

PEDIATRIC ORTHOPAEDICS



Memphis, Tennessee

Summer 2014

Team first in region to use Magnetic Expansion Control

New device provides non-invasive treatment for early-onset scoliosis

he Le Bonheur/Campbell Clinic orthopaedic team is the first in the southeast region to offer Magnetic Expansion Control (MAGEC) for children with early-onset scoliosis. The device allows surgeons to straighten a patient's spine gradually and non-invasively — a stark alternative to traditional growing rods, which require surgical procedures every six months to lengthen the rods and correct the spine's curvature.

Sage Downey, 8, of Toxey, Ala., was the first Le Bonheur patient to receive a MAGEC device and only the 10th in the United States since the device received FDA approval. For her family, the device offers new hope and relief from the pre-operation anxiety Sage endured before every traditional rod lengthening.

Sage, who has arthrogryposis, had developed neuromuscular scoliosis by the time she was 6 months old. Knowing her condition would progress, the Downeys looked for doctor who could offer Sage the best care possible throughout her childhood and adolescent years.

"We had known about the device's pending approval in the U.S.



Jeffrey R. Sawyer, MD, and MAGEC patient Sage Downey

for a few years and knew we wanted a surgeon who would stay on top of the latest developments in scoliosis treatment," said Sage's mom, Janet Downey.

The Downeys first met with Jeffrey R. Sawyer, MD, a Le Bonheur/ Campbell Clinic pediatric orthopaedic surgeon, in October 2011. They discussed Sage's plan of care and the future option of Magnetic Expansion Control. Sage had previously been treated with braces

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Dedicated clinic treats children with hand deformities, injuries

he Le Bonheur/Campbell Clinic Pediatric Hand Clinic opened in February 2013 to treat children with congenital abnormalities or

traumatic injuries of the hand and upper extremities.

"We saw a huge need for this type of care in our region," said Orthopaedic Surgeon Benjamin Mauck, MD, who leads the clinic. "Patients were having to travel long distances for treatment [before the clinic opened] or simply weren't getting the care they needed."

Cayden Vaughn, 4, sees Orthopaedic Surgeon Benjamin Mauck, MD, in Le Bonheur/ Campbell Clinic Pediatric Hand Clinic regularly since his procedure last October. Vaughn was born with arthrogryposis and clapsed thumbs.

Mauck joined the Le Bonheur/Campbell Clinic team in 2012 after completing a hand surgery fellowship at the University of Texas Health Science Center in San Antonio.

"The human hand is a so important to what makes us human — how we interact with the world around us and each other," said Mauck about choosing his specialty. "I wanted to be a part of restoring a patients' ability to do that."

Common abnormalities Mauck sees in clinic include duplicated digits, syndactyly, growth deficiencies and more.

Patient Thomas "Cayden" Vaughn of Grenada, Miss., was born with a form of arthrogryposis, a genetic neuro-musculo-skeletal disorder that primarily

affected his hands and feet. Mauck released the 4-year-old's clapsed thumbs by lengthening and releasing muscles and tendons in his hands and through a partial fusion of his thumb joint in October.

"We love Dr. Mauck and are so happy with how Cayden's procedure turned out," said mom Kaitlynn Vaughn, who was born

with the same condition.

In addition to the most advanced surgical and non-surgical treatment options, patients have access to a specialized care team that includes pediatric radiologists, an occupational therapist and child life specialists.

"Our multidisciplinary care team is so important to how well these patients recover," said Mauck. "Many times, patients need complex operations and, because of that, very difficult and challenging rehabilitation. Without a dedicated therapist and child life specialist to help the patient recover, operative intervention is useless."

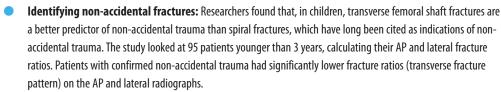


Research Spotlight 7 papers presented at EPOS meeting

Seven Le Bonheur/Campbell Clinic studies were accepted for poster and podium presentations at the April European Paediatric Orthopaedic Society (EPOS) annual meeting in Belgium. The team delivered presentations on:

- **Classifying femoral shaft fractures in children:** Classifications of femoral fractures in young children is highly variable among different specialists, according to the team's findings. The study looked at intraobserver and interobserver variability in defining femoral fracture patterns, which is important in identifying non-accidental trauma in children.
 - Intra and Inter-Observer Reliability and the Role of Fracture Morphology in Classifying Femoral Shaft Fractures in Children. Norfleet Thompson, MD; Derek M. Kelly, MD; Rush, William C. Warner Jr, MD; David D. Spence, MD; James H. Beaty, MD; Alice Moisan, RN; Jeffrey R. Sawyer, MD (poster).
- **Sub-axial cervical spine injuries:** The retrospective study characterized pediatric sub-axial cervical spine injuries by type, neurologic injury, associated non-spine injuries and treatment. Researchers reviewed the medical records of 111 patients and found that isolated fractures account for the majority **of** sub-axial cervical spine injuries in children and most were treated with a c-collar. Other findings showed that neurological deficits and associated non-spine injuries are common, and adolescent patients were more likely to sustain multiple spine injuries, both contiguous and non-contiguous.

Sub-axial Cervical Spine Injuries in Children and Adolescents. Robert F. Murphy, MD; Austin R. Davidson, BS; William C. Warner Jr, MD; Derek M. Kelly, MD; David D. Spence, MD; and Jeffrey R. Sawyer MD (poster).



Transverse Femoral Shaft Fractures are a Better Predictor of Non-Accidental Trauma than Spiral Fractures in Young Children. Ryan Murphy, BS; Derek M. Kelly MD; William C. Warner Jr, MD; Alice Moisan, RN; Norfleet Thompson, MD; David D. Spence, MD; James H. Beaty, MD; Jeffrey R. Sawyer, MD (poster).

- **Musculoskeletal infection:** Findings show Interleukin-6 (IL-6), an immune protein, might be a valid marker for musculoskeletal infection. Researchers collected IL-6 serum levels from 12 pediatric patients with a suspected musculoskeletal infection and examined them in triplicate using a Quantikine ELISA assay (R&D Systems). Eight patients were diagnosed with suppurative musculoskeletal infection (mean IL-6 level of 214.5 pg/ml), while four patients were diagnosed with "other" etiologies (mean IL-6 level of 68.63 pg/ml). Further research is in progress. Interleukin-6 in Pediatric Musculoskeletal Infection: A Pilot Study. Byron F. Stephens, MD; Jeffrey R. Sawyer, MD; William C. Warner, MD; James H. Beaty, MD; David D. Spence, MD; Alice A. Moisan, BSN; and Derek M. Kelly, MD (podium).
- Pediatric femur fracture treatment: Researchers used the U.S. Kids' Inpatient Database (KID) to review trends in treating pediatric femur fractures in a 12-year period. Findings showed an increased popularity in recent years of open reduction and internal fixation as a choice of treatment for femur fracture in children ages 5 to 9 years. There is evidence that pediatric femur fractures are now treated more commonly with internal fixation, which is utilized in the younger age groups.

Changes in the Treatment of Pediatric Femur Fractures: Trends from United States Kids' Inpatient Database (KID). Sameer M. Naranje, MD; Derek M. Kelly, MD; Jeffrey R. Sawyer, MD; Tamekia L. Jones, PhD; James H. Beaty, MD (podium).

- **Tibial tubercle fractures:** The comprehensive study looked at pediatric tibial tubercle fracture treatment methods, as well as evidence on associated injuries and functional and radiological outcomes. Highlights from the research include:
 - Average age at surgery was 14.6 years
 - Most common fracture reported was type III
 - Associated injury rate was 4.1 percent (more common in type III fractures)
 - ORIF was performed in 98 percent of cases

Jack Flynn, MD (podium).

- Fracture consolidation was achieved in 99 percent of cases
- Overall complication rate was 28 percent (removal of hardware due to bursitis was most common complication)

Outcomes and Complications of Tibial Tubercle Fractures within the Pediatric Population. A Systematic Review of the Literature. Juan Pretell-Mazzini, MD; Vinayak Perake, MD; Derek M. Kelly, MD; Jeffrey R Sawyer, MD; Alice A Moisan, BSN; David D Spence, MD; William C Warner, Jr, MD; James H Beaty, MD (poster).

Isolated anterior interosseous nerve (AIN) injuries: The multi-center study looked at the rate of isolated AIN injuries in supracondylar humerus fractures and their long-term outcomes. Of those patients with an isolated AIN injury, average time to surgery was 14.6 hours. Complete return of AIN function was found in 84 percent of cases with an average time to partial return of about 37 days. Full return of function is expected in most cases within five months. Emergent surgical intervention did not affect time to recovery of full AIN function. Supracondylar Fractures with Isolated Anterior Interosseous Nerve Injuries: Are they Urgent Cases? Kody K. Barrett, BA; David L. Skaggs, MD; Jeffrey R. Sawyer, MD; Lindsay Andras, MD; Alice Moisan, BSN, RN, CCRP; Christine Goodbody, BS;







Ortho recognized by U.S. News & World Report

U.S. News & World Report again has named the Le Bonheur/ Campbell Clinic team among the nation's top pediatric orthopaedic programs.



Le Bonheur was also recognized in six other specialties - cardiology/heart surgery, neonatology, nephrology, neurology/ neurosurgery, pulmonology and urology.

"We are thrilled to be recognized as one of the country's best children's hospitals," said Le Bonheur Children's President and CEO Meri Armour, MSN/MBA. "We use the U.S. News process as a way to improve the care we offer children. It is our responsibility as health experts to give our children every opportunity to grow up healthy and strong."

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and body casting techniques to slow the growth of her spine curvature. Waiting for MAGEC to become available, Sage underwent halo traction and VEPTR (Vertical Expandable Titanium Rib) implantation under Sawyer's care — five surgeries in all and plenty of overnight stays at Le Bonheur.

On May 7, Sage had a sixth surgery — this time to implant a MAGEC device. Using an external magnet, Sawyer expanded the rods for the first time on July 16.

"It was such a difference," said Janet. "Sawyer did the expansion in clinic. There was no anesthesia, no incisions we were eating lunch with Sage an hour later. We couldn't believe it."

The non-invasive procedure also meant Sage could go home the same day and didn't have to worry about recovery time and the infection risks that accompany surgical incisions. Like traditional growing rods, MAGEC devices need to be expanded every six months during the child's growing years. Sage will continue with MAGEC treatment until she can have a final corrective surgery when she's older, says Janet.

"MAGEC is a true-game changer in pediatric scoliosis care. "Saving a child from surgery every six months will have a significant, positive impact on their care," Sawyer said.



Magnetic Expansion Control

Former fellow brings lessons learned to Brazil

hen pediatric orthopaedic surgeon Nelson Astur, MD, wanted to learn more about the pediatric spine, he turned to Campbell Clinic Orthopaedics. Astur had already completed fellowship training in his home country, Brazil, but wanted to learn more about pediatric spinal deformities and early-onset scoliosis treatments like VEPTR (Vertical Expandable Prosthetic Titanium Rib). So he applied for another fellowship.

"Ever since I started my orthopaedic residency program in Sao Paulo, residents have had two 'Bible' books to follow: Rockwood's Fractures in Adults and Campbell's Operative Orthopaedics. I could never have imagined I would be part of Campbell Clinic someday," said Astur. "It was an honor for me to apply for a position at Campbell Clinic — even greater to get accepted."

Three years after graduating from the year-long fellowship program under the supervision of Pediatric Orthopaedic Surgeon Jeffrey Sawyer, MD, Astur is using what he learned to better care for children in Brazil. He credits the team at Le Bonheur and Campbell Clinic for teaching him a wide range of skills – from clinic structuring and organization to research and academic teaching. Astur has also been able to bring new surgical techniques to his practice in Brazil.

"Before my fellowship, patients with early-onset scoliosis in the university hospital I staff were treated with fusion and old-school techniques," said Astur. "Now, we now have a group of early-onset scoliosis patients treated with growing sparing/growth modulation surgical techniques. Eight patients have already received a VEPTR implantation."



Nelson Astur, MD

Astur works on staff at two hospitals in Sao Paulo, and also works at his family's private practice. Astur says he's dedicated to teaching each of his fellows and orthopaedic residents what he learned at Le Bonheur and Campbell Clinic. Following in his teacher's footsteps, one of Astur's fellows is even applying for the Le Bonheur/Campbell Clinic 2015/16 fellowship program.

Case Study: *Spine Trauma* **Pre-teen nearly paralyzed after ATV accident**

After an all-terrain vehicle (ATV) accident last May, Kristyn Wright, 12, was given a 50/50 shot of ever walking again. Kristyn had just finished fifth grade and was riding the ATV down a country road in her hometown of Pontotoc, Miss., when she swerved to miss an oncoming car. She landed in a ditch, and the ATV rolled on top of her.

"The driver stopped to help Kristyn and called her dad," said mom, Lorna Wright. "I was scared to death, hoping she'd be OK. She wasn't crying because she was just in shock."



Kristyn Wright

Kristyn was airlifted about 100 miles to Le Bonheur Children's. Scans showed she had a T12 compression fracture, L1 burst fracture and a compromised spinal cord injury at T12 and L1. Le Bonheur orthopaedic surgeons Derek Kelly, MD, and Jeffrey Sawyer, MD, fused her vertebrae from T10 to L3, and Frederick Boop, MD, chairman of the Department of Neurosurgery, decompressed her spinal cord.

"As with most complex spine trauma surgery at our hospital, Kristyn's surgery was performed with a team of neurosurgeons and

Kristyn Wright in therapy at Le Bonheur.

orthopaedic surgeons," said Kelly.
"We worked closely together to
maximize Kristyn's shot at a
complete recovery."

Kristyn remained at Le Bonheur for two weeks, as doctors and nurses continued to check for signs she had regained sensations.

"The surgery went well, but we had to take it day by day," said Lorna.

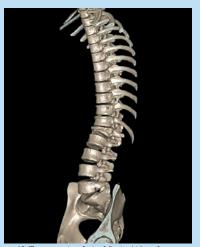
The Wright family loved her Le Bonheur caretakers, crediting

her physical therapists for helping Kristyn walk again.

"Each day, they told her, 'We've done our part. Now you have to take your recovery from here," said Lorna.

After 14 days at Le Bonheur, Kristyn underwent two weeks of intensive inpatient rehabilitation.

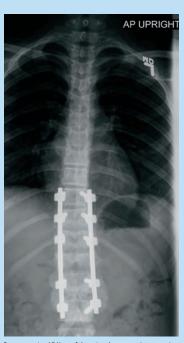
Today, just more than a year after her accident, Kristyn is walking again. She goes to physical therapy twice a week and still has some weakness in her right ankle. She hopes to go back to playing softball soon.



3D CT reconstruction of spine following L1 burst fracture



Post-operative lateral Xray of the spine demonstrating restoration of normal saaittal alianment



Post-operative AP Xray of the spine demonstrating posterior spinal fusion and instrumentation from T10 to L3

Non-Profit Org.











Research, Publications and Presentations

Le Bonheur Children's Hospital and Campbell Clinic's five surgeons are actively involved in research and presentations in the pediatric orthopaedic field. Highlights from their work are listed below:

Publications

The Use of Magnetic Resonance Imaging in the Evaluation of Spondylolysis. Rush JK, Astur N, Scott S, Kelly DM, Sawyer JR, Warner WC. Jr. J Pediatr Orthop. 2014 June 24. [Epub ahead of print]

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Beaty, J. The Othopaedic Lecture: Basics. AAOS Annual Meeting, Chicago, Ill. March 2013.

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Kelly Derek M., M.D. Beaty James H.M. D. Lan Pretell-Mazzini, M.D. Vinayak Perake, M. Jeffrey R. Sawyer, M.D. Akea A Moisan, B.Sh., David D Spence, M.D. William C. Warner, Jr., M.D. Outcomes And Complications Of Tibal Tuberder Fractures Within The Pediatric Population. A Systematic Review of The Heature (e-poster). European Pediatric Orthopaedic Society, Bedjourn, April 2014.

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Davidson, BS, David D. Spence, MD, and Jeffrey R. Sawyer MD. Sub-axial cervica
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M.D. Beaty James H. M.D. Byron F. Stephens M.D. Jeffrey R. Savyer M.D. William C. Wanner M.D. David D. Spence M.D. Alfer A. Moisan B.S.M. Interleuklin-6 in Pediatric Musculosideted Infection: A Pilot Study accepted ey poster. POSIA, Hollywood, Ca., April-May 2014.

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Kelly D.M.S. super, J.R. Womer W.D. Easy), H.L. Laren, Missian, Witts, Etzey, Medial Ulbar dialetted [Japanest Pagin on the Medial Episanoflar Apaphysis in the Selectual) Ulbar dialetted [Japanest Pagin on the Medial Episanoflar Apaphysis in the Selectual) Orthopaedic Surgeons, Chicago III, March 2013.

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Spence David O. MD, Beaty James H. MD, Ryan Murphy BS, Derek M. Kelly MD, William CV Gymer Jr. MD, Medisan RH, Northert Thompson MD, Jeffrey R. Sawyer MD. Transverse Femonal Shaft Fractures are a Better Predictor of Non-Accidental Trauma than Spiral Fractures in Usung Children (poster). European Pediatric Orthopaedic Society, Belgium, April 2014.

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