

Historical Overview of Clubfoot Treatment – Journey to the Ponseti Method

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I. Nonoperative Treatment

Hippocrates- manipulation and splinting recommended around 400 BC

Ambroise Pare (1575) and Nicholas Andry (1743) - manipulation and bandage/ splint

Antonio Scarpa – first clubfoot orthosis (1803)

Dieffenbach (1834) Guerin (1836) - Use Plaster of Paris for correction of clubfoot

Thomas wrench and other methods of forceful manipulation- late 1800s

Kite method- (1930)- recognized that forceful manipulation harmful- recommended return to manipulation and casting. “Principles involved in the treatment of clubfoot”

- Longitudinal traction/manipulation
- Sequential deformity correction- adduction, varus, equinus
- Push navicular laterally onto talar head, thumb on lateral talar head
- Apply slipper cast
- Mold forefoot into abduction with finger laterally at distal aspect of calcaneus
- Use slipper cast to externally rotate foot relative to thigh and correct medial spin of calcaneus
- Cast wedging to correct equinus
- Up to 95% corrected without surgery
- Average 22 months cast treatment

Denis- Browne –(1934) strapping / taping and use of corrective bar, “nutcracker” for recalcitrant cases

Ponseti method- developed in late 1940s. First publication – (1963)

- Manipulation and above knee plaster casts, changed weekly
- All components of deformity corrected simultaneously except equinus which is last
- Cavus corrected by supination of forefoot to align with hindfoot as foot is abducted
- Whole foot held in supination and flexion as it is abducted over fulcrum of thumb against lateral aspect of head of talus
- Never evert/pronate the foot
- Once heel varus and foot supination corrected by full abduction with maximal external rotation under the talus, equinus can be corrected
- Subcutaneous Achilles tenotomy can speed correction
- Almost all feet can be corrected without extensive surgery

- Average cast treatment – 2-3 months
- Long term abduction splinting after casting to prevent relapse

French methods – physical therapy and taping Bensahel (1990) and Dimeglio (1996) method- physical therapy, continuous passive motion machine, splinting

- These methods have not gained as much popularity in the US, likely because of the time/expense/need for trained PTs and CPM
- Manipulative techniques with some similarity to Ponseti
- Good results reported
- Comparative study ongoing (Richards et al, Texas Scottish Rite Hospital, Dallas)

II. Operative treatment

Tendo Achilles tenotomy- Georg Stromeyer (1838) described tenotomy, popularized by William John Little

Anesthesia (1846) leads to more operative treatment for clubfoot
Multitude of reports on different surgical techniques, soft-tissue procedures and osteotomies

Turco method

- Popularized in 1970's
- Medial incision to achieve one stage posteromedial release
- Posterior release first, then subtalar joint opened, hinged on lateral side, release of medial contractures
- Excessive internal rotation of foot and valgus hindfoot noted on follow-up
- Turco JBJS 1979
 - 240 feet/176 patients, 149 f/u 2-15 years, 83.8% good or excellent

Goldner method

- Based on premise that primary deformity is internal rotation of talus in ankle joint
- 4 quadrant release
- Subtalar joint not circumferentially released
- Deltoid ligament lengthened
- Goldner Curr Pract Orthop Surg 1969

Carroll method

- Believed talus is externally rotated in ankle joint
- Circumferential release and rotation through subtalar joint to correct equinus and varus deformity
- Preserve talocalcaneal interosseous ligament
- Porat and Kaplan, J Pediat Ortho 1989
 - 33 idiopathic, avg 4 yr f/u, clinical and radiographic eval., 82% satisfactory results

McKay method

- Similar to Carroll, but disagreed about talus, felt talus is in neutral alignment
- Usually partial, sometimes complete release of talocalcaneal interosseus ligament
- Designed to correct horizontal rotation and lateral displacement/equinus of the calcaneus
- McKay J Pediat Ortho 1983m -55 feet avg 3 yr f/u, evaluated radiographic analysis and appearance of foot, > 80% good to excellent results, use of post op hinge cast

Simons method

- Extensive circumferential release of subtalar joint
- Release of talocalcaneal interosseus ligament
- Release of calcaneocuboid joint
- Allows gross translational changes
- Simons JBJS 1985 compared two groups, 17patients/26 feet posteromedial and lateral release, 17 patients/25 feet CSTR, clinical and radiographic evaluation, CSTR 72% satisfactory vs 50%, tendency for overcorrection

A la carte approach – Bensahel (1987) = Do only what is necessary to get a good correction of the foot.

- Adopted by many clubfoot surgeons in past two decades
- Individual surgeon preferences
- Belief that each foot has slightly different pathology / thus needs slight modification of surgical technique
- Often a combination of surgical methods described above

Many others have added writings on surgical methods / techniques for clubfoot- Lloyd-Roberts, Catterall, Bensahel, Dimeglio, Crawford, Lehman, Thompson, etc.

Major concerns of operative treatment approaches- 1. Stiffness 2. Residual and/or Recurrent Deformity 3. Pain

Tarraf and Carroll, 1992- 159 recurrent Clubfoot deformities

- Most common deformities forefoot adduction and supination (95%)
- Usually from inadequate correction initially
 - failure to release calcaneocuboid joint, plantar fascia, unrecognized forefoot adduction
- Other components
 - Short medial column, long lateral column, equinus, varus, calcaneus

Dobbs, Nunley and Schoenecker, 2006. Long term follow-up of clubfeet treated with extensive soft tissue release. JBJS 88A:986-996.

Conclusion = “Many patients with clubfoot treated with an extensive soft-tissue release have poor long-term foot function. We found a correlation between the extent of the soft-

tissue release and the degree of functional impairment. Repeated soft-tissue releases can result in a stiff, painful, and arthritic foot and significantly impaired quality of life.”

Comparison - Cooper and Dietz long term follow-up of Ponseti method treatment of clubfeet to Dobbs et al extensive soft tissue release surgery :

Excellent and Good Results - 78% Ponseti method to 26% extensive soft tissue release
Fair and Poor Results - 22% Ponseti method to 73% extensive soft tissue release

III. Timeline of Trends in Clubfoot Treatment- where is the pendulum now, and how did it get there?

From Nonoperative to Operative and back to Nonoperative

- Prior to anesthesia, treatment methods were nonoperative, and frequently involved forceful manipulations
- Poor results from surgical and forceful manipulations led to resurgence of interest in gentle manipulations and serial casting, led by Kite in US in 1930s
- Ponseti in 1940s reviews results of surgical treatment of clubfoot and concludes it leads to stiff, poorly functioning, painful feet. Develops his manipulation and serial casting method in Iowa, beginning in 1948. Ponseti studied Kite's method and found it flawed and too lengthy.
- Until late 1990s, most centers and authors/speakers in US outside of Iowa quoted a less than 50% success rate with serial casting, but state that casting for all feet worthwhile as it will lessen the magnitude of surgical correction required, even if it does not correct the foot.
- Actual casting success rate of many centers much less than half, and vast majority of clubfeet treated with operative approaches
- Majority of literature on treatment of clubfoot 1960-1990s deals with technical details of operative treatments, for both initial deformity and residual/recurrent deformities. Often small, uncontrolled series with no or only short term followup.
- Major publications on success of Ponseti Method (by Ponseti in 1963,1972,1980,1994) , excellent results in long term followup study (Cooper/Dietz 1995), and textbook by Ponseti (1996) do little to increase popularity of the method outside of Iowa
- Parent groups and Internet influential in bringing attention to Ponseti Method (late 1990s)

- Ponseti Technique courses offered in Iowa (first course September 22-23, 2000)
- Parental insistence on nonoperative treatment (nosurgery4clubfoot) and seeking out “Ponseti-approved” providers
- Influential practitioners outside Iowa (and not trained in Iowa) adopt Ponseti method, have success, and begin to promote the method (ex. Herzenberg, Lehman, Mosca, Pirani, Richards, Morrissy and more)

“There are no reported long term studies of any operative procedures comparable to the Cooper and Dietz series with regard to length of followup, criteria for evaluation, and rate of excellent and good results.

..one should learn to master Ponseti’s method, reserving one’s standard operative approach for failures”

- V. Mosca in The Foot,
Lovell and Winter’s Pediatric Orthopaedics 5th ed.,
Morrissy and Weinstein eds., 2001

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