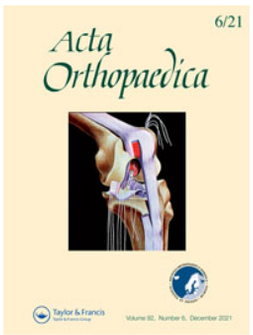

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CHONDROMALACIA OF THE PATELLA

Physical Signs in Relation to Operative Findings

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Cartilaginous changes on the patella are, according to post-mortem findings (Heine 1926, Øwre 1936) and findings at operation (Silfverskiöld 1938, Wiles et al. 1956), so common that one-third to one-half of the adult population has macroscopic changes on their patellae.

The object of this study was to investigate the relationship between the supposed characteristic physical signs of these cartilaginous changes named chondromalacia patellae and the macroscopic changes seen at operation.

MATERIAL AND METHODS

The material comprised 100 patients, 70 males and 30 females, treated for suspected intra-articular disease of the knee, most often sequelae to trauma. Patients with rheumatoid arthritis, severe osteoarthritic changes, sequelae to infections, and tumours in the knee joint were not included in this study. The youngest patient was 14 and the oldest 59. The age distribution is presented in Table 1. 52 cases were right-sided and 48 left-sided.

The methods included a physical examination preoperatively and peroperatively of the affected knee joint.

The *preoperative* examination was performed by one or more surgeons at the primary consultation and by the author on the day before the operation and included an examination of the limb and the knee joint as a whole, but the greatest importance was attached to palpation of the patellar region. The main findings here were divided into the following four groups.

Retropatellar crepitation

This examination was carried out on the extended, relaxed knee by pressing the patella down towards the patellar surface of the femur and moving it up and down and sidewards. As the changes are usually situated on the patella, any crepitation was ascribed to the patella, although the changes may be situated on the femur. To simplify the assessment of the results, the crepitation was not graded in quantity or in quality.

Table 1. Distribution, according to sex and age of the patient, of patellae with cartilaginous changes among 100 patients operated unilaterally for intra-articular diseases. The area involved on the medial (M) and lateral (L) facet is given in square millimeters (mm^2).

Sex	Age (years)	Number of patients	Number of patellae with changes	Area with cartilaginous changes					
				< 100 mm^2		100–200 mm^2		> 200 mm^2	
				M	L	M	L	M	L
Male	10–19	9	2	0	0	0	0	2	1
	20–29	22	9	5	1	1	0	3	1
	30–39	20	12	2	1	1	4	9	4
	40–49	13	8	2	0	2	1	4	2
	50–59	6	4	2	1	0	0	2	1
Female	10–19	6	1	0	0	1	0	0	0
	20–29	7	5	1	0	3	1	1	2
	30–39	10	4	0	0	0	0	3	2
	40–49	6	4	3	0	0	0	1	1
	50–59	1	1	0	0	0	0	1	1
Total		100	50	15	3	8	6	26	15

Pain on grating the patella against the femur

The examination was performed as described above, and the patient's reaction was recorded. The most common sensation was pain, in other cases merely discomfort. It was decided that no distinction should be made between the quality or quantity of the pain, stating merely whether or not pain was present.

Tenderness on palpation of the patella

In some cases tenderness is elicited by grasping the patella. In other cases the tenderness is produced by displacing the patella to the side, at the same time palpating the joint surface or by pressing distally upon the upper pole while the patient keeps the quadriceps tense. The site of tenderness on the patella was recorded, but to simplify matters only whether or not tenderness was present was stated.

Infrapatellar changes

Tenderness of the infrapatellar tissue on both sides of the inferior patellar ligament on palpation was recorded and stated as being present or absent, regardless of whether it occurred medially or laterally. Examination for swelling of the infrapatellar tissue was carried out, but proved to be too uncertain and was therefore not included among the findings.

The *peroperative* examination was done at operation (performed by the author) in a bloodless field through a medial, parapatellar incision. This incision offers a

good view of the posterior surface of the patella. Sometimes it was supplemented with a lateral incision.

FINDINGS

Physical Signs

The author's findings. Retropatellar crepitation was present in 52 cases. A subjective sensation in the form of pain on grating the patella occurred in 29 cases, discomfort in 10, a total of 39 positive cases. Tenderness on palpating the patella was found in 14 cases medially, in 15 cases medially as well as laterally, and in one case laterally only. A total of 30 patients were recorded as having this sign. Infrapatellar tenderness with or without swelling of the infrapatellar tissue was found in nine cases.

Effusion in the joint was observed in 18 cases, capsular swelling in five, capsular tenderness in four. Direct tenderness of the joint line and/or pain on rotation occurred medially and/or laterally in 72 and 49 cases, respectively. Quadriceps function was assessed by measuring the circumference of the femur 15 cm proximal to the patella compared with the normal leg. In 53 cases there was no difference, in 38 cases there was atrophy of less than 2 cm and in nine cases atrophy of 2–4 cm.

The other examiner's findings. In the records the findings, positive or negative, of the four main symptoms concerning the patella were not always mentioned. Of the 57 cases examined for retropatellar crepitation 35 showed a positive sign. Assessment of pain in this examination had been made in 54 cases and was positive in 27. Tenderness on palpation of the patella had been assessed in only 20 cases and was positive in 11.

Operative Findings

The report of these findings will be concentrated on the patella and its surroundings. Cartilaginous changes were present on the patella in 50 cases. The medial facet was more often involved than the lateral one. Changes on both facets, found in 23 cases, were often more extensive, comprising in nine cases the entire area of both articular facets. In five cases only a small area was involved, localized on the extreme medial aspect and covered by a synovial fold. Examination for crepitation during the operation failed to establish contact between this area and the patellar surface of the femur.

The most common change in the cartilage was oedema giving a greyish,

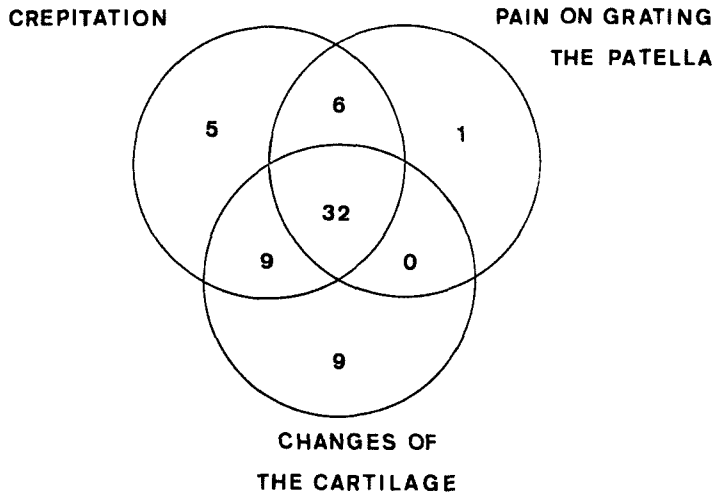

Figure 1. Correlation of retropatellar crepitation and pain on grating the patella with cartilaginous changes on the patella among 100 patients with intra-articular disorder.

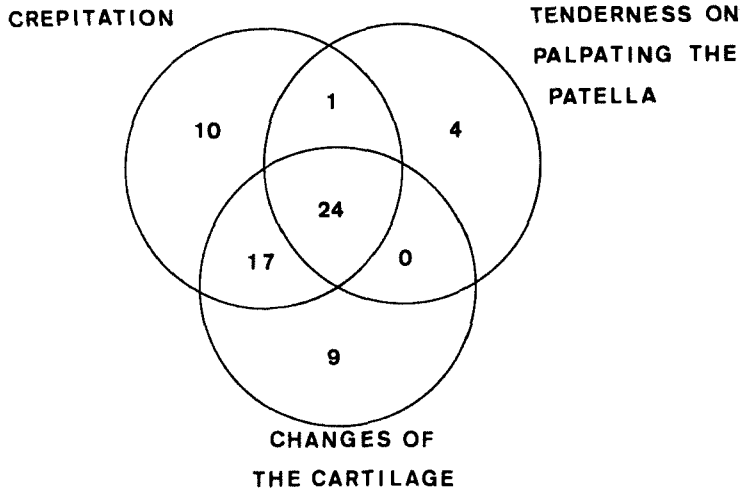

Figure 2. Correlation of retropatellar crepitation and tenderness on palpating the patella with cartilaginous changes on the patella among 100 patients with intra-articular disorder.

lustreless surface domed above the normal level and of a softer, more inelastic consistency. This was observed in 46 out of the 50 cases. Fissures were found in 42 cases. Flakes still sticking to the surface had formed in 22, and in nine cases there were cartilaginous flakes in the

synovial fluid. In another nine cases the fissures extended right down to the bone, denuding it in major or minor areas. Cartilage changes were seen also in other parts of the joint, in eight affecting the patellar surface of the femur, invariably associated with changes on the patella. In the femoro-tibial joint changes were found on the femur in 10 cases and on the tibia in four.

It was difficult to estimate the size of the infrapatellar pad of fat. It was estimated as being hypertrophic in five cases (only one of which was in accordance with the preoperative findings). In 24 cases synovial changes were observed, 11 of these were combined with cartilage changes on the patella, in five with patellar as well as meniscal changes, in five cases with meniscal lesion only, and in two cases the diagnosis was traumatic synovitis. In the cases exhibiting the cartilaginous changes it was particularly the synovial membrane around the patella which was affected. In six instances X-rays had shown the patella to be bipartite in the upper lateral corner. The junction between the two parts of the patella was visible at operation as a faint groove in the articular surface in three cases. In one case the changes affected the small extra bone, in two cases the medial articular facet; in the remaining three cases the cartilage was normal.

The most common lesion was a torn meniscus, 56 medial, six lateral,

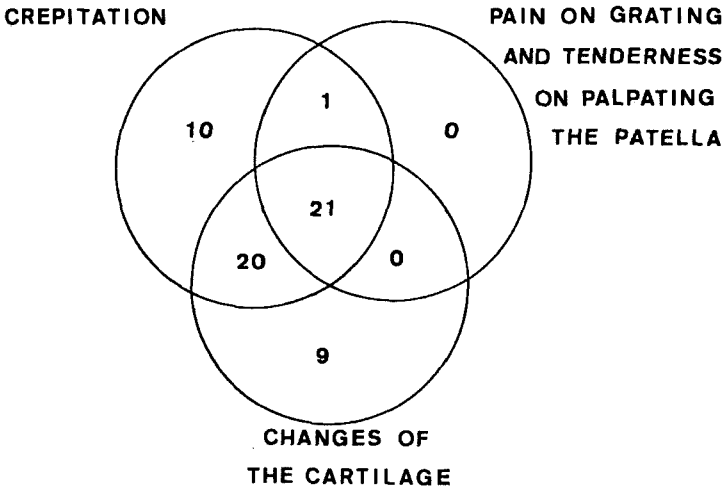

Figure 3. Correlation of retropatellar crepitation, pain on grating and tenderness on palpating the patella with cartilaginous changes on the patella among 100 patients with intra-articular disorder.

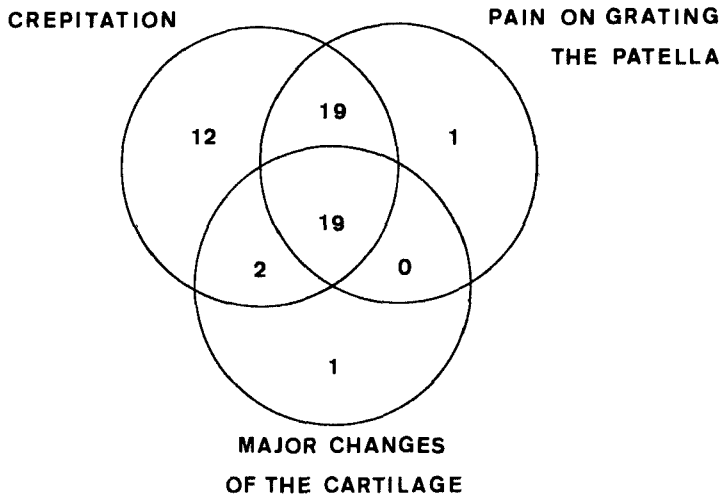

Figure 4. Correlation of retropatellar crepitation and pain on grating the patella with major cartilaginous changes on the patella among 100 patients with intra-articular disorder.

and two cases with injury to both menisci giving a total of 66 torn menisci. Two patients had recurrent dislocation of the patella, one had osteochondritis dissecans on the femur, two had traumatic synovitis, whereas in one case no abnormality could be demonstrated. Thus, the cartilaginous changes on the patella were the only abnormality in 28 cases, and in 22 cases they coincided with other intra-articular changes.

The relation between the clinical findings (crepitation, pain on grating and tenderness on palpation of the patella) and the cartilaginous changes is illustrated by Venn diagrams (Figures 1-4). In Figure 3 cases with both pain on grating and on palpation of the patella are related to crepitation and cartilaginous changes. Figure 4 includes only the cases with severe changes of the cartilage. The nine cases without any of the three main physical signs but with cartilaginous changes, had these rather small changes on the medial facet only and in five cases they were even in an extreme medial location. Only in one case did the changes involve about one-third of the medial facet.

Among the nine cases with infrapatellar tenderness six had cartilaginous changes. In four of these cases the synovial membrane showed changes, in particular medially and inferior to the patella.

The signs found by the other examiner were related to the operative

findings and to the author's findings. Crepitation had been found in 35 cases, 24 had cartilage changes and of the latter, 23 had exhibited crepitation during the author's examination. Pain on grating the patella was demonstrated in 27 cases, 17 were found to have cartilage changes and had pain when examined by the author. Tenderness on palpation of the patella was demonstrated in 11 cases, eight of which showed cartilaginous changes and all eight complained of tenderness when examined by the author.

Although the subjective symptoms were not included (mainly because of the difficulty in distinguishing them from symptoms due to other intra-articular diseases), it may be stated that 16 patients had a history indicating chondromalacia of the patella; at operation all exhibited cartilaginous changes on the patella. All 16 had crepitation, 11 had pain on grating and tenderness on palpation of the patella, and the remaining five had one of the two latter signs.

DISCUSSION

The present study confirms that cartilage changes on the patella are a common occurrence also when combined with other intra-articular changes. Among the physical signs retropatellar crepitation has been considered an important sign by all workers (Aleman 1928, Kulowski 1933, Hinricsson 1939, Bronitsky 1947, Cahen 1955). Büdinger (1906) and Läwen (1925) pointed out that the final diagnosis could not be made until operation and others (Øwre 1936, Thiemeyer 1955, Wiles et al. 1956) have submitted cases with cartilage changes, but without any preoperative crepitation. Aleman (1928) and Karlsson (1940) both felt that they could distinguish between the quality and quantity of the crepitation, the location and whether the changes were recent or long-standing. Such a classification has not been used in this study, although it must be admitted that the quality and quantity of crepitation does vary from patient to patient. Disregarding the five cases with cartilaginous changes localized extremely medially, outside the weight-bearing surface, crepitation could be elicited in 41 out of 45 cases. If only cases with more severe cartilage changes are included, crepitation was absent in only one case. On the other hand, this sign occurred in 11 cases without visible cartilage changes. Thus, crepitation must be considered an important, but not pathognomonic sign of cartilaginous changes on the patella.

Pain on grating the patella is considered by some authors as perhaps

an even more definite sign (Bronitsky 1947, Cahen 1955, Thiemeyer 1955, Wiles et al. 1956, Robinson & Darracott 1970). In this study it was found in 39 cases, and of these 32 showed cartilaginous changes. Darracott & Vernon-Roberts (1971) demonstrated bony changes with only modest microscopic changes of the cartilage. This might explain the pain elicited in seven cases with a macroscopically normal cartilage, where microscopic changes possibly could have decreased the ability of the cartilage to protect the underlying bone.

Tenderness on palpation has been described using various methods. Wiles et al. (1956) and Robinson & Darracott (1970) stress the importance of being able to palpate the joint surface. The former considered this sign, plus crepitation, to be diagnostic. In the present investigation this tenderness was demonstrated in 29 cases 24 of which had cartilaginous changes. As regards both pain-eliciting examinations, it is apparent that cartilaginous changes may be present in a fairly large number of cases without giving rise to these two clinical findings. A possible explanation is that in these cases the cartilage changes have not given rise to a painful state with a history of patellar disease and are therefore not demonstrable by the two methods of examination. This is to some extent confirmed by the 16 cases with a history of chondromalacia of the patella only. All had retropatellar crepitation as well as one, and in most cases two, of the pain-eliciting signs.

Infrapatellar swelling and tenderness were considered by Fründ (1926), Aleman (1928), Karlsson (1940), Bronitsky (1947), and de Montmolin (1951) to be signs of synovitis caused by the cartilaginous changes. In the present study infrapatellar swelling was recorded, but not included in the analysis, as it is difficult to assess. Infrapatellar tenderness was demonstrated in nine cases only. At operation six were found to have cartilaginous changes. Therefore, these two signs were not attributed any major diagnostic importance.

Other clinical signs were not related to the patellar changes, as other and presumably more important disorders were contributory. However, chondromalacia of the patella may give rise to effusion, capsular swelling, and capsular tenderness, etc., and together with the three main signs they may round off the picture of this common disease. However, a distinction should still be made between an asymptomatic change of the cartilage on the patella and the clinical symptom complex named chondromalacia of the patella, basing the diagnosis both upon the history and the physical signs.

SUMMARY

Cartilaginous changes on the patella are common and were demonstrated in 50 out of 100 patients who underwent operation for intra-articular disease of the knee joint. In order to clarify further the signs of this condition, the physical signs were related to the operative findings. Retropatellar crepitation was present in most cases, but cannot be called pathognomonic. Pain on grating and tenderness on palpation of the patella in fact occurred together only in cases with cartilaginous changes on the patella. On the other hand, cartilaginous changes were found in several cases without such signs, a condition which perhaps should be interpreted as cartilaginous changes only, not as the symptom complex chondromalacia of the patella in which there ought to be a history of symptoms.

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Key words: chondromalacia patellae; osteoarthritis; patella; knee joint; femoropatellar joint.

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