

A Comparison of Children with Clubfoot Who Underwent Surgical or Ponseti Treatment

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Study conducted at Sinai Hospital, Baltimore, Maryland,
and the DuPont Institute, Wilmington, Delaware

Purpose

To compare
intermediate
outcomes in club
feet treated with

Posteromedial
Release (PMR)

Ponseti Method



Previous Comparative Studies

CORR 2009 Zwick et al

- 19 subjects (28 feet)
 - Ponseti: 9 subjects (12 feet)
 - PMR: 10 subjects (16 feet)
- Mean follow-up: 3.5 years
- Method: PODCI, Functional rating, x-ray
- Outcome: Ponseti had greater foot motion, higher PODCI, and equal x-ray results

JBJS 2010 Halanski et al

- 55 subjects (86 feet)
 - Ponseti: 43 feet
 - PMR: 43 feet
- Mean follow-up: <4 years
- Method: Subsequent surgical interventions
- Outcome (Relapses requiring surgery)
 - Ponseti: 15 operations (4 major and 11 minor) for recurrence.
 - PMR: 14 re-operations (12 major and 2 minor) for recurrence.

Subjects

■ PMR (Dupont)

- N = 26
- Feet = 43
- Age = 5-11 years
- Average = 9.2 years

■ Ponseti (Sinai)

- N = 22
- Feet = 35
- Age = 5-10 years
- Average = 6.3 years

■ AGE MATCHED SUBJECTS

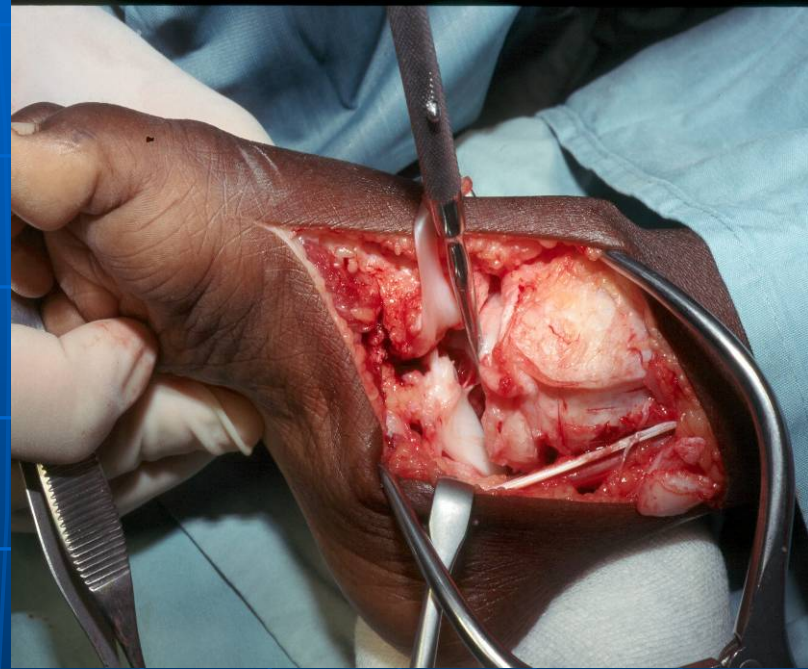
■ MINIMUM 5-YEAR FOLLOW-UP



Need for Secondary Surgeries

- PMR: $n = 14/43$ feet
- (11 major, 3 minor)

- Ponseti: $n = 3/35$ feet
- (0 major, 3 minor)

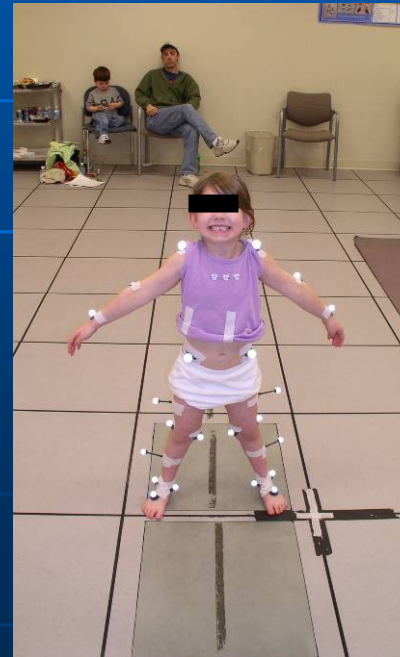
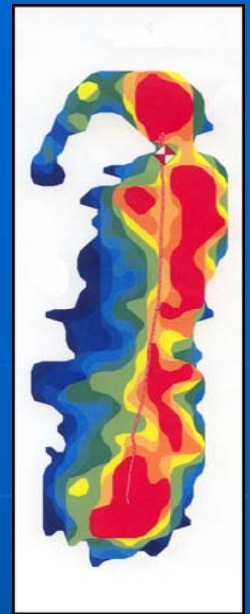


Minor surgery = tendon lengthening or transfer

Major surgery = arthrotomy or osteotomy

Methods

- Physical Exam
- Dynamic Foot Pressures
- Gait Analysis
- Quality of Life Measures
- X-Ray Assessment



Clubfoot Disease-Specific Instrument
Parent Form

Your child's doctors are carefully evaluating the condition of your child's foot before and after treatment. Please circle the one best answer to each question.
All results will be kept strictly confidential.

1. How satisfied are you with the status of your child's foot?	1	2	3	4
	Very Satisfied			Very Dissatisfied
2. How satisfied are you with the appearance of your child's foot?	1	2	3	4
	Very Satisfied			Very Dissatisfied
3. Rate the amount of teasing your child has related to the clubfoot.	1	2	3	4
	Never Teased			Always Teased
4. Rate problems finding shoes that fit your child.	1	2	3	4
	Never a Problem			Always a Problem
5. Rate problems finding shoes that your child likes.	1	2	3	4
	Never a Problem			Always a Problem
6. Does your child complain of pain in the foot that was operated on?	1	2		
	Yes	No		
7. Rate your child's limitations in the following activities.				
a. Walking:	1	2	3	4
	Not Limited			Completely Limited
b. Running:	1	2	3	4
	Not Limited			Completely Limited
8. How much does your child complain of pain during heavy exercise?	1	2	3	4
	Never Complains			Always Complains
9. How much does your child complain of pain during moderate exercise?	1	2	3	4
	Never Complains			Always Complains

Results: Physical Exam

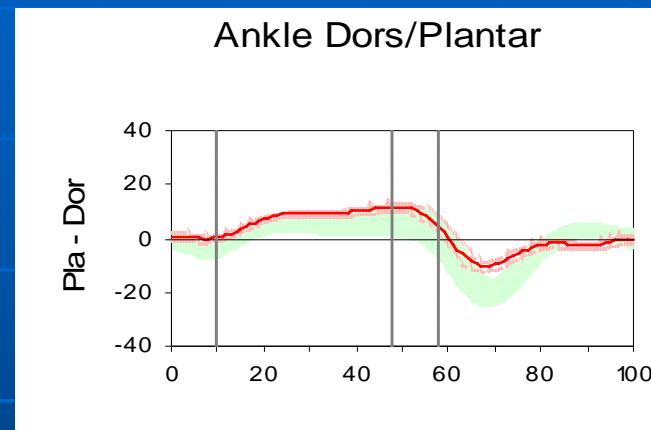
	Ponseti	PMR
Dorsiflexion	10°*	-1°
Plantar flexion	51°*	28°
Calcaneal inv/evr	38°*	17°
Midfoot abd/add	37°*	14°



*Ponseti treated feet significantly more flexible than PMR feet.

Gait Study Results: Dynamic ROM

	Normal	Ponseti	PMR
Ankle DF/PF	28°	24°*	19°
Max Ankle PF	14°	12°*	8°



*Ankle motion significantly better in Ponseti group than PMR group, but both have reduced dynamic ROM compared with normal feet.

Gait Study Results: Temporal and Spatial Results

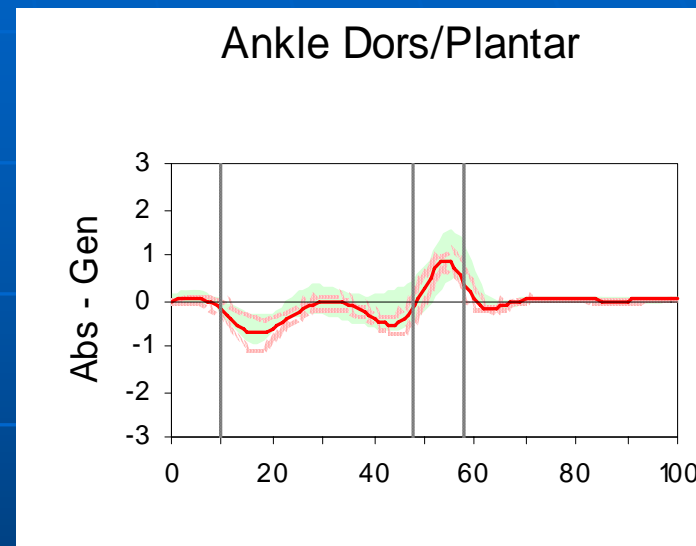
	Normal	Ponseti	PMR
Velocity (cm/sec)	123	99*	88
Step Width (cm)	9	9*	11

*Ponseti group walks significantly faster than PMR group and with a more normal step width.



Gait Study Results: Force Production

	Normal	Ponseti	PMR
Ankle push-off power (watts/kg)	25	18*	14



*Plantar flexion push-off is significantly better in Ponseti than PMR, but both groups have reduced force production compared with normal feet.

Outcome Assessments

	Normal	Ponseti	PMR
PODCI pain	100	98*	88
PODCI function	100	97*	94
ASKp	No sig diff		
DSI	9	12*	17
Dimeglio	NA	5*	15

*Ponseti group has statistically less pain, higher global function, and greater parent satisfaction.

Pediatric Health Assessment (parent-reported)

During the **last week**, how much of the time:
(Circle one response on each line.)

	Most of the time 1	Some of the time 2	A little of the time 3	None of the time 4
15. Did your child feel sick and tired?				
16. Were your child full of pep and energy?	1	2	3	4
17. Did pain or discomfort interfere with your child's activities?	1	2	3	4

During the **last week**, has it been easy or hard for your child to:
(Circle one response on each line.)

	Easy 1	A little hard 2	Very hard 3	Can't do at all 4	Too young for this activity 5
18. Run short distances?	1	2	3	4	5
19. Bicycle or tricycle?	1	2	3	4	5
20. Climb three flights of stairs?	1	2	3	4	5
21. Climb one flight of stairs?	1	2	3	4	5
22. Walk more than a mile?	1	2	3	4	5
23. Walk three blocks?	1	2	3	4	5
24. Walk one block?	1	2	3	4	5
25. Get on and off a bus?	1	2	3	4	5

26. How often does your child need help from another person for walking and climbing? (Circle one response.)

1 Never 2 Sometimes 3 About half the time 4 Often 5 All the time

27. How often does your child use assistive devices (such as braces, crutches, or wheelchair) for walking and climbing? (Circle one response.)

1 Never 2 Sometimes 3 About half the time 4 Often 5 All the time

During the **last week**, has it been easy or hard for your child to:
(Circle one response on each line.)

	Easy 1	A little hard 2	Very hard 3	Can't do at all 4	Too young for this activity 5
28. Stand while washing his/her hands and face at a sink?	1	2	3	4	5
29. Sit in a regular chair without holding on?	1	2	3	4	5
30. Get on and off a toilet or chair?	1	2	3	4	5
31. Get in and out of bed?	1	2	3	4	5
32. Turn door knobs?	1	2	3	4	5
33. Bend over from a standing position and pick up something off the floor?	1	2	3	4	5

Pediatric Outcomes Instrument: Page 5 of 8

Radiologic Results

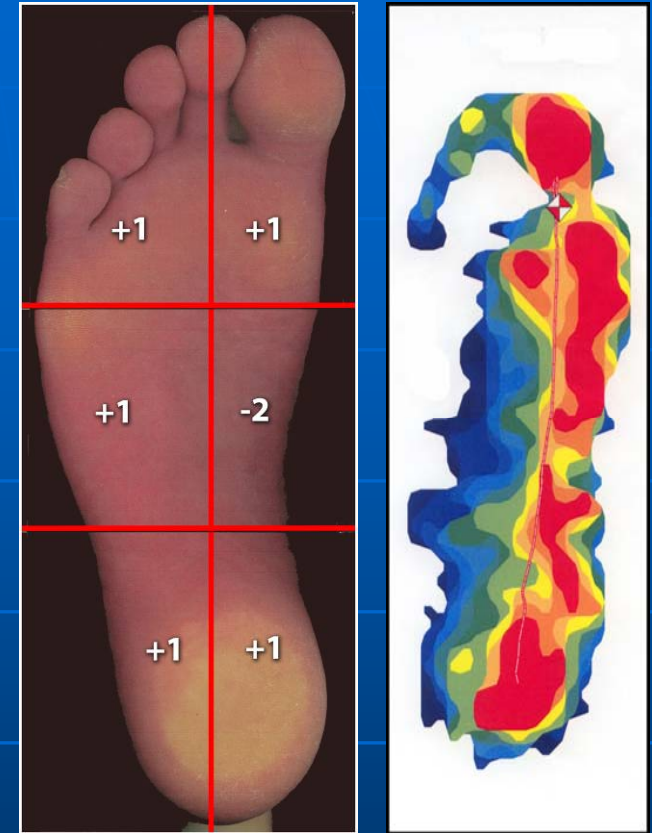
	Ponseti	PMR
AP adduct	13°*	31°
AP talo 1st	1°*	16°
Lat talo 1st	-1°*	8°



*Ponseti group had significantly better parameters than PMR group.

Foot Pressure Study Results

	Normal	Ponseti	PMR
Pressure index	11	-16	-37
Heel impulse (%)	37	42	32
Med mf pressure (psi)	34	40	19
Lat mf pressure (psi)	7	23	25



Both groups have more varus than normal but PMR much more so.
Ponseti group has high heel impact.

Ponseti vs. PMR: Conclusion

- Neither group is “normal”
- Ponseti group has
 - More foot ROM
 - More PF force production
 - More normal rotational profile
 - Better gait velocity and step width
 - Better foot alignment
 - Less cavus and varus
 - Less pain, greater family satisfaction



References

1. Zwick EB, Kraus T, Maizen C, et al. Comparison of Ponseti versus surgical treatment for idiopathic clubfoot: a short-term preliminary report. *Clin Orthop Relat Res.* 2009;467(10):2668-76.
2. Halanski MA, Davison JE, Huang JC, et al. Ponseti method compared with surgical treatment of clubfoot: a prospective comparison. *J Bone Joint Surg Am.* 2010;92(2):270-8.
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