FROM THE ORTHOPEDICAL CLINIC OF THE INSTITUTE FOR CRIPPLES, HÄRNÖSAND, SWEDEN. HEAD: DR. NILS LINDSTRÖM

ARTHROPLASTY AND ARTHRODESIS IN ARTHROSIS DEFORMANS COXAE

A Post-Investigation

BY

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In order to assess the results of the various operative procedures employed at the Orthopedical Clinic of the Institute for Cripples in Härnösand during the last decade 1940-49, I carried out a post-operative survey af all the cases concerned. The series comprises 58 patients, one of whom was operated on bilaterally. Thus 59 hip joints were surgically treated. The series includes 56 pure osteoarthritic hips and 3 with residual arthritis; on the whole the latter manifested conditions similar to those of the purely osteoarthritic cases. I wished above all to make a comparison between the results of the arthroplasties and of the arthrodesis operations. With respect to the latter my interest has centrêd particularly on the operative procedures introduced in recent years, owing to which the period of hospital care has been considerably reduced. Since the procedure proved promising and to my knowledge has not been employed elsewhere in Scandinavia, I considered it would be well worth while to give a detailed account of it in this publication.

There are first of all two main symptoms in patients with degenerative changes in the hip joint,—pain and reduced mobility. It is chiefly pain, however, which causes invalidity, even though in certain cases reduction of mobility can itself be the predominating factor. From this point of view our treatment of the disease should first aim at combating the pain and the results of the operations are evaluated for the most part on this basis.

My opinion is given concrete expression when it is realised that we have only performed arthroplasty on 16 patients; one of these was operated on bilaterally, thus making 17 arthroplasties.

The operation and aftertreatment were carried out along Smith-Peterson lines except for 2 cases, in which arthroplasties supplemented by interpolation of the fascia lata were performed. The results of these two operations are on a par with those we obtained by using the Smith-Peterson procedure. The series comprises 15 women and one man; 6 of these had bilateral changes. The ages varied between 31 and 57 years, average 41 years. In one case thrombosis and embolism occurred. In the case operated on bilaterally, both cups had to be extracted later owing to the effect of irritation. On this occasion it had not been possible to obtain original vitallium cups owing to the import difficulties which arose during the war. After the cups had been removed, however, the result proved satisfactory, both subjectively and objectively. As stated above, in all cases the after-treatment proceeded along the lines of Smith-Peterson; post-operative care averaged 3 months.

All the cases were re-examined from 4 months to 7 years after operation, giving an average of 2 years and 6 months. If one considers, like Albee, that 35° flexion is satisfactory, since this permits the patient to sit quite naturally, we obtained a good result in 15 arthroplasties of the hip-joint. Flexion of 70° or over appeared in 6 cases only. Smith-Peterson recently emphasised that total capsulectomy should produce better results. I performed this in 5 of the cases; 4 of them have 70° mobility or more, one has 55° flexion. This points to the same conclusion. Thus the mobility was quite satisfactory, but pain occurred in 8 cases and limping in 12; consequently sticks had to be used. Only 3 patients could walk more than 2 kms. and only 5 could work full-time—4 were employed in domestic work and 1 in a factory. Each one obtained full mobility in the knee joint but in spite of this only 3 could put on their own shoes.

Nailing (Watson-Jones) alone was carried out on 11 patients,—5 men and 6 women. 3 of these had bilateral changes. Their ages were between 43 and 69 years, average 54 years. Clinical ankylosis and freedom from pain were secured in 7 cases although bony ankylosis existed roentgenologically in 4 cases only. After a second operation bony ankylosis was secured in a further 2 cases. In one of these cases fracture occurred on nailing and therefore the patient lay in plaster for 3 months. After the plaster was removed the nail broke; the patient was therefore operated on secondarily. After extraction of the nail total intra-articular arthrodesis was performed and afterwards the bone united. Owing to lack of stability juxta-articular arthrodesis was carried out in 1 case 3 months after the first operation; this case too then obtained bony union. If we group the cases according to de-

gree of mobility before operation we find that those patients with very little mobility prior to operation achieve the best results with this operative procedure. Thus out of the 6 cases in which mobility before the operation had almost ceased, 5 exhibited clinical ankylosis and had no pain even though the joint space could be observed roentgenologically in 2 of the cases. The other 5 patients with 20°-70° flexion demonstrated very poor bone healing and only one of these progressed as far as bony ankylosis. In 2 cases the nail was extracted owing to its slipping 2 months and 2 years respectively after the operation. One patient had thrombosis and lung embolism and in one case a subtrochanteric fracture occurred 2 months after the operation; consequently the patient had to lie in plaster for 3 months. The patients who obtained primary ankylosis were allowed to get up after 6 weeks but owing to complications and secondary operations the average duration of the treatment was 3½ months. All the patients were re-examined from 2 years and 2 months up to 5 years and 9 months after operation, average 3 years and 7 months. Only 2 patients reported pain in the hip but 4 patients limp and 3 use sticks. 6 patients can walk more than 2 kms. but in two cases information is lacking. Only 4 patients have full mobility in the knee-joint. 3 patients state that they are fully at work; one is an electrician and 2 are occupied in house work.

During the period 1940-46 we carried out 12 total intra-articular arthrodeses, in one case with simultaneous nailing (Watson-Jones). The operation was performed on 4 men and 8 women between the ages of 17-53 years, average age 42 years. All the patients had unilateral changes. After the operation plaster was applied from the foot to the hip for 3-8 months, average 4 months; 6 patients wore a walking plaster for a further 4-9 months, average 6 months. 2 patients died in connexion with the operation, one from pneumonia and one from lung embolism. 7 months after the operation one patient suffered a subcapital fracture of the collum which united after a new operation and plaster treatment. The length of post-operative care varied between 4 and 9 months, with an average of 6 months.

One patient did not present himself for re-examination and consequently this includes only 9 cases. The examination took place between 2 and 9½ years, average 6 years 3 months, after the operation. 2 patients underwent nailing (Watson-Jones), 6 and 15 months respectively after the first operation, but only one of these secured bony union. The patient who had undergone primary nailing was re-operated upon 16 months later; this comprised a new total intra + justa-articular arthrodesis + nailing, with a tibia graft in the hole made by the

old nail, but no bony ankylosis was obtained. At the re-examination 7 patients proved to have bony ankylosis but one of these had undergone nailing secondarily (Watson-Jones). Both patients with fibrous ankylosis had pain in the hip, the others had none. Only one uses stick. 3 patients can walk over 2 kms.; there is no information available about 2 cases. 5 patients with bony ankylosis are fully at work, one of them is a lumberer. 6 have full mobility in the knee joint but only 4 can put on their own shoes.

Since dislocating the hip joint in itself was considered to involve an increased risk of shock we adopted a different operative technique. Thus partial intra- and juxta-articular arthrodesis was performed on 3 women aged 54, 55 and 64 years and after the operation plaster was applied from the foot to the hip for 3 months. In one case there was clinical ankylosis but after the plaster was removed she fractured the collum and therefore nailing (Watson-Jones) was carried out. Then the nail itself fractured and thus the patient's leg was kept in plaster from the foot to the hip for 4 months. There was no ankylosis in the other two cases; therefore these also underwent nailing (Watson-Jones). In one of the cases infection set in, with fistula. This patient was given plaster treatment for 3 months. Duration of hospital care for these patients was very lengthy, averaging one year. All healed with bony ankylosis and at the re-examination 2 years after the operation they were free of pain and walked without limping, although one uses a stick. 2 can walk over 2 kms. and declare that they carry out all their own housework. Only one possesses full mobility in the knee joint and can put on her own shoes.

A woman aged 50 underwent a partial intra-articular arthrodesis with simultaneous nailing (Watson-Jones), but the case was a technical failure owing to the arisal of a fracture during the nailing; consequently plaster was applied for 3 months from the foot to the hip. Afterwards the nail slipped and had to be extracted 8 months after the operation.

The re-examination 2 years post-operatively showed the end result to be a fibrous ankylosis with pain on exertion. She has considerable limitation of movement in the knee joint and walks with a limp, using a stick outdoors.

Employing a new method, Dickson and Willien from Cleveland published in 1947 10 case reports of successful hip joint arthrodeses. This led me to work out a similar operative technique which I then used in all arthrodesis cases. The procedure consists in a partial intra- and juxta-articular arthrodesis with simultaneous nailing (Watson-Jones).

A curved incision is made in the skin; it follows the frontal part of the iliac crest, the medial border of the tensor fasciae latae and turns back directly across the lateral aspect of the thigh to a point about a hand's breadth below the region of the trochanter. The musculature is detached subperiosteally from the ileum and the joint is exposed from above. The fascia is dissected along the medial border of the tensor and the fascia lata is divided transversely in the lower part of the wound; then the musculature can be detached and reflected laterally so that the trochanter region is exposed. The joint capsule is incised longitudinally in line with the neck of the femur and is hartly detached from the acetabular rim so that the joint is easily accessible from above to the surgeon. The cartilage in the acetabular roof and on the dorsal aspect of the joint head is then chiselled away; dislocation of the joint is not necessary. A long bone graft from the iliac crest to the acetabular roof is chiselled out and all the cancellous bone which can be secured is removed with a scoop. The leg is now placed in the desired position, flexed to about 30°, rotated slightly outwards and maintained mid-way between ab- and adduction provided that no shortening can give an indication for a definite abduction position. The operated leg must however never become longer than the sound one, if the patient is to walk well, and therefore great care must be taken with respect to the abduction position. The hip is immobilised in this position with a three-flanged nail (Watson-Jones) extending from the trochanter-region up into the pelvis. The cancellous bone from the ileum is packed into the defect between the head and the acetabular roof. In the later cases the head and the acetabular roof were also split. A groove is chiselled out on the dorsal aspect of the head and collum, then the bone graft is pushed down so that it fits into the groove and forms a bridge across from the ilium. The joint capsule is then sutured across the graft so that it is firmly fixed. After the soft tissue has been sutured and bandages applied, the patient is put to bed without plaster.

During the period embraced by the investigation I operated on 16 patients according to this method, 11 men and 5 women, aged between 15 and 55 years with an average age of 46 years. 4 of the patients also had changes in the second hip. I used spinal anaesthesia with percain (Sebrecht) although we had not consistently employed this anaesthesia before. At the same time as we introduced this procedure we also began to give consistent injections of dextran intravenously. In no case was it necessary to have recourse to blood transfusion. In spite of the fact that the operation lasted a considerable time the patients recovered well and no complications appeared. After 6 weeks in bed they were

allowed to get up and mobilisation of the knee joint was commenced at the same time.

Since, however, no definite clinical ankylosis was established in two cases, a secondary hip plaster was applied for 2 and 3 months respectively. Hospitalisation averaged 2 months, 19 days, but if the latter two cases are subtracted it becomes exactly two months. The patients were re-examined between 6 months and 2 years, 10 months, after the operation, average 1 year, 10 months. One patient died later of cancer and thus the investigation comprises 15 cases. Bony ankylosis exists in 14 cases and clinical ankylosis in one case; this patient states that he feels pain in the hip sometimes and now 10 months after the operation no definite bony bridging formation can be seen on the roentgenograms. 11 patients can walk more than 2 kms.; 3 patients use one stick and 3 limp while walking. 14 patients possess full mobility in the knee joint; one of the two patients given plaster treatment has 60° flexion. 11 patients are fully at work.

The follow-up examination showed that the arthroplasties resulted in satisfactory mobility but that pain occurred in about half the cases and that most cases had residual insufficiency and consequently were obliged to use sticks. Therefore the operation does not seem to be generally suitable for manual workers. In my opinion the main indication for arthroplasty is bilateral changes but not too pronounced changes in the second hip should not be regarded as an absolute contraindication to arthrodesis. Earlier I considered that an arthrodesis operation would result in a greater strain on the other hip but, as Prof. Friberg has pointed out, the possibility also exists that the operation would bring relief to the other hip, since the patient would thus obtain one painfree hip to rest on. This view is also supported by the fact that all the bilateral cases who underwent the new arthrodesis operation are now fully at work. It is encouraging to think that we do not need to restrict our use of the arthrodesis operation as much as before, since a successful arthrodesis seems to be the best operation for the majority of patients.

Which arthrodesis procedure is the most suitable then? Our investigation shows that nailing (Watson-Jones) is only suitable for cases with almost no mobility in the hip joint. The operation should be reserved for cases in which the surgeon does not dare to contemplate a more extensive intervention. Total intra-articular arthrodesis followed by plaster treatment is a strain upon the patient, requires long periods of hospitalisation and gives bad results i.e. a large percentage of mal-united cases. Moreover it is of great importance for an arthrodesis patient to have full mobility in the knee joint and

Comparison of all cases and follow-up results.

Operation	Men	Women	Average age	Average duration of treatment	Complications	Secondary operations	Good mobility	Bony ankylosis	Pain in the hip	Limp	Sticks	Full mobility in the knee joint	Fully at work
Arthroplasty. (1 bilateral case).	1	15	31 41 57	3	I ease of thrombosis and embolism. Irritation in 2 cases owing to lack of original cups.	2 cups were extracted.	15		8	12	12	17	5
Nailing. (Watson-Jones).	5	6	43 54 69	3 1/2	1 case—fracture on nailing. 1 case—breaking of nail. 2 cases—nail slipped. 1 case—thrombosis and embolism.	1 case—t.i.a.a. 1 case—j.a.a. 2 cases—extraction of nail.		6 (3)	2	4	3	4	3
Total intra-articluar arthrodesis.	4	8	17 42 53	6	2 fatal cases. 1 subcapfitular secondary collum fracture.	2 cases—nailing.(Watsen-Jones.) 1 case - t.i.a.a + j.a.a. + tibia graft. (1 not followed-up).		7	2	5	1	6	5
Partial intra-+juxta-articular arthrodesis + W.-J.	11	5	15 46 55	2 1/2		1 patient died of caneer		14	1	3	3	14	11
Partial intra-+juxta-articular arthrodesis		3	54 55 64	12	1 case—secondary fracture of collum.	3 cases of secondary nailing.(Watson-Jones).		3			1	1	2
Partial intra-articular arthrodesis + W.-J.		1	50	3 1/2	Slipping of nail.	Extraction of nail.			1	1	1		

Both the lowest and the highest age as well as the average ages are given, apart from the 3 patients on whom partial intra + juxta-articular arthrodesis was carried out. Here the actual ages of the patients are recorded. The figure 3 in parentheses denotes cases with clinical ankylosis and freedom from pain, in which no definite ankylosis could be established roentgenologically.

owing to the long period of immobilisation there are a relatively large number of patients who do not achieve this. Therefore it seems a cheering sign that we have been able to attain a considerably higher percentage of bony union—90 %—using the new method of partial intra + juxta-articular arthrodesis and simultaneous nailing (Watson-Jones), compared with the 50 % achieved when employing the total intra-articular arthrodesis. At the same time we have cut down the length of the hospitalisation by two thirds. No complications have appeared in connection with this new arthrodesis operation. In part this is due to the introduction of consistent shock prophylaxis when the operation was first adopted but it is undoubtedly mostly due to the fact that the patients did not have to undergo plaster treatment.

In my opinion, therefore, the partial intra + juxta-articular arthrodesis with simultaneous nailing (Watson-Jones)—as I have described the operation above—is the best arthrodesis operation, involving much less risk for he patient than the total intra-articular arthrodesis succeeded by plaster treatment. Since this follow-up examination finished I have received further confirmation of this opinion, for in 1950 I performed this operation on 7 more cases without complication and with good primary results.

Thus, summing up, I should like to emphasise that arthrodesis should be advised in all unilateral cases and also in cases with slight changes in the second hip. We can now stress this all the more because we have adopted a procedure which would seem to give very good results and to necessitate only a relatively short period in hospital.

SUMMARY

The author reviews the results of a follow-up examination of all cases of arthrosis deformans coxae operated on at the Institute for Cripples at Härnösand during the decade 1940-49. His object is chiefly to draw up a comparison between the results of arthroplasties and arthrodeses. Out of 58 patients 59 hips in all were operated on; 16 of these underwent arthroplasty and 43 arthrodesis. The best results were achieved by an operative procedure introduced during recent years, and consisting in a partial intra- + juxta-articular arthrodesis + nailing (Watson-Jones). The author recommends this procedure in all unilateral cases and in cases with slight changes in the second hip.

RESUME

L'auteur passe en revue les résultats d'examens complémentaires de tous les cas d'arthrose déformante de la hanche opérés à l'Institut

des Infirmes de Härnösand pendant les dix années 1940—49. Son but est principalement d'établir une comparaison entre les résultats des arthroplasties et des arthrodèses. Chez 58 malades, 59 hanches ont été opérées; 16 par arthroplastie et 43 par arthrodèse. Les meilleurs résultats ont été obtenus par une méthode opératoire adoptée les dernières années, consistant en une arthrodèse partielle intra- + juxta-articulaire + enchevillement (Watson-Jones). L'auteur recommande cette méthode dans tous les cas unilatéraux et dans les cas présentant de légères altérations dans la seconde hanche.

ZUSAMMENFASSUNG

Der Verfasser gibt einen Überblick der Ergebnisse einer Nachuntersuchung von allen Fällen von arthrosis deformans coxæ, die an der Heilanstalt für Krüppel in Härnösand während der Dekade 1940—49 operiert wurden. Seine Hinsicht ist vor allem die Resultate der Arthroplastiken und Arthrodesen zu vergleichen. An 58 Patienten wurden in allem 59 Hüften operiert. Bei 16 von diesen wurde eine Arthroplastik und bei 43 eine Arthrodese ausgeführt. Die besten Ergebnisse wurden mit einer operativen Methode erzielt, die in den späteren Jahren aufgenommen worden war und die in einer teilweisen intra- + juxta-artikulären arthrodese + Nagelung (Watson-Jones) bestand. Der Verfasser empfiehlt diese Methode in allen einseitigen Fällen und in Fällen mit leichten Veränderungen in der zweiten Hüfte.