without difficulty, but the posterior cruciate ligament was stretched during posteromedial viewing (Fig. 8b).



Anterolateral Approach

The site of entry was about 1 cm from the tibial articular edge and 1 cm from the patellar tendon.

This approach did not offer a good view of the medial capsule, the arthroscope reaching only as far as the anterior edge of the medial collateral ligament (Fig. 7a). The blind area included most of the posteromedial capsule. Laterally the arthroscope could be introduced as far as the insertion of the popliteus tendon and the fibular ligament, but the tension and the adherence of these structures to the lateral femoral condyle prevented further progress (Fig. 7b).

The blind spot was similar to that encountered in the central transtendinous approach and included the posterolateral part of the capsule. The curve of the lateral femoral condyle and the height of the medial intercondylar eminence allowed the arthroscope to move solely in a forward and oblique direction. Consequently only the posteromedial compartment could be relatively easily reached (Fig. 8c).

Posteromedial Approach

The site of entry was posterior to the medial collateral ligament and about 5–10 mm above the joint line. The entire posterior capsule could be viewed as far as the posterior cruciate ligament which could be examined for most of its intra-articular course. The upper surface of the posterior horn of the meniscus and its capsular insertion could be seen [5].

Posterolateral Approach

The site of entry was between 5 and 10 mm above the joint line, just behind the fibular collateral ligament. The posterolateral capsule could be viewed as far as the posterior cruciate ligament.

Discussion

Our findings suggest that the posterior part of the lateral capsule which is situated posterior to the femoral insertion of the popliteal tendon cannot be seen through any anterior approach. It can be

Fig. 4 a and b. Central approach. Posteromedial compartment: In the *upper picture* one pin has been placed in the capsular arm of the semimembranosus tendon and is visible in the endoscopic view **a**. The *arrow* points to the pin inserted at the medial head of gastrocnemius which is visible in the endoscopic view **b**

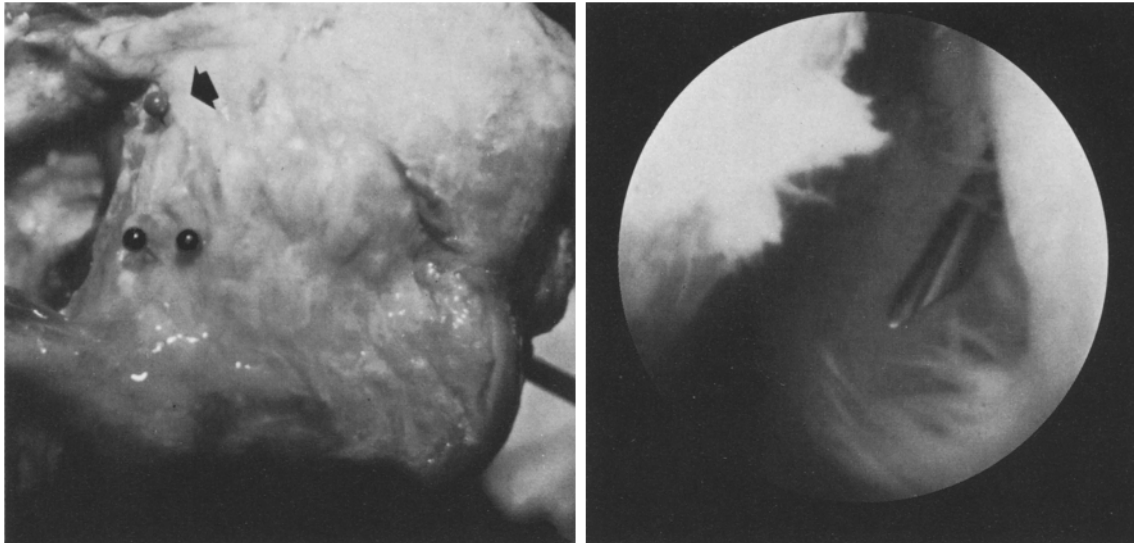


Fig. 5. Central approach. Posterolateral Compartment: Two pins are inserted at the popliteus tendon. The *arrow* indicates the pin at the lateral head of gastrocnemius which can be seen in the endoscopic view

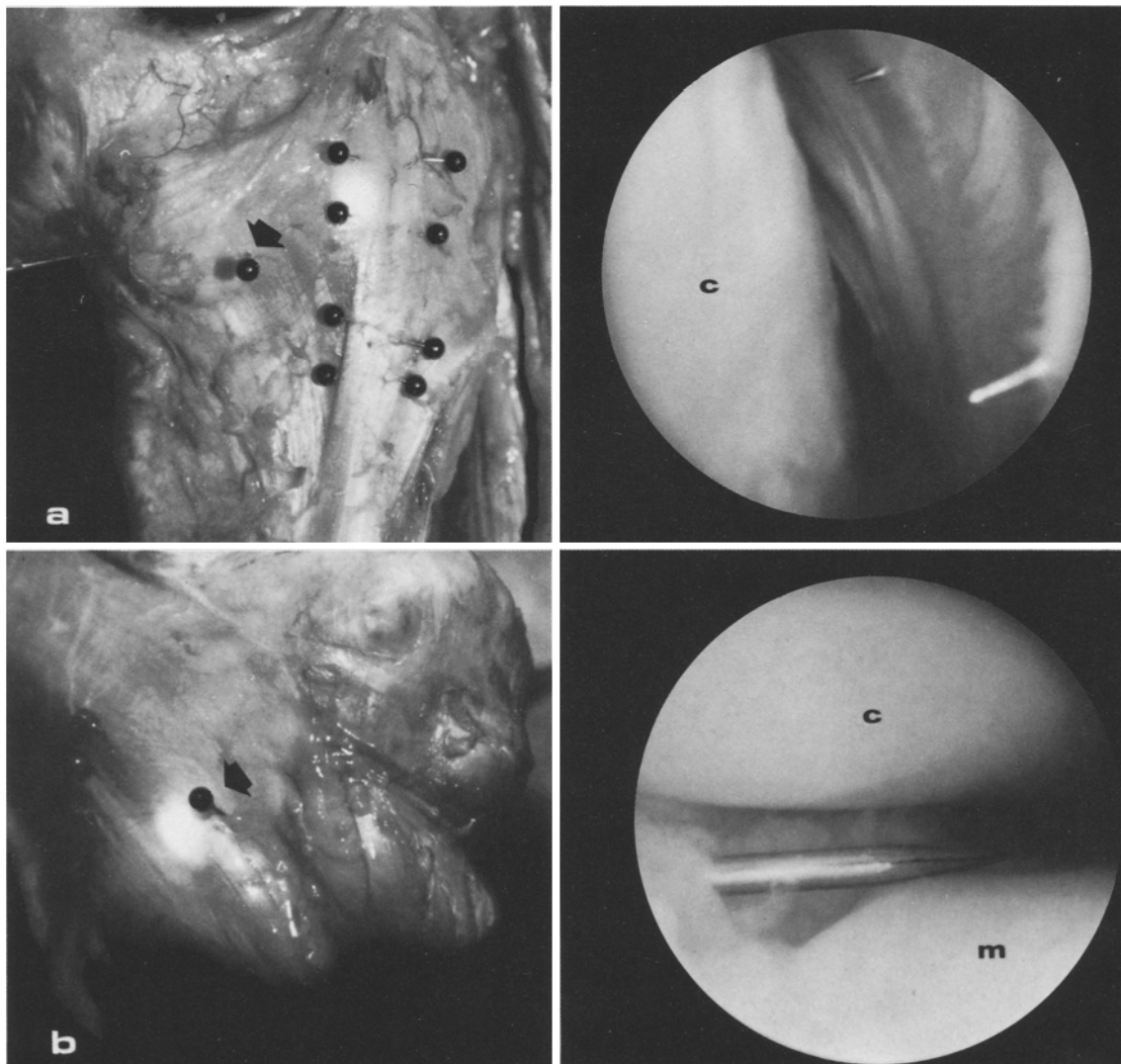


Fig. 6 a and b. Anteromedial approach. The *arrows* indicate the pin in the joint line
a *Medial side:* The endoscopic view shows good visualisation of the posterior oblique ligament;
b) *Lateral side:* The pin which marks the joint line is visible in the endoscopic view

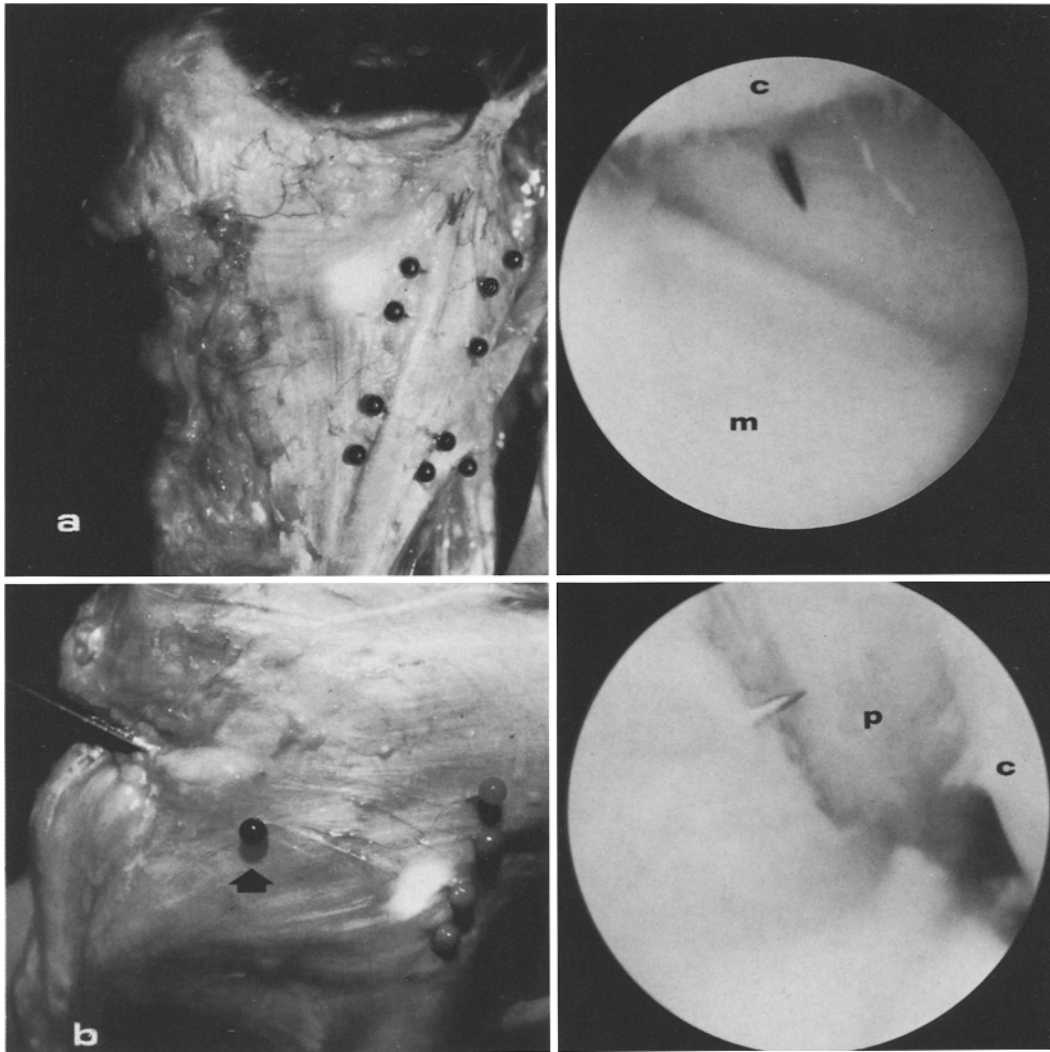


Fig. 7 a and b. Anterolateral approach.

a Medial side: The medial collateral ligament is outlined with pins but in the endoscopic view only one pin at the anterior edge of the ligament is visible;

b Lateral side: The row of pins is inserted into the fibular collateral ligament. One is visible in the endoscopic view. The *arrow* indicates the pin in the joint line

partly viewed only by using the posterolateral approach which requires exact location of the site of entry in order to avoid damaging the meniscus or the capsular structures. The same problems are present with the posteromedial approach.

Of the anterior approaches the central offers the best view of the posterior compartments. The arthroscope passes with relative ease between the cruciate ligaments and femoral condyles into the back of the knee, and the blind areas are smaller than in the other anterior approaches, which allow access to the posterior compartment only by stretching the cruciates because of the oblique direction of the arthroscope and the shape of the

condyles. A slight error in judging the site of entry will therefore make visualisation of the ipsilateral posterior compartment extremely difficult. The central approach also offers a complete view of the medial and lateral capsule, and with good capsular distension allows inspection of the oblique posterior ligament and the collateral ligaments using the 30° telescope.

With the anteromedial and anterolateral approaches, inspection of the contralateral compartment may be prevented by the femoral condyles, a fat pad or a mucosal plica.

It is important to choose the approach which is most suitable for the particular diagnostic or

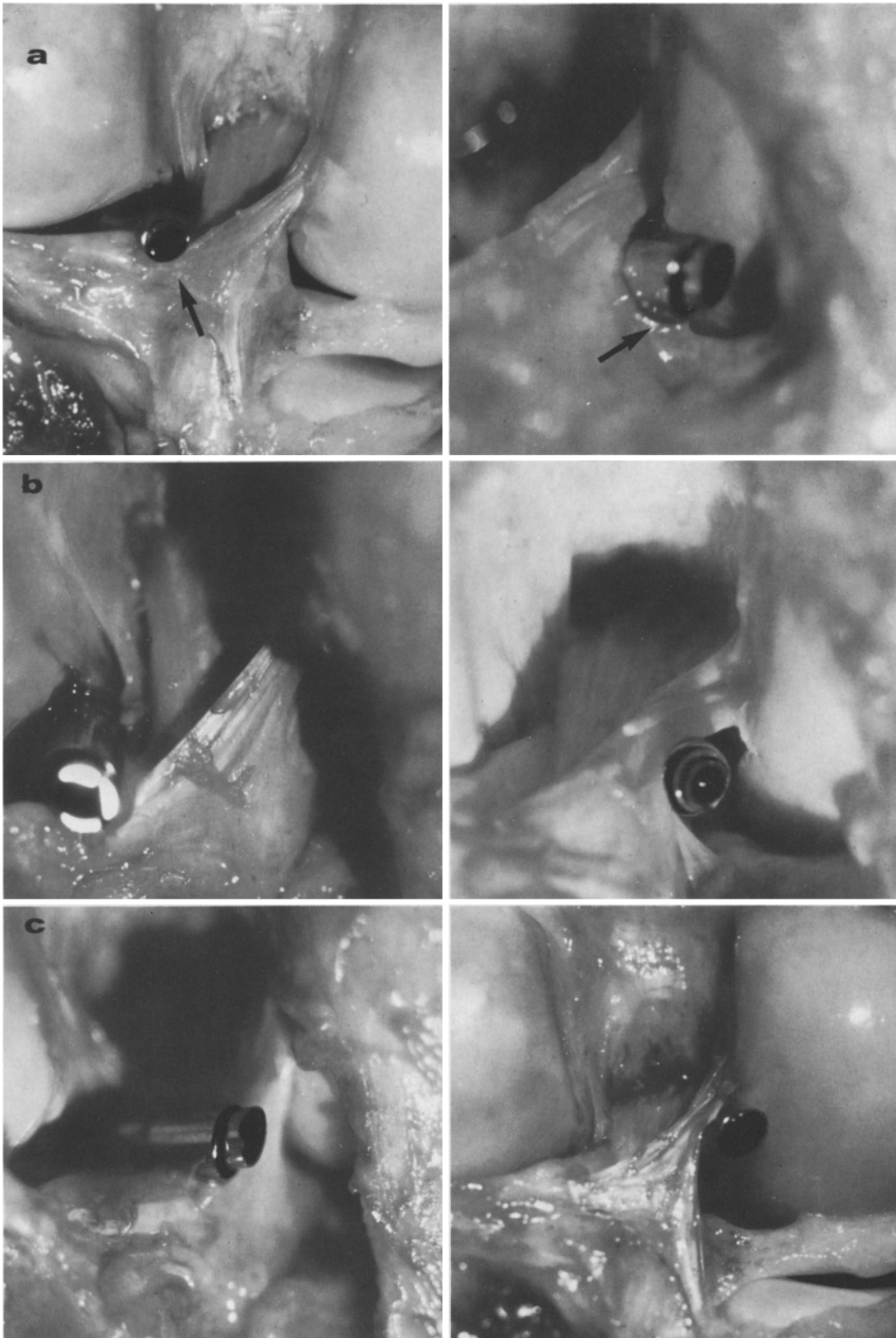


Fig. 8 a-c. Posterior view of the anterior approaches. **a** Central approach: The *arrow* indicates the tip of the telescope. **b** Anteromedial approach: The posterior cruciate ligament is stretched by the telescope during inspection of the posterior compartment. **c** Anterolateral approach: The oblique direction of the telescope may prevent adequate inspection of the posterior compartment

therapeutic problem. For a suspected lesion of the medial capsule it is advisable to use the central or medial approach which, because of the easy inspection of the posterior oblique ligament, offer the best view. The anterolateral or central approaches are most suitable for examination of the lateral compartment. The suprapatellar approaches are indicated for patellofemoral assessment, although this joint can usually be well seen from all the anterior approaches.

However the central approach offers easy and safe access and the widest field of vision in the knee, with good visualisation of the posterior compartments. We consider it to be the most useful route for both diagnostic and operative arthroscopy and reserve the other entries for specific indications.

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References

- 1 De Haven, K. E.: Lesions of the meniscus. *Orthop. Review* **6**, 25–30 (1977)
- 2 Eikelaar, H. R.: *Arthroscopy of the knee joint*. Netherland, Royal United Printers Hoitsema B.V. 1975
- 3 Gillquist, J., Hagberg, G.: A new modification of the technique of arthroscopy of the knee joint. *Acta Chir. Scand.* **142**, 123–130 (1977)
- 4 Jackson, R. W., Dandy, D. J.: *Arthroscopy of the knee*. New York: Grune & Stratton 1976
- 5 Johnson, L. L.: *Comprehensive arthroscopic examination of the knee*. Saint Louis: The C. V. Mosby Company 1977
- 6 Whipple, T. L., Bassett F. H.: Arthroscopic examination of the knee. Polypuncture technique with percutaneous intra-articular manipulation. *J. Bone Joint Surg. [Am.]* **60**, 444–453 (1978)