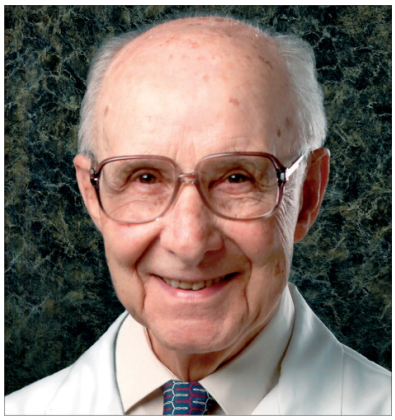


Ignacio Vives PONSETI (1914, Menorca, Spain – 2009, Iowa City, Iowa, USA)

EPOS Pro Maximis Meritis 2007

Ignasi Ponseti Vives (thereafter Ignacio V Ponseti) was born in 1914 on Menorca, the easternmost Balearic Island off the east cost of Spain. He graduated from Barcelona medical school on 17th July 1936, one day before the outbreak of the Spanish civil war. Within days he was serving as a front-line physician, treating hundreds of orthopaedic war wounds according to the principles of Trueta and Böhler: thorough wound irrigation and debridement, immobilization, and avoidance of primary skin closure or internal implants. Most wounds healed without gangrene or osteomyelitis.

In 1939 Ponseti left Spain for France where he worked in refugees' camps. The Nazis used to cut the Achillis tendons of prisoners making escape impossible. Ponseti observed a frequent prompt and spontaneous recovery. Then, he moved to Mexico, where he worked mainly as a general practitioner. In 1941 he went to the United States and joined the Department of Orthopedics at the University of Iowa, led by Arthur Steindler. Although his original diploma had been destroyed in the war, he began an orthopaedic residency that was regularized in 1946; he became a U.S. citizen in 1948. As he was not allowed to practice surgery, Ponseti founded in the 50s one of the first U.S. laboratories devoted to connective-tissue pathology and biochemistry to investigate the causes of so-called "idiopathic" paediatric orthopaedic conditions. At Steindler's request, Ponseti reviewed outcomes of clubfoot surgery and was dismayed by frequent pain, dysfunction, and arthritis in adulthood. This motivated him to develop a nonoperative treatment protocol for clubfoot. He waited for long-term follow-up before publishing the Ponseti method in 1963 [1].

In 1961 he married Helena Percas, a native of Valencia and a full professor of Spanish and modern languages.

A second career: After mandatory retirement in 1984, Ponseti, 70 years old, continued research—cataloguing histological specimens of clubfeet brought by Ernesto Ipolitto. In the early 1990s Dr. Stuart Weinstein invited him back to demonstrate proper clubfoot management; thereafter he travelled worldwide teaching the method, which gained universal acceptance. The list of the international centers Ponseti visited is impressive [Helena Percas-Ponseti. Homage to Iowa: The inside Story of Ignacio V. Ponseti. The University of Iowa, 2007, 91 pp.]. He suffered a stroke in his outpatient clinic and died in October 2009.

EPOS recognition

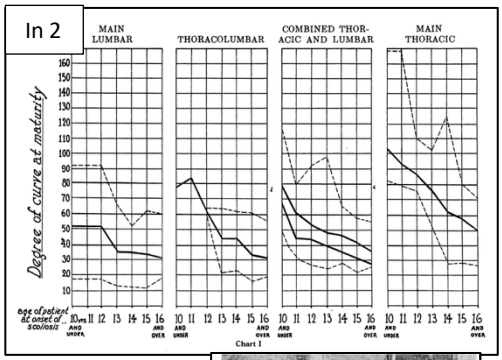
Ponseti visited many European centers and trained numerous EPOS members; Ernesto Ippolito (EPOS President 2007–2008) was his fellow for two years and later coauthored many papers. In 2007, during the 26th EPOS annual meeting in Sorrento (local host: Nando de Sanctis), Ponseti received the EPOS Pro Maximis Meritis award from President Shlomo Wientroub to recognize relevant contribution to Pediatric Orthopedics surgery.

Contribution to Paediatric Orthopaedics

Of more than hundred publications, roughly one third addressed pathogenesis, histochemistry, histomorphology, and ultrastructure of cartilage, growth plate, and soft tissues in pediatric conditions such as idiopathic scoliosis and juvenile kyphosis, DDH and acetabulum dysplasia, clubfoot and metatarsus varus, SCFE, Legg-Calvé-Perthes disease, congenital pseudarthrosis of long bones, torticollis, and multiple skeletal dysplasia like achondroplasia, metaphyseal dysostosis, Morquio's disease, spondyloepiphyseal dysplasia congenita, pseudo achondroplasia, multiple epiphyseal dysplasia, Ehler Danlos syndrome. Ponseti's curiosity led him to study the basic data of many diseases.

In 1950 Ponseti published an important paper on the prognosis of idiopathic scoliosis, reporting the natural progression of untreated curves in 444 patients. He described five curve patterns—lumbar, thoracolumbar, combined thoracic and lumbar, thoracic, and cervicothoracic—and noted a characteristic growth behaviour: "*when the scoliosis started when the children were under 10 years of age, it often did not increase much and then increased suddenly"*. By tracking curve progression during skeletal growth, he observed that progression tended to stop about one year before ossification of the iliac crest. He wrote: "*it would be desirable to evaluate of the patients and to correlate it with the growth of the scoliosis".* At skeletal maturity, curves that began at an earlier age had a worse prognosis than those that appeared later, as illustrated in his published graph: The degree of curve at maturity depend on the age of scoliosis diagnosis [2].

In 2



Between 1952 and 1965 Ponseti published over twenty papers on lathyrism, a neurotoxic disease caused by ingestion of aminonitrile-containing peas. These toxins produce severe nervous-system degeneration in humans and a broad spectrum of skeletal lesions in growing experimental animals fed the contaminated peas. Observed changes included growth-plate abnormalities that predisposed to slipped capital femoral epiphysis (SCFE) and kyphoscoliosis, and even vascular lesions such as dissecting aneurysms. Ponseti proposed that aminonitriles exert a deleterious effect on structural proteins in soft tissues—particularly ligaments—and on cartilage within the growth plates [3]. This

In 3

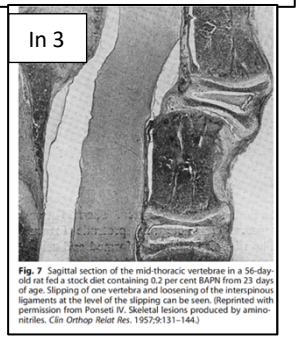


Fig. 7 Sagittal section of the mid-thoracic vertebrae in a 56-day-old rat fed a stock diet containing 0.2 per cent BAPN from 23 days of age. Slipping of one vertebra and loosening of the interspinous ligaments at the level of the slipping can be seen. (Reprinted with permission from Ponseti IV. Skeletal lesions produced by aminonitriles. *Clin Orthop Relat Res*. 1957;9:131–144.)

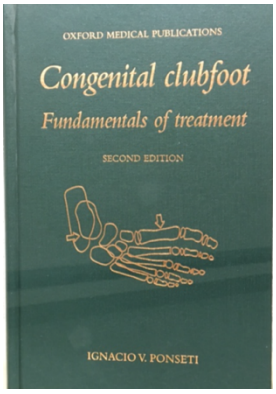
body of work exemplified his sustained effort to identify underlying aetiologies of diverse growth disorders.

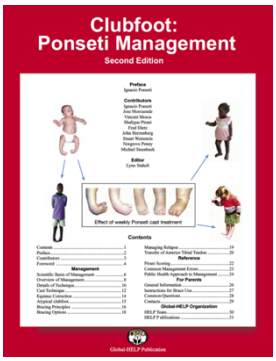
SCFE - In 1956, Ponseti studied biopsies specimen from the femoral neck and head of three patients with early SCFE. The loss of cohesion of the cartilage matrix was presumably caused by metabolic abnormalities like the one found in adolescent scoliosis. The epiphyseal-plate lesions were similar to the lesions observed in experimental animals fed with peas containing aminonitriles [4].

DDH - In infants with a unilateral DDH who died soon after birth, Ponseti showed that the hip socket was divided in two parts separated by a cartilage ridge. This ridge was formed by a bulge either of pure cartilage, or by cartilage covered with the inverted labrum. The true Ortolani sign is due to a jolt over the acetabular ridge, which completely differs from common "clicks" which are not a diagnosis of hip dysplasia. Ponseti observed also signs of degeneration of the acetabular cartilage. And, in 59 hips with DDH reduced after the child was two years old, he demonstrated scattered ossification centres seen on the X-rays in 50% [5].

Spine - In biopsy specimen of juvenile kyphosis, Ippolito and Ponseti found many abnormalities in comparison with normal vertebrae. Histological and histochemical studies of the growth plate and the vertebral cartilage showed either a loose-appearing cartilage or a complete loss of cartilage. In the areas of abnormal cartilage, the chondrocytes have an irregular shape, and they present large cisternae filled with proteoglycans. The matrix contains debris of necrotic chondrocytes and too thin collagen fibrils. The poor quality of the fibrils suggests a less resistance than normal to the mechanical stress bearing on the vertebral plate [6].

Clubfoot – Ponseti is definitively the Master of the "functional treatment" of the clubfoot. Between 1946 and 1956, 94 severe clubfeet treated with the well-known technique (serial casts, subcutaneous tendo Achillis tenotomy when necessary, and Denis Browne splints) were evaluated with a follow-up of 5 to 13 years. Fifty-three feet needed further treatment, mainly conservative, 7 tendo Achillis lengthening, 39 tibialis anterior tendon transfers. The results were good in 71%, only one foot had a poor result [1]. At that time, many surgeons refused this concept of treatment, probably because they considered the cumbersome nature of the treatment, the great number of second surgical procedures, 29% of fair or poor results, and especially because surgeons love surgical procedures. But Ponseti was sure he was right. His wife Helena wrote: "*Ignacio's success as a surgeon throughout his career, and as a magician redressing clubfeet to perfection, is due to his immense respect for nature, and his great love of art*".





In 1972, Ponseti described his observations on pathogenesis and treatment of congenital clubfoot. The first words of the paper are: "*In the treatment of clubfoot, as in many other orthopedic disorders, the orthopedic surgeon is handicapped because of his ignorance of the primary causes of the deformity"* [7].

These words reflect Ponseti's philosophy who always wanted to know why before doing what. A tireless worker, he travelled the world and visited numerous centres until the end of his life. Today, the paediatric orthopaedic community is grateful to him for his considerable contribution to the treatment of severe clubfoot.

Hobbies: Ignacio Ponseti was a great humanist. He was an expert in art, particularly Roman art and classical music. Whenever he visited a city anywhere in the world, he would always go to see an opera.

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Helena and Ignacio Ponseti
90th Ignacio's birthday, 2004
University of Iowa

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Pierre Lascombes, EPOS Historian