

# Division of Pediatric Orthopaedic Surgery

## DIVISION PROFILE

Number of Faculty	8
Number of Fellows	
Clinical Fellows	2
Number of Other Students (full and part-time)	7
Number of Support Personnel	25
Number of Peer Reviewed Publications	17
Patient Encounters	
Outpatient	26,300
Inpatient	918

## FACULTY LISTING

**Alvin H. Crawford, MD, FACS**, Professor of Pediatrics, Division Director

**Donita I. Bylski-Austrow, PhD**, Adjunct Research Assistant Professor-Affiliated, Director, Biomechanics Research

**Twee T. Do, MD**, Assistant Professor, Director, Neuromuscular Services

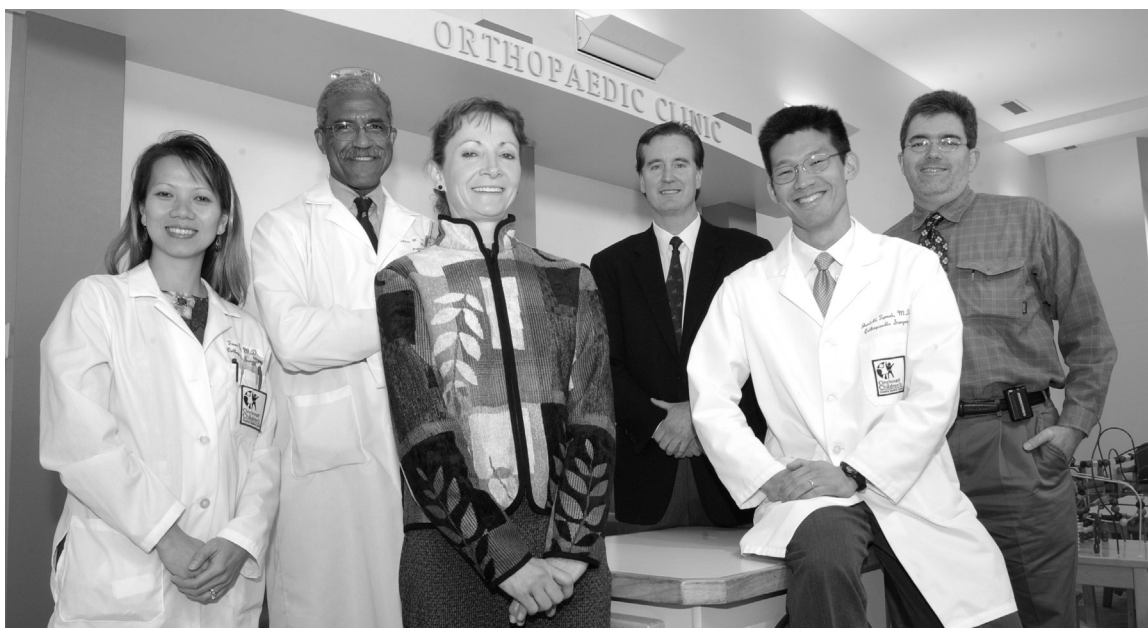
**Charles T. Mehlman, DO, MPH**, Associate Professor, Director, Musculoskeletal Outcomes Research; Co-Director, Limb Reconstruction Center

**Aaron W. Perlman, MD**, Emeritus

**Junichi Tamai, MD**, Assistant Professor

**Diane E. Von Stein, MD**, Assistant Professor, Co-Director, Limb Reconstruction Center

**Eric J. Wall, MD**, Associate Professor, Director, Sports Medicine



*Left to Right: (1<sup>st</sup> row) T. Do, D. Von Stein, J. Tamai, (2<sup>nd</sup> row) A. Crawford, E. Wall, C. Mehlman*

## OVERVIEW

The Division of Orthopaedics' primary focus is the management of congenital and acquired musculoskeletal problems in children. The division's clinical research efforts continue with the goal of improving patient care, while our basic science has continued to expand.

Because a crucial difference between pediatric and adult orthopaedic biomechanics is growth, the mechanobiology of growth is a primary research interest, especially as it impacts the clinical treatment of skeletal deformities. We have designed and fabricated a spinal implant based on the premise that some scoliosis may be surgically arrested or corrected much less invasively than currently, by slowing growth on the convex side of the curve. The second phase of the work was finished with the support of industrial partners Ethicon Endo Surgery and DePuy AcroMed, both divisions of Johnson and Johnson. We have determined that the implant and surgical procedures as they are now defined are capable of consistently altering spine growth. We are also examining spine growth plate tissues from scoliosis patients to define the structure and function of the growth plate in scoliosis, with these tissues; we have determined that growth activity remains in the spine in scoliosis patients with severe deformities, depending on age. We are now planning studies to define the pressure levels that arrest growth. A local company, ePrime, has licensed the staple. We have joined to define and design a staple for patients.

The spine research program in Orthopaedic Surgery has focused on understanding the anatomy, biomechanics and biology of the spine and how this may be used to improve the clinical practice of spine surgery. Drs. Alvin Crawford, Eric Wall, Charles Mehlman and Donita Bylski-Austrow have pursued: 1) the development of innovative treatment methods; 2) the mechanobiology of growth, which relates new treatment modalities and patient diagnosis, with in vivo pressures and growth plate structural changes, and 4) the biomechanical function of spine ligaments affected by surgical procedures. These studies, in addition to extending basic science, have been designed to relate directly to the diagnosis and management of patients with skeletal growth disorders such as scoliosis, kyphosis, limb length discrepancies, and genu valgum. The ultimate goal is to significantly advance the treatment of these disfiguring and often disabling musculoskeletal disorders.

## HIGHLIGHTS

### **Orthopaedic Research Laboratory**

We acquired funding and space for a new Orthopaedic Research Laboratory, awarded through CCHMC's Invest in Excellence program. The laboratory currently houses computers, mechanical, electrical and surgical tools, microscope and freezer area, as well as arthroscopy bioskills training equipment. Mechanical testing facilities were recently granted to the lab by Ethicon End Surgery. The Orthopaedic Research Laboratory (1,136 sq. ft.), located one block from the hospital, includes 2 offices and 4 lab bays with total desk space for 12.

### **Projects during the Summer 2004**

**Alison Grimaldi:** UC BME, 7/03- 4/04. Compiled and analyzed spine anthropometry from MR images of scoliosis patients.

**Jonathon Henkel:** Case Western Reserve, BME, CCHRF Summer Undergraduate Research Program. Quantified geometric needle parameters for painless injection device, and changes in bone and disc morphology after spine stapling.

**Nicole McDonald:** Summer Research Co-op Program. Nicole received her BS in Biomedical Engineering from the University of Toledo. She is a second year medical student at the University of Cincinnati College of Medicine. Summer project: torsional and flexion strength of inter-medullary pins in the femur when inserted from an antegrade approach.

**Frank Sauser:** UC ECE, under direction of David Glos, fabricating and testing sub-miniature pressure transducers which will be implanted in vivo to determine pressures on the growth plate of the spine.

**David Sheyn:** UC BME, ConnectionsE (accepted to UC Medical School), PSTP (UC Physician Scientist Training Program). Quantified changes to vertebral growth plates after spine stapling in preclinical model.

**Jonathan Snyder:** Summer Research Co-op Program. Jonathan received his BA in Biology from the University of Virginia. He is a second year medical student at the University of Cincinnati, College of Medicine. Summer project: A retrograde radiographic study of the remodeling capability of different age

groups when faced with a both-bone forearm fracture. The children included in this study are those which experienced at least 20 degrees of deformity at some point in their follow-up.

**Adarsh Srivastava:** Summer Research Co-op Program. Adarsh received his BS in Chemical Science from Xavier University. He is a second year medical student at the Nova Southeastern University, College of Osteopathic Medicine. Summer project: the effectiveness of elastic stable intramedullary nailing (ESIN) of the pediatric tibial shaft fracture.

### **Endoscopic Scoliosis Surgery**

We have a patent on a novel spine implant system, which has been shown capable of altering spine growth. The implants are being developed to correct adolescent idiopathic scoliosis using an entirely endoscopic technique. The work was presented to the 2003 Scoliosis Research Society where it won the prestigious Hibb's Award for clinical research and the 2004 Orthopaedic Research Society, and has been accepted for presentation in Spine.

A study on the histological structure of vertebral growth plates was presented at the 2004 Orthopaedic Research Society. This was a collaborative effort with CCHMC Pathology. Growth plate samples have also been banked to assess functional changes in the growth plate. Techniques in molecular biology have begun to be defined by collaborating with CCHMC divisions of Pediatric Surgery and Pathology.

To determine the mechanical state of stress that alters growth, we are preparing to directly measure pressures in the spine in an in vivo model. The data acquisition system for the miniature pressure transducers that will be implanted has been acquired, calibration and testing procedures continue. Subminiature pressure transducers are being fabricated in collaboration with UC Electrical Engineering. The work is the subject of a podium presentation at the IEEE Engineering in Medicine and Biology conference. A grant submitted to the NIH is in review.

## **TRAINING**

Vagmin Vora, MD  
David Antekeier, MD

PL-VI Grant Medical College, Bombay, India  
PL-VI University of Louisville School of Medicine,  
Louisville, Kentucky

## **PUBLICATIONS**

1. **Crawford AH.** Position of the aorta relative to the spine in idiopathic scoliosis. *J Bone Joint Surg Am* 2004;86-A(2):429; author reply 429-30.
2. Omoloja AA, Kumar K, **Crawford AH**, Strife CF. Epiphyseal stapling and recombinant human growth hormone for correction of genu valgum in children with chronic renal insufficiency. *J Pediatr Orthop* 2003;23(5):639-42.
3. Parikh SN, **Crawford AH.** Orthopaedic implications in the management of pediatric vertebral and spinal cord tumors: a retrospective review. *Spine* 2003;28(20):2390-6.
4. Parikh SN, Brody AS, **Crawford AH.** Use of a picture archiving and communications system (PACS) and computed plain radiography in preoperative planning. *Am J Orthop* 2004;33(2):62-4, 57.
5. Parikh SN, **Crawford AH**, Choudhury S. Magnetic resonance imaging in the evaluation of infantile torticollis. *Orthopedics* 2004;27(5):509-15.
6. Parikh SN, **Crawford AH, Do TT, Roy DR.** Popliteal pterygium syndrome: implications for orthopaedic management. *J Pediatr Orthop B* 2004;13(3):197-201.
7. **Do TT**, Strub WM, Witte D. Subacute Propionibacterium acnes osteomyelitis of the spine in an adolescent. *J Pediatr Orthop B* 2003;12(4):284-7.
8. Deitch J, **Mehlman CT**, Foad SL, Obbehath A, Mallory M. Traumatic anterior shoulder dislocation in adolescents. *Am J Sports Med* 2003;31(5):758-63.

9. Dunham R, **Mehlman CT**, Foad S. Anterior knee pain in children and adolescents: evaluation and treatment of plica syndrome. *Journal of the American Osteopathic Academy of Orthopedics* 2003;40:29-35.
10. Lee TM, **Mehlman CT**. Hyphenated history: Park-Harris growth arrest lines. *Am J Orthop* 2003;32(8):408-11.
11. Lucas JC, **Mehlman CT**, Laor T. The location of the biceps tendon in completely displaced proximal humerus fractures in children: a report of four cases with magnetic resonance imaging and cadaveric correlation. *J Pediatr Orthop* 2004;24(3):249-53.
12. **Mehlman CT**, Farmer JA. Teaching orthopaedics on the run: tell me the story backward. *Clin Orthop* 2003(413):303-8.
13. **Tamai J**, Erol B, Lo SS, Pawel BR, Meyer JS, Dormans JP. Leg pain in an 8-year-old boy. *Clin Orthop* 2003(417):321-32.
14. George M, **Wall EJ**. Locked knee caused by meniscal subluxation: magnetic resonance imaging and arthroscopic verification. *Arthroscopy* 2003;19(8):885-8.
15. Herrera JA, **Wall EJ**, Foad SL. Hematoma block reduces narcotic pain medication after femoral elastic nailing in children. *J Pediatr Orthop* 2004;24(3):254-6.
16. **Wall EJ**, Foad SL, Spears J. Backpacks and back pain: where's the epidemic? *J Pediatr Orthop* 2003;23(4):437-9.
17. **Wall E, Von Stein D**. Juvenile osteochondritis dissecans. *Orthop Clin North Am* 2003;34(3):341-53.