

## **PARTICIPANT REPORT FROM THE BAT EDUCATIONAL PROGRAMME IN PAEDIATRIC ORTHOPAEDICS**

*By Michal Burian, MD, Czech Republic*



The first EFORT EPOS BAT Educational Programme in paediatric orthopaedics took place from 18-20 May 2011, in Vienna. This training programme was held under the auspices of the Chairman of the EPOS Educational Committee, Bjarne Møller-Madsen, Local Chairman Franz Grill and EFORT Secretary General Manuel Cassiano-Neves. BAT stands for Basic, Advanced and Traumatology courses focused on childrens orthopaedics, and is aimed specifically at general orthopaedic surgeons.

This first course, Basic 1, took place at the Speising orthopaedic clinic in Vienna, at the heart of Europe. It is one of the top orthopaedic clinics in Europe. This BAT programme was fully subscribed, attended by a total of 116 clinical orthopaedic surgeons from 40 countries. Fifteen surgeons were supported by the EPOS foundation and fifteen by the EFORT Foundation. Smith&Nephew was the meeting's major sponsor.

Basic 1 focused on the topics of growth, biology and milestones, foot disorders, hip disorders, leg length discrepancy, genu varum and valgum, and torsional deformities. Each section lasted around two hours, followed by 30 minutes

of discussion. Each day was rounded off by a rotating programme of workshops, cases by participants and lecturers, and research into children's orthopaedics. Everyone had the opportunity to apply TSF to a shin bone model, and to try the HEXAPOD system at the Taylor Spatial Frame workshop led by Clifton Phiri (Smith&Nephew) from Switzerland. The cases presented by participants focused mainly on the topic of foot and hip disorders. A practical insight into research into orthopaedics was offered by Andreas Roposch (UK).

Every topic was broadly discussed. This report cannot cover all of the information presented during the course, but participants have access to all presentations in the password-protected area of the website.



Bjarne Møller-Madsen (Denmark) introduced the first BAT Educational Programme at the beginning of the course. He was followed by Darco Anticevic (Croatia), who talked about the developments and particular characteristics which distinguish adult and paediatric orthopaedics. He drew attention to the ossific centres of bones, and gave advice on the ossification of the elbow, using CRITOE. Martin Gottliebsen (Denmark) focused on the growth plate, which was described in detail. The Hueter-Volkmann law – an orthopaedic rule regarding bone growth which states that "compression forces inhibit growth and tensile forces stimulate growth" – was reiterated. Manuel

Cassiano-Neves (Portugal) familiarized us with development milestones, and delayed development, divided into 4 stages – qualitative abnormality, disordered developmental sequence, severely delayed rate of development, and regression of development. There was a lively discussion of motor development and common variations in achieving locomotion. The first section was concluded by Walter Michael Strobl (Austria) with a detailed, head-to-toe demonstration of a clinical orthopaedic examination.



The mid-morning section was devoted to foot disorders. It was moderated by Franz Grill (Austria). The normal growth and evaluation of the foot was presented by Manuel Cassiano-Neves (Portugal). Postural variations of the foot by age were pointed out. Physiological angles (e.g. the T-C angle AP, T-C angle lateral, talus horizontal angle) were highlighted. After the theoretical part, Darco Anticevic (Croatia) spoke about resistance to primary correction being a signal to review the diagnosis and search for neurological components in the calcaneovalgus foot. Pes metatarsus adductus is classified according to Bleck, and treatment is rarely needed (1 out of 10 cases), while 86% of cases resolve themselves spontaneously before the age of four. Serial casting is needed only in severe cases. Indications for surgery include older patients with symptoms – soft tissue surgery (abductor pollicis muscle is released) or double osteotomy of

the mid foot (open wedge medial cuneiform + closing wedge cuboid).

The classification and Ponseti treatment of club foot was presented by Gaetano Pagnotta (Italy). Two main classifications are used according to Pirani and Dimeglio. The Ponseti method is a very effective and relatively inexpensive treatment, with good long-term results (95%+). The goal is to reduce, if not eliminate, all elements of the club foot deformity to obtain a functional, flexible, pain free, strong, normal-looking, plantigrade and normally shoeable foot. You can read more at [www.global-help.org](http://www.global-help.org).

Christof Radler (Austria) talked about the early recurrence of club foot caused by non-compliance with bracing protocols, and insufficient initial correction under the age of one. Repeated manipulation and casting with complete pATT is needed. Late recurrence of club foot, which is due to limited compliance with brace wear, a weak peroneal muscle and strong m.tibialis anterior, is treated by tibial anterior muscle transfer or by pATT according to White. When recurrence does not respond to Ponseti casting, then open surgery, osteotomies or correction involving external fixation is necessary. Rocker-bottom deformity with fixed equinus in congenital vertical talus is rare, mostly associated with syndromes. Early treatment consists of serial casting as "reversed Ponseti", and a brace must be used until the age of 3-4. Open release with TA lengthening, capsulotomy, medial release with reposition of navicular, reconstruction of capsule and transfixation with K-wires, are all required. The final presentation in the mid-morning section, given by Andrew Wainwright (UK), was devoted to toe deformities. Polydactyly features as post-axial at most (79%). It is classified according to Venn-Watson. Treatment consists of the removal of the most malaligned toe. Other deformities

such syndactyly, ectrodactyly, curly toes, over-riding little toe and hallus varus were discussed.

The afternoon section was dedicated to foot disorders in children aged one to nine. The painful foot, as presented by Gaetano Pagnotta (Italy), is one of the most referred complaints in children. An X-ray should not be performed immediately because light trauma is often not recorded. The broad spectrum of "growing pains" should not be ignored in considering the painful symptoms. Stiff pes planus, as discussed by Bjarne Møller-Madsen (Denmark), is mostly frequently seen in the hind foot. Calcaneo-navicular and talo-calcaneal coalitions (median bar) together account for 90% of all coalitions. The presentation of symptoms in a calcaneo-navicular coalition is earlier (10-12 yrs) than in a median bar (14-16 yrs). The specificity of the anteatler sign in CN coalition is 100%, while the C sign in the TC coalition is around 87%. A drunken waiver sign can be seen. Treatment consists of resecting the bony bridge and filling it with fatty tissue or m. digitorum brevis. Triple arthrodesis is a rare indication for surgery.

The topic of the second day of the BAT Educational Programme in paediatric orthopaedics was hip disorders. The first presentation on anatomy and the normal development of the hip was given by Bjarne Møller-Madsen (Denmark). The normal development of the hip joint demands a delicate, genetically determined balance between the growth of the acetabular and triradiate cartilages, and the centered femoral head. This balance may be affected by the intrauterine environment. A detailed study of growth and development in the acetabulum in the normal child was published by Ignacio V. Ponseti in 1978.



The diagnosis of DDH is primarily done by ultrasound, which is readable in the first 12 months. Where ultrasound in hip screening is concerned, there is poor evidence of diagnostic accuracy and the benefit of the diagnostic test in terms of outcome. X-rays are unreliable before the child reaches the age of four months. New radiographic classifications (IDHD) for subluxation and the dislocation of the hip were pointed out by Andreas Roposch (UK). MRI and CT are not the primary diagnostic methods and are used to confirm concentric reduction for pre-operative planning. The main treatment method in early DDH is the abduction brace (Pavlik, Frejka, Van Rosen, Corretjio). Closed reduction is performed in the operating theatre under general anesthesia, using an arthrogram to screen the hip joint. MRI examination is recommended by Rüdiger Krauspe (Germany) in unstable hips one day after closed reduction to ensure the right concentric position of the hip. An open reduction should not be performed before the fifth month. The anterior approach (Smith-Peterson) takes priority over the medial (Ludloff-Ferguson) approach, because it is a less invasive procedure, gives better access to superior structures, and there is less incidence of AVN (Manuel Cassiano-Neves, Portugal). Plaster spica is applied in the safe zone position for a total of six weeks to three months. Residual DDH is solved mostly by pelvic osteotomies. Salter (innominate), triple or Ganz osteotomy is performed to change the direction of the acetabulum.

Pemberton or Dega osteotomies are recommended to change the shape of acetabulum, known as the wrapping of the femoral head. Roof augmentation is achieved by means of a Staheli shelf or Chiari osteotomy.



The basics of Perthes' disease were presented by Mark Paterson (UK). Two main classifications were given in addition to the etiology, epidemiology and diagnosis. The advantage of the Herring classification is better interobserver reproducibility than with the Catterall classification. Salter-Thompson subchondral fractures were also mentioned as the first sign on an X-ray. Catterall's "head at risk" factors worsen the prognosis of the outcome and are included primarily for surgical treatment. Andrew Wainwright (UK) then highlighted the goals of treatment in Perthes' – relieving symptoms, ROM restoration, femoral head containment, and accelerating the revascularisation of the bone. Age at presentation is one of the main factors affecting outcome, in addition to the degree of containment, the extent of femoral head involvement, and loss of ROM. Herring A has a very good prognosis, as does Herring B before six years of age. Herring B after the age of six and Herring C have a poor prognosis. There are two main types of surgery. The disadvantages of these procedures include shortening of the femur, elevating the trochanter, and varus correction with growth within three years in varus femoral osteotomy. On the other hand,

Salter innominate osteotomy can cause post-op stiffness and lengthening of the leg. Lateral hip abduction forms in noncontainable hips and is solved by salvage procedures, such as valgus extension femoral osteotomy, cheilectomy, shelf procedures or chiari osteotomy. A future treatment may be found in bisphosphonates, which have been studied on small mammals.



The afternoon section looked into SCFE, as presented by Rüdiger Krauspe (Germany). This hip disorder is divided into acute (10%), acute to chronic (15%) and chronic (75%) SCFE. A joint that is incapable of bearing weight, acute pain and clinical findings similar to femoral neck fractures are typical of acute SCFE. There is no history of pain in acute SCFE, but it is present in acute to chronic SCFE. Chronic SCFE with a stable slip presents with symptoms over several weeks and months, groin and knee pain, ROM reduction, shortening of the leg and Drehman's sign. An X-ray (pelvis AP and lateral – Imhauser technique) is the main diagnostic procedure. Treatment is determined by the degree to which the femoral head has slipped. Acute and acute to chronic SCFE are treated by gentle reduction, fixation and joint drainage. There is no clear evidence of the benefits of emergency surgery, but the condition should be treated as soon as possible by an experienced surgical team. Chronic SCFE under 30° is solved by in situ pinning, between 30-50° by in situ fixation. Primary or secondary



osteotomy is recommended if necessary. Chronic SCFE above  $50^\circ$  should be corrected by a Dunn or modified Dunn (Ganz) osteotomy (with dislocation of the hip). Many presentations prove the potential for remodelling, where the head-shaft angle is decreased during the remodelling process.

The last day was dedicated to leg length discrepancies and torsional deformities. Rudolf Ganger (Austria) introduced this section with the etiology, incidence and normal development of the lower limb. Leg length difference (LLD) of up to 2cm can be found in 30% of population and is mostly idiopathic. Pierre Lascombes (France) then presented the Green-Anderson, Moseley and Hécharde-Carlio (which are simpler than Moseley) charts, mostly used for growth prediction. Bone age is determined by the Greulich and Pyle atlas. Ossification in the olecranon, published by Dimeglio in JCO (2008), is also very helpful for predicting growth. It is too late for epiphyseodesis when the elbow is closed (15 years in boys, 13 years in girls). A very important factor in torsional deformities, presented by Rudolf Ganger (Austria), is the age of presentation. Metatarsus adductus in early infancy, medial tibial torsion at toddler age and medial femoral torsion in early childhood are common and generally resolve spontaneously over time. If severe tibial torsion or femoral torsion deformity persists (normal average  $15-20^\circ$ ), a supramalleolar osteotomy or possibly an intertrochanteric femoral osteotomy is performed.

The next section concerned genu varu (bow legs) and genu valgum (knock knees). A standard AP long leg standing radiogram with patella pointing forward must be done for further investigation. Bow legs before 2 years and knock knees presenting before 6 years will resolve spontaneously. If isolated axial deviation ( $10-20^\circ$ ) is present, then surgical

epiphyseodesis by eight plate or Blount staples should be performed 2-3 yrs before growth ends (12 years in girls, 14 years in boys). In the case of severe deformities (over  $20^\circ$ ), a temporary epiphyseodesis is required in younger children, or an osteotomy of subtraction in older children.



The Ilizarov principles were reiterated in the presentation of Pierre Lascombes (France). The five Ilizarov principles are 1. Osteotomy with respect to periosteum and endomedullar vascularisation, 2. Stable and elastic fixation (not rigid), 3. Beginning of lengthening at day 5-6, 4. Optimal rate of lengthening (1mm/day), 5. Early joint motion and weight bearing. A corticotomy should be done using the cold technique with no periosteal alteration. A healing index of 30-35 days/cm is excellent, 35-45 days/cm is satisfactory, more than 50 days/cm is fair. Automatic lengthening ( $0.017 \times 60$ ) and intramedullary nails decrease the healing index. Pierre Lascombes (France) presented his study on 268 femoral and tibial lengthenings, and stated the favourable factors in limb lengthening (lengthening before 9 years in girls and 11 years in boys, combined lengthening and axial deviation correction, early weight bearing, second lengthening should be performed before the puberty and with a four-year gap after the first lengthening), as well as unfavourable factors (lengthening at the beginning of puberty, combined lengthening and foot correction osteotomies, no early weightbearing, a second lengthening

within four years of the first one, lengthening of more than 18% of the initial bone).



Rudolf Ganger (Austria) introduced the Taylor Spatial Frame (HEXAPOD system with 6 telescopic struts). There have already been 662 TSF segments performed at the Speising clinic in Vienna. TSF advantages vs. Ilizarov are in the greater accuracy of correction, better determination of the correction period, better patient compliance, and its greater suitability for axial and rotational deformities. Intramedullary lengthening (e.g. Fitbone) is performed in closed growth plates and uniapical deformities. The lengthening complications are delayed ossification, pseudoarthrosis, fracture after frame removal, axial deviation, pin track infection, loss of ROM, joint dislocation, neurovascular damage, and premature osteoarthritis.

The final presentation, from Pierre Lascombes (France), focused on pre, per and post-op lengthening procedures. A physiotherapist and psychologist should be present as part of preoperative management. On the third day of post-op management, walking with crutches is allowed. Lengthening starts on the fifth day. The patient may be discharged on day seven. Partial weight bearing is allowed from 10% at the beginning, to 90% at the end of the lengthening.

The Basic 1 course fulfilled all my expectations of a knowledge-sharing concept. All topics were debated in detail during the discussions. Surgeons had the opportunity to discuss and share their experiences with the lecturers during the coffee breaks and at lunchtime.

The next step in the BAT core curriculum in paediatric orthopaedics will be the traumatology course, to be held from 12–14 October this year (<http://www.efort.org/ic/epos2011/trauma>).

This meeting will concentrate on fractures of upper and lower extremities in children, diagnosis and fracture treatment. This second course will take place again at the Speising orthopaedic clinic in Vienna. This facility meets all the requirements for such international training programmes. It is in the middle of Europe, has affordable accommodation in the surrounding area, a large auditorium and well-equipped teaching rooms. The Basic 2 course, focused on disorders of the upper limb and knee, musculoskeletal infections and spine, will be held in March 2012 and will conclude the core curriculum in paediatric orthopaedics. For more information please visit: [www.efort.org/ic/epos2012/basic2](http://www.efort.org/ic/epos2012/basic2)



It was a pleasure to sharing this course with all of you and I look forward to seeing you all in October!