

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/265418816>

# In Search of Ortolani: The Man and the Method

Article in *Journal of Pediatric Orthopaedics* · September 2014

DOI: 10.1097/BPO.0000000000000250 · Source: PubMed

---

CITATIONS

5

READS

1,371

1 author:



Scott J Mubarak

Rady Children's Hospital

219 PUBLICATIONS 12,025 CITATIONS

SEE PROFILE

# In Search of Ortolani: The Man and the Method

Scott J. Mubarak, MD

**Abstract:** Dr Marino Ortolani was an Italian pediatrician who developed a test for hip instability in the infant (1936) and then promoted early diagnosis of this condition to the medical community. He studied the pathoanatomy of hip instability in the 1940s. He wrote his textbook in 1948 and in 1952 he produced a movie about the examination and treatment of hip dysplasia which was translated into many languages to promote early diagnosis and treatment of developmental dysplasia of the hip (DDH). In his career, he wrote a monograph and 31 articles on the subject of hip dysplasia and besides his classic test he developed various braces to treat the infants with hip instability. A remarkable achievement for this early clinician-scientist.

**Key Words:** hip dislocation, infants, Ortolani history

(*J Pediatr Orthop* 2014;00:000–000)

**D**r Marino Ortolani was an Italian pediatrician who developed a test for hip instability in infants (1936) and then promoted early diagnosis of this condition to the medical community. He studied the pathoanatomy of infants' hip, developed braces for the treatment of hip dysplasia, and set up a hip dysplasia clinic in his hospital in Ferrara, Italy.

## ORTOLANI WAS NOT THE FIRST

The first known clinical description of hip instability was by noted German surgeon, Wilhelm Roser from University of Marburg (Fig. 1). In 1870, he described a clinical test<sup>1</sup> and then later wrote about it in his textbook on surgical anatomy when he described “schlottrige Huefteglenke,” which when translated means “hip reduced by abduction.”

French physicians also moved forward with their understanding of the infants' hip. Francois Calot (Fig. 2), a surgeon most noted for his treatment of Pott disease of the spine, also studied infant hip instability. In his article of 1905 entitled “la luxation congenitale de la hanche” he described in detail reduction of the infants' hip.<sup>1–3</sup> A few

years later in 1912 another French physician, Pierre Le Damany (Fig. 3) also described reduction of the infant hip with abduction and termed it “signe du ressault” (Fig. 4). He classified newborn hips into 2 types: (1) anthropologic group (our common developmental hip dysplasia); and (2) the teratologic hips associated with syndromes.<sup>4</sup> This grouping remains true today. He also described the provocative hip instability test 50 years before Barlow<sup>5,6</sup> (Fig. 5). A fourth report occurred in 1926 with Froelich<sup>7</sup> describing infant hip reduction with abduction.



**FIGURE 1.** Wilhelm Roser (1817 to 1888).

From the Department of Orthopedics, Rady Children's Hospital, San Diego, CA.

The author declares no conflicts of interest.

Reprints: Scott J. Mubarak, MD, Department of Orthopedics, Rady Children's Hospital, San Diego, CA, 3030 Children's Way, Ste 410, San Diego, CA 92123. E-mail: smubarak@rchsd.org.

Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Website, www.pedorthopaedics.com.

Copyright © 2014 by Lippincott Williams & Wilkins



FIGURE 2. Jean Francois Calot (1861 to 1944).



FIGURE 3. Pierre Le Damany (1870 to 1963).

During the 1930s in Italy, Vittorio Putti (from Bologna) was the premier orthopaedic surgeon on congenital hip dislocation (Fig. 6). Putti who spoke many languages went to Germany in 1907 to learn about the use

of Rontgen’s equipment and to work with surgeons such as Oscar Vulpius. When he returned to Italy his new scientific understanding enabled him to pursue hip research and to later write a superb anatomy text on the

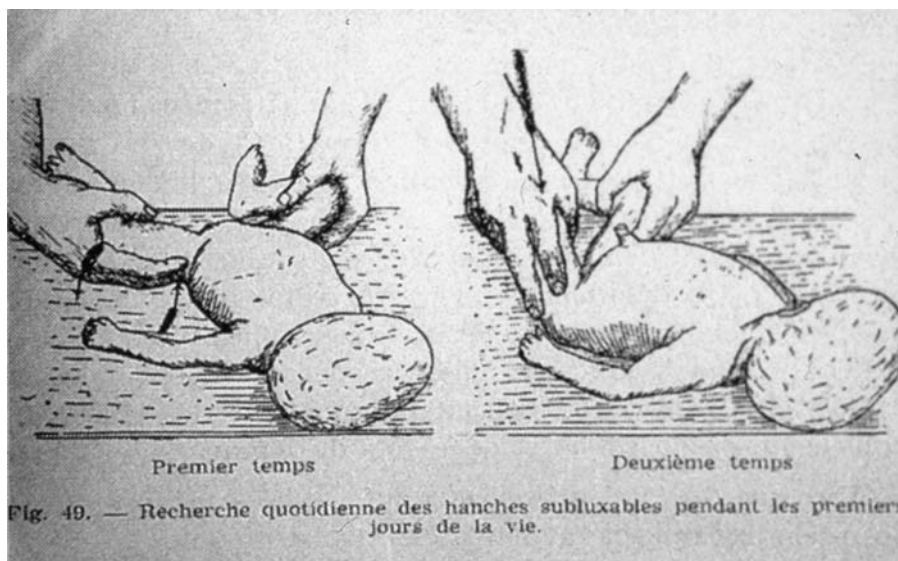


FIGURE 4. Drawing from the article by Pierre Le Damany “Signe du ressault,” 1912.



**FIGURE 5.** Provocative hip instability test (hip is reduced in socket but dislocatable). This was first described by Pierre Le Damany in 1912 and later by Barlow in 1962.

subject.<sup>8</sup> Putti stressed the radiographic criteria to make the diagnosis congenital hip dislocation: (1) superolateral migration of the femoral head; (2) increased acetabular angle; and (3) small capital femoral epiphysis.

These radiographic findings were not so useful until after 12 months of age. Furthermore, in the 1930s many children were born at home and therefore a clinical test for hip instability was needed for earlier diagnosis.

### THE ORTOLANI TEST

Marino Ortolani (Fig.7) was an Italian pediatrician who was born in 1904. He grew up in rural Italy, attended medical school in Bologna, and began his pediatric practice in 1929 in Ferrara. He spent his entire career at the Institut Brefotrofito, a hospital for deprived and abandoned children. Ortolani wrote that “you must listen

to your mothers of your patients. I learn so much from the mothers.” In January 1935, a mother told him that every time she bathed her child and cleaned the perineum she felt a click of the baby’s hips. Ortolani examined the child and noted “segno della scatto” (Figs. 8, 9). He confirmed this baby’s hip dislocation with an x-ray. This jerk sign or hip reduction into the socket with abduction had not previously been described in any pediatric texts. Stimulated by this 1 case he proceeded to screen and study all infants at his hospital. In the next few months he



**FIGURE 6.** Vittorio Putti (1880 to 1940).



**FIGURE 7.** Marino Ortolani (1904 to 1983).



**FIGURE 8.** Marino Ortolani examining an infant in Hospital San Paolo, Brazil, 1972. From Remi Kohler, MD.

confirmed the diagnosis of 31 dislocated hips in 810 infants. He wrote his first paper on this subject in 1936, entitled “A very little known sign and its importance in the early diagnosis of congenital hip predisposition.” In 1937, in a second paper he described this test in more detail.<sup>9,10</sup>

**INFANT HIP PATHOANATOMY**

Ortolani, a curious man, got interested in the pathoanatomy of infant hip dislocation. In this era before antibiotics, many children admitted to the hospital with pneumonias, would eventually succumb to their disease. In these postmortem cases, Ortolani performed extensive dis-



**FIGURE 9.** Line drawing of Ortolani’s reduction maneuver.

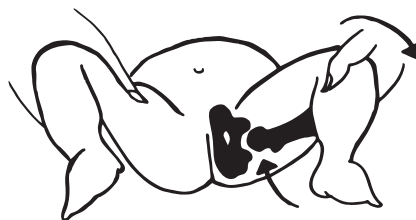


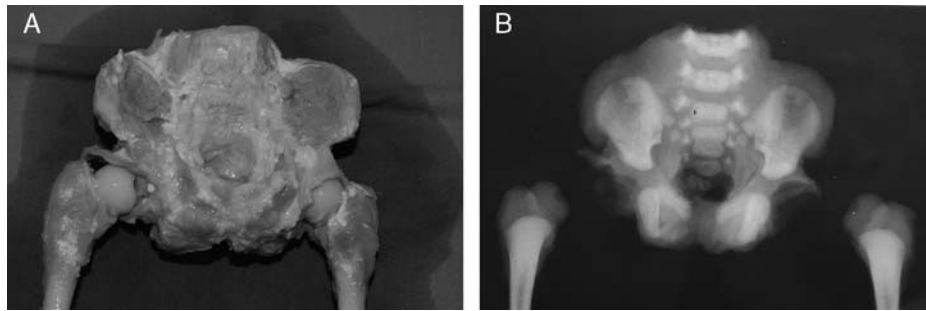
**FIGURE 10.** George Thompson, MD; Marco Ortolani, his son; and Scott Mubarak, MD in Padua, 2007 (exam Ortolani’s fetal hip specimens).

section of these infants’ hips, both normal and the unstable cases. His efforts in the study of hip pathology allowed him to have a better understanding of the clinical findings.<sup>11–24</sup> In 1948, he published his sentinel paper on this subject based his pathologic dissections over the prior 10 years.

After his death, these specimens, collected throughout his career, were preserved by his son, Dr Marco Ortolani, a physiatrist, who brought them to his hospital in Padua, Italy. In September 2007, Dr George Thompson and I had the unique opportunity to visit Dr Marco Ortolani in Padua (Fig. 10), and review these original specimens preserved in formalin since the 1930s. This material included normal and pathologic hip specimens along with their accompanying hip radiographs (Figs. 11A, B). He even saved specimens with dwarfing conditions such as achondrodysplasia. In some specimens, the entire femur was present so that one could appreciate the amount of femoral anteversion present in the pathologic state.

In 2008, his son Marco died and the Ortolani specimens were donated to “The Institute of Human Normal Anatomy at the University of Padua” by Mar-





**FIGURE 11.** A, Marino Ortolani's hip specimens with the right hip dislocatable. Photograph by George Thompson, MD. B, Radiographs of the same with the right hip dislocatable.

ino's grandson, Dr Luca Ortolani, a neurologist. That's where they are on view today.

### TREATMENT OF HIP DYSPLASIA

In 1938, Marino Ortolani became the director of his hospital, Institut Brefotrofiu in Ferrara, Italy a position of leadership he held until 1972. In 1946, he set up a Hip Dysplasia Center "for diagnosis, prophylaxis, and treatment of DDH." He treated about 20 patients with this diagnosis daily or nearly 8000 in his career.

Ortolani developed various abduction orthosis and splints which he illustrated in his articles and in his movie. At that time, Le Damany had a hip orthotics, as well as, Gruck, Kafka, Putti, and Felix Bauer from Vienna.<sup>25,26</sup> And following World War II, Pavlik presented his harness at a meeting in Prague, Czechoslovakia (1946).<sup>27</sup>

Most commonly, Ortolani used abduction pillows for the newborns similar to Frejka's pillow (Fig. 12). For older infants after reduction he used an orthosis that held the infant's hips abducted and internally rotated into the acetabulum (Fig. 13).<sup>19,21-24</sup> Surprisingly, Ortolani even had a stirrups orthosis very similar to Pavlik's harness. Although little is said about its use in his articles, his monologue on hip dysplasia (1947) pictured a child in a

stirrup device.<sup>13-15</sup> All of his various braces for infant hip dislocation were a remarkable and a unique feat for a pediatrician then or now.

### HIP DYSPLASIA EDUCATION AND PROMOTION

Marino Ortolani also spent a great deal of time educating doctors and nurses on the important aspects of early diagnosis of hip instability. He encouraged nurses to make house calls, as well as, to apply the braces to treat infants with congenital hip dislocation. In 1952, he produced a movie on the subject for the education of physicians and nurses (see video, Supplemental Digital Content 1, <http://links.lww.com/BPO/A21>, <http://links.lww.com/BPO/A22>, <http://links.lww.com/BPO/A23>, <http://links.lww.com/BPO/A24>). The movie, about 6 minutes in total length, shows Ortolani performing his test and discussing the pathoanatomy on his hip specimens. He demonstrates the brace application and promotes nurses going to homes on bicycles for early diagnosis and treatment of this condition.

In summary, Dr Ortolani developed his test in 1935. He studied the pathoanatomy of hip instability in the 1940s. He wrote his textbook in 1948, and in 1952 produced the movie about the examination and treatment of hip



**FIGURE 12.** Two infants with the abduction pillows at their home. Photographs from Marino Ortolani movie of 1952.



**FIGURE 13.** Abduction orthosis of Ortolani for infants greater than 10 months, the hips are reduced, abducted, and internally rotated. From his movie of 1952.



**FIGURE 14.** Ortolani (see arrow) attending a conference in Michigan with Drs Salter, Ponseti, Stanisavljevi, and other prominent pediatric orthopedic hip experts, including Dr Robert Hensinger who provided this photograph.

dysplasia which was translated into many languages to promote early diagnosis and treatment of DDH. In his career, he wrote a monograph and 31 articles on the subject of hip dysplasia. He would participate in courses throughout the world with some of the leading orthopaedic surgeons on the subject including Drs Robert Salter, Ignacio Ponseti, and S. Stanisavljevic<sup>28-34</sup> (Fig. 14). He died in 1983.

Ortolani's contributions were best summarized by Dr Ignacio Ponseti (2001) in a letter to the author:

*This man, Marino Ortolani, was really one of the first to understand the pathology of DDH. He was a pioneer in not only the diagnosis but also the treatment by maintaining the hip in abduction with a pillow similar to the Frejka or with a harness like Pavlik's. Furthermore, he promoted his test, early diagnosis and treatment to physicians and nurses throughout the world and that has left his namesake attached to this test of early diagnosis of hip instability.*

#### ACKNOWLEDGMENTS

*The author thanks his colleagues who contributed with their insight and photos: Kaus Parsch, Germany; Remi Kohler, France; and George Thompson, and Robert Hensinger, USA and for the wonderful assistance of Marco (his son) and Luca Ortolani (his grandson).*

#### REFERENCES

- Roser W. *Éléments de Pathologie Chirurgicale Spéciale et de Médecine Opératoire*. Paris: Librairie Chamerot & Lauwereyns; 1870.
- Calot F. *Technique du Traitement de la Luxation Congénitale de la Hanche*. Paris: Massion & Cie; 1905.
- Calot F. *L'orthopédie indispensable aux praticiens*. Paris: Masson; 1926.
- Le Damany P. *La Luxation Congénitale de la Hanche: Études d'Anatomie Comparée, d'Anthropologie Normale et Pathologique, Déductions Thérapeutiques*. Paris: Alcan; 1912.
- Dickson JW. Pierre Le Damany on congenital dysplasia of the hip. *Proc R Soc Med*. 1969;62:575-577.
- Barlow TG. Early diagnosis and treatment of congenital dislocation of the hip. *Proc R Soc Med*. 1963;56:804-806.
- Froelich R. *Études de Chirurgie infantile [Studies of Pediatric Surgery]*. Paris Maloine. 1926.
- Putti V. *Anatomia della lussazione congenital dell'anca*. Bologna: Capelli; 1935.
- Ortolani M. A very little known sign and its importance in the early diagnosis of congenital hip predislocation. *Atti Accademia Medica Ferrara*. 1936.
- Ortolani M. Un segno poco noto e sua importanza per la diagnosi precoce di prelussazione congenita dell'anca [A little known sign and its importance for the diagnosis early subluxation in congenital hip]. *La Pediatr*. 1937;129.
- Ortolani M. Il problema della lussazione congenital dell'anca quale si prospetta oggi ad un pediatra [The problem of congenital dislocation of the hip today for the pediatrician]. *Organo della Società Medica Chirurgica di Bologna*. 1938;16:1-4.
- Ortolani M. La diagnosi precocissima della lussazione congenital dell'anca [The early diagnosis of congenital dislocation of hip]. *Organo Della Società Medica Chirurgica di Bologna*. 1943;4:3-13.
- Ortolani M. *La diagnosi precocissima della lussazione congenital dell'anca [The early diagnosis of congenital dislocation of hip]*. Ferrara: Istituto Provinciale Per L'Infanzia; 1945.
- XXXI Congresso della Società Italiana di Ortopedia e Traumatologia. Il problema dell'anca che tende congenitamente a lussare (così detta lussazione congenita dell'anca) quale appare oggi al pediatra October 12-14, 1946 [The hip problem that tends to congenitally dislocate (so-called congenital dislocation of the hip) as it appears today for the pediatrician]. Bologna: Tipografica Mareggiani. 1947:1-3.
- Ortolani M. La Bretella quale mezzo profilattico terapeutico dell'anca che tende congenitamente a lussare. [The braces as a means of prophylactic therapy for hips that tend to congenitally dislocate] *Minerva Med*. 1947;38:1-8.
- Ortolani M. *La lussazione congenital dell'anca. Nuovi criteri diagnostici e profilattico-correctivi [Congenital dislocation of the hip. New policies for diagnosis and prevention]*. Bologna. 1948;127.
- Ortolani M. Clinical diagnosis made by examination of the rebound phenomenon is the only method permitting truly early & total treatment of congenital hip dislocation. *Bull Acad Natl Med*. 1957;141:188-193.

18. Ortolani M. *Diagnosi, profilassi e trattamento della lussazione congenital dell'anca fin dalla nascita [Diagnosis, prophylaxis and treatment of congenital dislocation of the hip in infants]*. Ferrara: Istituto Provinciale Per L'Infanzia Di Ferrara; 1957.
19. Ortolani M. Symptoms and development of dislocation abnormality of the hip. *Rev Chir Orthop Reparatrice Appar Mot*. 1958;44:75–83.
20. Ortolani M. Signes et évolution de la malformation luxante de la hanche [Signs and evolution of hip dislocation malformation]. *Rev Chir Orthop*. 1958;44:75–83.
21. Ortolani M. L'anatomia della dysplasia congenital dell'anca nell feto nell premature e nell neonato [The anatomy of congenital dysplasia of the hip in the premature fetus and in the newborn]. *Soc Int Chir Orthop Traumatol*. 1960;108–134.
22. Ortolani M. Les Nouveaux Problemes de la Luxation Congenitate de la Hanche [The New Problems of Congenital Dislocation of the hip]. *Extrait de La Revue de Medecine*. 1963;10:1–17.
23. Ortolani M. Congenital hip dysplasia in the light of early and very early diagnosis. *Clin Orthop Relat Res*. 1976;119:6–10.
24. Ortolani M, Galante A. Nuovi criteri diagnostici e profilattico—terapeutici della prelussazione congenital dell'anca [New diagnostic criteria and prophylactic treatment of congenital hip subluxation]: Istituto Provinciale Per L'Infanzia Di Ferrara. 1938;16:3-12.
25. Peltier L. *Orthopedics: A History and Iconography*. San Francisco: Norman Publishing; 1993.
26. Rang M. *The Story of Orthopedics*. Philadelphia: Saunders; 2000.
27. Mubarak SJ, Bialik V. Pavlik: the man and his method. *J Pediatr Orthop*. 2003;23:342–346.
28. Kohler R. Charles-Gabriel Pravaz (1791-1853) Créateur de l'orthopédie médicale et précurseur du traitement de la luxation congénitale de hanche [The medical and orthopedic causes of congenital hip dislocation]. *La Gazette N13*. 2004;13:5–7.
29. Kohler R. Les enjeux du dépistage de la luxation congénitale de la hanche [The challenges of screening for congenital dislocation of the hip]. *Arch Pediatr*. 2011;18:935–938.
30. Kohler R. *Histoire du Traitement de la Luxation Congenitale de Hanche [History of the Treatment of Congenital Dislocation Hip]*. Cahiers du Cercle Nicolas Andry N5. Montpellier: Sauramps Medical; 2011:11–28.
31. Kohler R. Screening for developmental dysplasia of the hip: a challenge. *Arch Pediatr*. 2011;18:935–938.
32. Scapinelli RaK R. Le harnais dit de Pavlik ou plutôt de Bauer-Ortolani-Pavlik. [Pavlik's harness or rather Bauer-Ortolani-Pavlik] *La lettre du GEOP*. 1996;2–4.
33. Stanisavljevic S. Tribute to Marino Ortolani. *Clin Orthop Relat Res*. 1976;119:4–5.
34. Vigliani F. Inaugural lecture at the international symposium on “Congenital Hip Dislocation: Today” in memory of Marino Ortolani. Montegrotto Terme (Padua): 23-25 October, 1988. *Arch Putti Chir Organi Mov*. 1989;37:77–81.