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EXPERIENCE AND RESULTS FROM MOBILIZING PLASTIC OPERATIONS IN FOUR CASES OF OSSEOUS ANKYLOSIS OF THE KNEE[1]

BY

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The knee is, as we know, a joint on which greet demands are imposed with respect to stability. Like the other large joints of the lower extremities—the ankle and the hip—it must partly bear the whole weight of the body. But at the same time it is a modified hinge joint with great range of movement and it lacks the deep socket of the hip joint and the furcated form of the ankle. Therefore the ligaments and the fibrous capsule play for the knee joint a specially important role.

In the processes which lead to osseous ankylosis not only are the crucial ligaments destroyed, but we also often find more or less destruction or subsequent atrophy of the lateral ligaments of the fibrous capsule.

The demands to be fulfilled in order that plastic treatment of the knee may be regarded as successful are, besides good mobility and freedom from pain, also sufficient stability to bear the weight of the body. For the reasons above mentioned these demands are not easy to satisfy, particularly in dealing with the knee. Many have therefore adopted a sceptical attitude towards plastic treatment of the knee joint. It is justly maintained that a ankylotic, painfree knee is far preferable to a mobile joint with instability or pains.

This will, however, always be a relative question. In the life

[1] A paper read at the meeting of The Danish Orthopedic Association Sept. 27nd 1946.

of a modern city, where people are accustomed to sit in trams or in cinemas—and where many are engaged in sedentary work —a stiff knee is a very considerable drawback. And as it has proved possible to satisfy the demands for stability, good mobility and freedom from pain, we can surely agree with

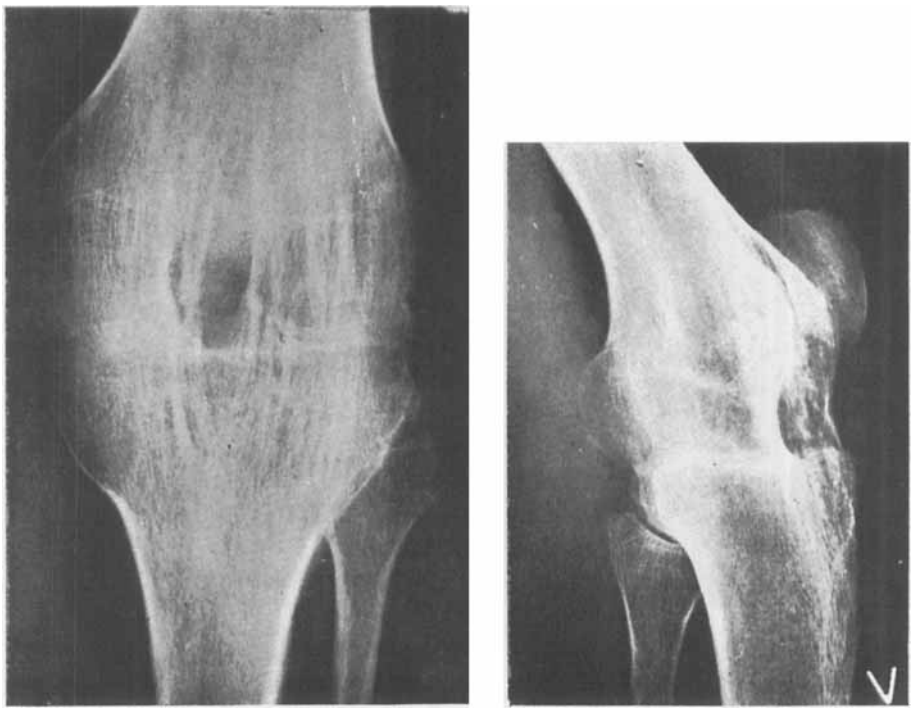


Fig. 1. Before operation.

Klapp in saying that plastic treatment of the knee is undoubtedly a valuable addition to the methods employed in orthopedic surgery.

An important requirement, when it is proposed to perform a plastic operation on the knee, is a comparatively good functioning of the quadriceps. It follows therefrom that an ankylotic patella offers a considerably less favourable prognosis than a mobile patella.. But, contrary to what has been maintained, an

ankylotic patella is not in itself a contra-indication. This will be seen from Case 2.

That in cases where the mobility has not proved to be satis-

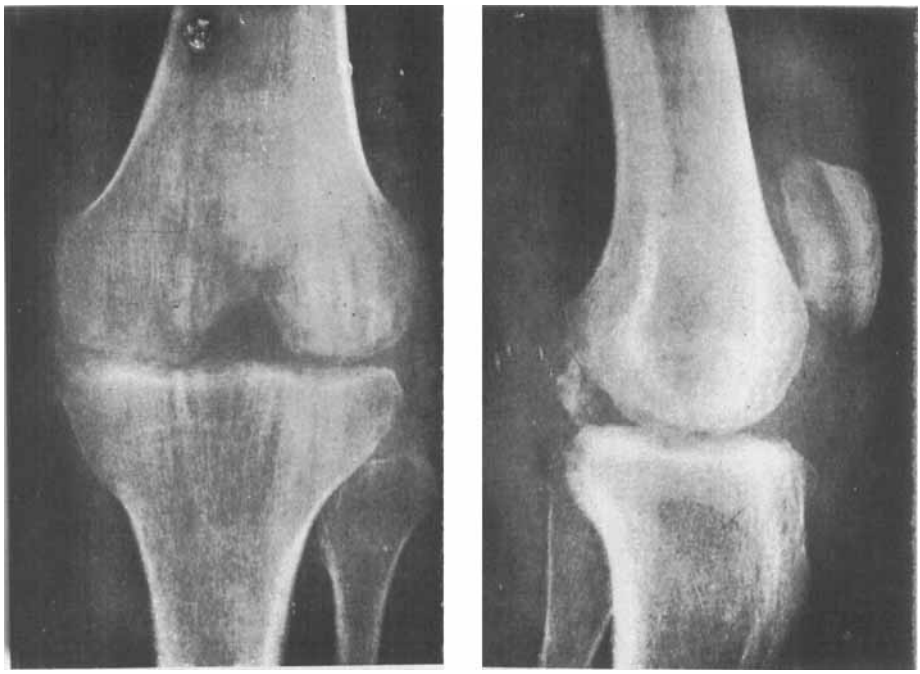


Fig. 2. Case 1. 4 weeks after first operation.

factory we can re-operate with good results is shown by the first case here reported.

Case 1.

A female factory worker, born 15/10-08, being thus 34 years old when she consulted me, on 19/6-42, for ankylosis of the left knee, following an attack of pyarthrosis 16 years before. The stiff knee inconvenienced her both in her sedentary work and when she came to sit in a tram, a cineme or the like.

The left knee was found to be ankylotic at 15° flexion, with thickening of the surrounding soft tissues. The patelle was just

barely movable. Great atrophy of the femoral muscles, but the quadriceps is functioning.

Radiogram (Fig. 1) shows osseous ankylosis between femur

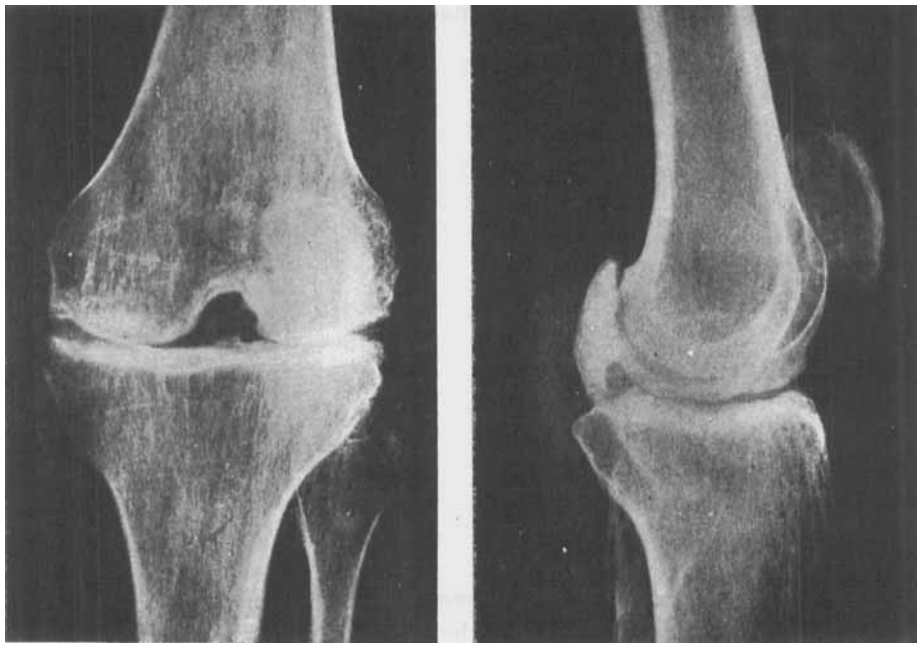


Fig. 3. Case 1. 2½ years after first operation.

and tibia at 10° flexion, but the articular space between femur and patella is visible.

14/11-42. In morphine-ether narcosis.

PLASTIC OPERATION ON KNEE JOINT

Median longitudinal incision, with shaped severance of the lig. suprapatellare. After chiselling through the synostoses, removing old cicatricial tissue and dressing the joint-surface of the femoral condyles and tibia with chisel and file, a coherent free fascia late flap was laid over the femoral condyles back-

wards into the fossa poplitea and therefrom forwards to the tibial condyles. It was everywhere well fixed with catgut sutures.

With light traction on the foot the distance between the

Case 1. Three years after the second plastic.

Fig. 4.

Fig. 5.

joint surfaces was one finger-breadth. After closing the wound the knee can be flexed 90° without resistance.

After the operation, traction with stiff wire through the calcaneum. 4 kg at 20° flexion. On 14th day sutures removed, primary healing. At the same time she begins to exercise the quadriceps and the knee is laid in extended position.

20th day: Flexion exercises with retention of traction.

30th day: Traction (discontinued) ended.

40th day: Gets up. Discharged after 8 weeks.

Radiogram (Fig. 2) shows behind the lateral malleolus a been-sized fragment of bone. Distance between joint-surfaces 2-3 mm. Mobility was than fully 40°. Mobility gradually decreased.

On 3/2-44 it was 30° and on 26/2-45, i.e., 2 years and 2 months after the operation, it had fallen to 15°.

Radiogram (Fig. 3): The bean-sized fragment behind the lateral malleolus had grown to 3½ × 1 cm.

As the rigid knee inconvenienced her, there was on 3/3-45, *2½ years after the first operation,* performed in morphine-ether narcosis *a new plastic operation on the knee.*

Fig. 6.

Fig. 7. Case 1. Flexion of knees with same weight on both feet.

Incision through skin in the old longitudinal incision, but subcutaneously a lateral S-incision. The anatomical findings on re-operation will be described later.

So much of the femoral condyles is chiselled away that the distance between the joint-surfaces with light traction is 1 cm. and the condyles are made to taper more from front to back. The thick connective tissue on the tibia is pared off until it forms a thin layer. The condyles are covered by a coherent flap of fat from the abdomen, 1 cm. thick.

After the wound is closed, the knee canbe flexed 90°. The leg is laid, with knee flexed 4g°, on Brown's splint with 4 kg. stiff-wire-traction through the lower tibial metaphysis. The traction is successively increased to 6 kg. in the course of 3 days.

10th day: The patient begins with passive movement exercises by raising the pelvis, while keeping the leg fixed.

12th day: Sutures removed, promary healing.

20th day: Movement exercises with hanging knee. In the

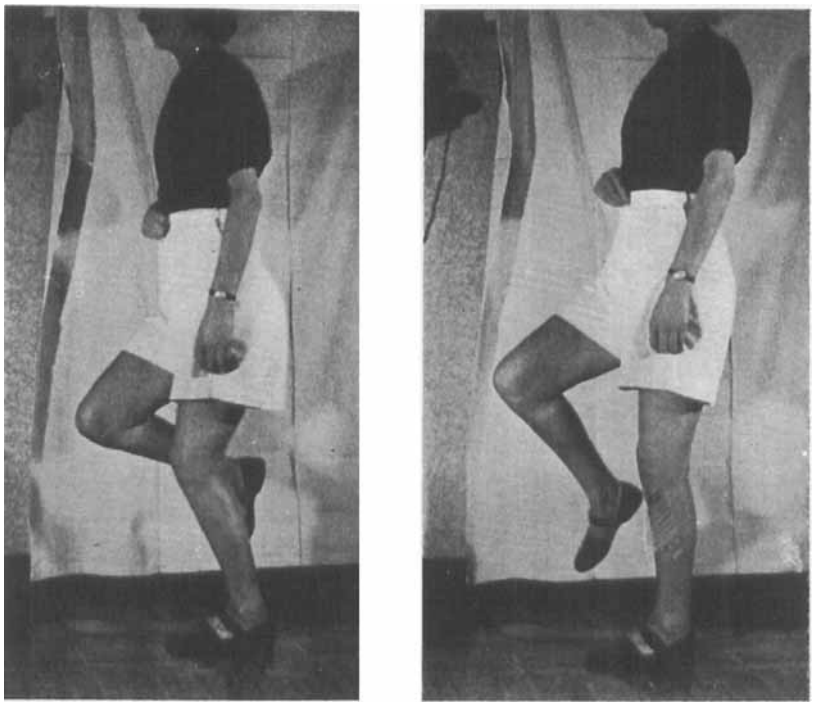


Fig. 8 a & b. Case 1. With all weight on the operated leg she can flex the knee 30° and extend fully, without support.

5th week the traction-wire was removed. Active exercises without traction. Manchette traction at night, 3 kg.

Radiogram taken after cessation of traction shows that the distance between the joint-surfaces is 10-12 cm.

6th week: Patient gets up. Radiogram shows that the distance between the joint-surfaces is reduced to the half.

On discharge on 16/6-45, *i.e.*, 3½ months after operation, she

can flex 80°, but there is lacking 15° for full active extension. Full passive extension.

The flexion afterwards gradually increased. On 16/9-45, *i.e.*, 6½ months after operation, it was 90°. She then had pains,

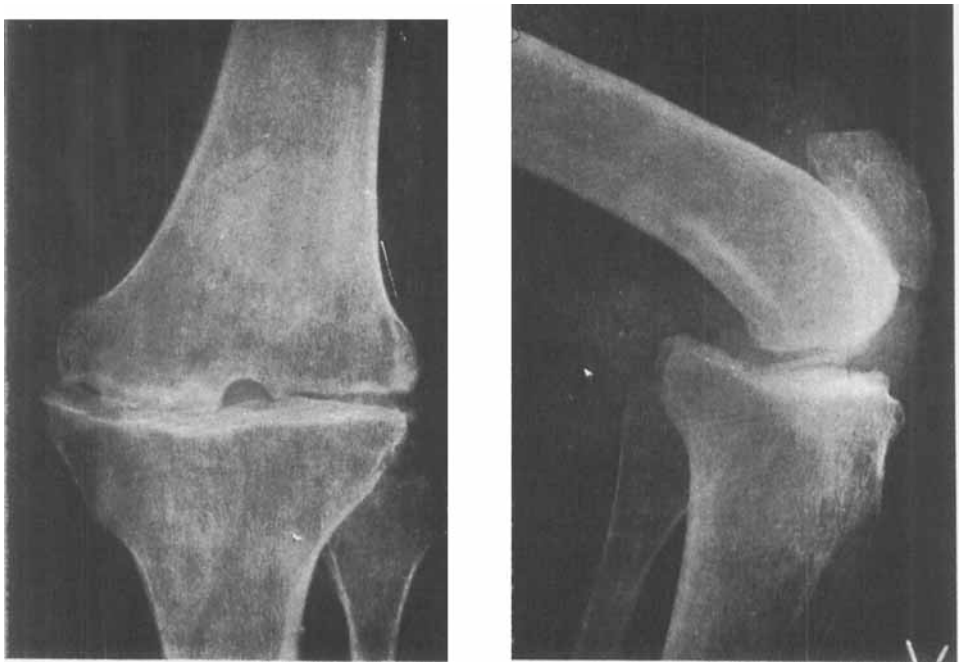


Fig. 9. Case 1. Radiogram 3 years after the 2nd operation, at the time when the cinematographic film was taken.

which subsided by degrees, and in the last 1½ year, since New Year 1946, she has been quite free from pain.

15/847[1], 3 years after operation: *Never has pains. Goes up and down stairs and walks in the street without difficulty. Never uses stick. Can dance. On examination she is seen to limp a little on left leg. Active flexion over 90°* (Fig. 4). *Full active extension* (Fig. 5). *By backward flexion* (Fig. 6) *she can flex the*

[1] Addition by the correctur.

about 70°. Standing she can flex the knees 70° without difficulty with equal weigt on both legs (Fig. 7). When standing on the operated leg alone, she can flex the knee about 30° without difficulty (Fig. 8 a and b). Drawer sign is now negative (3 months

Fig. 10. Case 2. Before operation. Note the broadly ankylotic patella. 55° flexion.

earlier positive). Lateral mobility in valgus direction positive. but decreasing.

Cinematographic demonstration of patient when walking. Flexion of knee with weight on both legs and with weight only on the affected leg, as well as when she rises from a chair, goes up and down stairs, bends and stretches knee with the thigh in horizontal position or bends the leg backwards with thigh in vertical position.

Summary of radiographic changes in Case 1.

Else R.

Radiogram I. Before operation. Complete osseous ankylosis between femur and tibia. Articular space between patella and femur. Fig. 1.

Case 2. Two years after operation.

Fig. 13.

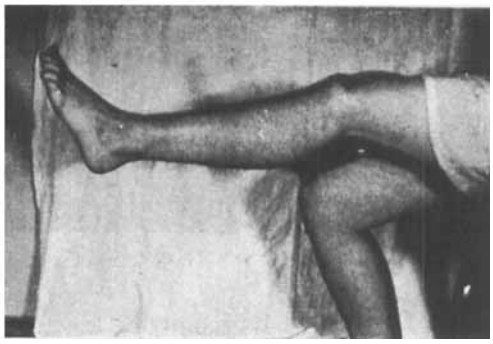


Fig. 14.

„ II. Three weeks after first operation. Fig. 2.

„ III. Two years after first operation. Fig. 3.

„ IV. Five weeks after second operation. Cessation of traction.

„ V. Eleven weeks after second operation. Six weeks after cessation of traction. Joint surfaces, especially on medial condyle, begins to become irregular. Resorption focus in medial part of medial femoral condyle.

„ VI. Seven months after second operation. Joint surfaces more irregular. In the lateral condyle, where the radiogram taken 11 weeks after the operation showed a resorption focus in medial

condyle, there is now seen corresponding thereto a sharply defined defect. The articular space is narrower.

.. VII. Nearly three years after second operation. The calcic atrophy has mainly disappeared. Incipient sclerotisation of the joint surfaces. Irregularity

Fig. 15. Case 2. 80° flexion with equal weight on both legs.

of the condyles seems not to have increased in the last 9 months. In the same period she has been free from pain. Incipient marginal deposits. Fig. 9.

Case 2.

Karin B., schoolgirl, born 9/12-28. Admitted 1/10-44.

Six years before admission, pyarthrosis in left knee. Incision and drainage at 3 place in front and also in poplitea. Knee has since been stiff in flexion position. Has difficulty in walking owing to angular position of knee.

Status 2/10-44.

Fully 2 cm. shortening of left lower extremity. Left knee ankylotic at 55° flexion. Patella immovable. Retracted scars

after incisions on both sides of patella, a scar after drainage 10 cm. above articular line and one in the poplitea. Great atrophy, but perceptible quadriceps functioning, in spite of ankylotic patella.

S.R. 11. Temp. constantly normal.

Fig. 16. Case 2. Three weeks after operation.

Radiogram, Fig. 10: *Complete osseous ankylosis, without sharp delimitation between femur and tibia in flexion 55°. Patella broadly ossified, concrescent with femur.*

14/10-46. (Patient is now not quite 16 years old and the ankylosis has lasted about 6 years.)

In atropin-morphine-ether narcosis:

PLASTIC OPERATION ON LEFT KNEE

Payr's incision. Muscles greatly atrophied. Quadriceps and rectus with its tendon are rather strongly adherent to the anterior surfaces of the femur and are mobilized upwards.

Otherwise the same procedure as in the previous case. The

Fig. 17. Case 2. Two years after operation. Great resorption of end of femur and consequent gliding thereof to one side. The development has been followed radiographically. There is a great contrast between the radiological findings and the clinical picture, which has steadily improved. Three years after the operation the radiogram is unchanged.

posterior part of the patelle is chiselled off and resected, so that the patella forms only a thin disk of small circumference. It is covered by a fatty strip of fascia. The condyles and tibia are covered by coherent fascia. The ossified drainige scars are loosened from the underlying surface and are lined on the under side with a strip of fat.

After the wound is closed the knee can be flexed 90° and completely extended.

Brown's splint in 10° flexion.

Stiff-wire-traction trough the calcaneum.

Traction after 48 hours, 2 kg. After 3 days, 4 kg.

11th day: Sutures removed. Primary healing.

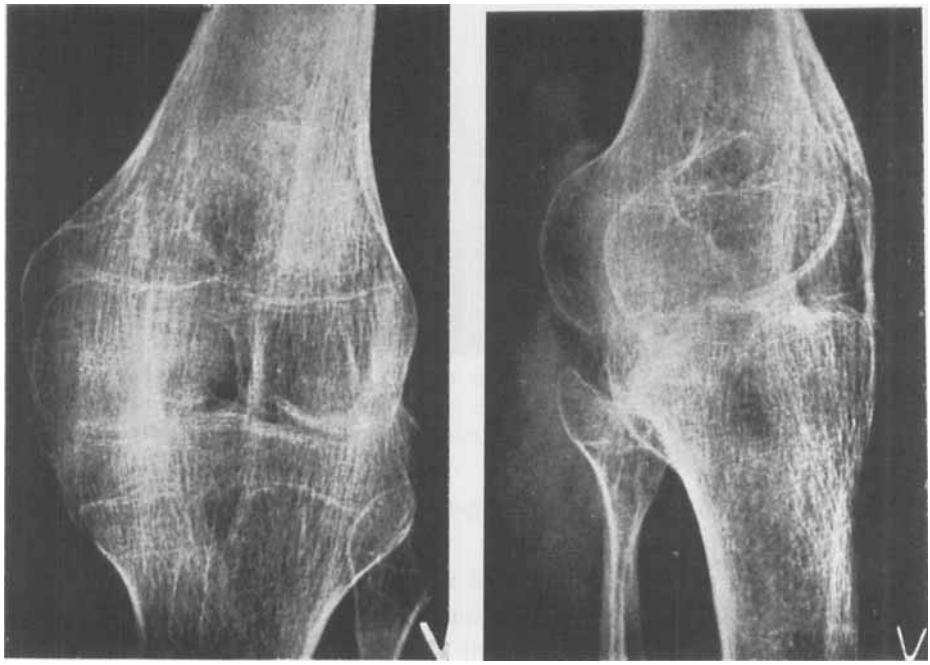


Fig. 18. Case 3. Before operation.

Begins with contractions of the quadriceps and passive flexion exercises with the traction still applied.

Radiogram 3 weeks after operation, Fig. 16.

Began to get up and walk after 1½ months.

Discharged after 4 months. Could then flex 45° and lacked some few degrees for full active extension, but can make complete passive extension.

15/9-46. Three years after the operation her state is as fol-

lows: The patient lives in the fifth story of a house without lift and goes up and down stairs several times a day—and she and her mother say that she always walks with normal change of leg. When she walks a longer distance, for instance, up to 1 kilometre, she feels tired and sometimes also has pains in the knee. There is some variation in this respect.

Fig. 19. Case 3.
Flexion 2 years after operation 90°.

Flexion 90°. Fig. 13. Full active extension (when sitting on a chair). Fig. 14.

Flexion of knee, with equal weight on both legs, about 45°. Fig. 15. Limps when walking and jerks out the right hip. This is due to 4 cm. shortening, but if she walks on the right heel in order to compensate for the shortness of the left leg, this seems to put a strain on the knee and therefore she prefers to let the shortness remain uncompensated.

There is some side movement in varus direction.

Drawer sign absent. No crepitation.

Patella hardly palpable.

Demonstration of radiographic development in Case 2.
Karin S.

Radiogram VIII. Before operation. Osseous ankylosis between femur, tibia and patella. 55° flexion.

„ IX. Three weeks after operation, with traction applied. The tibial condyle projects 3-4 mm. medial to the femoral condyle. Fig. 16.

Fig. 20 a. Case 3.
Flexion 80°, with weight mainly on the operated limb.

Fig. 20 b.
And complete extension thereof.

„ X. Five weeks after operation. Unchanged.

„ XI. Three and a half months after operation. Articular space is narrower and the surfaces are irregular. Especially the medial condyle seems to show a ragged edge.

„ XII. One year after operation. The defect in the medial femoral condyle has increased. ¾ cm. lateral displacement in medial direction. In side view of flexed knee the condylar surfaces are irregular.

„ XIII. Two years after operation. Fig. 17.[1]
The radiographic picture is highly alarming. The epiphyseal part of the femur has become still more narrowed. Further resorption, mostly of the medial condylus, where the tilting up

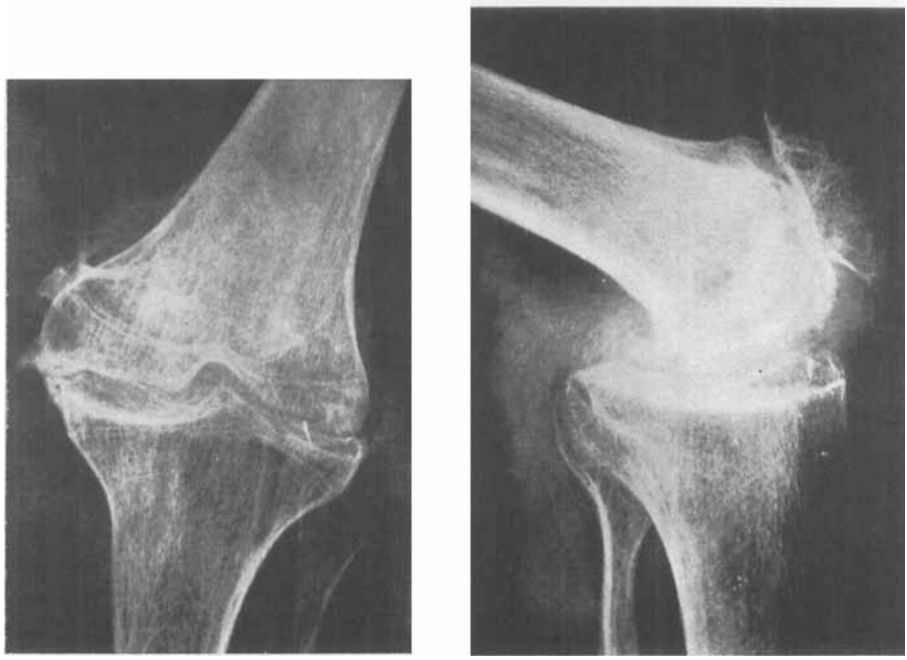


Fig. 21. Case 3. Two years after operation. "Dentated form" ad modum Haass is still markedly present.

has still further increased. The fossa intercondyloidea has become much broader. Also the lateral condyle is narrowed off to the half. The subluxation of the tibia in medial direction has increased. The tibial surface is undulating. Viewed from the side, the condyles are seen to be greatly narrowed off. The medial femoral

[1] Three years after the operation the radiogram is mainly unchanged.

condyle is jagged. One must be simply amazed at the discordance between the clinical and the radiographic findings.

Fig. 22. Case 4. Before operation.

Case 3.

Oivind T. Warehouse clerck, born 21/6-06, being thus 39 years old when he came under treatment on 1/10-45.

Ankylosis of left knee after "rheumatic fever" in 1924, having thus lasted for 21 years.

Considerable muscular atrophy, but the functioning of the quadriceps continues, although greatly reduced.

The patella is movable, but its mobility is considerably restricted.

Radiogram, Fig. 18, shows osseous ankylosis between femur and tibia. Fissure between patella and femur.

2/10-45. In morphine-ether narcosis:

Fig. 23. Case 4. 1½ year after operation.

PLASTIC OPERATION ON KNEE-JOINT

Payr's medial incision. The end of the femur is made as a "Kippgelenk" ad modum Hass and the intercondylar eminence is made especially high. Otherwise the same technique as before.

1 cm. of the tibial surface is resected. The medial lateral ligament is present, but rather weak. The distance between the joint surfaces with light traction is 2 cm.

After closing the wound the knee can be flexed 85-90°.

The semi-flexed limb is laid on Brown's splint, with 3 kg. traction through the tibial metaphysis.

12th day: Sutures removed. Primary healing.

He begins with passive flexion movements and contractions of the quadriceps.

29th day: Traction discontinued.

Radiogram XV: 2 cm. interval between joint surfaces.

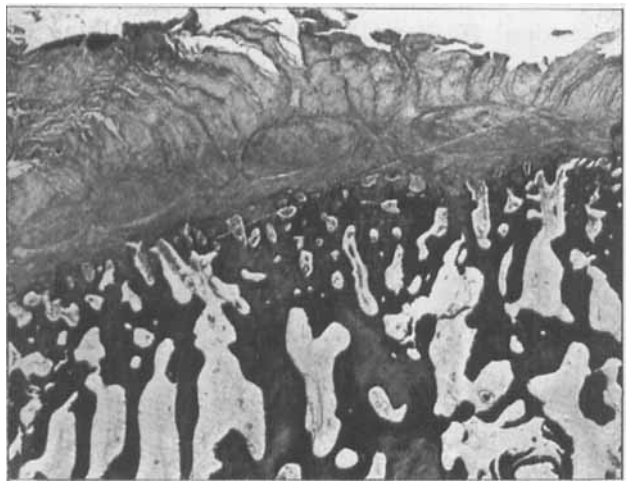


Fig. 24. Slightly enlarged survey picture. Above: fascia lata. In the middle: a layer of fibrous cartilage. Below: spongioid bone.

Two weeks after operation Radiogram XIV shows that the distance has decreased to 1 cm.

Radiogram 7 weeks after operation. Distance further diminished. Irregular joint surfaces.

27/12-45. 8 weeks after operation he is allowed to put weight on the limb. Gets up and stands with two sticks.

28/1-46. Can extend actively to within some few degrees of full extension. 55° flexion. Complains of pain under the kneecap on movements.

There is just barely perceptible lateral movement in valgus direction. Drawer sign absent.

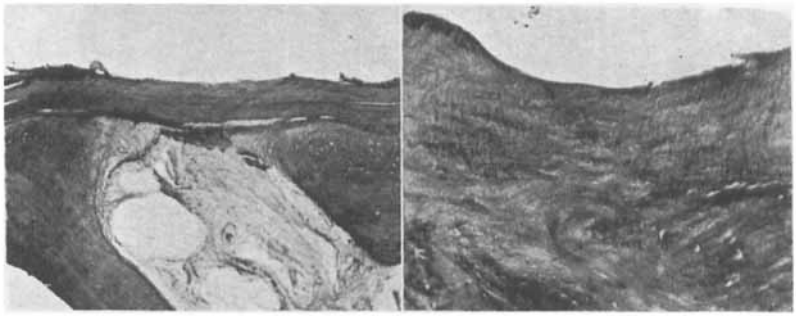
Discharged after 16 weeks. Walks with a stick.

Radiogram XVII.

Flexion 70°. Full active extension. Coarse crepitation on movements.

5/9-46. Radiogram XVIII. Pains in knee when he has walked for some time. Walks with stick out-of-doors, but indoors without stick. Is employed as warehouse clerk and is on his feet the whole day. Has little opportunity of sitting.

Examination: He limps somewhat when walking without a stick. Inner condyle is prominent. Flexion 90° (Fig. 19). Some



a. *b.*

Fig. 25 a. Medium enlargement. A thin layer of fibrous cartilage covers the spongioid bone substance and sends offshoots down into the medullary cavities, where fibrillary connective tissue is seen at some places.

Fig. 25 b. Great enlargement of a part where the fascia late is inunited with the layer of fibrous cartilage.

degrees short of full extension, both active and passive. (Fig. 20 b.) Feels pain on forced extension. No lateral mobility.

Drawer sign absent.

With equel weight on both legs 80° flexion. Fig. 20 a.

On flexion and extension there is a visible slipping movement. Audible crepitation.[1]

Survey of radiographic changes in Case 3.

Radiogram XIV. Before operation. Fig. 18.

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[1] Addition by the correctur: One year later he has no pains in his knee. The flexion is 90°, full extension. Use never stick.

Radiogram XV. Four weeks after operation, with traction, 2 cm. interval between the joint surfaces. Loose fragments of bone in the soft parts.

„ XVI. 6 weeks after removal of traction. Distence between joint surfaces reduced to the half.

„ XVII. 16 weeks after operation. Contours of outer condyle begin to become indistinct. Inner condyle has become flatter. In side view is seen the form of "Kippgelenk" ad modum Hass.

„ XVIII. 8 months after operation. Outer condyle irregular. The inner one is flattened and has a raised border in the middle, due to secondary excavation of the condyle. In side view the "kippgelenk" form is seen to be maintained. The loose fragments have now become firmly attached to the inner side of the inner femoral condyle.

„ XIX. 2 years after operation. Essentially unchanged. Fig. 21.

Cinematographic demonstration of the patient's movements.

Case 4. Henriette S. Cook, born 27/6-04.

Admitted to hospital 19/10-45, being then 41 years old.

The knee has been stiff for 14 years, after inflammation ("rheumatic fever"). It inconveniences her a good deal.

Status 20/10-45. Left knee shows osseous ankylosis in extension position. (Fig. 22.) Patella is movable, but to greatly reduced degree.

Radiogram XVI shows broad osseous ankylosis between femur and tibia, but free space between patella and femur.

Psoriasis.

18/12-45. In morphine-ether narcosis:

PLASTIC OPERATION OF KNEE-JOINT

Payr's medial S-incision.

Calcic atrophy of the condyles, with large vacuoles, which

renders the plastic moulding difficult. The intercondylar eminence is made rather high. The posterior half of the patella is resected. Traction 6 kg. Begins to practice movements 1 month after operation. Begins to put weight on the limb 8 weeks after the operation.

15/6-47, 1½ year after operation.

Has pain when she has walked much. Not otherwise. Walks without stick. Walks rather stiffly with the operated knee.

Flexion 45°. Comes some few degrees short of full extension. Flexion with equal weight on both legs 30°.

When standing only on the operated leg she can bend the knee 30° without support.

Lateral movement and drawer sign not much evident.

Survey of radiographic changes in Case 4.
Henriette S.

Radiogram XX. Before operation. Fig. 22.

„ XXI. Five weeks after operation. Posterior part of patella resected. Distance between joint surfaces well over 1 cm.

„ XXII. Five months after operation. Distance between joint surfaces still 1 cm. Inner condyle has become more flattened, with small exfoliations. Sclerotisation of the joint surfaces.

„ XXIII. Nine months after operation. The distance between the joint surfaces is well maintained. Picture unaltered from before. Fig. 23.[1]

THE ANATOMICAL FINDING ON RENEWED PLASTIC OPERATION OF THE KNEE

On opening the joint the bursa suprapatellaris is found open and clothed with a membrane resembling synovial membrane, with scanty serous fluid. Downwards towards the patella, how-

[1] 1½ year after the operation the radiogram is mainly unchanged (addition by the correctur).

ever, the anterior and posterior walls of the bursa are in part attached to each other by bridges of connective tissue. The space behind the patella is open and the patella is movable. The surface of the newly-formed condyles is covered by the transplanted fascia lata, which, in general seems to be unaltered. It forms a fibrous fascia about 1 mm. thick, in which especially the well-arranged longitudinal fibres are prominent. They glossy-yellow tendon fibres, from very thin to the thickness of a sewing-needle, resembling the iliotibial band.

They have not the character of a substitutional product—only at some few places in the intervals between the coarser fibres does resorption and new-formation of tissue seem to have taken place, as we here in some small areas find an irregular vascularized tissue. At some places connective tissue from the fascia has grown down into the spongiosa, but practically everywhere the fascia can be loosened unbroken from the joint surface without resistance.

Beneath the fascia the joint surface is found to be quite smooth, but not glassy. It is of greyish-white appearance, like cartilage, but is hard as marble to the touch. It was supposed to consist of eburnated bone tissue.

The fascia extends over the posterior wall of the fossa poplitea, but towards the tibia it passes over into an irregular layer of connective tissue, half a centimetre thick, firmly adherent to the surface of the capsule and tibia. This layer of tissue is seen to be the cause of the reduced mobility and it must be cut through in order to enable the knee to be flexed.

The posterior surface of the patella is covered with a thin layer of connective tissue outside on the cartilage.

The microscopical description given by Professor Francis Harbitz, M.D., of the Pathological-anatomical Institute at the Rikshospital in Oslo, is as follows:

"In the first piece—the transplanted fascia lata with underlying joint surface—there is found a living fibrillary connective tissue, containing few cells, with fibres in parallel arrangement, without signs of necrosis, merging into a layer of cartilage and then into spongioid bone-tissue. (Figs. 24 and 25 a and b.) The

other piece, from the chiselled off newly-formed joint surface, consists of spongioid bone, covered with a layer of cartilage, which scales off in fibrillary flakes. Likewise here there is no sign of necrosis.

In the inner bone tissue in the piece a small part of the medullary cavity is filled with fibrillary connective tissue. (Fig. 24 and Fig. 25 a.) Altogether there is in the two pieces found only living tissue, without signs of necrosis, and the surface (*i.e.*, the joint surface) which you have called eburnated bone tissue is covered with cartilage."

Briefly expressed, we find:

1. That by far the greater part of the transplanted fascia late seems to have become incorporated, without undergoing substitution.

2. That after 2 years no necrotic parts are found therein.

3. That the spongioid bone which came to form the new joint surface in the operation has been converted into fibrous cartilage.

SUMMARY

The author points out that a stiff knee is a great inconvenience in a community where people are very often sitting in trams, cinemas or theatres, or have sedentary work.

He describes and demonstrates (cinematographically and radiographically) results and experiences in four cases of plastic operation for osseous ankylosis of the knee. In one of these cases the operation was repeated after 2½ years with very good result.

Only two of the four cases were ripe for demonstration, so far as one can speak of a case being so after a plastic operation on a joint, where the situation may change from year to year. These two patients were operated three years ago. The other two, who were operated respectively 1½ and 2 years ago, are still in the after-treatment stage, but this cases are described, because they present some points of interest.

The duration of the osseous ankylosis in these cases has been

from 6 to 21 years. *The youngest patient had also osseous ankylosis of the patella in 55° flexion.* The quadricipital functions, however, could be improved by practice, so that two years after the operation she is able, standing without support and with equal weight on both legs, to flex the knee up to 55° and to walk upstairs to the fifth story, with normal change of leg. She can bend the knee 90° and extend it fully. The last-operated patient can bend only 45°, and the degree of flexion has not increased last year.

Three of the patients can stand on the affected limb alone, without support, and bend it about 20-30°.

The pains felt on movement have decreased in all the cases. Of the two patients operated three years ago one feels a little pain after walking 1 kilometre. The other has been quite free from pain for two years.

Of the two patients last operated one has considerable pain,[1] but in his work he is continuously standing or walking for 8 hours daily. The other has slight pains. Both of these have now come to the point of time after the operation at which also the other two felt pains. In the first of the four cases here is lateral movement valgus direction. In the second case there is lateral movement in invarus direction. In the last two patients there is no lateral movement.

The drawer sign in absent in all the cases.

Radiographic examination shows that resorption processes gradually arises in spongy joint surfaces and in course of time they come to appear quite irregular, in spite of their having been carefully evened off at the operation.

In one case with good clinical results the radiographic changes were quite formidable, the joint surface of the medial femoral condyle being completely excavated, so that the tibial glided in medial direction.

On the whole, the clinical findings seem to conflict with the radiographic. The resorption of bone does not seem to cor-

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[1] By last examination a year later 25/7/47 he tells that he now has only slight pains.

respond to the calcic atrophy before the operation, seeing that a case with marked calcic atrophy and great vacuolation in the spongiosa, which rendered difficult the moulding of the joint surfaces, shows least secondary changes.

In all cases except one—reoperated patient—Payr's incision was employed.

The joint surfaces of the femur were given a semicylindrical form. A coherent strip of the fascia lata was laid over both joint surfaces and everywhere carefully fixed.

In the case in which the pains still persisted after 11 months the femoral condyles were given a "kippgelenk" form ad modum Hass.

This form persists unchanged and a slip is noted when he extends the joint. The author will therefore refrain from using this method in the future.

After the operations there was employed traction through the lower tibial metaphysis or through the calcaneum, with a weight of 4-6 kg. during 4 or 5 weeks. In the case reoperated after 2½ years on account of reduced mobility it was found that the reduction of mobility was due to a thick layer of connective tissue, which covered the tibia, having coalesced with capsular connective tissue.

The upper end of the joint was free, with newly-formed socket.

The femoral condyles were covered by the freely transplanted fascia lata which seemed to have become incorporated as such and to have only to a small extent undergone substitution. There were here no signs of necrosis, either on macroscopical or microscopical examination there is found only living tissue.

The underlying joint surface was smooth as marble and covered by a newly-formed layers of fibrous cartilage.