THE SURGICAL TREATMENT OF OSTEOARTHRITIS OF THE HIP

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The etiology of the osteoarthritis has not been clearly understood, and therefore, many and various theories have been influencing orthopaedic surgeons in the treatment of this lesion for the past several decades. Research also has been carried out on animal osteoarthritis, histologically almost similar to that of human coxarthrosis. The inflammatory theory introduced by Menkin seems to be a suitable explanation of this entity, especially of the secondary osteoarthritis following anatomical incongruity in the weight bearing joint.

Professor Y. Shima, Wakayama Medical College, Japan, and one of the authors have been studying experimentally Menkin's inflammatory factors in human coxarthrosis and in animal experiments. These factors, namely Leucotaxine, Necrosin and Exsudin, have been isolated from the joint fluids of diseased human hips or from the granulation tissue and purified. These factors were used as inducers of osteoarthritis in the rabbit's knee joint.

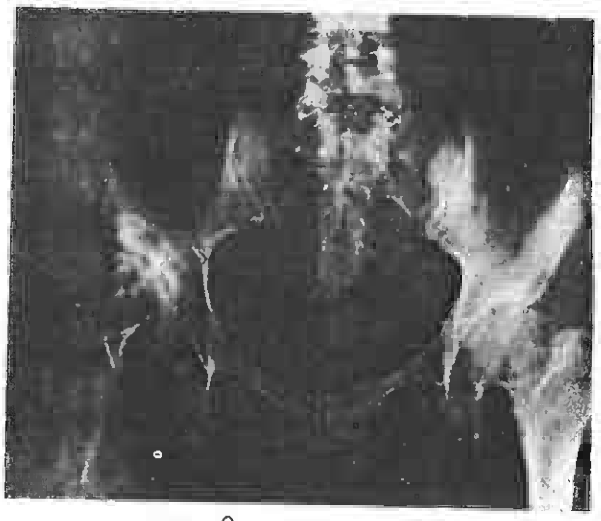
The incidence of secondary osteoarthritis of the hip is high in Japan, as is that of congenital dislocation of the hip. Furthermore, the mode of daily life in a Japanese style house badly requires a wide range of hip motion.

The principle of surgical treatment for this entity may be established, I believe, in interruption of the inflammatory process or in the remodelling of the mechanical inadequacy of the weight bearing joint. The authors have used the following surgical procedures on various stages and a combination of procedures on bilateral cases (Table 1).

TABLE I

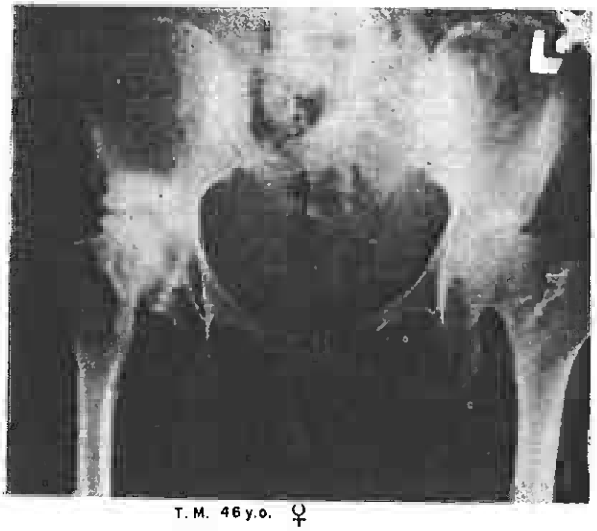
SURGICAL PROCEDURES

I Unilateral cases:			
beginning stage	(1) Intertrochanteric osteotomy	- - -	12 hips
	(2) Arthroplasty - -	- -	21 hips
advanced stage	(1) Resection angulation operation (Milch-Batchelor type)	- -	46 hips
	(2) Fusion - -	- -	11 hips
	(3) Intertrochanteric osteotomy	- - -	4 hips
preventive means	(1) Varus osteotomy - -	- -	5 hips
	(2) Horizontal osteotomy of innominate bone (Chiari's type)	- -	1 hip (100 hips)
II Bilateral cases:			
(1) Fusion & arthroplasty - -		- -	0
(2) Fusion & intertrochanteric osteotomy		- -	0
(3) Fusion & resection angulation operation		- -	1 case (2 hips)
(4) Bilateral resection angulation operation		- -	8 cases (16 hips)
(5) Resection angulation operation & intertrochanteric osteotomy -		- -	1 case (2 hips) (10 cases 20 hips)
	Total	-	110 cases (120 hips)



T. M. 39 y.o. ♀
Pre-op.

Fig. 1a.



T. M. 46 y.o. ♀
Post-op. 7 Years.

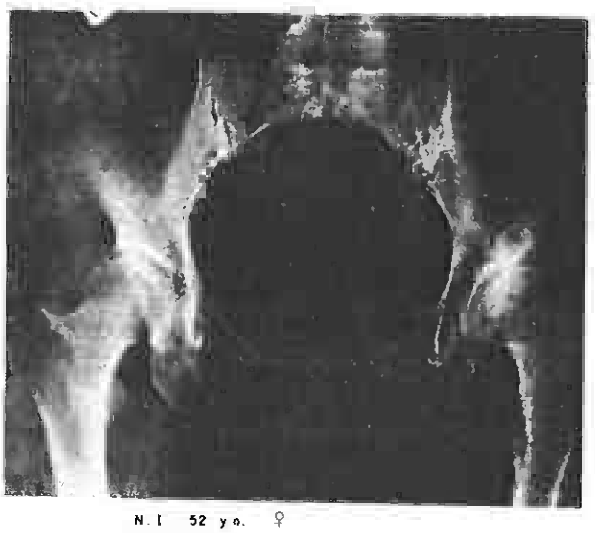
Fig. 1b.

T. N. 46 y.o. ♀
Pre-op.

Fig. 2a.

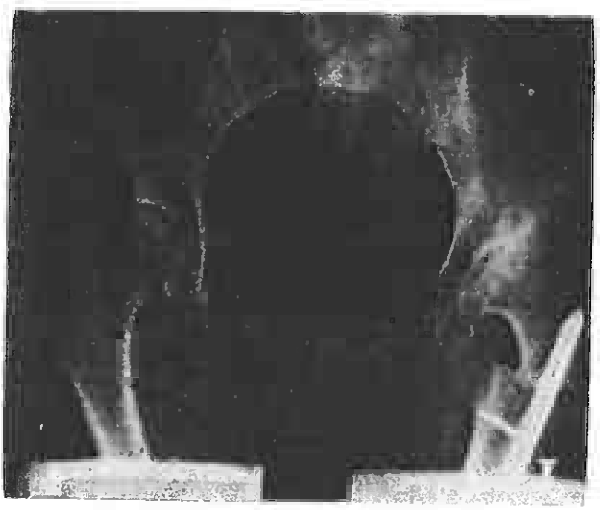
T. N. 50 y.o. ♀
Post-op. 4 Years and 8 Months.

Fig. 2b.



N. I 52 y.o. ♀
Pre-op

Fig. 3a.



N. I 52 y.o. ♀
Immediate Post-op.

Fig. 3b.

TABLE II

CRITERIA FOR CLINICAL EVALUATION

Degree	Pain	Gait	Mobility
5	none	normal gait	normal range
4	mild	more than 800m distance without any support	slightly decreased
3	moderate	800m distance with cane	50% decreased
2	severe, by motion; mild at rest	crutch gait	more than 50% decreased
1	severe even at rest	in and around bed	almost nil

ASSESSMENT OF DAILY LIVING

a) Put on or take off shoes	Good
b) Sitting cross-legged	↑
c) Sitting in Japanese style	↓
d) In and out of bathtub	Poor
e) Daily hygiene	

1. Arthroplasty and Intertrochanteric Osteotomy for the Beginning stage

Too much has been expected from arthroplasty as the solution in such a hip, but it has been found to be discouraging even among the very early lesions, according to follow-up studies (Figs 1a & 1b; Figs. 2a & 2b). Criteria for clinical evaluation in five different degrees is shown in Table II. Evaluation is made of the relief of pain, walking pattern or stability, mobility of hip, and ability in ADL. The final results of arthroplasty are not so satisfactory as you can see from these cases. We are doing very few of these now (Tables III & IV).

Intertrochanteric osteotomy is more encouraging, especially for the average Japanese, of medium size and moderate body weight (Figs. 3a, 3b, 3c & 3d).

For the bilateral cases, this procedure is indicated on the milder side and the replacement of the affected articulation by either fusion or by artificial pseudarthrosis is needed on the more advanced opposite side.

Unexpectedly favourable results may be obtained in the follow-up studies, both on clinical and roentgenographic findings (Tables V & VI).

2. Resection Angulation operation for the more advanced cases

Prosthetic replacement of the femoral head and neck is not considered by us an effective solution for the secondary coxarthrosis, because the abnormal anatomical relationship between head and socket, which is the cause of the

TABLE III

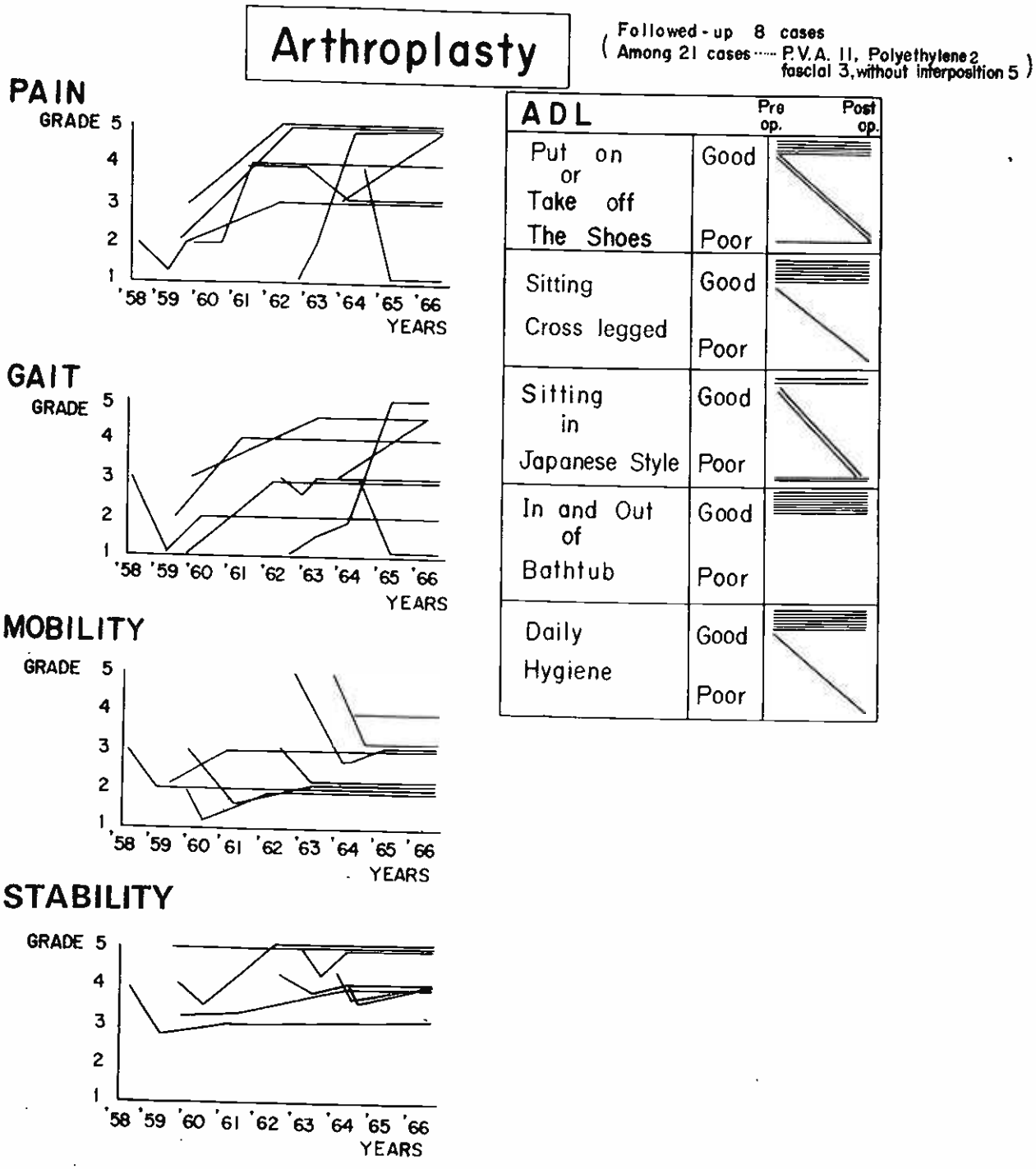
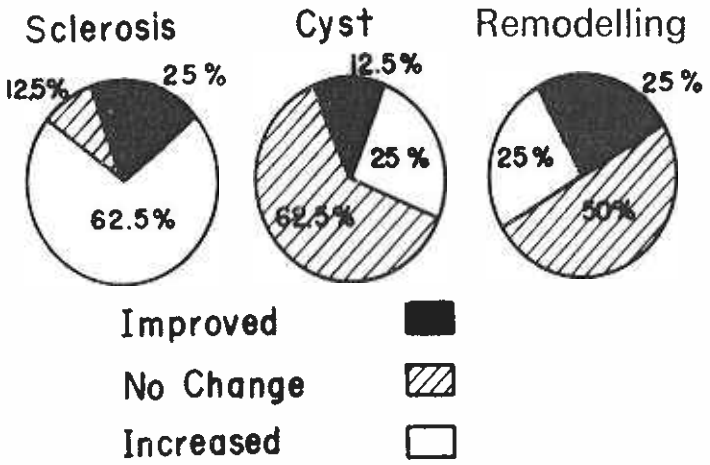

Arthroplasty
(Followed-up 8 cases
Among 21 cases ····· P.V.A. 11, Polyethylene 2
fascial 3, without interposition 5)
PAIN
GRADE 5
4
3
2
1
'58 '59 '60 '61 '62 '63 '64 '65 '66
YEARS
GAIT
GRADE 5
4
3
2
1
'58 '59 '60 '61 '62 '63 '64 '65 '66
YEARS
MOBILITY
GRADE 5
4
3
2
1
'58 '59 '60 '61 '62 '63 '64 '65 '66
YEARS
STABILITY
GRADE 5
4
3
2
1
'58 '59 '60 '61 '62 '63 '64 '65 '66
YEARS
ADL
Pre op.
Post op.
Put on or Take off The Shoes
Good
Poor
Sitting Cross legged
Good
Poor
Sitting in Japanese Style
Good
Poor
In and Out of Bathtub
Good
Poor
Daily Hygiene
Good
Poor

TABLE IV

Follow-up Studies (ARTHROPLASTY)

A: ROENTGENOGRAPHIC EVALUATION



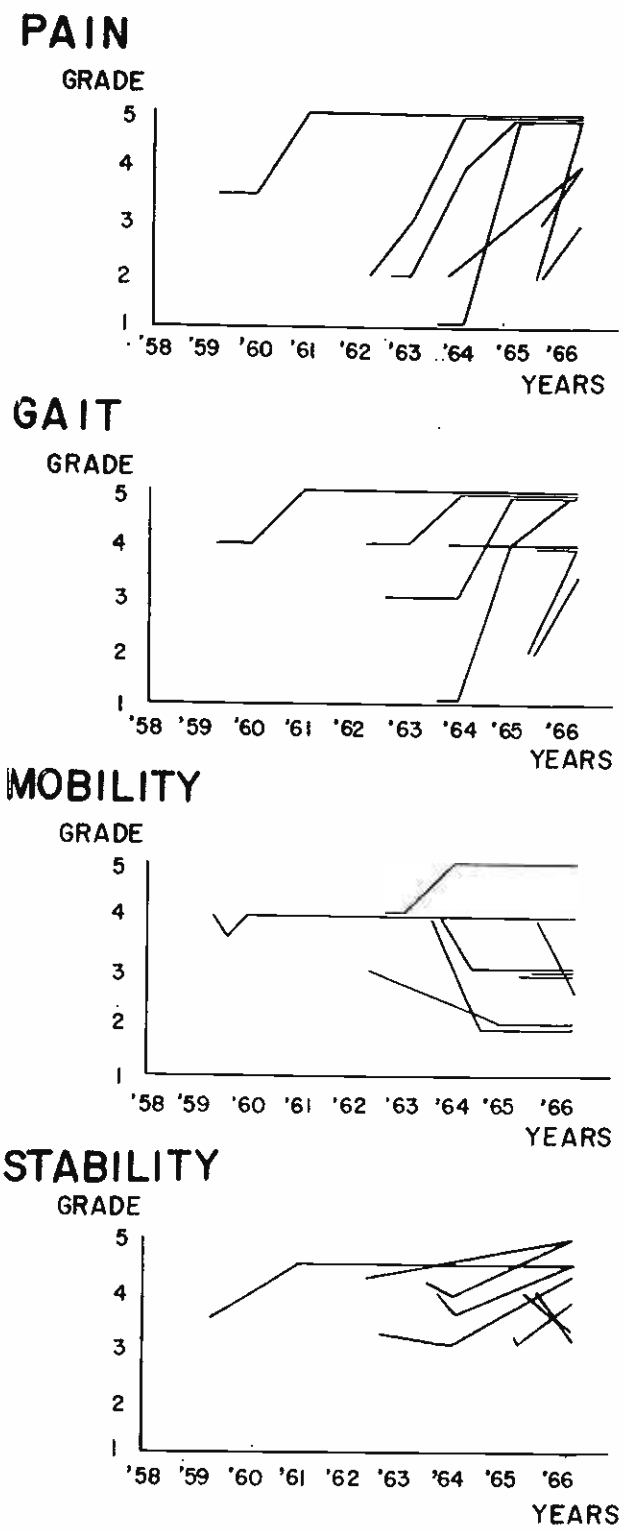
B: CLINICAL EVALUATION

Mode of Evaluation \ Result	Excellent	Good	Fair	Poor
Pain	4 (50%)	1 (12.5%)	2 (25%)	1 (12.5%)
Walking Pattern	3 (37.5%)	1 (12.5%)	2 (25%)	2 (12.5%)
Mobility	0	1 (12.5%)	3 (37.5%)	4 (50%)
Stability	3 (37.5%)	4 (50%)	1 (12.5%)	0
A.D.L	0	5 (62.5%)	2 (25%)	1 (12.5%)

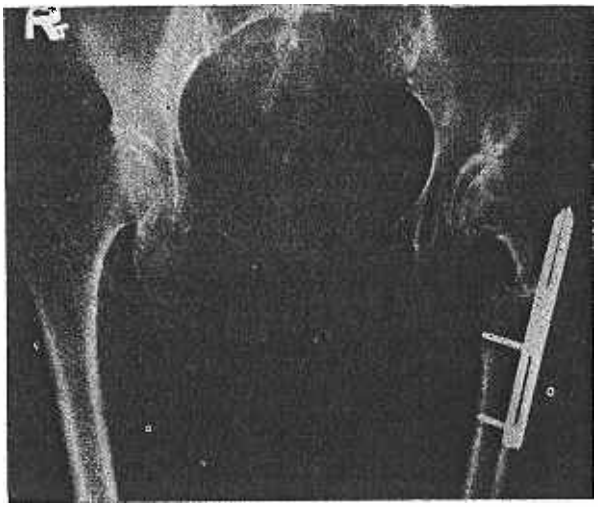
TABLE V

Intertrochanteric Osteotomy

Followed-up 8 cases. (Among 16 cases ····· beginning & advanced stage)



ADL		Pre op.	Post op.
Put on or Take off The Shoes	Good		
	Poor		
Sitting Cross legged	Good		
	Poor		
Sitting in Japanese Style	Good		
	Poor		
In and Out of Bathtub	Good		
	Poor		
Daily Hygiene	Good		
	Poor		



N. I. 52 y o ♀
Post op. 4 Months

Fig. 3c.

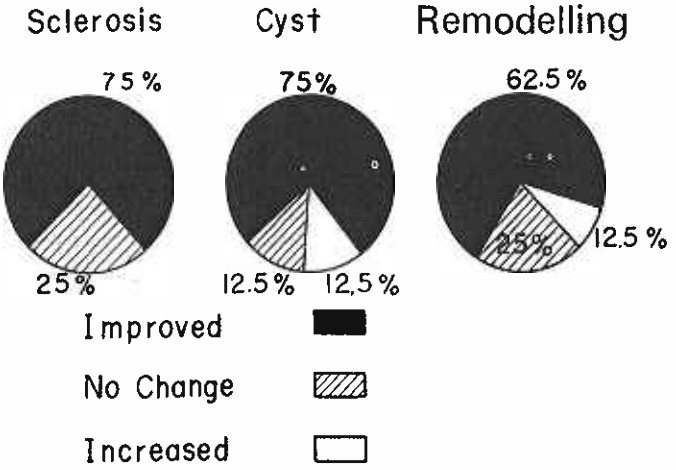
N I 53 y.o ♀
Post op 16 Months

Fig. 3d.

TABLE VI

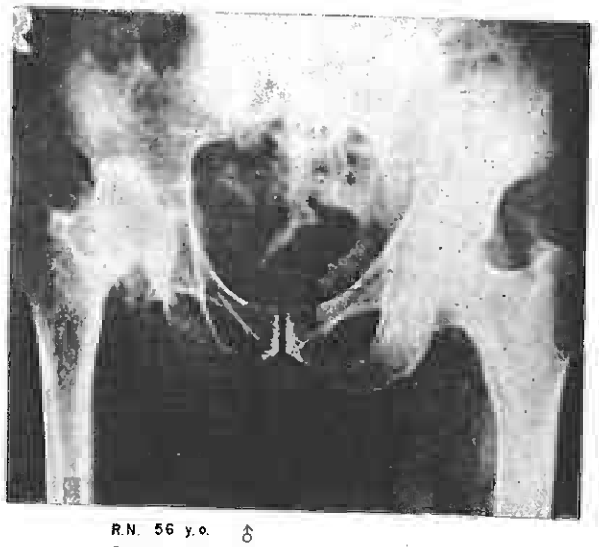
Follow-up Studies (INTERTROCHANTERIC OSTEOTOMY)

A: ROENTGENOGRAPHIC EVALUATION



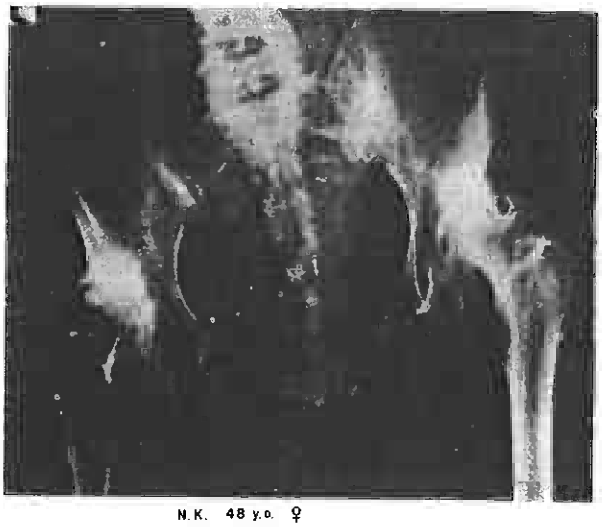
B: CLINICAL EVALUATION

Mode of Evaluation \ Result	Excellent	Good	Fair	Poor
Paln	5 (62.5%)	2 (25 %)	1 (12.5 %)	0
Walking Pattern	4 (50 %)	3 (37.5 %)	1 (12.5%)	0
Mobility	1 (12.5%)	1 (12.5 %)	4 (50 %)	2 (25%)
Stability	4 (62.5%)	2 (25 %)	2 (25 %)	0
A.D.L.	3 (37.5%)	2 (25 %)	2 (25 %)	1 (12.5%)



R.N. 56 y.o. ♂
Pre-op.

Fig. 4a.

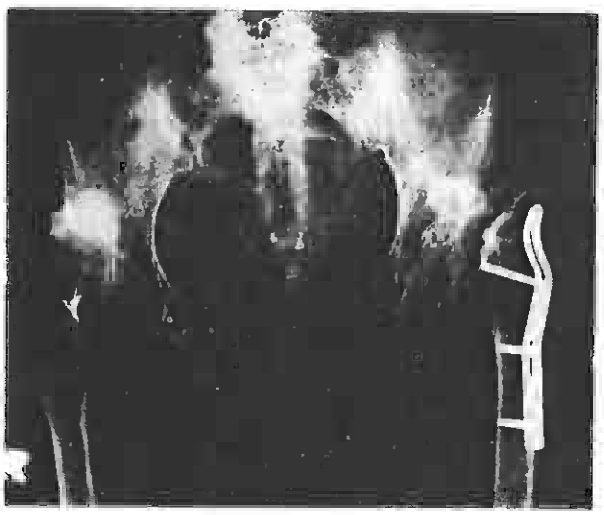


N.K. 48 y.o. ♀
Pre-op.

Fig. 5a.

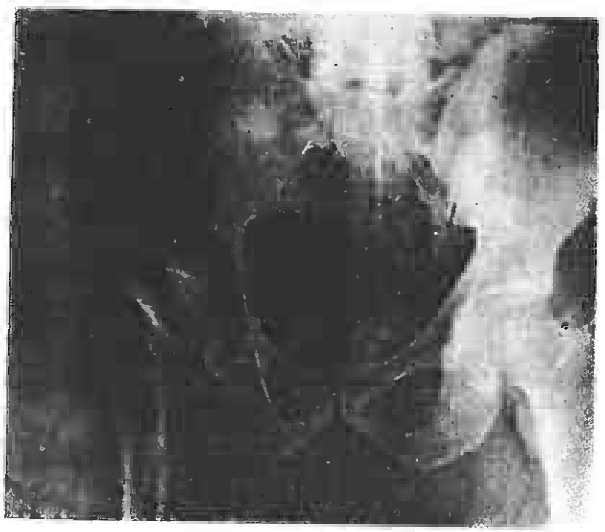
R.N. 56 y.o. ♂
Post-op. 3 Months

Fig. 4b.



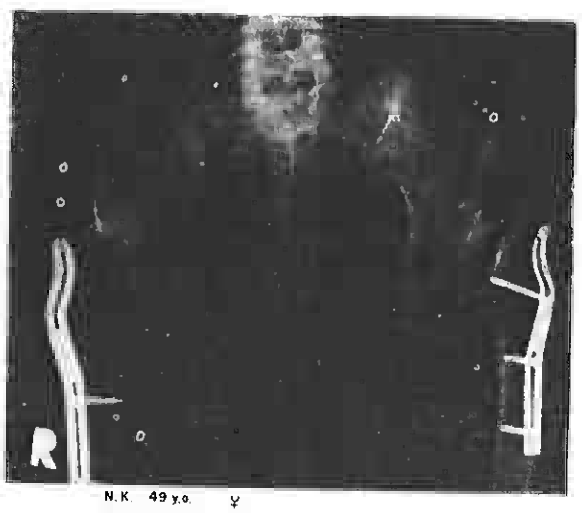
N.K. 48 y.o. ♀
Post-op. 9 Months

Fig. 5b.



R.N. 58 y.o. ♂
Post-op. 2 Years and half

Fig. 4c.

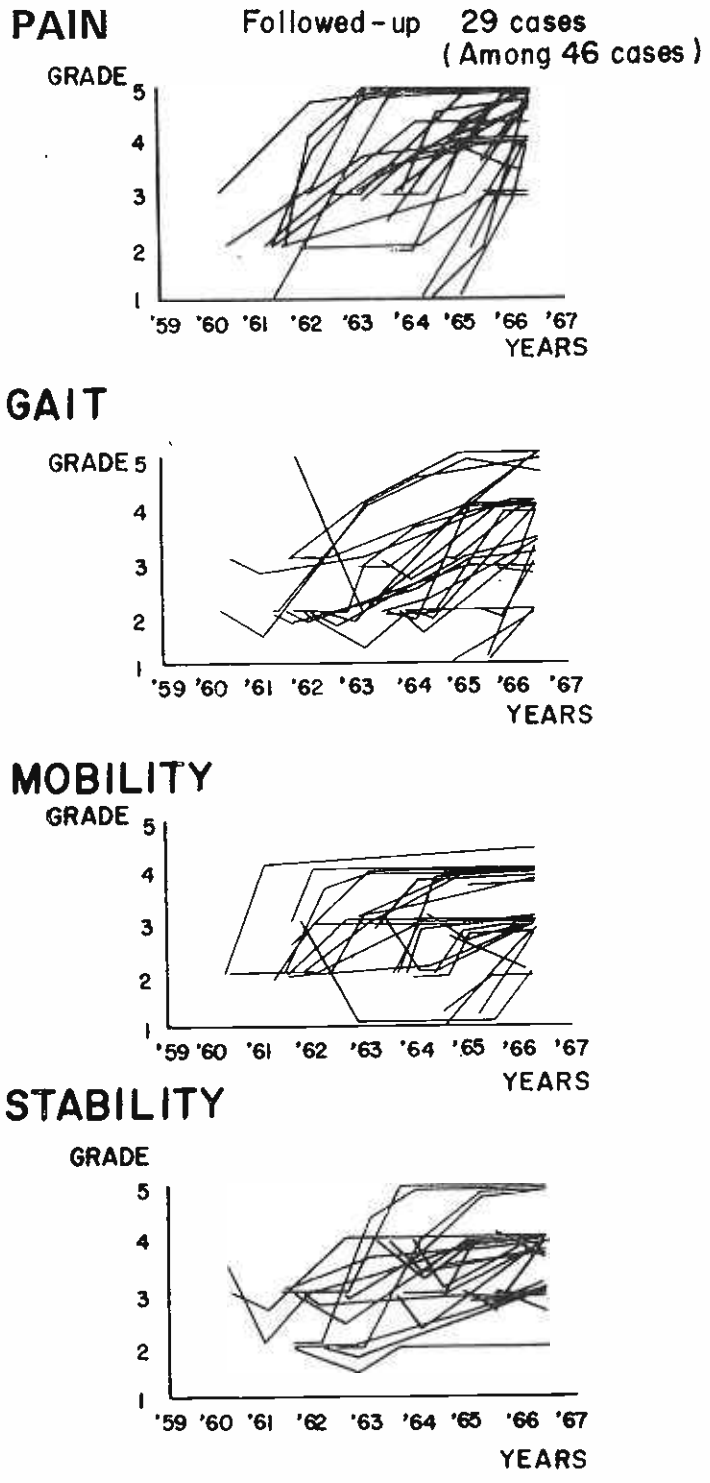


N.K. 49 y.o. ♀
Right . Post op. 5 Months
Left . Post op. 1 Year and 4 Months

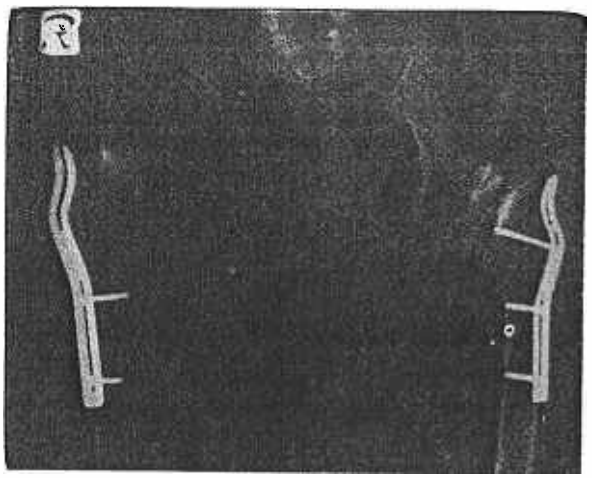
Fig. 5c.

TABLE VII

Resection Angulation Operation



A. D. L.		Pre op. / Post op.
Put on or Take off the Shoes	Good Poor	
Sitting Cross legged	Good Poor	
Sitting in Japanese Style	Good Poor	
In and Out of Bathtub	Good Poor	
Daily Hygiene	Good Poor	



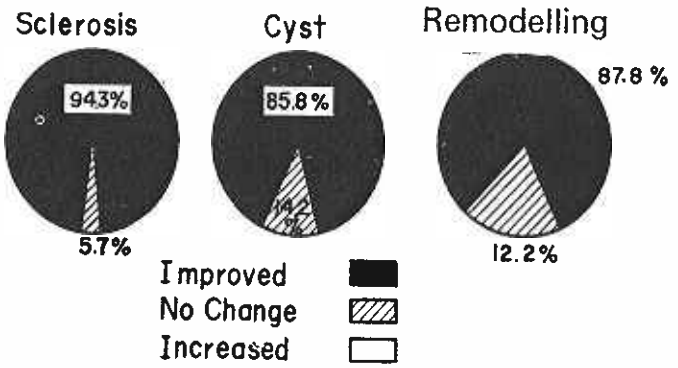
N.K 51 y o ♀
Right . Post op. 1 Year and 11 Months
Left : Post op. 2 Year and 10 Months

Fig. 5d.

TABLE VIII

Follow-up Studies (RESECTION ANGULATION OPERATION)

A: ROENTGENOGRAPHIC EVALUATION

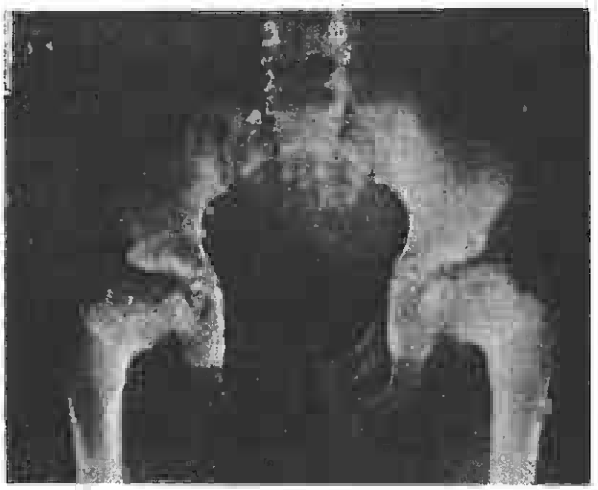


B: CLINICAL EVALUATION

Mode of Evaluation \ Result	Excellent	Good	Fair	Poor
Pain	16 (55.2%)	10 (34.4%)	3 (10.4%)	0
Walking Pattern	5 (17.2%)	14 (48.2%)	7 (24.1%)	3 (10.5%)
Mobility	1 (3.4%)	14 (48.2%)	11 (37.9%)	3 (10.5%)
Stability	4 (17.2%)	17 (55.3%)	7 (24.1%)	1 (3.4%)
A. D. L.	5 (17.2%)	17 (55.3%)	7 (24.1%)	0

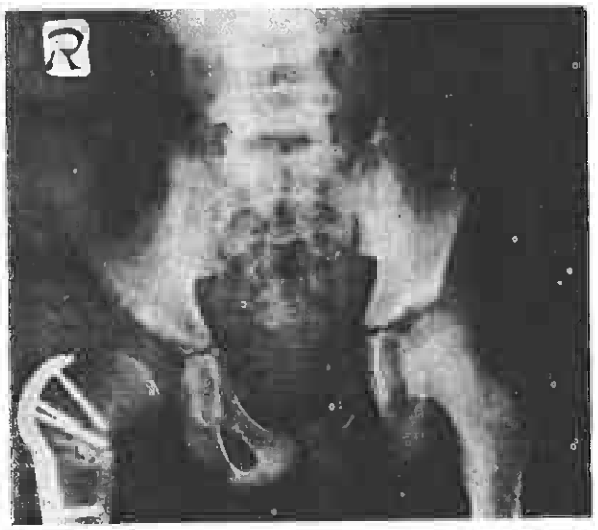
N.T. 11 y.o. ♂
Pre - op.

Fig. 6a.



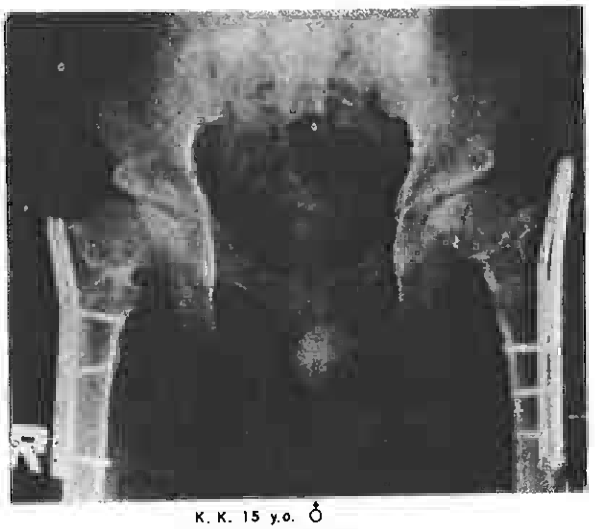
K.K. 14 y.o. ♂
Pre op.

Fig. 7a.



N.T. 11 y.o. ♂
Post op. 1 Month

Fig. 6b.

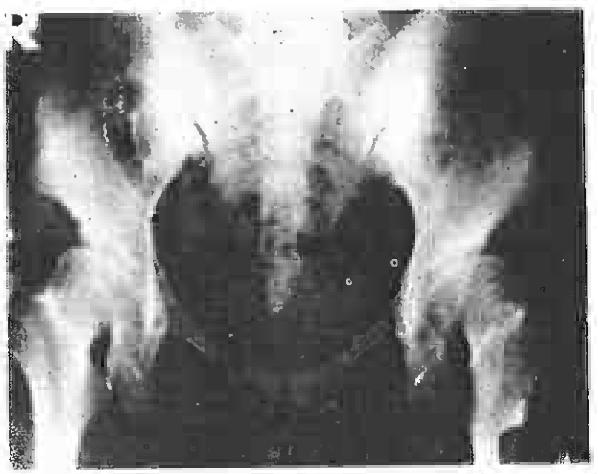


K. K. 15 y.o. ♂
Right : Post op. 8 Months
Left : Post op. 4 Months

Fig. 7b.

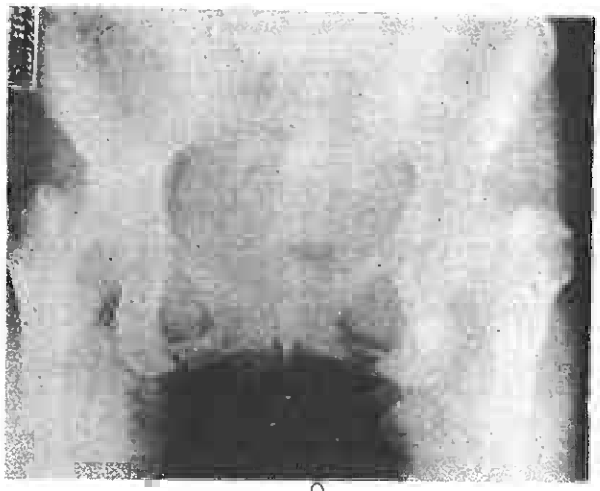
N.T. 11 y.o. ♂
Post op. 1 Year

Fig. 6c.



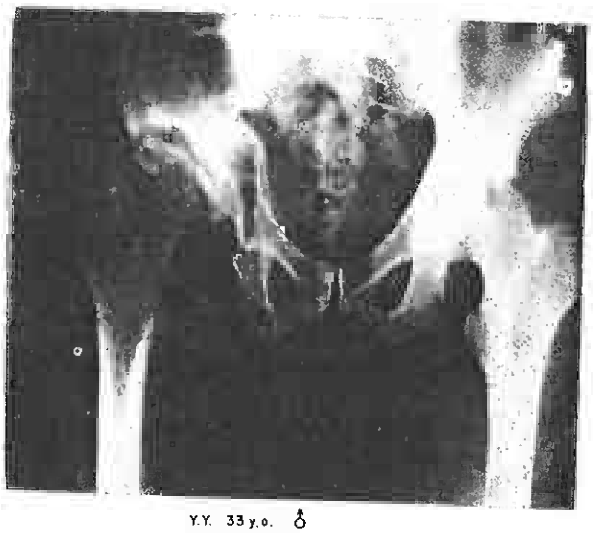
K. T. 29 y.o. ♀
Pre op.

Fig. 8a.



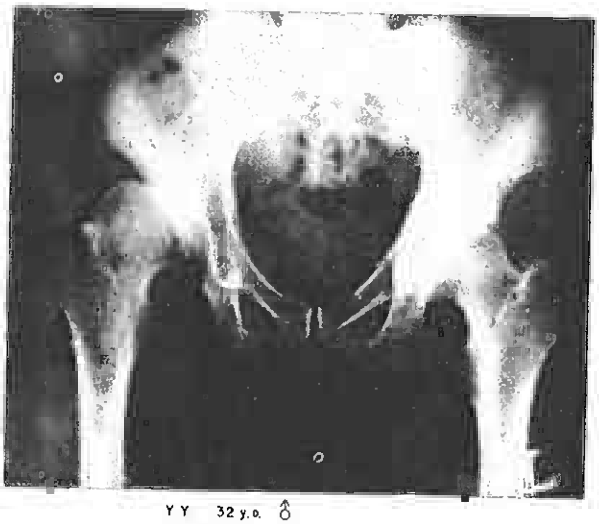
K.T. 31 y.o. ♀
Right : Post op. 2 year and 2 Months
Left : Post op 2 year and 5 Months

Fig. 8b.



Y.Y. 33 y.o. ♂
Post op. 16 Months

Fig. 9c.



Y Y 32 y.o. ♂
Pre op

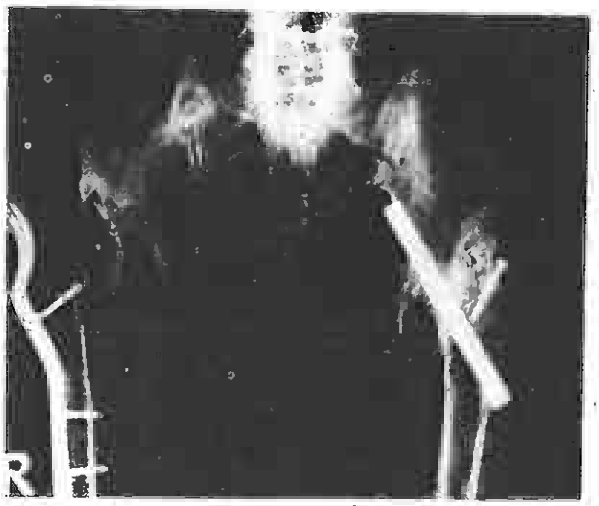
Fig. 9a.

M. K. 35 y.o. ♀
Pre-op.

Fig. 10a.

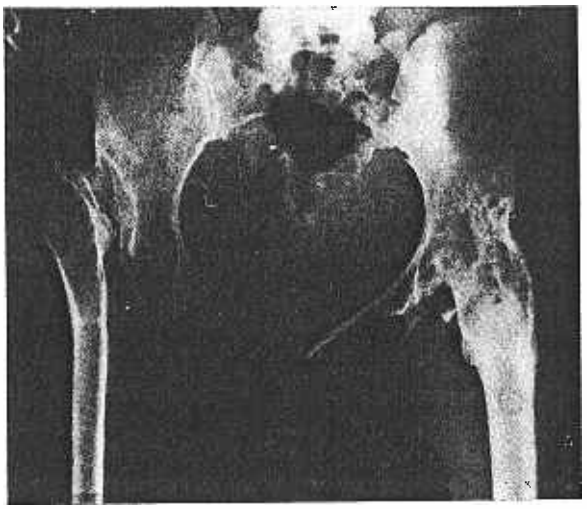
Y. Y 32 y.o ♂
Post op. 3 Months

Fig. 9b.



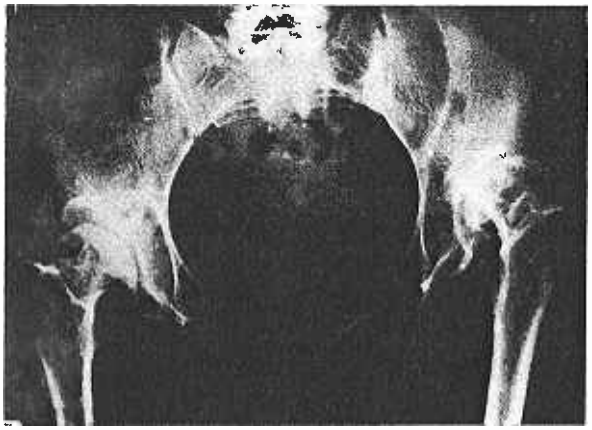
M. K 35 y.o. ♀
Right Post-op. 16 Months
Left : Post-op. 15 Months

Fig. 10b.



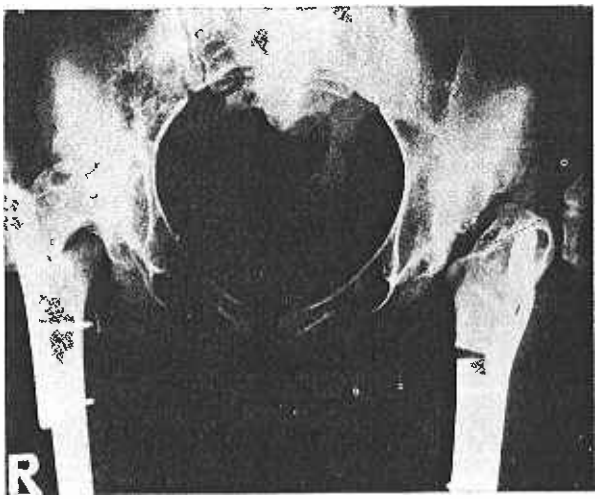
M. K 39 y.o. ♀
Right: Post-op. 4 Years and 11 Months
Left : Post-op. 4 Years and 10 Months

Fig. 10c.



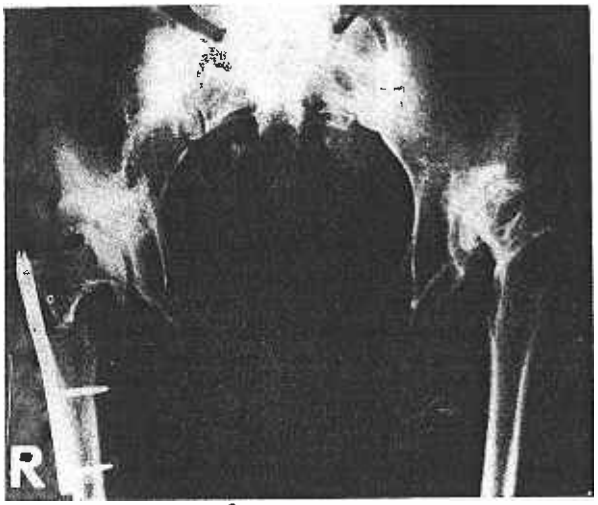
F. N. 28 y.o. ♀
Pre - op.

Fig. 11a.



F. N. 28 y.o. ♀
Right : Post - op. 2 Months
Lett : Immediote Post op.

Fig. 11c.



F N 28 y.o ♀
Post - op 1 Month

Fig. 11b.

F. N. 29 y.o. ♀
Right : Post - op 1 Year and 9 Months
Left : Post - op 1 Year and 7 Months

Fig. 11d.

TABLE IX

EVALUATION OF VARIOUS PROCEDURES

Kind of procedure / mode of evaluation	Intertrochanteric osteotomy	Arthroplasty	Resection Angulation operation	Fusion
Pain	Complete or partial relief gradual improvement between 1 ~ 1.5 years	not so dependable, late improvement over 2 years	Complete or partial relief between 1 ~ 1.5 years	Complete relief after solid union
Gait	Quick improvement or Improvement	Deterioration	Improvement is expected within 1.5 year	Almost normal gait as soon as complete fusion
Mobility	Partial improvement, same or deterioration	Usually lose the initial range	Increased range on every patient	None

ASSESSMENT OF DAILY LIVING

Put on or take off the shoes	difficult	difficult	difficult	difficult
Sitting crossed legged	difficult	difficult	difficult	Impossible
Sitting on the floor in Japanese style	without difficulty	without difficulty	without difficulty	difficult
In and out of Japanese bathtub	without difficulty	without difficulty	without difficulty	difficult
Daily hygiene	without difficulty	without difficulty	without difficulty	difficult

secondary osteoarthritis, cannot be corrected at all by the prosthetic replacement.

The Milch-Batchelor type artificial pseudarthrosis with pelvic support osteotomy secures relief of pain, good mobility and moderate stability for the advanced stages (Figs. 4a, 4b & 4c).

For bilateral cases this procedure may be indicated first on one side, and then on the other when, after one and a half to two years, the gluteus medius muscle has regained adequate strength (Figs. 5a, 5b, 5c & 5d).

Most of the patients except a few elderly bilateral cases are satisfied at the time of the clinical follow-up evaluation, according to the criteria shown in Table II. This operation seems to be particularly acceptable for the housekeeping chores of the middle aged Japanese females (Tables VII & VIII).

3. Fusion of the Hip

Most of the secondary coxarthrosis in Japan are seen in females, usually following neglected congenital dislocation of the hip or in a hypoplastic hip without particular signs until the pain begins in middle age. Arthrodesis is not suitable for such cases but is indicated only for the young male unilateral patient, usually resulting from untreated Perthes' disease.

Solid union might not be expected without long term internal or external immobilization.

Sitting on the floor in formal Japanese style or in the cross legged position is always difficult in the ADL of the coxarthrosis patient. However, sacrificing this mobility of the hip for weight bearing ability, arthrodesis may be indicated for the farmer, hard labourer and other young males of the working age group. Compensatory hypermobility of the lumbar spine might develop another problem later on.

4. Prevention of coxarthrosis

Since the prevention of coxarthrosis is the final target of the treatment of congenital dislocation of the hip, Perthes' disease or some other hip lesions, mechanical incongruity of head and socket has to be corrected somehow, and accordingly various kinds of surgical procedures have been developed in the past several decades.

Among them, intertrochanteric osteotomy and Chiari type innominate bone osteotomy are rather worthwhile for this purpose. According to our experience, the following procedures have seemed rational and have proved effective for the prevention of secondary coxarthrosis,

a) Derotation osteotomy (Figs. 6a, 6b & 6c & Figs. 7a & 7b).

b) Derotation, varus and displacement osteotomy (Figs. 8a & 8b).

c) Horizontal innominate bone osteotomy (Chiari) (Figs. 9a, 9b & 9c).

5. Bilateral cases

Careful planning is needed at the very beginning of treatment, and a careful combination of procedures has to be selected for each individual case, taking into consideration the ultimate ADL and vocation requirements.

For example:

a) Bilateral resection angulation operations (Figs. 5a, 5b, 5c & 5d).

b) Fusion and resection angulation operation (Figs. 10a, 10b & 10c).

c) Resection angulation operation and intertrochanteric osteotomy (Figs. 11a, 11b, 11c & 11d).

Actually, combination (b) has been performed on only one case.

For maximal improvement in the final results, it is extremely important that an optimal term of post-operative rehabilitation should be scheduled between operations.

SUMMARY

Following-up the cases (Table IX), four surgical procedures are discussed in the clinical evaluation and in the ADL.

As for the *Pain*, complete relief is expected only with fusion, but complete or partial relief is gained by intertrochanteric osteotomy or by resection angulation operation. Arthroplasty fails to secure the relief of pain.

As for the *Stability*, fusion is excellent as soon as solid union is completed. Osteotomy and Milch-Batchelor operation give rather favourable results.

As for the *Mobility*, naturally on fusion, no mobility is left. Resection angulation operation is practically speaking the best, but usually 1-3 years after surgery.

As for the *ADL*, in selecting the proper surgical procedures careful consideration of individual patient needs must be made—weighing the relative importance of ADL need for mobility against vocational use for weight bearing stability.