Pediatric Limb Discrepancies and Deformities: new techniques for complex orthopedic surgery

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The treatment of pediatric limb discrepancies and deformities continues to evolve with fast and significant advancements in evaluation, imaging, and surgical management.

Pediatric orthopedics increasingly focuses on prevention, as most pediatric musculoskeletal disorders result from late management or inadequate treatment of birth defects and developmental problems.

The Pediatrics Masterclass, organized by Orthofix at the Orthofix Education Center in Verona, attracted attendees from all over the world, and provided a unique occasion to refresh individual knowledge, to learn from each other's experiences, to discuss challenging cases, to debate with peers, and practice new surgical methods and devices.

Limb Length Discrepancies (LLD), Clubfoot and Combined Use of Internal and External Fixation were the main topics of the seminar.

Christopher Iobst, from the Center for Limb Lengthening and Reconstruction at the Nationwide Children's Hospital in Columbus, Ohio, US, stated that "*the treatment decision for a child with LLD is based not only on the extent of the disparity at the time of diagnosis, but also on predicted increases in discrepancies over time. We must be aware of the patient's history and overall status.*" He added: "***Surgery is not only a science, but also an art.*** *We must know the developmental biology of a normal bone and cartilage, including histogenesis; then we should master biomechanical aspects and surgical techniques. Furthermore, we have to understand the patient and family's needs. Their preferences must be always seriously considered during the whole therapy planning and implementation.*"

Mikhail Samchukov comes from the Center for Excellence in Limb Lengthening and Reconstruction at the Texas Scottish

Rite Hospital for Children in Dallas, Texas, a world-renowned institution for its elevated standards of research. He said: "***Each child deserves an individual, tailor-made medical approach.*** *For us, as pediatric orthopedic surgeons, the parents' and child's compliance is fundamental during the entire treatment, which may last a long time. We are continuously working to provide innovative tools and devices to help surgeons to improve patients' lives. For example, 3D imaging and HEX-ray software, for precise pre-, intra-, and post-op planning.*"

Alexander Cherkashin is also from the Center for Excellence in Limb Lengthening and Reconstruction at the Texas Scottish Rite Hospital for Children. In the dry lab he showed how to perform a correction, managing a distal tibial deformity and lengthening: "***Tibial deformities are common in pediatric orthopedic practice****, and correcting multi-planar tibial deformities associated with limb length discrepancy may be challenging. The TL-HEX hardware and software can be a valid solution in these cases. Based on Ilizarov principles, it allows multiplanar adjustments to perform bone segment repositioning in a three-dimensional space.*"

Pierre Journeau is a university professor, head of the Department of Chirurgie Infantile Orthopédique at the Centre Hospitalier Universitaire de Nancy, France. He affirmed the value of a **combined technique** for limb length disorders and deformity correction: "*After many years of experience and*

*positive outcomes, I consider f**lexible intramedullary nails** a valid approach for treating limb length deformities when combined with circular external fixation."* He concluded: *"I consider it highly educational to present many different and valid surgical options and procedures to manage pediatric limb deformities".*

Ivan Astori, an expert pediatric orthopedic surgeon specialized in the lower limb from the Queensland Children's Hospital in Brisbane, Australia, explained **when and why to perform a fixator-assisted plating**, and spoke at greater length about epiphysiodesis: *"This procedure, performed on the longer limb, slows down growth by blocking the growth plate, allowing the affected limb to catch up. But timing of epiphyodesis is critical, and proper timing of the treatment is fundamental for best outcome."*

The course gave the attendees the opportunity to evaluate and put into practice different surgical techniques. External fixation seems to be a versatile solution to manage LLD, deformities, and recurrent clubfoot. Advanced techniques for specific diseases can also be treated with a combination of internal and external fixation devices.
An external frame is generally less invasive and is indicated in the presence of infection and osteomyelitis. An external frame also offers the possibility of allowing early mobilization and easy removal.

Faculty members succeeded in providing their colleagues with an **innovative and comprehensive overview of the newest research outcomes in pediatric orthopedics**, together with the best practices for detecting and managing different severe pediatric orthopedic conditions.