

# PAN-TALAR ARTHRODESIS FOR POST POLIO FLAIL FOOT

By M. Natarajan (Madras)

## INTRODUCTION

Anterior Poliomyelitis is still a very common disease in India as there is no programme of mass immunisation against this crippling disease. Unstable and flail feet due to gross imbalance of muscle power in the legs is a common orthopaedic problem as the highest percentage of muscle paralysis occurs in the lower limbs.

When the rest of the lower extremities have good muscle power, stabilisation of the foot and ankle is a most satisfying surgical procedure as it converts a high stepping flail foot gait into practically a normal gait.

## HISTORICAL

Lothier (1911) was the first to describe the peritalar arthrodesis for flail foot wherein he temporarily removed the talus, excised the articular cartilages from the talus as well as the mortice of the ankle and the calcaneum and replaced the cancellous talus as a bone graft. The ankle, talo-calcaneal and talo-navicular joints were fused.

Liebolt (1939) reviewed the largest series of 84 cases done at the New York Orthopaedic Hospital. The operation was performed in 2 stages; a triple arthrodesis followed by ankle fusion a few weeks later. The ankle was exposed through a midline anterior incision. The mortice was packed with cancellous bone taken from the lower end of tibia. Good results were obtained in 80%; 11 cases (13%) required revision operation for pseudarthrosis or persisting deformity of varus, valgus or equinus.

In a review of 20 cases of pan-talar arthrodesis done at the New York Hospital for Special Surgery, Lee Paterson and Hathaway (1950) state that good results were obtained in 65%, fair in 25% and poor in 10%. They consider pan-talar fusion as the most difficult of the operations for stabilisation of the foot, and state it is best done in 2 stages. 13 of the 20 were done in 2 stages. In cases where there is circulatory deficiency, the 2 stage procedure was found safe. 3 cases of wound sloughing and 3 cases of pseudarthrosis occurred after the one stage procedure done in 7 cases.

Manel Bastor Ansart (1951) achieved pan-talar fusion either by Lothier technique or by

placing an anterior tibial inlay graft across the tibia, talus and navicular. He advocated this procedure in cases with flail foot and varus deformity.

Hunt and Hugh Thomson in 1953, reviewed a series of 38 cases all done as one stage procedure. The technique used by them was that of Lothier.

The indication for pan-talar fusion according to them is rather too sweeping. They state "we feel that all flail feet, all complete drop foot and all calcaneum deformities are best treated by pan-talar fusion". 4 cases resulted in pseudarthrosis of 34 done in children.

## MATERIAL

16 cases of pan-talar arthrodesis done by the author during 1962-65 in the Department of Orthopaedic Surgery, Govt. General Hospital, Madras have been followed up and are presented here. All these cases were post-polio paralysis, 10 are females and 6 are males.

Age	10 - 15	—	8 cases
	16 - 20	—	7 "
	Over 20	—	1 case

The commonest age group was 12-17, 13 cases were in this age group. The average age of the patient at operation was 16.2 years. 10 cases had good knee extensor (3 and above). Those with poor knee (i.e. Quadriceps power less than 3) were five.

*Table I gives the summary of the cases.*

### Case No. 1

Farouk a boy aged 13 had APM at the age of 3 years. Left leg was totally flail below the knee. Hip was normal and quadriceps power was 3+. Pan-Talar arthrodesis was done on 13-8-62. Follow up 3 years later showed the patient's gait perfectly normal. There is no deformity or pain. He had a stress fracture lower end of tibia 6 months after the fusion which healed well.

### Case No. 2

Prema a girl aged 14, had residual APM with flail foot and ankle; hip and quadriceps power was poor and there was a shortening of 1". Pan-talar fusion done 1-10-62. Result satisfactory.

PAN-TALAR ARTHRODESIS FOR POST POLIO FLAIL FOOT

TABLE I

S. No.	Name	Age Sex Sd.	Clinical features	Date of operations.	Follow up Remarks																																												
1. FAROUK		13 M Lt.	At the age of 3 attack of APM. Residual weakness of left lower limb. Hip—normal—knee-Ext. 3+ Flex. 4 Foot and ankle Dorsiflexion — 0 Plant flex. — 0 Invert — 0 Evert — 0 No shortening.	13-8-62	<i>Clinical:</i> Walking is good. No support and no shoes. No pain. <i>X-ray:</i> Fusion good.																																												
2. PREMA		16 F Lt.	APM III with flail foot and ankle. Hip abductor and quadriceps weak. Shortening of 1".	1-10-62	<i>Clinical:</i> No pain. No deformity. Function good. <i>X-ray:</i> Fusion good. Gap in the talo-navicular joint.																																												
3. SRINIVASAMOORTHY		12 M Rt.	At the age of 4 yrs patient had an attack of fever with involvement of speech and paralysis of all four limbs. Speech and power of upper limbs recovered, Residual paralysis of both lower limbs. <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td></td> <td>Rt.</td> <td>Lt.</td> </tr> <tr> <td>Hip:</td> <td>Flex</td> <td>2</td> <td>2</td> </tr> <tr> <td></td> <td>Ext.</td> <td>2</td> <td>1+</td> </tr> <tr> <td></td> <td>Abd.</td> <td>2</td> <td>2</td> </tr> <tr> <td></td> <td>Add.</td> <td>0</td> <td>2</td> </tr> <tr> <td>Knee:</td> <td>Flex</td> <td>1</td> <td>1</td> </tr> <tr> <td></td> <td>Ext.</td> <td>1</td> <td>1</td> </tr> <tr> <td>Ankle:</td> <td>Dor. Flex.</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td>Plan. Flex.</td> <td>2</td> <td>1</td> </tr> <tr> <td></td> <td>Invert</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td>Evert</td> <td>0</td> <td>0</td> </tr> </table> No shortening.			Rt.	Lt.	Hip:	Flex	2	2		Ext.	2	1+		Abd.	2	2		Add.	0	2	Knee:	Flex	1	1		Ext.	1	1	Ankle:	Dor. Flex.	0	0		Plan. Flex.	2	1		Invert	0	0		Evert	0	0	13-10-62	<i>Clinical:</i> No pain. No deformity. Appliance discarded on Rt. side. Patient wants operation on the left side also. <i>X-ray:</i> Fusion good.
		Rt.	Lt.																																														
Hip:	Flex	2	2																																														
	Ext.	2	1+																																														
	Abd.	2	2																																														
	Add.	0	2																																														
Knee:	Flex	1	1																																														
	Ext.	1	1																																														
Ankle:	Dor. Flex.	0	0																																														
	Plan. Flex.	2	1																																														
	Invert	0	0																																														
	Evert	0	0																																														
4. AKILESWARAN		26 M Lt.	APM III with flail Lt. foot and ankle—Q-3 Gross inversion deformity. Shortening—1".	29-10-62	<i>Clinical:</i> Slight inversion present. <i>X-ray:</i> Fusion good.																																												
5. MANOHARAN		20 M Lt.	Fever at the age of 4 years and inability to use the Lt. lower limb. Walking with crutch on left side. Hip—Normal—Knee— Ankle: Dor. Flex. — 0 Plan. flex. — 0 Invert — 0 Evert — 0 Shortening—1½"	5-12-62	<i>Clinical:</i> Patient walks without crutches No pain on walking. Short leg gait. <i>X-ray:</i> Fusion good.																																												

TABLE I (continued)

S. No.	Name	Age Sex Sd.	Clinical features	Date of operations	Follow up Remarks
6.	VIMALA	13 F Lt.	<p>Fever at 1 year and paralysis of both lower limbs.</p> <p>Hip: Flex. 3 4 Ext. 2 3 Abd. 1 2 Add. 2 3 Knee: Flex. 0 3 Ext. Ankle: Dor. flex 0 1 Plan. flex 0 1 Invert 0 0 Evert 3+ 0</p> <p>Rt. lower limb was short by 1½"</p>	21-10-63	<p><i>Clinical:</i> Function excellent.</p> <p><i>X-ray:</i> Small gap in the Talo-navicular joint. Other joint fused well.</p>
7.	PANCHALINGAM	15 M Rt.	<p>Fever at the age of 1 year followed by paralysis of both lower limbs.</p> <p style="text-align: right;">Rt. Lt.</p> <p>Hip: Flex. Ext. Abd. good good Add. Knee: Flex. 3 Ext. 3 good Ankle: Dor. flex. 0 3 Plan. flex. 0 2 Evert 0 3 Invert 0 2</p>	10-6-64	<p><i>Clinical:</i> Cal valgus deformity corrected. Patient complains of pain in excessive walking. Shortening ½". The other foot also is in valgus. <i>X-ray:</i> Fusion good.</p>
8.	SHANTHI	16 F Lt.	<p>Fever at 2 years followed by paralysis of both lower limbs.</p> <p style="text-align: right;">Rt. Lt.</p> <p>Hip: Flex. 4 4 Ext. 4 3+ Abd. 4 3+ Add. 4 3+ Knee: Flex. 3 3+ Ext. 4 4 Ankle: Dor. Flex. 4 0 Plan. flex. 4 1 Invert 4 0 Evert 4 0</p> <p>Shortening of ½".</p>	1-7-64	<p><i>Clinical:</i> F Deformity corrected. No pain. Gait improved. Gluteus medius gait. <i>X-ray:</i> Fusion good.</p>

TABLE I (continued)

S. No.	Name	Age Sex Sd.	Clinical features	Date of operations	Follow up Remarks																																																
9.	LALITHA	17 F Lt.	<p>Fever at the age of 3 years followed by paralysis of both lower limbs.</p> <table border="0"> <tr> <td></td> <td></td> <td>Rt.</td> <td>Lt.</td> </tr> <tr> <td>Hip:</td> <td>Flex.</td> <td>3+</td> <td>4</td> </tr> <tr> <td></td> <td>Ext.</td> <td>1</td> <td>2+</td> </tr> <tr> <td></td> <td>Abd.</td> <td>2</td> <td>3</td> </tr> <tr> <td></td> <td>Add.</td> <td>2+</td> <td>3</td> </tr> <tr> <td>Knee:</td> <td>Flex</td> <td>2</td> <td>3</td> </tr> <tr> <td></td> <td>Ext.</td> <td>2+</td> <td>3</td> </tr> <tr> <td>Ankle:</td> <td>Dor. flex</td> <td>3</td> <td>0</td> </tr> <tr> <td></td> <td>Plan. flex</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td>Invert</td> <td>0</td> <td>0</td> </tr> <tr> <td></td> <td>Evert</td> <td>3</td> <td>0</td> </tr> </table> <p>Patient was crawling.</p>			Rt.	Lt.	Hip:	Flex.	3+	4		Ext.	1	2+		Abd.	2	3		Add.	2+	3	Knee:	Flex	2	3		Ext.	2+	3	Ankle:	Dor. flex	3	0		Plan. flex	0	0		Invert	0	0		Evert	3	0	6-7-64	<p><i>Clinical:</i> No pain. Deformity corrected. Gait improved.  <i>X-ray:</i> Fusion good.</p>				
		Rt.	Lt.																																																		
Hip:	Flex.	3+	4																																																		
	Ext.	1	2+																																																		
	Abd.	2	3																																																		
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10.	VASANTHA	15 F Rt.	<p>Fever at 4 yrs. and paralysis of right lower limb.</p> <table border="0"> <tr> <td></td> <td></td> <td>Rt.</td> <td>Lt.</td> </tr> <tr> <td>Hip:</td> <td>Flex</td> <td>3</td> <td>N</td> </tr> <tr> <td></td> <td>Ext.</td> <td>2</td> <td>O</td> </tr> <tr> <td></td> <td>Abd.</td> <td>2</td> <td>R</td> </tr> <tr> <td></td> <td>Add.</td> <td>2</td> <td>M</td> </tr> <tr> <td></td> <td></td> <td>A</td> <td>L</td> </tr> <tr> <td>Knee:</td> <td>Flex</td> <td>2</td> <td></td> </tr> <tr> <td></td> <td>Ext.</td> <td>2</td> <td></td> </tr> <tr> <td>Ankle:</td> <td>Dor. Flex</td> <td>0</td> <td></td> </tr> <tr> <td></td> <td>Plan. flex</td> <td>0</td> <td></td> </tr> <tr> <td></td> <td>Invert</td> <td>0</td> <td></td> </tr> <tr> <td></td> <td>Evert</td> <td>0</td> <td></td> </tr> </table> <p>shortening of <math>\frac{1}{2}</math>".</p>			Rt.	Lt.	Hip:	Flex	3	N		Ext.	2	O		Abd.	2	R		Add.	2	M			A	L	Knee:	Flex	2			Ext.	2		Ankle:	Dor. Flex	0			Plan. flex	0			Invert	0			Evert	0		5-8-64	<p><i>Clinical:</i> No pain. Foot stable. Deformity corrected. Patient has a peculiar-internal rotation of the limb at the right hip while walking.  <i>X-ray:</i> Fusion good.</p>
		Rt.	Lt.																																																		
Hip:	Flex	3	N																																																		
	Ext.	2	O																																																		
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Knee:	Flex	2																																																			
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Ankle:	Dor. Flex	0																																																			
	Plan. flex	0																																																			
	Invert	0																																																			
	Evert	0																																																			
11.	RADHA	19 F Rt.	<p>APM at 3½ years left leg                      Flail foot-Quadriceps— 2+                      Gait poor—Hip Abd. 3                      No shortening</p>	4-7-65	<p><i>Clinical:</i> 21-3-66 Gait very much improved. Fusion good.  <i>X-ray:</i> Fusion satisfactory.</p>																																																
12.	YAMMUNA BAI	17 F Rt.	<p>Fever at the age of 1 year followed by paralysis of right lower limb.                      Hip &amp; knee—Normal.                      Ankle                      &amp;                      foot: Dor. Flex. 0                      Plan. flex. 1                      Evert 0                      Invert 0                      Toes: Dor. Flex. 0                      Plan. Flex 2                      Shortening of <math>\frac{1}{2}</math>"</p>	8-9-65	<p><i>Clinical:</i> Gait improved.  <i>X-ray:</i> Fusion good.</p>																																																

TABLE I (continued)

S. No.	Name	Age Sex Sd.	Clinical features	Date of operations	Follow up Remarks
13.	MALATHI	14 F Rt.	Fever at the age of 4 yrs with paralysis of right lower limb. Hip: Flex. 3 Ext. 2 Abd. 2+ Knee: Flex 3 Ext. 3 Ankle: Dor. Flex. 0 Plan. Flex. 0 Invert 0 Evert 0 Shortening of 1".	14-10-65	<i>Clinical:</i> Gait improved. Foot stable. <i>X-ray:</i> Fusion good.
14.	VITTO BAI	15 F Lt.	APM at 3 years. Right leg normal. Lt. Qua- 2. Flail foot and ankle shortening + Hip muscle poor walks with hand support on thigh. Flail foot.	17-10-65	<i>Clinical:</i> Gait not improved. <i>X-ray:</i> Fusion good.
15.	RAMACHANDRAN	17 M Rt.	Fever at the age of 5 years followed by paralysis of right lower limb. Hip: Normal. Knee: Flex. 3 Ext. 3 Ankle: Dor. Flex 0 Plan. Flex 0 Foot: Invert 0 Evert 0 Shortening—1"	8-12-65	<i>Clinical:</i> No deformity. Foot stable. <i>X-ray:</i> Fusion Satisfactory.
16.	SAROJA DEVI	13 F Rt.	APM Residual palsy Rt. leg Hip: Flex. 3 Ext. 2 Abd. 2 Add. 2 Knee: Ext. 0 Flex. 2 Ankle & Foot: Flail. Shortening—1" Inversion deformity + - Collosite in the outer side of foot. Walking with hand support on thigh.	6-4-66	Still in Plaster.

**Case No. 3**

Srinivasamoorthy male aged 18 had APM at the age of 4 involving all 4 limbs. Residual palsy of both lower limbs. Right side pan-talar fusion done in October 1962. Fusion good and he was able to discard appliance on the operated side. Walks with below knee appliance left leg.

**Case No. 4**

Akileswaran, male aged 26. This is the oldest patient in the series. Had APM in childhood. He had flail left foot and ankle with shortening of 1" and gross inversion deformity. Fusion done on 29-10-62. Fusion good. Slight residual inversion deformity present. Gait improved.

**Case No. 5**

Manoharan male aged 20 had APM at 4 years. Residual palsy left leg with flail ankle and foot with shortening 1½". Pan-Talar fusion done on 5-12-62. Fusion good. Gait normal.

**Case No. 6**

Vimala female aged 13 had APM at 1 year. Residual paralysis of both lower limbs. Left leg flail ankle and foot. Pan-Talar fusion done on 21-10-63. Fusion satisfactory clinically; Talonavicular joint shows a small gap in the X-ray. Gait improved.

**Case No. 7**

Panchalingam male 15 had polio at the age of 1. Residual paralysis both legs. Right leg totally flail below knee, left leg slight foot drop. Pan-Talar fusion done on 10-6-64. Fusion good and gait normal.

**Case No. 8**

Shanti a girl aged 16 years developed APM at the age of 2. Flaccid paralysis involving both lower limbs. Motor power in hip and knee was good on both sides. Ankle and foot was good on right side. Left side ankle and foot was flail. Shortening ½" on the left side. Pan-Talar arthrodesis done on 1-7-64. Deformity corrected. No pain. Walks with stable foot. Fusion good.

**Case No. 9**

Lalitha girl aged 17 years a case of Residual APM of 14 years duration involving both lower limbs. Motor power on the right side was poor. On the left side hip and knee good. Ankle and

foot flail and patient was crawling. It was decided to fuse ankle and foot on the left side and discard appliance. Pan-Talar arthrodesis done on 6-7-64. Radiological fusion good. Able to walk well without appliance on the left and with appliance on the right.

**Case No. 10**

Vasantha a girl aged 15 years developed APM at the age of 4 years involving right lower limb. Motor power on the right side hip and knee fair, ankle and foot flail. True shortening ½". Pan-Talar done on 5-8-64. Radiological fusion good. Deformity fully corrected. Walks with stable ankle and foot without any appliance.

**Case No. 11**

Radha, 19 years old girl is a case of APM of 16 years duration involving left leg. Motor power- hip—Abduction 3 Knee Q. 2+. Ankle and foot flail. No shortening. Gait poor. Pan-Talar fusion done on 4-7-65. Fusion good. Reviewed on 21-3-66. Gait very much improved.

**Case No. 12**

Yammuna Bai 17 year old girl APM of 16 years duration Paralysis involving right lower limb. Motor power hip and knee normal. Ankle and foot flail. Shortening ½". Fusion done on 8-9-65. Fusion good. Deformity corrected. Walks with stable foot.

**Case No. 13**

Malathi 14 years old girl APM Rt. lower limb. Motor power hip and knee good. Ankle and foot flail. Shortening 1". Fusion done on 14-10-65. Fusion good. Able to walk with normal gait.

**Case No. 14**

Vittobai 15 years old girl APM 12 years duration. Ankle and foot flail. Left Q. 2. Walks with hand support on thigh. Fusion done on 17-10-65. Deformity corrected. Gait not improved.

**Case No. 15**

Ramachandran 17 years old boy had flaccid paralysis due to APM of 12 years duration. Ankle and foot flail. Shortening 1". Fusion done on 8-12-65. Clinically foot stable and deformity corrected.

### Case No. 16

Sarojadevi girl aged 13 years. APM Rt. leg with knee extensor O and ankle and foot flail. Shortening 1" with inversion deformity. Walks with hand support on thigh. Fusion done on 6-4-1966. Patient is still in Plaster.

### INDICATIONS

Cases for pan-talar arthrodesis are carefully selected, for the procedure is not done when we feel that a triple arthrodesis alone can meet the needs of a patient.

We do not agree with the statement of Hunt and Thompson that all flail feet, all complete drop feet and all calcaneal deformities are best treated by pan-talar arthrodesis.

Loss of muscle power in the foot alone should not be the criterion to decide the procedure to be adopted. Many feet with no power in the muscles have a good amount of stability at the ankle due to capsular contracture. These are satisfactorily stabilised by a triple arthrodesis alone. In some cases the ankle is very unstable due to overstretching of the capsule and ligaments around the ankle joint. These cases are chosen for the pan-talar arthrodesis.

The aim of the operation is to stabilise the foot in good position and correct the deformities of equinus, calcaneus, varus or valgus. It aims at improving the gait on the whole and in some cases helps to discard appliances. In some cases it helps to stabilise the knee also.

### TECHNIQUE FOLLOWED

The incision is an extended anterolateral one. All cases have been done as a one stage procedure. The procedure adopted is to arthrodesis the ankle in addition to the standard Triple Arthrodesis and not just a pan-talar fusion. The talus is never removed from the socket. The capsular attachment to the neck of Talus is carefully preserved, the tibial attachment only being raised to expose the ankle joint for denudation of the cartilage. Access to the medial side is by the use of a cranked chisel. Although technically more difficult than the temporary removal of the talus, it gives better and surer fusion due to the preservation of the blood supply to the talus.

In all cases, cancellous bone chip grafts from the iliac crest of the patient were used to pack the ankle joint cavity after complete denudation of the articular surfaces. The ankle is kept in about 10° equinus.

The tourniquet time has been on an average 1 hour and 15 minutes and the whole operation

is completed within this time. Time is saved by a second team taking the iliac bone graft. The leg is immobilised in a groin to toe plaster cast for 10-12 weeks and a below knee walking plaster cast for a further 2-4 weeks. Thereafter an ankle boot is worn for 6-8 months.

### FOLLOW UP

The cases were followed up and assessment made according to a set pattern. The criteria used, for assessment of the results of the operation are as follows:—

- Excellent:*
1. Solid fusion
  2. No pain
  3. No deformity
  4. Normal gait
  5. Stable foot
- Good:*
1. Solid fusion
  2. No pain
  3. Slight residual deformity
  4. Good gait
  5. Stable foot
- Failure:*
1. Pseuarthrodis
  2. Pain present
  3. Deformity persisting
  4. Poor gait
  5. Instability

*Table II gives a summary of the results.*

### RESULTS

Case No. 3 Srinivasamoorthy, had below knee appliance for both legs. After surgery on the right side he has discarded the appliance. He is now keen to have similar operation done for the left leg also.

One case (Case No. 4) showed a slight persisting inversion deformity and the gait was not satisfactory. He is the oldest case in the series with a very gross inversion deformity preoperatively. Although the result was not excellent, the patient was very satisfied with the marked improvement in his gait and appearance.

Case No. 5 preoperatively was walking with the use of a crutch on the left side. After operation he is able to walk long distances without any crutch or appliance.

Case No. 9 girl aged 17 was very severely paralysed and was crawling on all fours when she sought treatment. At present she wears a full caliper on the right side and an ordinary boot on the left side and is able to walk.

In one case (No. 14) although the foot was well stabilised and fusion was good clinically and radiologically, the gait in general was not good as the hip muscles were poor and quadri-

TABLE II  
PAN-TALAR ARTHRODESIS: RESULTS OF OPERATION

No.	Name	Fusion	Pain	Correct of Deformity	Gait	Stability	Result
1.	FAROUK	Good	Nil	Corrected	Improved	Good	Excellent
2.	PREMA	*Incomplete	Nil	Corrected	Improved	Good	Excellent
3.	SRINIVASAMOORTHY	Good	Nil	Corrected	Improved	Good	Excellent
4.	AKILESWARAN	Good	Nil	Inversion (Not corrected)	Improved	Good	Good
5.	MANOHARAN	Good	Nil	Corrected	Improved	Good	Excellent
6.	VIMALA	*Incomplete	Nil	Corrected	Improved	Good	Excellent
7.	PANCHALINGAM	Good	On Walking long distance	Corrected	Improved	Good	Good
8.	SHANTHI	Good	Nil	Corrected	Improved	Good	Excellent
9.	LALITHA	Good	Nil	Corrected	Improved	Good	Excellent
10.	VASANTHA	Good	Nil	Corrected	Improved	Good	Excellent
11.	RADHA	Good	Nil	Corrected	Improved	Good	Excellent
12.	YAMMUNA BAI	Good	Nil	Corrected	Improved	Good	Excellent
13.	MALATHI	Good	Nil	Corrected	Improved	Good	Excellent
14.	VITTO BAI	Good	Nil	Corrected	Not Good	Good	Fair
15.	RAMACHANDRAN	Good	Nil	Corrected	Improved	Good	Excellent
16.	SAROJA DEVI	Still in	O.P.				

\* Clinical Fusion Good. X-ray shows, gap in Talo Navicular Joint.

ceps was only 2. There was not sufficient equinus to compensate both for weak quadriceps and shortening and hence the knee was not stabilised well.

In all the other cases the results in terms of appearance and function have been extremely gratifying.

12 out of 16 cases showed excellent results and the patients were very satisfied with the improvement in their function. One case is too recent to be assessed.

A further three more cases have been done during 1966 using the same technique bringing the total in the author's series to 19.

SUMMARY

16 cases of pan-talar arthrodesis done during 4 years for post polio flail foot have been followed up and presented. A single stage operation was done in all cases without removal of the Talus and cancellous bone chip grafts were used. The fusion was good in all cases and the results were excellent in 13 cases and good in 2.

ACKNOWLEDGEMENT

I wish to thank Dr. S. Soundarapandian, M.S. (Gen), M.S. (Orth), my assistant for helping me in the management and follow up of these cases.

I thank Dr. S. Govindarajan, M.D., D.B., Dean, Madras Medical College and Government General Hospital and the Government of Madras for permitting me to use the clinical material and present this paper.

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