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PATELLA ALTA IN NON-DISLOCATING KNEE JOINTS

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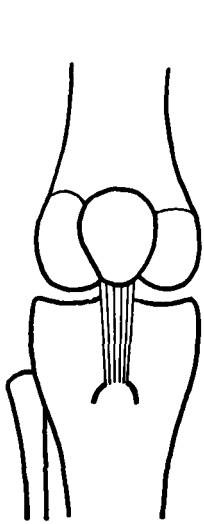
Patella alta (p.a.) or high-standing patella has been referred to by many authors as one of the main causes of recurrent dislocation of the patella. At extended knee and relaxed quadriceps muscle, the apex of the patella in a normal knee is level with the joint line. (Figures 1 A and B). The sides of the intercondylar groove of the femur give it bony support laterally and medially. If the patellar ligament is abnormally long, the patella will lie cranially to the entrance of this groove and lack this bony support (Figure 1, C and D). The patella will therefore become unstable sideways and may dislocate. Consequently, some of the most common operations for recurrent dislocation of the patella are partly directed against the high standing patella by transferring the tibial tuberosity—and the patella—distally. (For survey, see Brattström 1964).

Nowhere in the literature, however, is there any information to suggest that a patient with no history of dislocation will have symptoms from a high standing patella.

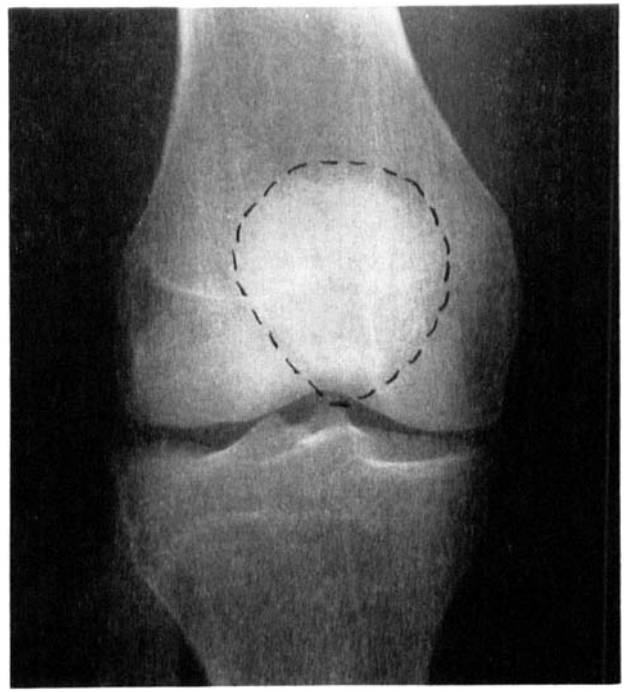
The purpose of this article is to point out that a person with high-standing patella may have symptoms without suffering dislocations and to stress that the position of the patella should be examined in patients with uncharacteristic knee troubles.

DIAGNOSIS

To be able to make the diagnosis patella alta, one must know the normal variation limits of the position of the patella. The diagnosis is made difficult by the fact that, as the condition is usually bilateral, there is no healthy side with which to compare. The matter is referred



A



B

Figure 1 A and B. Normal knee. Apex patellae approx. level with the joint line.

to only rarely in current textbooks on anatomy, röntgenology and orthopaedics, and then it is stated that the apex of the patella is level with the joint line.

The first to occupy himself with the diagnosis p.a. was Schulthess (1899), who described some spastics with high standing patella. He pointed out that with the knee flexed at a right angle, the patella normally sinks in between the femoral condyles and this produces a rounded contour of the knee (seen from the side, Figure 2A). If there is a p.a., the patella appears as a protuberance of the femur and the knee contour is angular (Fig. 2B).

By lacking bony support side-ways, the patella can usually be passively moved laterally-medially more than a normal one. This "abnormal mobility" of the patella, however, is an appraisal based on the experience of the individual investigator.

To determine the position of the apex by palpation may be difficult because it lies embedded in the ligament.

X-ray examination gives the definite diagnosis. Blumensaat (1938) is to be given credit for having described the simple method which,

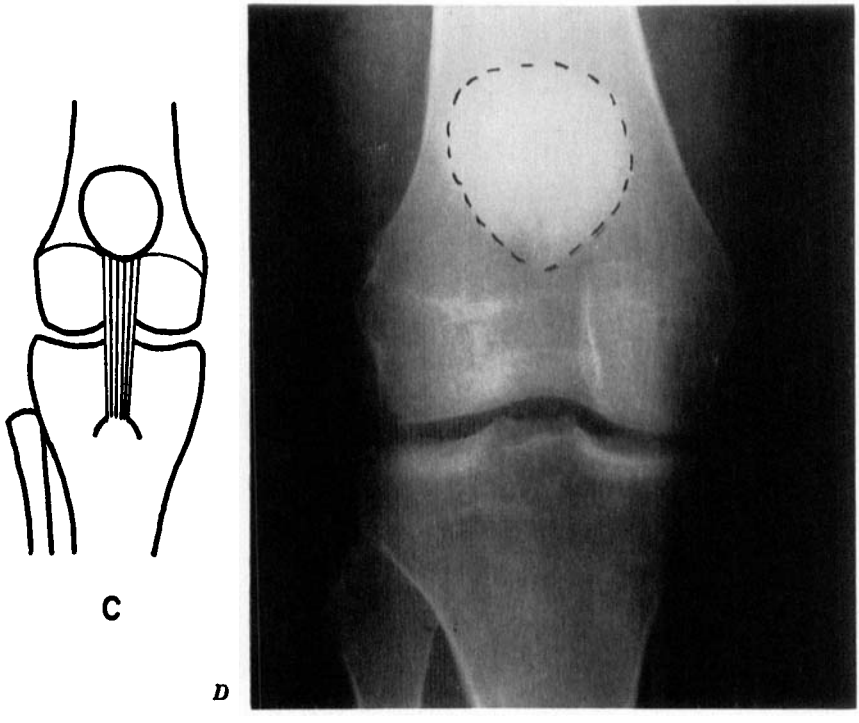


Figure 1 C and D. Patella alta, apex above or level with the beginning of the intercondylar groove.

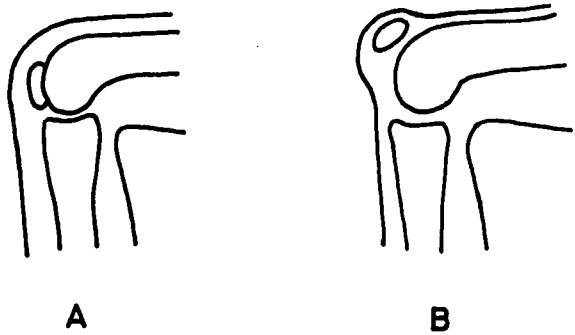


Figure 2 A. Normally, the patella sinks in between the femoral condyles at 90 degrees flexion. This produces a rounded contour of the knee joint.

Figure 2 B. Patella alta: the patella appears as a protuberance on the ventral surface of the femur; the knee contour is "angular".

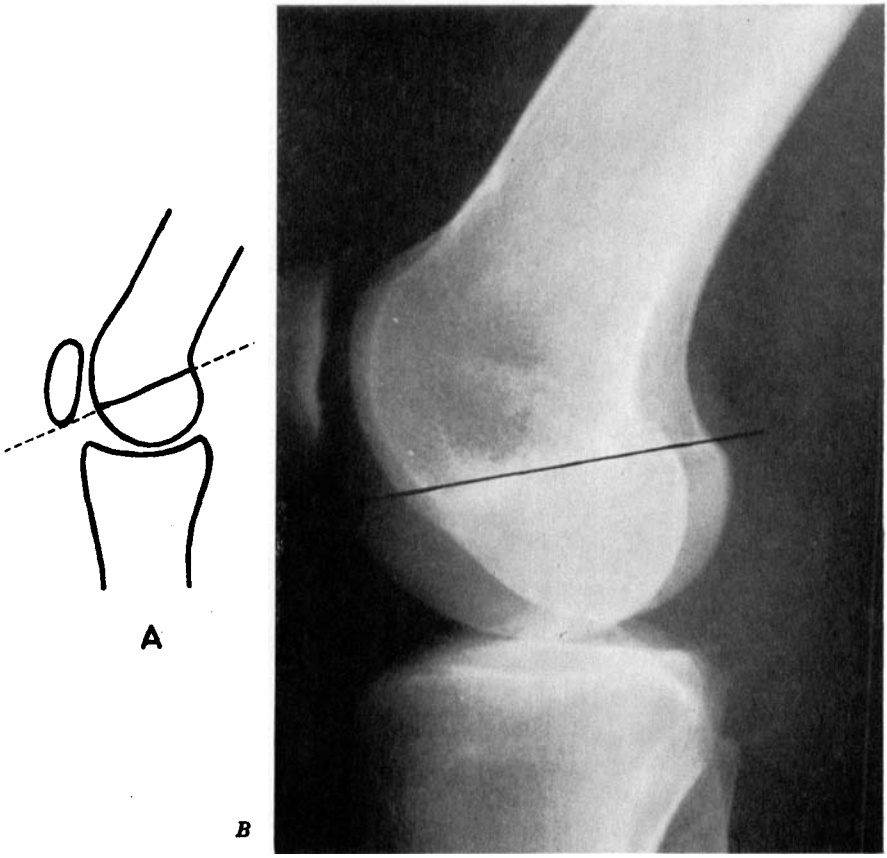
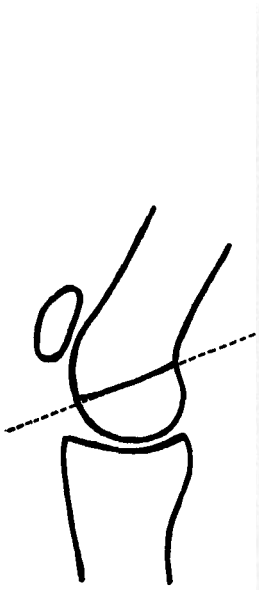


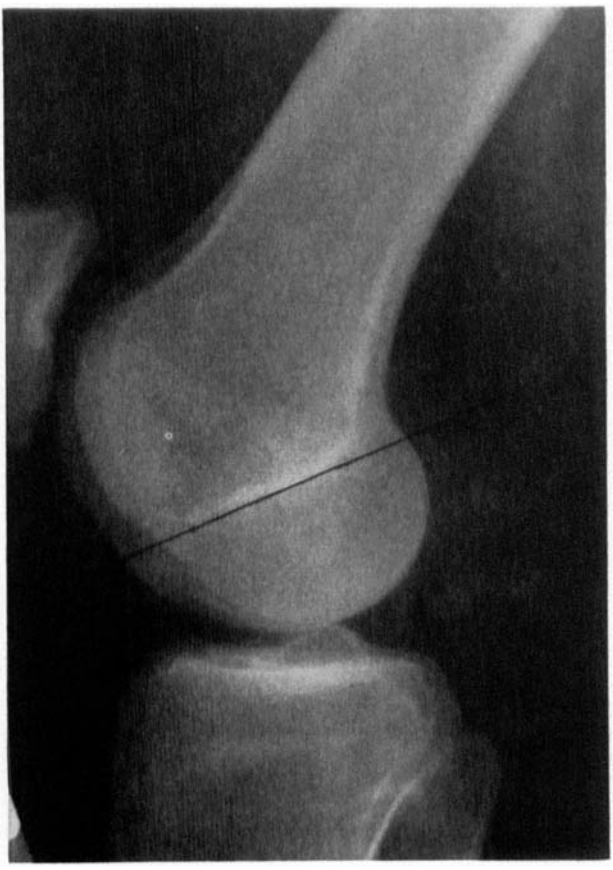
Figure 3 A and B. Normal knee. Apex patellae on Blumensaat's line (see text) at 30 degrees flexion of the knee.

though not fully exact (see below), is good enough for practical clinical work. It is based on the following: on an X-ray film (lateral view) with the knee in 30° flexion, a dense line can be seen, formed by the ventral border of the intercondylar fossa (Figure 3 A). If this line is extended ventrally it will normally meet the apex of the patella (Figure 3, A and B). If the apex lies above this line, a p.a. condition exists (Figure 3, C and D). This method was used by, among others, Thestrup Andersen (1955) in a large investigation of patients with recurrent dislocation of the patella. He found that 207 out of 286 knee joints had p.a. However, he allowed for the apex to lie 5 mm above this line before making the diagnosis p.a. (personal communication).

In order to test Blumensaat's method the angle u (Figure A A), which



C



D

Figure 3 C and D. Patella alta, apex high cranially of this line.

is formed between Blumensaat's line and the longitudinal axis of the femur, was measured. The angle was found to vary between 27 and 60 degrees (average 45°) in 100 randomly measured patients, and as Figure 4 shows, this suggests that Blumensaat's method is not fully exact. It was found, approximately, that a reduction of the angle u of, for instance, 10° from the average value 45° to 35° meant that Blumensaat's line would go about 10 mm below the apex, and a "false" diagnosis of p.a. may be made (Figure 4B). If, on the other hand, the angle u is, for instance, 55°, the apex, in a normal knee, lies about 10 mm below Blumensaat's line.

In most cases, however, Blumensaat's method is a good guide and this, together with the position of the apex on the antero-posterior

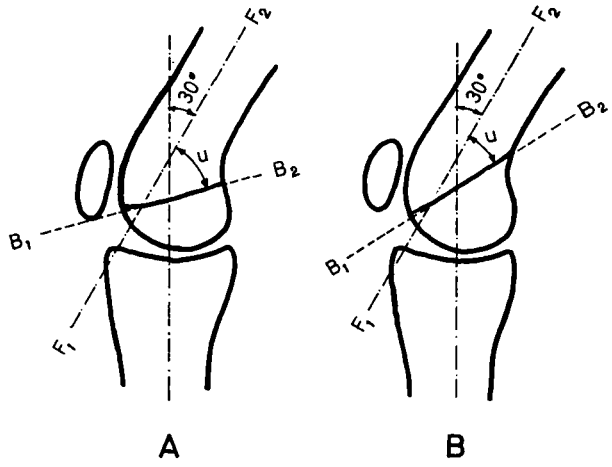


Figure 4 A. Normal knee at approx. 30 degrees flexion. F_1–F_2: Longitudinal axis of the femur. B_1–B_2: Blumensaat's line. u = the angle between F_1–F_2 and B_1–B_2, normally approx. 45 degrees. Apex patellae lies on Blumensaat's line.

Figure 4 B. Knee joint at 30 degrees flexion. The angle u is here approx. 30 degrees (normally: 45 degrees). This means that in spite of the apex being in its normal position, i.e. level with the joint line, it lies cranially of Blumensaat's line. There is here a "false patella alta".

view, makes it possible to diagnose a p.a. if corrections are made according to the foregoing.

On the antero-posterior view (extended knee) it must be known whether the quadriceps muscle has been contracted at the moment of exposure and the centring must have been towards the joint line (Figure 1D).

OWN SERIES

Since 1962 12 knee joints in 8 patients (4 female and 4 male) with pronounced symptoms have been classified as p.a., according to the X-ray criteria referred to later on, and, excluding other conditions, the symptoms referred to the abnormal position of the patella. Surgery was considered necessary in all these cases. They had no history of dislocation of the patella.

The diagnosis p.a. was made in another 18 knees in 12 patients (5 female, 7 male) but the symptoms were so slight that surgery was considered unnecessary; these will not be discussed here.

Table 1. 12 knees, operated on under the diagnosis patella alta

Knee no.	Sex	Age at op.	Subjective troubled (besides ache)	Treatment	Results	Obs. period (years)	Comments
1	f	10	Exudate	raphe of lig.	excellent	5	same patient as no. 2
2	f	10	Exudate, catching	raphe of lig.	poor	2	same trouble for 2 yrs., then lux. (see text)
3	f	12	Exudate, catching (see text)	raphe of lig.	excellent	7	see text
4	f	16	"tired"	transf. of tub. tib.	excellent	5	same patient as no. 5, see text
5	f	17	"tired", insecure	transf. of tub. tib.	excellent	3	see text
6	f	39	"tired", insecure	transf. of tub. tib.	excellent	2	
7	m	26	"tired", see text	transf. of tub. tib.	excellent	7	same patient as no. 8 see text
8	m	26	"tired", see text	transf. of tub. tib.	excellent	7	same patient as no. 8
9	m	19	"tired", insecure	transf. of tub. tib.	excellent	6	
10	m	16	"tired", exudate	transf. of tub. tib.	excellent	4	same patient as no. 11
11	m	16	"tired", exudate	transf. of tub. tib.	excellent	4	
12	m	38	"tired", insecure exudate	transf. of tub. tib.	excellent	1	

Symptoms: All patients have been bothered by aching and tiredness in the knee after walking and standing for a while. In 6 knees there was recurrent effusion, and in 4 knees a feeling of instability (but no dislocation). Two patients had noticed catching of the patella (see case nos. 2 and 3, Table 1).

3 female patients complained voluntarily of the angular, lumpy look of their knees.

All 8 patients had bilateral p.a. and in 4 patients, the symptoms made surgery necessary in both knees. One patient with pronounced symptoms in one knee was almost symptom-free in the other, and 3 patients were completely free from symptoms in the other knee.

Objective findings. At the clinical examinations the pathological findings have been very few. Four patients with symptoms in mainly one knee had an atrophy of the thigh on that side and in 3 knees an effusion was noticed. In all 8 patients bilateral "angularity" (see above) was noted in the records and in 7 patients bilateral "abnormal lateral mobility".

No swelling of the joint capsule was registered. Range of movement was normal and muscle strength 5 (according to the 0–5 grading).

Two patients (cases nos. 3 and 4) walked with their knees in about 10° of flexion and refused to extend the knees fully.

The ESR was normal in all patients.

At X-ray examination (antero-posterior view, side view and axial view of the femoro-patellar joint ad modum Knutson, 1941) no pathological findings were observed apart from a high-standing patella. No femoro-patellar dysplasia (Knutsson 1941, Brattström 1964) was registered.

In 6 knees an arthrography was performed with no pathological findings.

For the diagnosis p.a. it was required in this series that the apex of the patella was more than 10 mm above Blumensaat's line (corrections made!) and, on the antero-posterior view (with the quadriceps relaxed) more than 20 mm above the joint line (femoral border). These generous limits were set to allow for an unequivocal diagnosis.

Proper guidance was given by the "angularity" and the "abnormal mobility" referred to above.

Treatment. At operation the aim was to "draw down" the patella into the groove. In 9 knees this was done by chiselling free the tibial tuberosity with the ligament and attaching it 1–2 cm distally in a new bed with a screw. On 3 knees in two patients (10 and 12 years of age)

a raphe was made on the ligament in order not to injure the epiphyseal plate.

All joints were opened by a medial incision and inspected. The cartilage, the ligaments and the menisci were normal. In 4 cases a slight effusion and swelling of the synovial membrane was noticed.

Mean age at operation was 21 years (39–10).

After surgery the knee was put in a plaster cylinder for 3 weeks. The only complication was temporary peroneal nerve palsy in one patient with diabetes (plaster pressure?).

Result. In 11 knees, the end result was considered excellent: the patients were subjectively trouble-free, range of movement was normal and muscle strength 5 (according to the 0–5 grading). Mean observation time was 4 years 6 months (7–1 years). The end result was, in all cases, achieved within a year; the last degrees of full flexion were the most difficult to obtain.

One knee was a failure (case no. 2, Table 1): in spite of good position of the patella after surgery (checked by X-ray) the symptoms remained and 2 years later the patient had 3 dislocations of the patella in 2 months. She was operated on ad modum Krogius (1904) with good result.

A few cases call for a more detailed description.

Knee No. 3: Girl, 12 years of age. Complained of an ache and a feeling of discomfort in the right knee, which was always flexed at an angle of 5–10 degres. She was examined under anaesthesia, and the knee could be straightened completely. It was found that the patella slid laterally, about 1 cm, and stayed there, riding over the lateral femoral condyle. The patella maintained this position when the knee was bent a few degrees, and not until it was flexed a few degrees further did the patella slide into the groove with a slight click, and it then articulated normally until the knee was again extended completely, when the patella again slid laterally. This was so unpleasant for the patient that, when conscious, she refused to straighten the knee completely. After operation (raphe of ligamentum patellae) she was trouble-free (7 years' observation time). No symptoms from the left knee, but here, too, there is p.a.

Knee No. 4 and 5: This patient was considered by teachers and school friends to be a trifle strange because she always walked with slightly bent knees.

Knee No. 7 and 8: This patient was an enthusiastic spectator at football matches, but was always troubled by pronounced ache and feeling

of tiredness in the knees after he had been standing for 5–10 minutes. He then discovered that he could stand more comfortably with his knees flexed about 20 degrees and supported against a lemonade box. The patella was thus drawn down into the groove and obtained bony support, and his symptoms then disappeared. He was free from symptoms after bilateral operations.

DISCUSSION AND SUMMARY

That patients with recurrent dislocation of the patella often have patella alta (p.a.) is known, and if a patient with an obvious dislocation in the history visits the clinic, the position of the patella in the vertical plane is investigated to see whether a p.a. is present. The diagnosis must be made röntgenologically and clinically (Blumensaat's line, the contour of the knee joint at 90 degrees flexion, and possible abnormal mobility laterally).

Through the unphysiological articulation between the patella and the distal femur, however, p.a. can result in other symptoms than dislocation: ache, tiredness, exudate, feelings of instability and in some cases catching of the patella, and it is essential to consider the diagnosis with these different symptoms, even though there is no history of dislocation.

The author describes 12 knee joints in 8 patients where the symptoms have been so pronounced that an operation was considered necessary. The patella was drawn distally into the intercondylar groove of the femur by raphe of the patellar ligament (3 knees) or distal transfer of the tibial tuberosity (9 knees).

Results were excellent in 11 cases and the success of the operation is taken as proof of the symptoms having been caused by high standing patella.

The author made the diagnosis p.a. in 18 other knees and believes this to be the explanation of the patients' symptoms (which were the same as in the operation group). Operation, however, was refused (slight symptoms) or was postponed.

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