

PARTIAL INTRA-PLUS JUXTAARTICULAR ARTHRODESIS WITH SIMULTANEOUS NAILING ACCORDING TO WATSON-JONES

By

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The clinical picture of deforming hip lesions is dominated mainly by two symptoms, pain and impaired range of movement. Although the latter may be predominant, it is usually the pain that is invalidating. Treatment should therefore aim at freeing the patient from pain.

In unilateral cases with changes so pronounced that the symptoms indicate a more radical operation, the choice must be made between arthroplasty and arthrodesis.

Successful arthroplasty with subsequent freedom of pain, good range of movement and stability would, of course, be ideal, but unfortunately this is achieved only in a small percentage of cases. Thus, Judet (1950), for example, reported persistent pain in 30 per cent of his series of 300 cases and two thirds used a walking stick. Of a personal series of 16 arthroplasties before Judet's report 50 per cent had persistent pain and 12 used walking sticks.

Arthrodesis, on the other hand, will always give stability and freedom of pain. That arthrodesis has not been performed so widely is probably due to several factors, such as the difficulty in securing bone union, the strain such an operation places on the patient, the long bed rest in plaster and the patient's aversion to a stiff joint.

Older surgical methods with total intra-articular arthrodesis and subsequent fixation in plaster gave pseudarthrosis in anything up to 50 per cent of the cases. In 1934 Watson-Jones pointed out that lack of bone union was due to imperfect fixation and introduced internal fixation with a three-flanged nail from the subtrochanteric region up

into the ileum. Experience gained with this method was presented in 1936. In the beginning he performed the operation as a one stage procedure, but after the first 37 operations had claimed 2 deaths he suggested a two-stage operation. He first performed an ordinary intra-articular arthrodesis and then after 10 days to 2 weeks nailed the hip, after which the patient lay in plaster for about 3 months. He described 3 technically unsuccessful cases which, however, healed after re-operation. For elderly persons he suggested nailing only without intra-articular intervention and without plaster. As pointed out in an earlier article on surgery of the hip (Lindström 1951) this operation method is suited only to patients with a practically stiff hip joint because otherwise there is a great risk of the nail breaking.

With Watson-Jones' method or one of its modifications other orthopaedic surgeons as Harris and Haggart have obtained good results. The largest collection in recent years was published from New York Orthopaedic Dispensary and Hospital by Stinchfield & Cavallaro (1950). The after-examination comprised 117 hip-joint arthrodeses performed during the years 1935-1946 for diseases other than tuberculosis. Different methods were used, but the best results were obtained by intra- + juxtaarticular arthrodesis with bone-chips + nailing according to Watson-Jones, 11 cases with 1 unsuccessful, and with intra-articular arthrodesis + 3 vitallium nails in different directions, 10 successful cases. All the patients lay in plaster for 14 weeks and then in ambulatory plaster for a further 11 weeks. For all 117 cases the mortality noted was 3.4 per cent and in 23 per cent pseudarthrosis occurred. Infection occurred in 6 per cent.

It is thus clear that with simultaneous internal fixation much better results can be obtained than earlier. However, the disadvantages of prolonged fixation in plaster persist, which, in addition to the risk of complications especially in elder patients, involves a risk of impaired range of movement of the knee-joint. In hip-joint arthrodesis such impairment of movement in the knee-joint is a most serious complication and if it occurs, the operation must be regarded as unsuccessful.

Niebauer & King performed total intra-articular arthrodesis + fixation with a three-flanged nail from the subtrochanteric region and a screw from the inside of the pelvis. In 1946 they published 24 cases in which, however, only 15 of the patients had a "painless stable hip". Nothing was said about bone fusion.

The difficulty in obtaining bone-fusion in total intra-articular arth-

rodesis is due not only to the difficulty in fixation, but also to the fact that after removal of the cartilage the femoral head is too small for the acetabulum. With such incongruent surfaces impaired bone union must be expected, and therefore the method is not suited to nailing only. Such an operation requires good healing conditions and that soon enough a state be secured, which corresponds practically speaking to a stiff joint, where we know that simply nailing according to Watson-Jones gives good results.

Dickson & Willien (1947) described a surgical method in which they only thoroughly laminated the cartilage, in the acetabulum and on the caput without removal of cartilage and thereby retained the surface as congruent as possible. At the same time juxta-articular arthrodesis was performed with a bone graft from the ileum and fixation with a three-flanged nail. The patients lay in bed free and were allowed to get up after 4-6 weeks but weight bearing was not allowed until fusion had occurred. They described 10 cases, in all of which bone ankylosis was achieved.

In 1955 Apley & Denham published a method with partial intra-articular arthrodesis and fixation with a three-flanged nail in which they also performed subtrochanteric femoral osteotomy. After 6 weeks' traction the patients were allowed to get up and walk with a hip-plaster for a further 6 weeks. They described 12 cases operated by this method in which bone union was secured. Personally, however, this method does not appeal to me.

Finally Charnley devised a method with central luxation of the caput and internal fixation, in which he achieved a changed loading of the hip. In several cases, however, the bone did not heal, but he says that nevertheless the hip is painless.

Since luxation as such was regarded as a shock-producing factor, I tried partial intra- + juxta-articular arthrodesis; however, secondary nailing according to Watson-Jones always proved necessary. Then, influenced by Dickson & Willien I devised in 1947 a method which I have since used and which consists of partial intra- and juxta-articular arthrodesis with simultaneous nailing according to Watson-Jones.

The technique is as follows. Spinal anesthesia according to Sebrecht. The patient is placed on a traction table. Large curved skin incision is made along the anterior part of the crista iliaca to the spina iliaca ant. sup., then a few decimeters down the thigh along the medial edge of tensor fasc. lat. after which the incision swings backwards transversely over the thigh. The fascia is divided medially to the tensor,

the fascia lata is distally cut transversely and the musculature is loosened subperiosteally from the anterior part of the ileum after which a skin-muscle flap can be bent down backwards and the hip-joint and the trochanter thereby be exposed. The joint is opened by a T-incision in the capsule with the transverse incision along the edge of the acetabulum. Without luxating the joint cartilage is removed from the acetabulum and the upper part of the caput and the joint surfaces are split. The leg is adjusted at 20–30° flexion, slightly external rotation and the neutral position for abduction unless shortening of the leg can cause slight abduction. However, one should not be tempted to compensate any shortening of the leg by pronounced abduction because of the risk of back-pain. A three-flanged nail is driven in over a guide from the subtrochanteric region and up into the ileum towards the sacro-iliac joint. This often produces a slight separation of the hip-joints, especially if the bone in the acetabulum is sclerotic. Before the nail is driven home, I therefore usually apply a nail extractor; when I try to screw out the nail with the extractor the caput is instead pressed against the acetabulum. With a rapid blow it is then usually possible to drive in the nail without any widening of the joint space. Under no circumstances whatsoever should one be satisfied with a joint with any diastasis. A bone graft about 2 centimeters wide is chiseled out from the acetabulum and up in the ileum and pushed down over the joint and hammered into a canal chiseled in the caput so that it overbridges the joint. A fair amount of cancellous bone is scooped out of the ileum and packed in any defect between the caput and the acetabulum and between the graft and the joint so that a compact mass of bone is obtained between the ileum and femur. The capsule is then sewn over and fixes the graft firmly in position. After suturing the soft tissues and bandaging the patient is placed in bed without plaster.

All the patients received macrodex intravenously and none required blood transfusion. Although the operation is fairly tedious the patients tolerated it well and no post-operative complications were noted. After 6 weeks the patients were usually allowed to get up, weight bearing was then permitted and physiotherapy commenced.

As an example a short account of two cases is given below. One was a case of pure deformans changes (No. 23, Table I), the other with a collum pseudarthrosis and caput necrosis (No. 40, Table I).

The first case was seen in a 44 year old woman who has been treated at the orthopedic clinic in Härnösand from 2/10 to 23/12 1950. She had

since childhood had an increasing limp and trouble from the right hip. On admission there was moderate limited movement of the right hip and Trendelenburg sign was positive and the left hip-joint also showed slight impairment of movement. Radiographic examination showed marked subluxation and pronounced deformans changes in the right hip-joint (Fig. 1). Slight deformans changes were also seen in the left hip-joint.

It was decided to perform arthrodesis of the right hip-joint and later possibly plasty of the other joint. On 28/10 1950 the patient was submitted to partial intra- + juxta-articular arthrodesis + nailing according to Watson-Jones. Spinal anesthesia according to Sebrecht, 19 cc. nupercain. After operation 800 cc. macrodex was given intravenously. The maximum temperature recorded during the post-operative period was 38.7° C. After 2 weeks the temperature was normal. The patient was allowed to get up 11/12, thus after 6 weeks, and when discharged on 23/12 1950 she could walk fairly well.

Radiographic examination on 9/2 1951, three months after operation, showed overbridging bone formation (Fig. 2).

After-examination on 14/4 1954. She used a stick in the right hand because of weakness of the left hip-joint. She did her own house-work. Radiographic examination showed bone ankylosis of the right hip-joint (Fig. 3).

The other example was a 60 year old woman who on 19/3 1949 sustained right-sided fracture of the femoral neck. Nailing according to Sven Johansson was done at the local hospital. In autumn 1949 she had pain in the hip for which reason the nail was removed. Since then she has had increasing hip-pain.

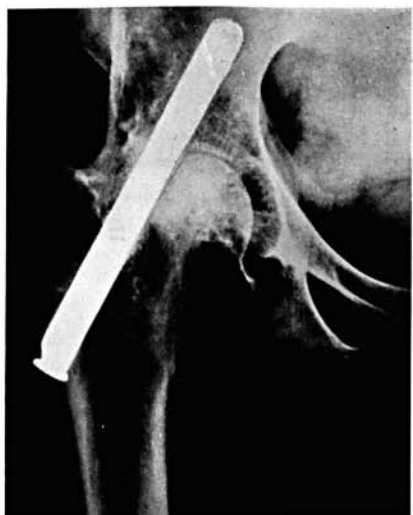
The patient was cared for at the orthopedic clinic in Härnösand 12/4-17/10 1950. On admission she had a pronounced limp of the right side and adduction contracture. Radiographic examination showed subcapital collum pseudarthrosis with upward displacement of the trochanter and caput necrosis (Fig. 4).

On 9/5 1950 she was submitted to partial intra- + juxta-articular arthrodesis and nailing according to Watson-Jones. Spinal anesthesia according to Sebrecht, 12 cc. nupercain. At operation a large portion of the necrotic caput was removed laterally and the end of the neck was laterally denuded. After operation 800 cc. macrodex was given. The maximum temperature noted during the post-operative course was 39° C. After 4 days temperature was normal.

Since healing conditions in this case were judged as unfavourable,

*Fig. 1.**Fig. 2.**Fig. 3.**Fig. 4.*

the patient was not allowed to get up until 4 months later, i.e. 16/9 1950. Radiographic examination on 26/7 1950 showed that the bone graft had healed in but no bone union was seen in the hip (Fig. 5). Radiographic examination on 14/9 showed commencing bridging of bone (Fig. 6).

*Fig. 5.**Fig. 6.**Fig. 7.**Fig. 8.*

Radiographic examination on 4/4 1951 showed definite bone ankylosis and commencing reformation of the sclerotic bone in the caput (Fig. 7).

On re-examination on 7/4 1954 the patient had no pain from the hip and carried on with her own house work. Radiographic examination

TABLE I

No.	Sex	Age in years	Complications	Sec. op.	Hospital care	Bone anky- losis	Range of movement in knee	Put on shoes themselves	Wal- king stick	At work
1	M	35			7 weeks	+	free	+		+
2	F	51			17 "	+	free	+		+
3	F	55	Thrombosis		14 "	+	free	+		+
4	M	15			11 "	+	free	+		+
5	F	52			8 "	+	free	+		+
6	M	48			9 "	+	free	+		+
7	F	36			8 "	+	free	+		+
8	M	37			8 "	+	free	+		+
9	M	48		Hip plaster	14 "	+	180-70			+
10	M	46			8 "	+	free	+		+
11	M	49		Hip plaster	20 "	+	?		+	
12	M	45			7 "	+	free	+		+
13	F	53	Dead of cancer		8 "					
14	M	53			9 "		free			+
15	F	55			13 "	+	free		+	+
16	M	54		Hip plaster	22 "	+	180-120			+
17	M	36			7 "	+	free	+		+
18	F	55	Pneumonia		10 "	+	free	+		+
19	F	60			13 "	+	free	+		+
20	F	38			9 "	+	180-60		(+)	+

21	F	52		13 "	+	180-70	+		
22	F	41		15 "	+	free	+		
23	F	44		8 "	+	free			
24	F	34		9 "	+	free	+		
25	F	57		9 "	+	free			
26	F	30		7 "	+	180-90			
27	F	47		8 "	+	free		(+)	
28	F	45		7 "	+	free	+		
29	F	38		7 "	+	free	+		
30	F	44		8 "	+	free	+		
31	F	45	Femoral fracture	Hip plaster	+	free	+		
32	F	46		8 "	+	free	+		
33	F	46		10 "	+	free	+		
34	M	27		9 "		free			
35	M	52		10 "	+	free	+		
36	F	39		8 "	+	free	+		
37	F	53	Thrombosis	10 "	+	free	+		
38	M	54		9 "	+	free	+		
39	M	54	Thrombosis	Hip plaster	+	180-80		+	
40	F	60		23 "	+	free	+		
41	M	16		7 "	+	free	+		

Nos. 1-37 arthrosis deformans coxae.

No. 38 painful arthroplasty according to Smith-Petersen.

Nos. 39-41 pseudarthrosis colli femor. et necrosis capit.

showed bone ankylosis with total reformation of the sclerotic bone (Fig. 8).

During the years 1947–1955 I have personally operated on 41 cases by this method, 16 males and 25 females, aged 15–60, with an average age of 45 years. 37 patients had genuine deformans changes, 1 had pain after Smith-Petersen plasty and 3 collum pseudarthrosis and caput necrosis. All cases are accounted for in Table 1.

As is apparent from Table 1, three patients (Nos. 3, 37 and 39) had thrombosis of the leg and 1 patient (No. 18) pneumonia. One woman (No. 31) sustained subtrochanteric femoral fracture the same day as she was to be discharged and was then placed in a hip-knee-foot plaster for 3 months. In 4 cases where a definite clinical ankylosis was not observed 6 weeks after operation, the patients were placed in a hip plaster for 1, 2, 3 and 4 months, respectively (Nos. 9, 16, 11 and 39).

The patients in Table II are classified according to the 3 above mentioned groups. It is apparent that the hospital care after the operation for the purely deformans cases was on the average two and a half months, for the 3 cases with collum pseudarthrosis and caput necrosis where conditions for fusion were less favourable five and a half months, and in the case with earlier arthroplasty according to Smith-Petersen two months.

One patient died of cancer for which reason the re-examination comprised 40 cases. The interval between operation and the re-examination varied between 6 months and 6½ years with an average of 2 years and 2 months.

Bone ankylosis was seen in 38 cases, thus bone fusion in 95 per cent.

Of these, all the hips were ankylotic with 20–30° flexion except in one patient with 35° flexion and one with 40°. Twenty-one hips are in neutral position for abduction, 13 in slight —5° abduction, 2 in 10–15° abduction and 2 in slight adduction. Twenty-four are in slight —15° external rotation, 10 in 20° external rotation, 3 in 25° external rotation and 1 in 40° external rotation. The position may thus be regarded as generally being good, but the external rotation in some cases was unfortunately pronounced, which, however, none of the patients found disturbing. The adduction in two cases implied slight functional shortening which was readily corrected with a cork wedge under the heel. As mentioned earlier, I consider the ideal position to be 20–30° flexion, slight external rotation and neutral position for abduction or, in the presence of shortening, slight abduction. It was, however, found that it was difficult at operation exactly to determine the position before-

TABLE II

Disease	Men	Women	Average age	Average duration of treatment	Complications	Secondary operations	Bony ankylosis	Painlessness	Full mobility in the knee-joint	Sticks	At work	Double sided
Osteoarthritic hips	13	24	(15)	2½ months	2 cases of thrombosis	4 cases plaster spica	34	35	30	4	34	6
			45		1 case of pneumonia							
			(60)		1 case of secondary fracture of femur*							
Smith-Petersen's arthroplasty with pain	1		54	2 months			1	1	1		1	
Pseudarthrosis of neck of femur and necrosis of femoral head	2	1	(16)	5½ months	1 case of thrombosis et pleuritis	1 case plaster spica	3	3	2	1	2	
			43									
			(60)									
Total	16	25	45	2½ months	*		38	39	33	5	37	6

* 1 patient died of cancer.

hand, for which reason a certain deviation from the planned position was sometimes unavoidable. It was also sometimes difficult to overcome a marked external rotation.

One further case had clinical ankylosis and a painless hip although radiographic examination showed no bone union. This patient is carrying on his fulltime employment as a foreman at a salting house 6 years after the operation. He is on his feet anything up to 10 hours a day (No. 14, Table I). The patient with pseudarthrosis was afterwards operated on at another clinic with total intra-articular arthrodesis without bone union being achieved (No. 34).

Thirty-three patients have full range of movement of the knee joint and as is apparent from Table I, only one has a flexion of less than 90°. Twenty-seven patients can put on their shoes themselves. Three patients always use a stick and 2 patients sticks only out-of-door (in Table I marked as (+)). Those patients who use a stick for the other hip are not included. Thirty-seven patients are carrying on with their work ranging from house-work to heavy factory work and farm-work. For comparison it might be mentioned that of my earlier (1951) arthroplasty series, only one third were able to return to their work.

Six patients have had bilateral changes. As pointed out in my earlier article on hip-joint operations, slight changes in the other hip need not contraindicate arthrodesis. An arthrodesis on one side can instead relieve the other hip which then becomes painless. If the changes are bilateral, I am of the opinion that arthrodesis on one side and arthroplasty on the other is preferable to bilateral arthroplasty.

Seven of the patients complained of back pain but only in 2 was the pain so severe that the patients decided to wear a cloth corset. But these two patients had spinal deformans changes which should perhaps have contraindicated arthrodesis. Successful arthrodesis should not involve any appreciable risk of subsequent back pain; on the contrary it can, as pointed out by Watson-Jones, give relief from any such existent trouble. However, I believe that before deciding upon arthrodesis, it is wise to examine the lumbar spine radiographically and disc degeneration or deformans changes should be regarded as contraindicating the operation.

To sum up, I would emphasize that the method I have described with partial intra- + juxta-articular arthrodesis + nailing according to Watson-Jones has proved to give good results with bone fusion in 95 per cent of 40 after-examined patients operated on personally. With this method it is possible to shorten hospital care considerably, there

are good prospects of obtaining a good range of movement in the knee-joint and a long period in bed in plaster is avoided. Therefore the operation can be offered to all patients with unilateral arthrosis deformans or with slight lesions even in the other hip-joint and in those cases in which arthroplasty is planned or has been performed on the other side provided that the lumbar spine is satisfactory and the range of movement of the knee is good.

• SUMMARY

The advantage of arthrodesis is that it gives a painless stable hip. It has, however, proved difficult to secure bone union and earlier methods have resulted in up to 50 per cent pseudarthrosis. In 1947 the author introduced his new method at the orthopedic clinic in Härnösand. This method consists of a partial intra- + juxta-articular arthrodesis with simultaneous nailing according to Watson-Jones. After 6 weeks' post-operative bed rest without plaster the patient is usually allowed to get up and then weight bearing is permitted.

During the years 1947-1955 the author operated on 41 hips by this method. One patient died from cancer. The remaining 40 were after-examined on the average 2 years and 2 months after the operation. Thirty-eight showed bone union and a further one clinical ankylosis and freedom from symptoms. Thus bone union was achieved in 95 per cent and relief from symptoms in 97 per cent. Thirty-seven of the patients returned to work ranging from house-work to heavy factory work and farm labour.

The author recommends the operation for patients with unilateral arthrosis deformans and for patients with slight changes also on the other side as well as for cases in which arthroplasty is planned or has been performed on the other side, provided that the lumbar spine is satisfactory and the range of movement of the knee is good.

RESUME

Les avantages de l'opération de l'arthrodèse sont l'abolition des douleurs et la stabilité. Toutefois, on a constaté qu'il était difficile d'obtenir la guérison osseuse et les méthodes utilisées autrefois provoquaient jusqu'à 50 % de pseudarthroses.

En 1947, l'auteur introduisit sa nouvelle méthode à la Clinique orthopédique de Härnösand. Celle-ci comportait une arthrodèse partielle intra + juxtaarticulaire avec application simultanée de la méthode

de clouage de Watson-Jones. Après l'opération, le malade peut rester alité librement, sans bandage de plâtre et, en règle générale, il peut se lever et appuyer sur la jambe au bout de six semaines.

Durant les années 1947 à 1955, l'auteur a personnellement opéré 41 hanches d'après cette méthode. Un malade est décédé du cancer. Les 40 autres ont été réexaminés, en moyenne au bout de 2 ans et 2 mois après l'opération. Chez 38 malades la guérison osseuse s'était effectuée; de plus, il y avait chez un malade une ankylose clinique et aucune douleur. On a ainsi obtenu la guérison osseuse dans 95 % et l'abolition des douleurs dans 97 % des cas. 37 malades avaient repris leur travail, comportant toute une gamme d'occupations, depuis les travaux du ménage jusqu'aux durs travaux d'usine, d'autres étant occupés dans l'agriculture.

L'auteur recommande l'arthrodèse dans les cas d'arthrose déformante unilatérale, ainsi que dans les cas présentant de légères déformations également dans l'autre hanche, comme aussi dans les cas où l'on envisage de procéder ou bien où l'on a procédé à une opération plastique dans la hanche opposée, à la condition que la partie lombaire du dos soit satisfaisante et la mobilité de l'articulation du genou bonne.

ZUSAMMENFASSUNG

Die Vorteile der Arthrodesenoperation sind Schmerzf়reiheit und Stabilität. Es hat sich jedoch erwiesen, dass es oft schwierig ist knöcherner Heilung zu erzielen und frühere Methoden ergaben bis zu 50 % Pseudarthrosenbildung. 1947 führte der Verfasser seine neue Methode an der orthopädischen Klinik in Härnösand ein, die in einer teilweisen intra und juxtaartikulären Arthrodesen mit gleichzeitiger Nagelung nach Watson-Jones besteht. Der Patient liegt nach der Operation ohne Gips und darf das Bein durchschnittlich nach 6 Wochen belasten.

Der Verfasser hat von 1947–1955 persönlich 41 Hüften mit dieser Methode operiert. Ein Patient starb an Cancer. Die übrigen 40 Patienten wurde im Durchschnitt 2 Jahre und 2 Monate nach der Operation nachuntersucht. 38 zeigten knöcherner Ankylose und ein Patient hatte klinisch eine Ankylose und Schmerzf়reiheit. Daher wiesen 95 % knöcherner Heilung und 97 % Schmerzf়reiheit auf. 37 Patienten arbeiteten teils im Haushalt, teils in schwererer Fabrikarbeit und in der Landwirtschaft.

Der Verfasser empfiehlt die Arthrodesen in Fällen mit einseitiger Arthrosis deformans, ebenso wie in Fällen mit leichten Veränderungen

im anderen Hüftgelenk, ausserdem auch dort wo man auf der anderen Seite bereits eine Hüftgelenksplastik ausgeführt hat oder eine solche plant, unter der Voraussetzung, dass die Lendenwirbelsäule sich in einer zufriedenstellenden Verfassung befindet und dass die Beweglichkeit im Kniegelenke eine gute ist.

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