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EDITORIAL

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# The *Journal of Orthopaedics and Traumatology* welcomes pediatric orthopaedics

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With this issue, the *Journal of Orthopaedics and Traumatology* initiates a new section of pediatric orthopaedics, in collaboration with the Italian Association of Pediatric Orthopaedics and Traumatology (SITOP). The journal welcomes this speciality, which played a key role in the birth of the field of orthopaedics when it merged off from general surgery. In fact, as indicated by the etymology of the word (from the Greek *orthos pais*, meaning "straight child") and from the first definition by Andry in the eighteenth century, orthopaedics is an autonomous science and a specific branch of surgery focused on childhood deformities and, more generally, pathologies of locomotion in children. Despite numerous attempts to change this definition, it has remained in use until today.

The evolution of orthopaedics over time has led to the development of orthopaedic sciences, which regard all pathologies of the locomotor apparatus, in both children and adults. Improved knowledge of biology, anatomy, pathology and genetics, and advances in diagnostic and therapeutic technologies have led to the development of the specific field of pediatric orthopaedics; although this specialty seems to be a new branch of orthopaedics, it actually represents a return to origins. In my opinion, it is important not to separate the pediatric world from that of the adult. In the same manner, we must prevent that the actual fragmentation of orthopaedics into multiple subspecialities distances us from basic orthopaedic sciences which instead must continue to be the "connective tissue", the cohesive element, of our entire field. This will help avoid that a science might be transformed into a technology, far from the spirit and culture of medicine.

Pediatric orthopaedics has, more than other sectors of orthopaedics, ancient roots bound to the same origins as general orthopaedics and passed down by the great masters of the past, with a strength such to be considered "dogma", difficult even to discuss. As examples, let us consider some major pediatric pathologies.

## Congenital dislocation of the hip

The etiopathogenetic hypotheses, the epidemiology and especially the therapy for congenital hip dislocation were, for many decades, influenced by the ideas of great orthopaedists like Putti, Merle d'Aubignè, Paci and Lorenz, to cite just a few, and even Le Damany, who proposed an etiological theory that congenital hip dislocation was characteristic of the Arian race which was more evolved than others, especially regarding the passage from the quadruped to the biped position. Only in the 1960s was congenital hip dislocation redefined and called *dysplasia,* with subclassification into simple dysplasia (or "dislocatable hip") and hip luxation (present at birth or as sequel to dysplasia), and with a precise interpretation of its etiopathogenesis and geographic distribution. As a result, it was possible to recognize the poor results of closed reductive treatment as proposed by Paci and Lorenz (1901), invalidated by the high rate of post-reduction osteochondrosis, particularly due to the "first position" of the treatment. This particular step caused a vascular crisis in the hip that, together with the poor distribution of loads resulting from the residual articular incongruence, led to osteochondronecrosis [1].

In past decades, the Paci-Lorenz treament was applied even to established congenital dislocation and subluxation, in children older than 5 years in whom normal anatomy could no longer be restored. In fact, in the 1950s and 1960s, treatments for congenital hip dislocation, both open and closed, simply aimed to reduce the dislocation at any cost without correcting the geometric parameters of the hip in order to reestablish the natural articular congruence. As a result, in children older than 5 years of age treated with surgical reduction, the failure rate was 50%–80%, mostly due to post-reduction osteochondrosis. This was the justification to use closed reduction, which had essentially the same failure rate (50% in 2362 cases treated between 1948 and 1958 [2]).

The Paci-Lorenz treatment was definitively abandoned in the 1960s and 1970s following not only an evaluation of the outcomes but also a greater understanding of the vascular crisis that the treatment induced in the hip. In fact, the hip's circulation is in hemodynamic equilibrium with the iliofemoral system (femoral and cephalic vessels) and the hypogastric system (iliolumbar, iliac, obturator and superior and inferior gluteal vessels). In congenital hip dislocation, this equilibrium is already precarious, but the first position of Paci-Lorenz blocked the return circulation, especially in the iliofemoral district, and caused a vascular crisis of the femoral meta-epiphysis, a major contributing factor for osteochondrosis of the hip [3]. Contemporaneously, closed reduction consisting of continuous traction followed by immobilization directly in the second position was considered more valid and praticable, especially due to improvements in anesthesia.

A major change in therapy for congenital hip dislocation was provided by femoral and para-acetabular osteotomy. This treatment has, as its first objective, the recovery of femoral and acetabular angles and the reestablishment of articular congruence and stress distribution in the hip. Sommerville, Salter, Chiari, Scaglietti, Helbing, Pawels, De Marchi, Dunlop, Fairbank and Virenque are some of the great masters of orthopaedics who developed, in the 1960s and 1970s, the technique of osteotomy, contributing not only to progress in treatment but also to the understanding of the etiopathogenesis and evolution of hip dislocation. Intertrochanteric femoral osteotomy was shown to have a positive effect on the hemodynamic equilibrium of the hip and on the pathologies of the growth cartilage and of the epiphyseal nucleus, typical of the dysplasia [4].

In 1978, a paper in *Acta Orthopaedica Belgica* stated "*aujourd'hui les osteotomies de centrage femorale e de bassin sont les interventions les plus importantes dans la luxation congenitale de la hance*". Even though this affirmation is still valid, it is important to emphasize that the real change in hip dysplasia therapy is tied to its *early diagnosis*. In fact, it was the early diagnosis, first by clinical means (Ortolani's sign) and then radiographically (at 4 months of age in at-risk infants) and, finally, ultrasonographically (in the first days of life), that permitted a new definition and classification of dysplasia and congenital dislocation and that radically modified the therapy, prognosis and outcome. In my opinion, and without exaggerating, this can truly be considered a great public healthcare advance.

Finally, it is worth remembering a series of interventions in adolescents and adults that were the precursors to modern surgery for coxarthorsis, in particular hip arthrodesis, femoral osteotomy, pelvic osteotomy (Chiari), and capsuloplastic reduction (Colonna). I used the latter procedures in the 1980s to treat established hip dislocation, especially monolateral cases [5].

## Congenital clubfoot

Congenital clubfoot is another classic argument that shaped pediatric orthopaedics for more than a century. Although this congenital deformity, second in incidence only to hip dysplasia, has been known since ancient times, its etiopathogenesis and an effective treatment have been difficult to define. The most important advances in understanding clubfoot have been: (1) classification of the deformed foot into inverted (equinus,

varus and supinated) and everted (Talus-valgus and pronated) forms, and (2) etiological distinction into a genetic form and a developmental one, regarding a delay in foot positioning during intrauterine growth. This distinction is in agreement with the previous recognition of distinct embryonal and fetal etiologies of clubfoot. In fact, the genetic, embryonal etiology is different from the fetal etiology, which is caused by an alteration in development and in the relative intrauterine position of the foot, which passes from inversion in the embryonal period to eversion during the fetal period and which normalizes during the last intrauterine months. This explains the high rate of heel valgus in premature neonates. This deformity must nonetheless be distinguished from congenital clubfoot (usually in inversion) and from the teratological deformity of the everted foot (e.g. vertical talus in which the talus appears to be a "bone of the leg and not of the foot", according to an old definition).

Knowledge of the pathogenesis of everted clubfoot led, in the 1950s and 1960s, to a radical change in therapy. Rather than being treated as a malformation, with manual correction in casts, it was considered as a delay in development, i.e. that the normal foot position would develop even during extrauterine life, but more slowly, and could be therapeutically assisted with manipulation.

Closed treatment of the true, genetic clubfoot in inversion was, instead, carried out for many decades with a series of casts until, in the 1970s, the casts were abandoned in favor of a dynamic correction with elastic bandages, together with manipulations, without substantially interfering with the growth and development of the foot and leg, as did the casts.

Codivilla's operation, proposed in 1905, has been considered the basis of the surgical approaches to inverted clubfoot and, together with several modifications (like that proposed a few decades later by Moro), represented the first-line corrective treatment. Delitala, 60 years later, wrote "*L'operazione di Codivilla è una delle basi dell'ortopedia. E' inutile modificarla … è nata perfetta*". The most important advance in surgical therapy for clubfoot was the application of Codivilla's operation to infants in their first months of life instead of waiting several years, as Codivilla himself suggested. Finally, another important advance was the association of Codivilla's operation with derotatory osteotomy of the tibia, proposed in recognition of the role of the leg in the rotatory deformity of the foot.

## Obstetric palsy

This infantile paralysis has been recognized since Scaglietti distinguished it from obstetric trauma and classified it into three forms: upper, total, and lower. The work of Scaglietti stimulated the development of microsurgery which had a major role in the treatment of obstetric palsy as did neuromuscular facilitation techniques, in particular that proposed by Vojta, which established the closed treatment with satisfying results. The concept that re-educational treatment should prevent and cure deformities consequential to paralysis and not the palsy was fundamental [6].

Infantile cerebral palsy represents even today a major chapter of pediatric orthopaedics, even though the incidence of this pathology has diminished as a result of improvements in maternal and neonatal care. Interdisciplinary research involving pediatric neuropsychiatry and orthopaedics was fundamental not only to the development of a classification and of nonsurgical re-educational treatments but also for the establishment of surgical therapies within the global care strategy that this pathology requires. In particular, therapy must address and integrate neuromuscular training, re-education (logotherapy, occupational therapy), pharmacological and surgical interventions, and social and psychological issues. Not addressing these needs was the cause of serious damage to patients as well as interdisciplinary incomprehension [7].

## Epiphysiolysis

Among the many pediatric orthopaedic pathologies, such as Perthes' disease, perinatal and post-traumatic deformities and acute anterior poliomyelitis, which were major burdens for orthopaedists in the last century and remain unfortunately today serious diseases in some countries, I wish to single out epiphysiolyis of the hip subsequent to growth cartilage pathology, which is distinct from traumatic epiphyseal detachment because it occurs at the growth plate (a critical biomechanical zone), such to be used by Ilizarov for bone lengthening. Epiphysiolysis develops in the prepubertal age and can lead to limb shortening and to meta-epiphyseal morphology. This has been the subject of many histological and ultrastructural studies. Recently, Guzzanti et al. [8] introduced an innovative osteosynthesis technique that provides both stability and the possibility of growth.

## The evolution of pediatric orthopaedics

According to Guzzanti, "pediatric orthopaedics has recognized the technological, radiological and surgical evolution that has affected all of orthopaedics. In traumatology, the use of ultrasonography, arthroscopy and bone synthe-

sis is widespread. Ultrasonography has radically modified the approach to congenital hip dysplasia and is today being widely applied in the diagnosis of ligamentous lesions. The applications of arthroscopy in knee surgery, even in children, have been widened from arthroscopic synovectomy to anterior cruciate ligament reconstruction, even in growing subjects".

"In traumatology, there has been a greater use of synthesis in place of the traditional closed reduction or the use of casts, with the aim of giving, even to children, the possibility of an earlier return into activities of daily living. In the field of research, pediatric orthopaedics is quite interested in the possible applications of stem cells and genetic engineering to treat joint cartilage pathologies."

Aware of the need to unite past achievements with new prospects that require substantial cultural and practical experience, the editorial committee of the Italian Association of Orthopaedics and Traumatology (SIOT) has chosen to appoint Prof. Vincenzo Guzzanti as editor of the new pediatric orthopaedics section in the *Journal of Orthopaedics and Traumatology;* this decision is widely shared by the Editor and editorial committee of this journal.

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