PEDIATRIC ORTHOPAEDIC SOCIETY OF NORTH AMERICA's

Resident REVIEW

CUTTING EDGE ORTHOPAEDIC INFORMATION ENHANCING RESIDENT EDUCATION

February 2010

From the Editor,
Kenneth Noonan, MD

Welcome to the third edition of the POSNA Resident Review. This publication is produced by the Pediatric Orthopaedic Society of North America on a semi-annual basis. The singular goal is to expose orthopaedic residents to the science and the life of pediatric orthopaedics. In this edition we present a series of "OITE-Style" questions on pediatric spine deformity. Questions, figures and answers are produced by leading pediatric orthopaedists and allow you to "test your knowledge base."

In addition, we highlight two different pediatric orthopaedists: Dr. Ben Alman and Dr. Min Kocher. Dr. Alman will give us a peek into the life of a pediatric orthopaedist practicing in a socialized medical system and Dr. Kocher discusses his life and career as a pediatric orthopaedist practicing predominantly sports medicine.

Finally, we highlight the 2009 IPOS symposium through the experiences of two orthopaedic residents. The editorial staff hopes that you will find this effort to be educational and illuminating; comments are welcome at noonan@ortho.wisc.edu.

Challenging Cases: What Would You Do?

CASE #1

An anterior-posterior radiograph (Figure 1) of a newborn baby girl with rib hump is obtained. The following organ(s) is unlikely to be concurrently affected:

A. Spinal Cord
B. Ovaries
C. Kidney
D. Heart
E. Trachea and Esophagus

Your Response: ___

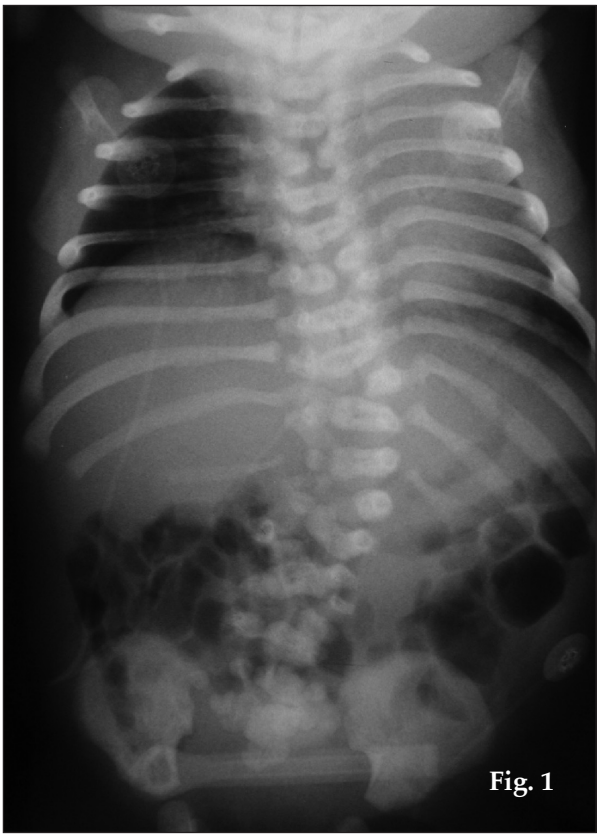

Fig. 1

CASE #1, *continued*

Discussion

The radiograph demonstrates a child with congenital spinal deformity. These children have failure of formation (hemivertebra) and failure of segmentation (spinal bars). Spinal deformity occurs in utero at the same time as other organ systems are developing. Associated medical problems can be present and include trachea-esophageal fistulas. Spinal cord anomalies can occur in greater than 20% of affected individuals; cardiac anomalies occur in 10% and renal abnormalities occur in greater than 30% of patients. Disorders of the ovaries are not to be expected in these children.

The correct answer is B.

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Profile: Ben Alman, Canadian Pediatric Orthopaedist
What's the Future for the American Pediatric Orthopaedist?

By: Ken Noonan, MD

"…times, they are a changing…" As the Congress debates the future of health care, all patients, public (patients to be) and healthcare providers are anxiously watching and predicting how new legislation will affect healthcare delivery. In this edition of the *POSNA Resident Review,* the Editorial Board interviews Dr Ben Alman. As a US citizen who practices in Canada, Dr Alman brings an American perspective to pediatric orthopaedics in a Socialized Health system, is he practicing in our future?...

1) Where were you raised and what led you to an academic career in pediatric orthopaedics?
I was born and raised in Philadelphia and planned to become a material science engineer. The University of Pennsylvania had a bioengineering department with strong links to orthopaedics which exposed me to medicine and orthopaedics. As a medical student, I loved my pediatrics rotation, so I decided to combine orthopaedics and pediatrics as a pediatric orthopaedists.

2) Who stimulated you to consider a career as children's orthopaedist?
As a resident at Tufts in Boston, Michael Goldberg (Chief of Pediatric Orthopaedics) was influential in my career. He not only mentored me but he encouraged me to combine pediatric orthopaedics and fundamental research into my academic career.

3) Describe your current practice profile.
While I see the broad variety of pediatric orthopaedic problems, more than half of my practice focuses on children with syndromes, genetic neuromuscular conditions, and tumors. Despite this busy practice, I spend about 30 to 50% of my time on administrative duties and research. Because I practice at a Children's hospital I only take pediatric call.

4) What are the differences in practice between Boston and Toronto?
Having practiced in both Boston and Toronto, there are really very few differences in how the individual clinician provides care. Indeed, private practice orthopaedist bill "fee for service" to the Provincial health insurance plan, just like a United States doctor (except Canadians only bill one insurance company). Canadian doctors also bill Workers Compensation or accident insurance, but these are infrequently a source of patient care revenue for pediatric doctors. One difference is that the medical-legal climate is a bit better in Canada. Canadians tend to sue less than people from the United States in general; this probably results in Canadian physicians practicing less defensive medicine.

5) What are the advantages for caring for children in a system of socialized medical system?
We have a unique ability to plan care based primarily on what is best for the children, without concerns about competition or financial implications. The Canada Health Act provides equal access to health care for all Canadians through insurance provided by a small number of Provincial Health plans. Because of the small number of available plans, it makes billing very easy. In addition, because there is basically one insurance company which answers to the provincial government; it is much easier to establish screening or preventative strategies. Despite this fact there is currently no pediatric orthopaedic screening program such as Ultrasound for DDH or scoliosis screening.

As a practical example, children with in-toeing, minor scoliosis, or minimally displaced radial fractures can be easily managed in the community, closer to children's homes in a manner that is more convenient for the family. As such, we defer patients with these problems to community practitioners who are pediatric orthopaedists or general orthopedists. Because these children have insurance the local practitioners are willing to assume the care of these patients. A pediatric orthopedist can sometimes bill more for a busy outpatient clinic than a day in the operating room; thus, there is a financial incentive for all orthopaedists to do outpatient care.

Ben Alman, MD

6) What are the disadvantages of caring for children in a socialized medical system?
Provincial health insurance plans are controlled centrally and get their funding from the Provincial governments; the hospitals funding is limited and they are under pressure to maintain costs. Due to their size and power of these health plans, they can effectively negotiate medical implant costs which are lower than in the United States. The hospitals need to maintain a balanced budget (the hospital CEOs and boards are responsible to do this); as such there is some pressure on the surgeon to minimize costs. However, I am not aware of an instance where such pressure actually kept a child from receiving appropri-

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ate care. In addition, one cannot simply institute a different treatment that costs more money than an established treatment without negotiating for funding at multiple levels. A recent example of this is minimally invasive obesity surgery, which took several years of negotiation to get approved for additional funding in Toronto.

7) Is pediatric orthopaedic care rationed or capitated in Canada and are there any procedures (Example: Idiopathic Scoliosis Surgery) in children that cannot be done due to regional quotas?
Pediatric Orthopaedics is not rationed in Canada; indeed, it is the opposite. Our hospital gets a financial incentive for doing cases in addition to those done the year before for certain diagnosis.

8) Do some children have private insurance in addition to public insurance and does this child get care faster in Canada then the child on Provincial Health plans?
It is illegal in Canada to use private insurance (or any other method of payment) for care that is funded by the public system. As such physicians in Canada do not have "Government Practices" and "Private Practices" as seen in some countries such as Spain. If people want to get care out of the Canadian system they will pay cash to get care in the United States, or for children they can seek care in the Shrine system.

9) Is there widespread transfer of trauma patients from regional hospitals to Canadian children's hospitals?
Similar to the United States there is regional variability in trauma related transfers; although such transfers are probably less than in the United States. Some general orthopaedists rarely transfer trauma cases because the general orthopaedists always gets reasonably paid for treating pediatric fractures. Some general orthopaedists transfer routinely but this is predominately due to their comfort in treating these problems. This comfort is defined more by technical expertise as opposed to risk of litigation.

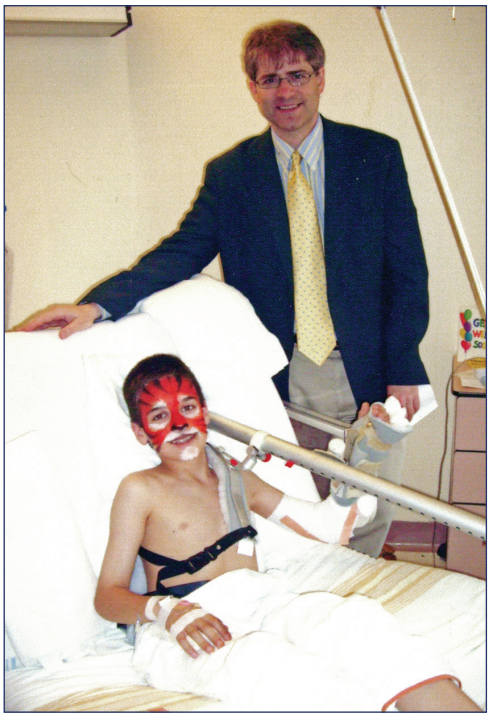
10) Do you feel socialized medicine is a risk to academic medicine?
Quite the opposite, I feel that it makes it much easier to do academic medicine. Indeed, some academic physicians actually get additional salary support for doing academic work in the University of Toronto system. In addition, it is due to socialized medicine in Canada that it is easier to track patients to study outcome. It is for this issue that so many long term or large patient cohort outcome studies come from Canada.

11) Is there a shortage of pediatric orthopaedists in Canada?
No – but similar to the United States, there is a lot of regional variability. There is difficulty recruiting pediatric orthopaedists to some Canadian Centers. In these places geographically further from major children's hospitals, the general orthoapedists are more likely to do children's care.

12) Do Canadian pediatric orthopaedists make less than their American counterparts?
I believe that Canadian pediatric orthopaedists salaries are about the same as salaries in the United States. Indeed at some Canadian centers the salaries are probably higher than average United States salaries (as compared to ACGME published rates).

13) Any final comments?
The main reason that Canadian universal health care works so well, is that you can not "buy out" of the system with private care. Thus, it is in the best interest of everyone in the country (including the richest individuals) to fight to make the care as good as possible. In other systems where there is private care as well, many individuals don't care about the public system because they do not use it. While the Canadian system has its drawbacks, and is not always so cost efficient, it does have a lot of pluses, especially for academic practice. In academic medicine, it is easier than in the United States to get protected time and salary support for academic work. It is easier to track and follow patients because they all remain part of the same public insurance system (unless they leave the Province). While there is a lot of talk about wait times, these are generally for elective procedures for which there are often limited evidence that care needs to be provided quickly. The Provincial governments work hard to keep wait times down, as this is used as a measure of the overall success of the system.

Dr. Alman completed his Pediatric Orthopaedic fellowship at the Hospital for Sick Children, Toronto. He practiced at Tufts University for 3 years before returning to Toronto. After 14 years of practice he is currently the A. J. Latner Professor and Chair of Orthopaedic Surgery at the University of Toronto, and he is Head of the Division of Orthopaedic Surgery at The Hospital for Sick Children. Ben is married with two teenage children.



Dr. Ben Alman at the bedside of one of his many patients.

Pediatric Orthopaedics Meets Sports Medicine – Dr. Min Kocher

By: Michelle Caird, MD

Where were you were born and raised?

I was born and raised in Rochester, NY. My parents came from India to the US in the late 1950's for college. I went to Dartmouth College and medical school at Duke University School of Medicine.

Were there any significant experiences or exposures that led you to consider pediatric orthopaedics as a career?

Like every other eventual orthopaedic resident, I hurt my knee playing basketball in high school. I actually had a meniscal repair by Dr. Ken DeHaven in 1982. I think that sparked my interest in orthopaedics and I eventually went to the same college as Dr. DeHaven (Dartmouth), was in the same fraternity and became interested in knee surgery.

Who stimulated you to consider a career as children's orthopaedist?

Dr. John Feagin was my first mentor in medical school and through him I became fascinated by the form and function of the knee. He set me up for a "primary care" rotation in the ski clinic in Jackson Hole which was amazing to examine loads of freshly torn ACL's right off the mountain before pain and swelling set in and limited the physical examination. I also did clinical and biomechanical research with him. That cemented my decision to go into orthopaedics and sports medicine.

Dr. John Hall had a profound impact on me during residency in the Harvard Combined Orthopaedic Program. Dr. Hall was a role model for technical skill as a surgeon, compassion for patients, and for being a good person with a principled life. I loved working with children and their families. I liked the complexity of considering growth and remodeling. I understood kids desire to get better and back to play and sports. My wife pointed out that I was jumping out of bed in the morning to get to Children's.

Where did you do your residency and fellowship training?

I completed residency in the Harvard Combined Orthopaedic Program…. I stayed at Children's Hospital Boston for pediatric orthopaedic training and went to Steadman Hawkins Clinic in Vail for sports medicine training…. I completed an MPH in Clinical Epidemiology at the Harvard School of Public Health.

What are your family specifics?

We have a very active and fun family which is my number one focus. I met my wife, Mich Dupre, while in college. We were on an ecology foreign study program living in tents in the rain forest of Costa Rica for three months and studying coral reef ecology in the waters of Jamaica for one month. Since then, the adventure has continued! We are blessed with 5 wonderful kids: Sophia (11) who loves horses, Izzy (10) who is super fast on skis or on foot, Calvin (7) who wants to play ball all the time, Ava (4) who is really in charge, and Hank (5 months) who is a nice baby and very mellow (thankfully!). As a family, we like the outdoors (skiing, hiking, camping, kayaking, mountain biking). We like sports and the kids are playing soccer, flag football, ski racing, swim team, lacrosse, and baseball. We like to travel on family adventures and have been to Switzerland, Japan, Italy, England, and Nova Scotia. We love animals. Our house is an old farm from the 1800's. We have just finished fixing up the barn and are preparing for the arrival of 2 horses, 2 sheep, 1 Vietnamese potbelly pig, and 2 barn cats in the spring. We don't do video games, fast food, or snowboarding.

What do you do for fun?

I like to do our family activities. I played basketball in college and have finally given up my adult league after Achilles tendon rupture, medial meniscus tear, nasal fracture, and loose

The Kocher family at the Matterhorn.

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body in my hip. I am now trying not to get hurt and focusing on mountain biking, kayaking, and skiing.

How did you select pediatric sports as your subspecialty?

Fourth year residency was the only period of my entire life where I had trouble sleeping because I was torn between pursuing three seemingly disparate interests: sports medicine, pediatric orthopaedics, and clinical epidemiology. I struggled trying to figure out which of the three paths to follow. Fortunately, Dr. Jim Kasser convinced me that I could "do it all." Drs. Lyle Micheli (Sports) and Peter Waters (Hand) showed me that they were able to blend two subspecialties: They encouraged me to do two clinical fellowships in sports medicine and in pediatric orthopaedics and to pursue further education in clinical epidemiology.

Describe your current practice.

I do approximately 675 operations per year. There are straightforward cases and complex cases referred from far away. In my first couple of years, I did some general pediatric orthopaedics and really enjoyed deformity correction, particularly Blount's disease. However, as my practice in pediatric sports medicine has grown and as our large (28 pediatric orthopaedic surgeons!) group has grown and subspecialized, my practice has focused on pediatric sports medicine. I take call and we are a very busy trauma center so I do lots of pediatric fractures. I really enjoy taking care of pediatric fractures as well and because everyone in the group takes care of pediatric fractures, it gives us a common denominator.

How did you set up your practice?

I was already joining an established pediatric sports medicine practice that Dr. Micheli started in the 1970's so I did not have to start to build a practice from scratch. I think the best way of establishing your practice is to do a great job taking care of patients and to get excellent results. That is more important that marketing, brochures, websites, etc. Beyond that, it is very important to be available and to get out into the community by giving talks, doing screenings, taking care of teams, etc.

Dr. Kocher in the operating room.

For us, sports medicine is so much more than sports trauma surgery, as we have research and clinical focuses also in concussion, the female athlete, bone health, sports injury prevention, medical issues in sports medicine. We are the team physicians for many high schools including the Boston Public Schools, many colleges including Northeastern University, and other athletic organizations including Boston Ballet, Boston Marathon, USA Track and Field, US Figure Skating, and US Ski and Snowboard team.

Why should a young surgeon consider pediatric orthopaedics as a career?

Working with children and helping them get better is so fulfilling. The surgery in pediatric orthopaedics is more interesting, often with a more "biological" approach, consideration of future growth, and an emphasis on joint preservation instead of joint replacement.

Pediatric orthopaedics could have contracted and given up pediatric spine to the adult spine surgeons, pediatric sports injuries to the adult sports medicine surgeons, pediatric foot and ankle problems to the adult ankle surgeons, and pediatric fractures to the adult trauma specialists. But what is happening is that pediatric orthopaedics is focusing and even sub-specializing in these areas such as pediatric sports medicine, pediatric spine centers, deformity correction, pediatric hand surgery, and pediatric foot disorders. Beyond that, pediatric orthopaedics is expanding into relevant conditions in the young adult which are likely better treated by our specialty such as the young adult hip with techniques of periacetabular osteotomy, surgical dislocation, and hip arthroscopy. There is the option of sub specializing within pediatric orthopaedics or remaining a generalist who operates all over the body from infants to adolescents. In terms of research, there is so much need for prospective clinical studies

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Dr. Min Kocher, *continued from page five*

and randomized trials so a researcher can make a big impact. There are interesting clinical research issues such as outcome by proxy and pediatric health related quality of life.

What advice do you have for residents considering pediatric sports as a subspecialty?

There has been a lot of recent interest in pediatric sports medicine. The fundamental dilemma is how do you train for this? A pediatric orthopaedic fellowship? A sports medicine fellowship? Two fellowships? Personally, I did two fellowships and I think this gave me excellent skills and credibility in both fields. I would recommend this approach. With the adoption of the CSQ in sports medicine, I think it will be important to do a one-year accredited sports fellowship in order to sit for the CSQ. There are some pediatric orthopaedic fellowships, such as CHOP in Philadelphia, that have substantial exposure to pediatric sports medicine.

How did you develop an interest in evidence based medicine in orthopaedics?

The other person who had a major impact on me during residency was a rheumatologist and health services researcher, Dr. Matt Liang. During residency, I became involved in small clinical research projects. When doing a retrospective review of total joint replacements, I was amazed at how there can be two totally different approaches (uncemented at Brigham and Women's with Dr. Sledge et al and cemented at Massachusetts General Hospital with Dr. Harris et al) that are both supported by retrospective case series and such passionate debate over which was best. It was clear to me that the answer lay in clinical research methodology and that we needed higher quality clinical research in orthopaedics. I got involved with Dr. Liang who ran an NIH supported musculoskeletal clinical research center at Brigham and Women's Hospital and learning about research methods not typically employed in orthopaedic research: randomized clinical trials, decision analysis, cost-effectiveness analysis, outcomes assessment, survivorship analysis, logistic regression, etc. It was at this stage that I did a study developing a clinical prediction rule to differentiate transient synovitis versus septic arthritis of the hip in children. It was well received (Kappa Delta award) and was incredibly gratifying for me to take a vexing clinical diagnostic problem and try to improve decision making by using data and research methodology. I was hooked. I knew I had to involve clinical research in my career somehow.

How did you go about training in study design etc? What support did you receive to do this?

In terms of research, I direct our Clinical Effectiveness Research Unit which is an applied clinical epidemiology research group that supports prospective clinical studies. We have approximately 15-20 research associates within teams of hip, upper extremity, sports, spine, and lower extremity. I try to protect 0.75 days per week for research which involves meeting with the research associates, residents, fellows, etc. However, this is not enough time so I still end up getting a lot done from 4:30am – 6:00am. Our research is funded through a variety of mechanisms including grants (OREF, etc), philanthropy, and departmental funds.

It was a long road to do two clinical and one research fellowship after residency, but I think it was well worth it in the end. I feel very well trained for my current role. The mentorship, vision, and support of Drs. Kasser, Micheli, and Waters were invaluable and they remain mentors (and now partners). Most importantly, my wife was supportive of this path especially if it went through Vail for a year as she was a former Dartmouth ski racer.

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IPOS 2009: The Resident Perspective

By: Brian Smith, MD

The Pediatric Orthopedic Society of North America (POSNA) and the American Academy of Orthopaedic Surgeons (AAOS) have combined to produce a systematic symposium on the current state of treating orthopaedic problems in children. The 2009 International Pediatric Orthopaedic Symposium was held in Orlando Florida in early December and by all accounts it was an amazing success. The editorial staff of the POSNA Resident Review identified two residents who would be willing to report on their experiences as scholarship attendees. The following reports are the unedited perspectives of these two individuals.

Following the Pediatric Orthopaedic Urban Legend Symposium; JR Cruz [PGY4 from Yale] (left) and Michael Booker [PGY4 from Philadelphia] (right), are seen discussing pediatric orthopaedics with Dr. Brian Smith (center) from Yale University.

Resident Profile: Ryan Muchow. PGY4 from University of Wisconsin in Madison, Wisconsin:

Promoted as an interactive educational conference to enhance knowledge of pediatric orthopedic conditions and their management, the International Pediatric Orthopaedic Symposium (IPOS) exceeded all of my preconceived expectations. The conference delivered high quality education while showcasing the collegial nature of the field.

Ryan Muchow (PGY4) learns the fine points of Ponseti casting from Dr. Lori Karol, Texas Scottish Rite Hospital.

Being a fourth year orthopedic resident with aspirations of completing a pediatric orthopedic fellowship and practicing in the field, IPOS had intrinsic value to me as an educational conference. The opportunity to expand my knowledge of pediatric orthopaedics and be introduced to the field were motivating factors for attending IPOS. However, the resulting experience of the quality of lectures, the clinical and surgical relevance of the topics, and the delivery of information greatly surpassed my expectations. Utilizing a mix of didactic lectures, panel discussions, small group surgical technique labs, and discussion groups; the organizers of IPOS created an interesting and interactive environment for learning. The ability to tailor my schedule to focus on areas of personal or clinical interest further enhanced the experience. Thus, the multiple avenues for learning created a fun, interactive environment that was successful at optimizing education.

Contributing to the high quality of education available was the impressive number of faculty that are distinguished leaders in the field of pediatric orthopaedic surgery. Remarkably, each talk was delivered by *the* leader in that particular subspecialty. Each panel discussion involved *the* foremost practitioners in that area of interest. Having access to the information and thought processes of leaders within the field of pediatric orthopaedics was the single most notable point about IPOS. I was struck by the collective humility and approachability of the faculty; they openly welcomed discussion with residents and were eager to teach in the breakout sessions.

A **resident mentorship program and breakfast and discussion session** aimed at promoting a career in pediatric orthopaedic surgery further enhanced exposure of the residents to pediatric orthopaedics. Each resident was given the opportunity to partner with a faculty mentor for personal Q/A during a breakfast session as well as throughout the meeting. The result of these interactions with the faculty of IPOS was a resounding encourage-

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ment for the residents interested in going into the field. This uniformly increased the image of pediatric orthopaedic surgery among the residents and provided significant reinforcement of my decision to enter the field.

In summary, IPOS provided a great week away in central Florida learning about the treatment of pediatric orthopaedic conditions. No other orthopaedic subspecialty, in my experience, demonstrates the character, academic prowess, and collegial atmosphere that I was able to witness through IPOS. The education was superb and the manner of delivery made for a clinically applicable and fun experience. IPOS greatly exceeded my expectations as an educational conference and produced excitement for a future career in pediatric orthopaedic surgery.

Resident Profile: Aristides (JR) Cruz. PGY4 from Yale University in New Haven, Connecticut:

I had the opportunity to attend the IPOS meeting as both a third and fourth year resident. During my first meeting, I used the occasion to learn more about pediatric orthopaedics and help me decide whether it was a suitable fit for me. I left that meeting in awe of the "giants" of pediatric orthopaedics and was happy to put faces to the names whose articles and books I have read. This year, the meeting reinforced my career choice and the faculty members made me feel, through their affable and engaging personalities, that they were not only my role models but my colleagues.

IPOS truly was a symposium. It was a forum for the exchange of ideas regarding pediatric orthopaedics; it was a pediatric orthopaedic course, meeting, and conference all in one. The atmosphere was one of extraordinary collegiality with experts across the field sharing their experiences and recommendations regarding a variety of topics. The subject matter was broad and no matter what your taste, there was a flavor for you. For residents and fellows, the symposium provided an excellent review of common pediatric orthopaedic problems such as DDH, adolescent idiopathic scoliosis, sports injuries in the young athlete, and basic fracture management. For the more seasoned pediatric orthopaedist, discussions included more cutting-edge or controversial topics such as treatment of neglected orthopaedic conditions, exotic spine deformity correction, complex foot deformity management, and presentations of difficult cases.

Several Faculty and IPOS scholarship winners gather for a picture during the during the IPOS Scholarship Reception; joining the group is IPOS Chairman Dr. Jack Flynn (second from left) and POSNA Vice President, Dr. Peter Waters from Children's Hospital Boston (back and center).

IPOS 2009, *continued*

The meeting was relatively small with less than 300 attendees. This was an especially welcome aspect and I believe it helped foster a more intimate atmosphere which made it easy to approach and engage individual speakers. Each educational session placed a heavy emphasis on interaction and served as more of a seminar than a lecture. Several breakout sessions afforded participants hands-on learning experiences with implants and surgical techniques led by orthopaedists from various notable institutions— nothing equals learning the San Diego osteotomy directly from a San Diego faculty member. The pediatric orthopaedic community is a relatively small one which allows for intimate collaboration and "bouncing" ideas off one another. Meetings such as IPOS reinforce this community atmosphere.

Emphasizing the international aspect of IPOS, Mr. Nick Clarke from Sheffield England (center) and Pablo Casteneda from Mexico City (right) discuss the fine points of the Salter Osteotomy with 2 residents.

One of the most important aspects of IPOS for me was its focus on fostering the "young" pediatric orthopaedist. Ranging from the resident thinking about a career in pediatric orthopaedics to the fellow or junior attending just starting their careers, the meeting placed a special emphasis on these future leaders in the field. I was one of many fortunate enough to receive a scholarship in order to attend the meeting. Scholarship recipients were limited to residents and fellows and a **special scholarship recipient reception during the program introduced us to each other as future colleagues**. Each scholarship recipient was also paired with a mentor to meet with during the meeting. Applicants were able to use the mentorship as an opportunity to connect with a leader in pediatric orthopaedics and perhaps foster a relationship with that individual. The list of mentors was impressive and was essentially a who's who in pediatric orthopaedics.

As further testament to the meeting's emphasis **on the young pediatric orthopaedist, there was a breakout session addressing the "urban legends" of pediatric orthopaedics.** This was essentially a panel discussion regarding everything you ever wanted to know about a career in pediatric orthopaedics. Panelists addressed issues they encountered early in their careers, advice on how and what to look for in a fellowship and/or job, balancing clinical and research interests during your career, the future of pediatric orthopaedics, and opinions regarding The Match. This breakout session gave me an inside look at the careers of these role models as well as a feeling that I now have an inside track regarding how best to succeed in fellowship and beyond.

In summary, IPOS was a unique and fun meeting of a unique and fun field. If afforded the chance to attend the meeting in subsequent years, I would not hesitate to do so and I encourage all those interested in learning more about pediatric orthopaedics to make the trip as well.

Save the Date.

2010 IPOS
December 1 - 4, 2010
Orlando, Florida

2010 AAOS-POSNA SPECIALTY DAY
March 13, 2010
New Orleans, Louisiana
www.aaos.org

2010 POSNA HALF DAY COURSE
"Pediatric Trauma:
The Cases for Best Treatment"
May 4, 2010
Waikoloa, Hawaii
www.posna.org

2010 POSNA ANNUAL MEETING
May 4 - 7, 2010
Waikoloa, Hawaii
www.posna.org

CASE #2

A 3 year old boy has a 2 year history of non-progressive head tilt that is painless. Radiographs and a clinical photograph are presented (Figure 2a and 2b). The most likely diagnosis is:

A. Atlanto-axial rotatory subluxation
B. Klippel Feil Syndrome
C. Grisel Syndrome
D. Cervical Disc Calcification
E. Congenital Muscular Torticollis

Your Response: ___

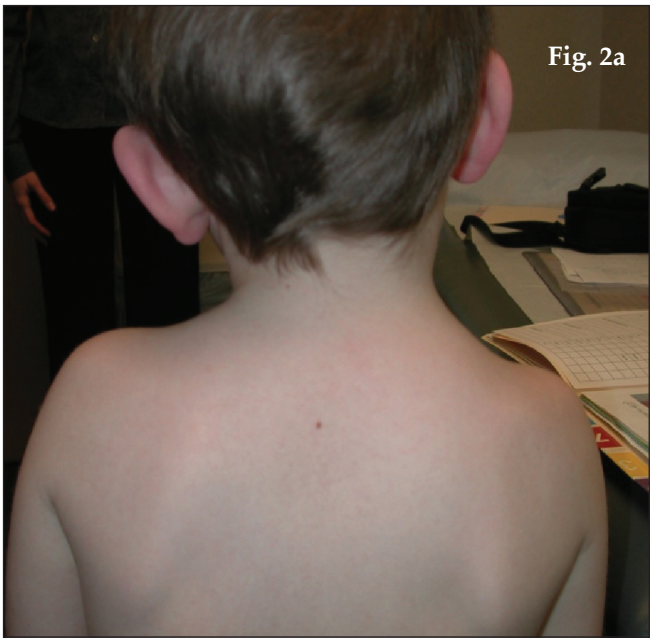
Fig. 2a

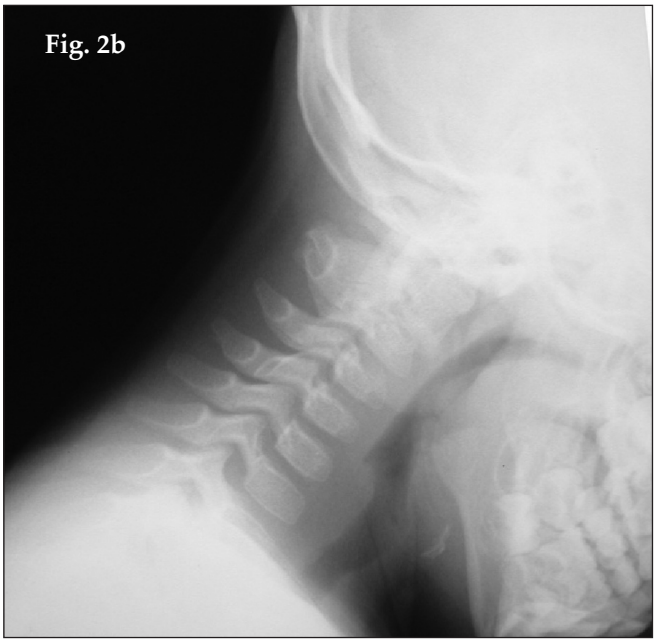
Fig. 2b

CASE #2, *continued*

Discussion

There are a host of different processes that can present with head tilt. The clinical picture demonstrates a child with webbing of the neck and low hairline. Radiographs demonstrate congenital fusion of C2 and C3. This constitution of findings is consistent with the diagnosis of Klippel Feil syndrome. Other findings in these patients may include Sprengel's deformity, hearing loss and renal anomalies. These children will have painless limits in neck motion and parents are instructed to avoid activities such as tackle football and gymnastics in order to prevent traumatic instability. Patients with atlanto-axial rotatory subluxation, Grisel Syndrome and cervical disc calcification will have pain in the acute setting. Children with congenital muscular torticollis may present prior to a year of age with a history of difficult birth trauma, swelling in the sternocleidomastoid muscle and without the physical examination and radiographic features here. These patients have head tilt and rotation which are opposite in direction.

The correct answer is B.

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Hedequist D, Emans J. Congenital scoliosis: a review and update. *J Pediatr Orthop*. 2007 Jan-Feb;27(1):106-16.

CASE #3

A 14 year old girl who is three years post-menarchal presents with complaints of back pain and deformity. Evaluation reveals a notable prominence on forward bending, a normal neurologic examination, and an otherwise benign examination. Radiographs show a 62 degree right thoracic curve with moderate hyperkyphosis on the lateral view. Pelvis is Risser 4. MRI of her spine and brain stem ordered by her pediatrician for pain was normal. The best initial treatment recommendation would be:

A. Initiation of bracing to control the deformity
B. Thoracoscopic instrumentation and fusion
C. Posterior spinal fusion
D. Vertebral stapling
E. "Growing rod" instrumentation to control the curve until the child is 18

Your Response: ___

Continued on next page

CASE #3, *continued*

Discussion

Idiopathic scoliosis is treated based upon the notion that curves greater than a certain level will continue to progress into maturity and cause problems later in life that are more difficult to treat. Therefore, treatment is contingent on the factors causing progression, namely growth and curve size. Patients with curves greater than 25 or 30 degrees with significant growth remaining are often treated with a brace. This child is mature, based upon menstrual status and Risser sign, therefore bracing is not indicated. Two fusionless technologies were also offered as choices (D,E). Without growth remaining, stapling, which harnesses the patient's growth to maintain/correct a curve, is not indicated. Along those lines, growing rod instrumentation is a treatment for immature patients with severe curves who are too young to undergo definitive fusion (infantile/juvenile). It is not helpful in this case.

For curves larger than 50 degrees at maturity, particularly if there is documented progression, surgery is often recommended. There are 2 possible options for surgical treatment commonly used in these cases. While anterior treatment, either open or thoracoscopic, can successfully treat these curves, it is often kyphosing and the correction maneuver consists of compression of the anterior column of the spine. This patient is hyperkyphotic, and may be made even more so by anterior surgery. Therefore the best answer is C, posterior spinal fusion.

The correct answer is C.

References

Upasani VV, Newton PO Anterior and thoracoscopic scoliosis surgery for idiopathic scoliosis. *Orthop Clin North Am.* 2007 Oct;38(4):531-40, vi. Review.
Schiller JR, Thakur NA, Eberson CP. Brace Management in Adolescent Idiopathic Scoliosis. *Clin Orthop Relat Res.* 2009 May 30.

CASE #4

A 13 year old girl presents with a 60 degree thoracolumbar curvature. Anterior spinal fusion is recommended and performed via a left thoracoabdominal approach from T11 to L3. The intraoperative course was unremarkable. Postoperatively, you are paged by an alarmed nurse who reports that the left foot is much warmer than the right foot which seems cool to touch. The most appropriate treatment is:

A. MRI to rule out spinal cord infarct leading to Brown Sequard syndrome from ligation of the segmental vessels
B. Vascular consultation to evaluate for possible Aortic injury and vascular insufficiency
C. Ultrasound for evaluate for venous obstruction
D. Observation
E. Warmed blankets and intravenous fluids and calcium channel blockers to relieve vasospasm.

Your Response: ___

Discussion

The thoracoabdominal approach involves detaching the diaphragm peripherally and dissecting in the retroperitoneal space. At the thoracolumbar level, the sympathetic chain lies on top of the vertebral bodies and often must be sacrificed or retracted in order to perform discectomy and fusion. This disruption of sympathetic tone causes vasodilation in the ipsilateral limb, in this case the left. Because of typical postoperative sympathetic tone in the extremities, they are often cool to touch. The involved leg is not, due to the disruption of the sympathetic chain, therefore it is abnormally warm compared to the opposite side. While this may be permanent, it is temporary in the majority of cases. Patients should be warned to expect this prior to a thoracoabdominal approach. Ligation of the segmental vessels is routinely performed and is a generally safe procedure, although cases have been reported that documenting neurologic dysfunction after ligation. Venous thrombosis would present with significant swelling, and with aortic injury, both legs would be involved.

The correct answer is D.

References

Tsirikos AI, Howitt SP, McMaster MJ Segmental vessel ligation in patients undergoing surgery for anterior spinal deformity. *J Bone Joint Surg Br.* 2008 Apr;90(4):474-9.
Orchowski J, Bridwell KH, Lenke LG. Neurological deficit from a purely vascular etiology after unilateral vessel ligation during anterior thoracolumbar fusion of the spine. *Spine* (Phila Pa 1976). 2005 Feb 15;30(4):406-10

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CASE #5

A 4 month old boy presents with a history of head turned to the right and tilted to the left. He was the product of a normal pregnancy and was delivered breach after significant efforts were made to extricate him from the birth canal. Examination reveals a mass in the sternocleidomastoid muscle on the left (Figure 5). Further studies of this patient would include:

A. MRI of the cervical spine
B. Ocular muscle examination
C. Hip examination and possible ultrasound
D. Scoliosis series
E. Dynamic CT scan in left and right rotation

Your Response: ___

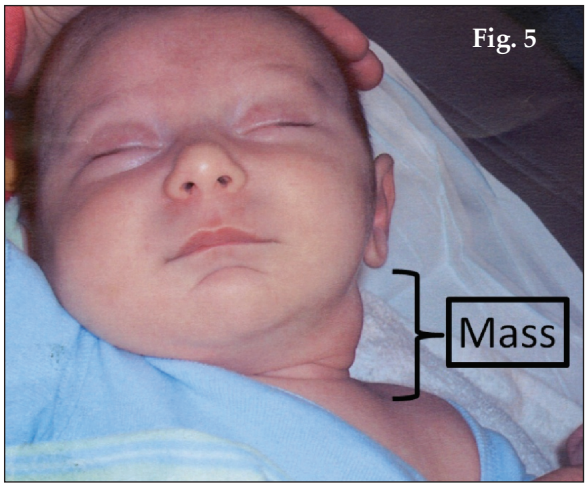

Fig. 5

Discussion

The patient most likely has a congenital muscular torticollis due to tightness of the right sternocleidomastoid (SCM). Some children may present with a mass in the SCM. 50-70% of cases respond well to physical therapy (PT) with resolution of head tilt when treated at this age. Although many recommend cervical spine radiographs to exclude the presence of congenital anomalies prior to beginning PT, their value may be limited as noted in a study by Snyder with only 4 true positives out of 502 patients imaged. Heideken found that 12.5% of patients with congenital torticollis have coexistent developmental hip dysplasia and this should be evaluated especially if other risk factors such as breach positioning are present.

The correct answer is C.

References

Snyder EM, Coley BD. Limited Value of Plain Radiographs in Infantile Torticollis. *Pediatrics.* 2006;118:1779-1784.
Heideken JV, Green DW, Burke SW, et al. The relationship between developmental dysplasia of the hip and congenital muscular torticollis. *J Pediatr Orthop* 2006;26:805-808.

CASE #6

A 14 year old boy presented to the emergency department with his neck rotated maximally to the left after a fall while skateboarding. All radiographs were negative for fracture. He is neurologically intact but is unable to turn his head. The following CT image (Figure 6) was obtained. Initial management should include:

A. Further imaging with MRI of the head and cervical spine.
B. Trial of chin traction and muscle relaxants
C. Open reduction and posterior spinal fusion of C1-C2.
D. Open reduction and anterior fusion of C1-C2.
E. Psychiatric consultation.

Your Response: ___

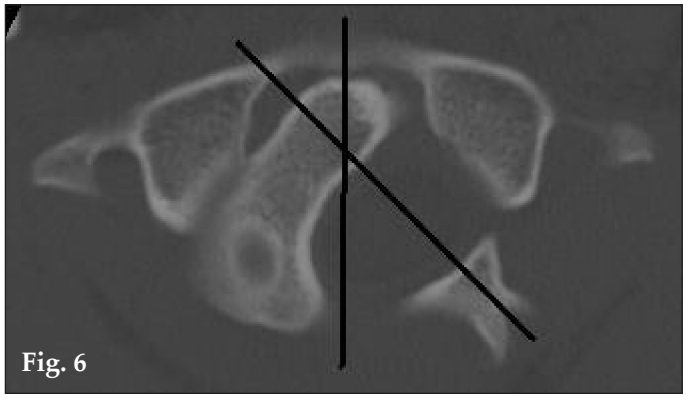
Fig. 6

Discussion

The CT image demonstrates atlantoaxial rotatory subluxation (AARS). The black lines have been drawn along the axis of C1 and C2 and although this amount of rotation can be normal, the lateral mass at C1 has subluxated off of C2 as noted on the left side of the image (patient's right). When identified acutely, this can respond to muscle relaxants and chin traction followed by hard collar if the subluxation resolves. If longstanding, reduction with traction alone becomes difficult and fusion of C1-C2 from an anterior or posterior approach may be required.

The correct answer is B.

References

Fielding JW, Hawkins RJ. Atlantoaxial rotatory fixation. *J Bone Joint Surg* 1977;59A:37-44.
Ishii K, Chiba K, Mariuwa H, et al. Pathogonomic and radiological signs for predicting prognosis in patients with chronic atlantotoaxial rotatory fixation. *J Neurosurg Spine.* 2006;5:385-391.

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CASE #7

A 15 year old boy presents with low back pain that is worse on extension. Forward bend test demonstrates severe Kyphosis and tight hamstrings; he has a negative straight leg raise. His lateral radiograph is presented (Figure 7). The most likely cause of his back pain is:

A. Tethered Cord
B. Postural Kyphosis
C. Disc herniation
D. Scheuermann's Kyphosis
E. Spondylolisthesis

Your Response: ___

Discussion

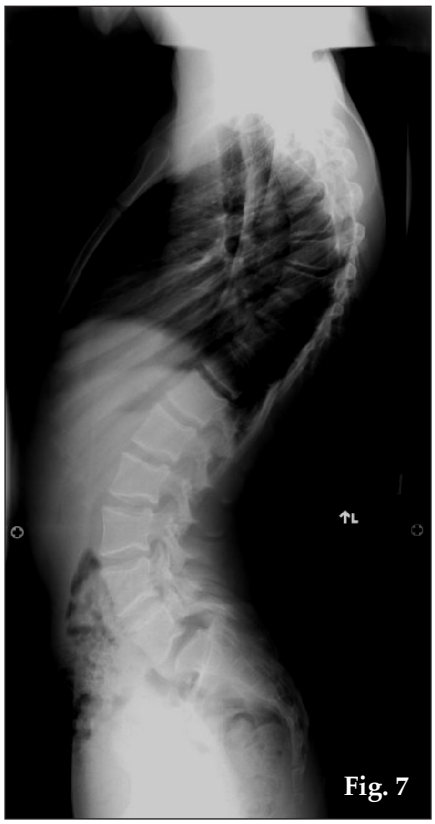

Fig. 7

This patient has both Scheuermann's Kyphosis (SK) and Grade 1 spondylolisthesis. Affected individuals with thoracic SK have wedging greater than 5 degrees at three adjacent segments and may have endplate irregularities such as Schmorl's nodes. This boy does not have postural Kyphosis. Tethering of the cord is very rare without congenital spine anomalies. Patients with herniated discs usually have severe leg pain. Most patients with thoracic SK have some low level pain in the thoracic spine while Spondylolisthesis patients have low back pain which is worse on extension.

The correct answer is E.

References

Aufdermaur, M.: Juvenile kyphosis (Scheuermann's disease): radiography, histology, and pathogenesis. *Clin Orthop Relat Res*, (154): 166-74, 1981.
Lowe, T. G.: Scheuermann's disease. *Orthop Clin North Am*, 30(3): 475-87, ix, 1999.
McIntosh, A., Sucato, DJ: Scheuermann's Kyphosis. *Current Opinion in Orthopaedics*, 18(6): 536-543, 2007.

CASE #8

The most common cause of proximal junctional kyphosis following surgical treatment for Scheuermann's kyphosis occurs in cases where there is:

A. Curve correction that is greater than 25%.
B. Failure to incorporate the proximal end vertebra.
C. Failure to incorporate the first lordotic disc.
D. Fracture of the transverse processes.
E. Anterior discectomy performed

Your Response: ___

Discussion

Although curve correction greater than 50% and excessive soft tissue dissection (particularly of the ligamentum flavum) have both been implicated in post-op proximal junctional kyphosis, failure to incorporate the proximal end vertebra is the most common cause. Failure to incorporate the first lordotic disc leads to distal junctional kyphosis. Anterior and posterior surgery results in less junctional kyphosis than posterior surgery alone.

The correct answer is B.

References

Denis, F.; Sun, E. C.; and Winter, R. B.: Incidence and risk factors for proximal and distal junctional kyphosis following surgical treatment for Scheuermann kyphosis: minimum five-year follow-up. *Spine* (Phila Pa 1976), 34(20): E729-34, 2009.
Lonner, B. S. et al.: Operative management of Scheuermann's kyphosis in 78 patients: radiographic outcomes, complications, and technique. *Spine* (Phila Pa 1976), 32(24): 2644-52, 2007.

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CASE #9

Scheuermann's disease is a heritable disorder, and the underlying inheritance pattern is thought to be:

A. Autosomal dominant.
B. Autosomal recessive.
C. X-linked dominant.
D. X-linked recessive.
E. None of the above.

Your Response: ___

Discussion

Several familial pedigree studies have shown that the inheritance pattern for Scheuermann's is autosomal dominant, with a complete penetrance pattern in boys, and incomplete in girls. A large twin cohort study has shown much higher concordance in monozygotic than in dizygotic twins. The responsible gene has not yet been identified.

The correct answer is A.

References

Axenovich, T. I.; Zaidman, A. M.; Zorkoltseva, I. V.; Kalashnikova, E. V.; and Borodin, P. M.: Segregation analysis of Scheuermann's disease in ninety families from Siberia. *Am J Med Genet*, 100(4): 275-9, 2001.

Damborg, F.; Engell, V.; Andersen, M.; Kyvik, K. O.; and Thomsen, K.: Prevalence, concordance, and heritability of Scheuermann kyphosis based on a study of twins. *J Bone Joint Surg Am*, 88(10): 2133-6, 2006.

McKenzie, L., and Sillence, D.: Familial Scheuermann disease: a genetic and linkage study. *J Med Genet*, 29(1): 41-5, 1992.

CASE #10

A 14 year old boy presents with mid lumbar pain that is worse on flexion. Physical examination demonstrates loss of Lordosis and tight hamstrings (Figure 10a). Radiographs and MRI are obtained (Figure 10b). The most likely diagnosis is:

A. Tuberculosis of the Spine
B. Bacterial Discitis
C. Leukemia
D. Spondylolisthesis
E. Scheuermann's Disease

Your Response: ___

Discussion

This boy has atypical Scheuermann's disease/ These patients have endplate irregularities in the thoracolumbar spine which can include undulations, erosions and Schmorl's nodes. As opposed to thoracic Scheuermann's disease; the atypical form has less deformity but may have more pain especially with activities in flexion. His MRI scan does not show changes typical for marrow replacement seen in leukemia and there is no spondylolisthesis. The MRI also does not reveal soft tissue masses or inflammation seen in infectious spondylitis.

The correct answer is E.

References

Tsirikos AI.Scheuermann's Kyphosis: an update. *J Surg Orthop Adv.* 2009 Fall;18(3):122-8

Betz RR. Kyphosis of the thoracic and thoracolumbar spine in the pediatric patient: normal sagittal parameters and scope of the problem. *Instr Course Lect.* 2004;53:479-84.

Wenger DR, Frick SL. Scheuermann kyphosis. *Spine* (Phila Pa 1976). 1999 Dec 15;24(24):2630-9.

Papagelopoulos PJ, Mavrogenis AF, Savvidou OD, Mitsiokapa EA, Themistocleous GS, Soucacos PN. Current concepts in Scheuermann's kyphosis. *Orthopedics.* 2008 Jan; 31(1):52-8; quiz 59-60.

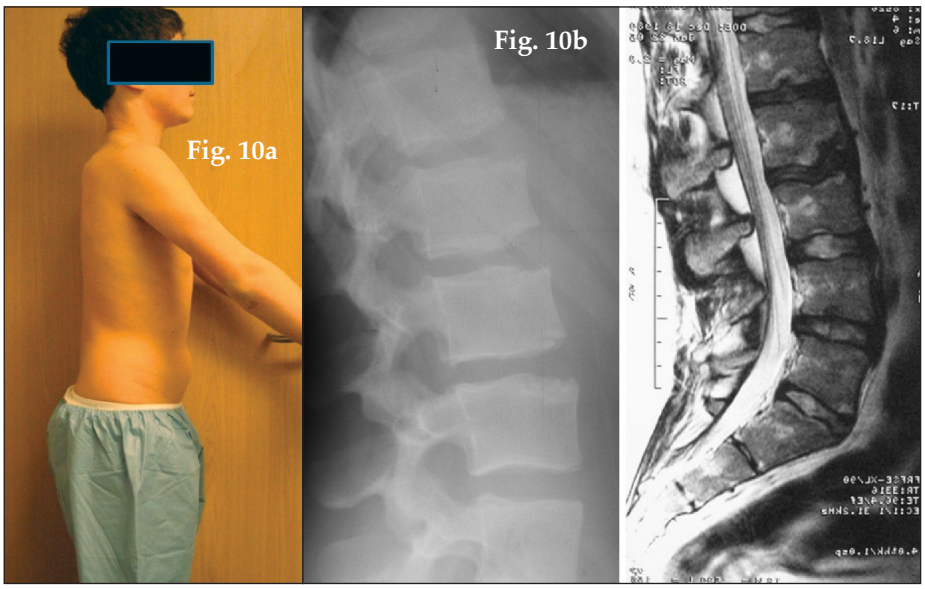

Fig. 10a

Fig. 10b

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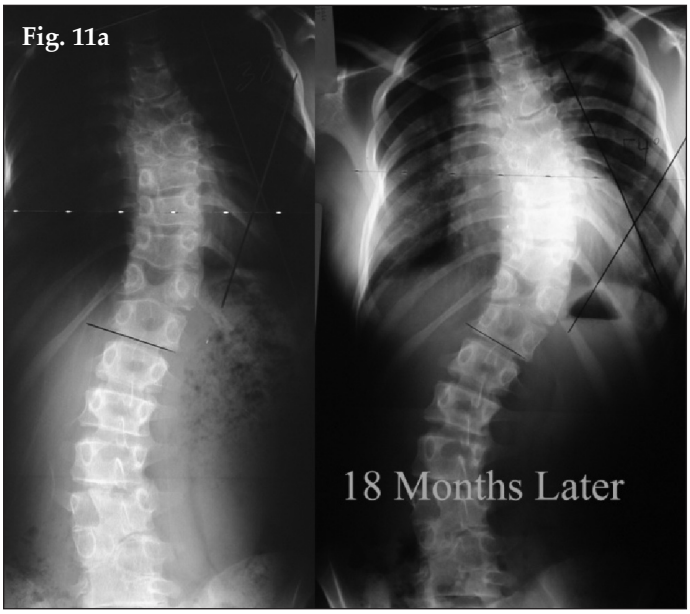
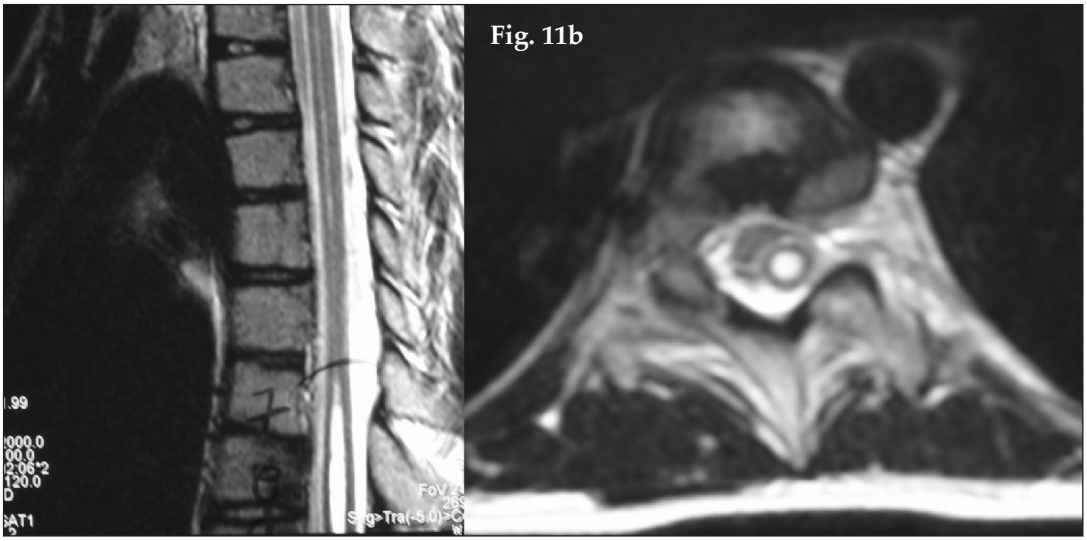
CASE #11

A 12 year old girl has had progression of her scoliosis over the last 18 months (Figure 11a). MRI evaluation was performed (Figure 11b). The most likely cause of her progression is:

A. Normal progression seen in idiopathic scoliosis
B. Block vertebra in the lumbar spine
C. Unsegmented bar in the convexity of the curve
D. Multiple hemivertebra on the concavity of the curve
E. Spinal Dysraphism

Your Response: ___





CASE #11, *continued*

Discussion

This young girl has congenital scoliosis which has progressed. Progressive congenital scoliosis may be a result of altered growth such as a bar which tethers growth in the concavity of the curve. Alternatively curvature may be due to increased growth due to hemivertebra on the convexity of a curve. Block or butterfly vertebra do not usually lead to curve progression. This child has curve progression as a result of the syrinx seen on her MRI scan. 20 to 30 % of children with progressive congenital scoliosis may have spinal dysraphism such as cord tethering, diastematomyelia, lipomeningeocele, Chiari malformation or a syrinx. These patients need referral to a neurosurgeon for treatment especially if corrective instrumentation is considered.

The correct answer is E.

References

Chan G, Dormans JP Update on congenital spinal deformities: preoperative evaluation. *Spine* (Phila Pa 1976).

Continued on next page

Challenging Cases: What Would You Do?

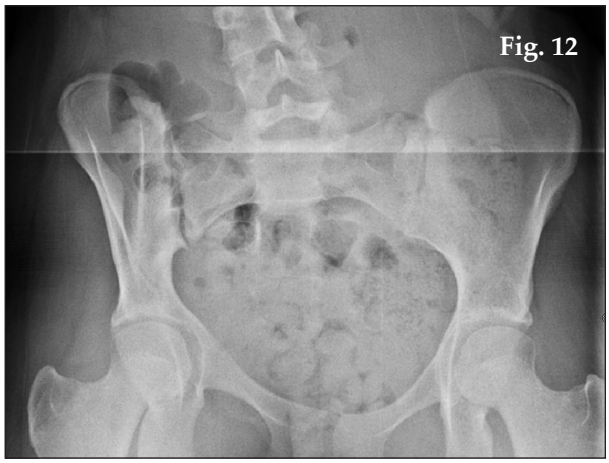
continued from page fifteen

CASE #12

A 13 year old healthy female was sent to you in consultation from her primary care physician who suggested a brace for idiopathic scoliosis. She is 2 years post menarchal and plays on the basketball team in school. Her spine films show a right thoracic scoliosis that measures 32 degrees with a compensatory lumbar curve of 20 degrees. Image of her pelvis is shown in Figure 12. What is the next step in your management?

A. TLSO brace to be worn 23 out of 24 hours
B. Charleston night time bending brace worn only while sleeping.
C. Milwaukee Brace worn 23 out of 24 hours
D. Observe and return in 4-6 months with repeat spinal radiographs
E. Plaster cast application

Your Response: ___



Discussion

This child is not a candidate for brace management for scoliosis. While brace management for scoliosis is controversial and there are ongoing prospective trials to determine its efficacy; it is only indicated for growing individuals. The indications do not include those patients that are skeletally mature. This patient is 2 years post-menarchal and she is a Risser 4. Both of those pieces of data clearly show that she is past her peak height growth velocity and thus not a brace candidate.

The correct answer is D.

References

Bowen JR, Keeler KA, Pelegie S. Adolescent idiopathic scoliosis managed by a nighttime bending brace. *Orthopedics.* 2001 Oct;24(10):967-70.

Janicki JA, Poe-Kochert C, Armstrong DG, Thompson GH. A comparison of the thoracolumbosacral orthoses and providence orthosis in the treatment of adolescent idiopathic scoliosis: results using the new SRS inclusion and assessment criteria for bracing studies. *J Pediatr Orthop.* 2007 Jun;27(4):369-74.

CASE #13

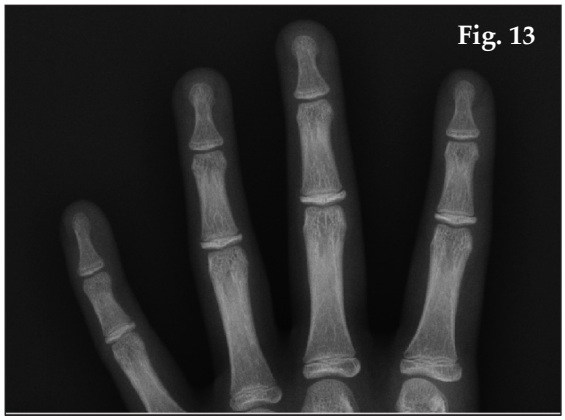
An 11 year old female presents to your clinic with a diagnosis of scoliosis. Her physical exam is unremarkable besides her right thoracic prominence. Radiographic examination of her spine reveals a 40 degree right thoracic scoliosis. The family wants to know about risk of progression. You also obtain a hand film to give the family more information (Figure 13). What is her risk of progressing past 50 degrees?

A. 100%
B. 0%
C. 50%
D. 15%
E. 75%

Your Response: ___

Discussion

According to her modified Tanner-Whitehouse maturity grade, the risk of progression is 15%. Figure 13 shows that the distal phalanx physes are closed and that the middle phalanx physes are open but capped. Capping refers to the position of the epiphysis in relation to the metaphysis. This method of maturity assessment was found to be the most reliable when compared to other traditional maturity assessment measures such as Risser sign and menarche.



The correct answer is D.

References

James O. Sanders, Joseph G. Khoury, Shyam Kishan, Richard H. Browne, James F. Mooney, III, Kali D. Arnold, Sharon J. McConnell, Jeanne A. Bauman, and David N. Finegold Predicting Scoliosis Progression from Skeletal Maturity: A Simplified Classification During Adolescence *J. Bone Joint Surg. Am.*, Mar 2008; 90: 540 - 553.

James O. Sanders, Richard H. Browne, Sharon J. McConnell, Susan A. Margraf, Timothy E. Cooney, and David N. Finegold Maturity Assessment and Curve Progression in Girls with Idiopathic Scoliosis *J. Bone Joint Surg. Am.*, Jan 2007; 89: 64 - 73.

James O. Sanders Maturity Indicators in Spinal Deformity *J. Bone Joint Surg. Am.*, Feb 2007; 89: 14 - 20.

Continued on next page

CASE #14

A 14 year old baseball pitcher presents with a three month history of low back pain. He denies any traumatic event but states the pain is worse with activity, relieved with rest and denies any radiation into his lower extremities. Physical exam reveals tight hamstrings and pain with lumbar hyperextension. Lumbar spine radiographs are normal. The next most appropriate study is:

A. DXA scan
B. CT of lumbosacral spine
C. HLA-B27
D. MRI of lumbar spine
E. Single-photon emission CT (SPECT) of lumbosacral spine

Your Response: ___

Discussion

The patient's history and physical exam are suggestive of spondylolysis. When plain radiographs are normal, the most effective method of detecting a stress reaction in the pars interacticularis is a SPECT scan. MRI is indicated when neurologic symptoms and signs are present. CT can be used to better define the bony anatomy after a positive SPECT scan. DXA or HLA-B27 would not be indicated.

The correct answer is E.

References

Bellah RD, Summerville DA, Treves ST, Micheli LJ. Low-back pain in adolescent athletes: detection of stress injury to the pars interarticularis with SPECT. *Radiology.* Aug 1991;180(2):509-512.
Lusins JO, Elting JJ, Cicoria AD, Goldsmith SJ. SPECT evaluation of lumbar spondylolysis and spondylolisthesis. *Spine* 1994, 19:609-612

CASE #15

An 11 year old girl present with a history of increasing back pain and difficulty with ambulation and increased urinary urgency and frequency. Physical exam reveals a flattened lumbosacral spine with sagittal malalignment, hamstring tightness, numbness on the medial aspect of her feet. Radiographs and MRI are shown in Figures 15a and 15b. Treatment should consist of:

A. Gill procedure
B. Physical therapy consisting of core back strengthening and hamstring stretching
C. In-situ non-instrumented fusion
D. Wide surgical decompression L5-S2 with L5 foraminotomies and fusion
E. Bracing consisting of a TLSO with a thigh cuff

Your Response: ___

CASE #15, *continued*

Discussion

The patient's history and physical exam are suspicious for a spondylolisthesis with neurologic findings. This is confirmed on the studies demonstrating a dysplastic spondylolisthesis (Wiltse type I) with the intact posterior elements of L5 slipping forward. The intact posterior arch of L5 is compressing the thecal sac against the posterior sacrum resulting in severe stenosis (Figure 15b). The dysplastic type of spondylolisthesis in a young patient carries a greater risk of progressive deformity. In view of this as well as the significant neurologic findings, surgery is indicated and should include a wide decompression and fusion. Because isthmic spondylolisthesis has a pars fracture, the posterior elements of L5 do not migrate forward with the body of L5 and thus do not lead to stenosis as seen in children with dysplastic spondylolisthesis.

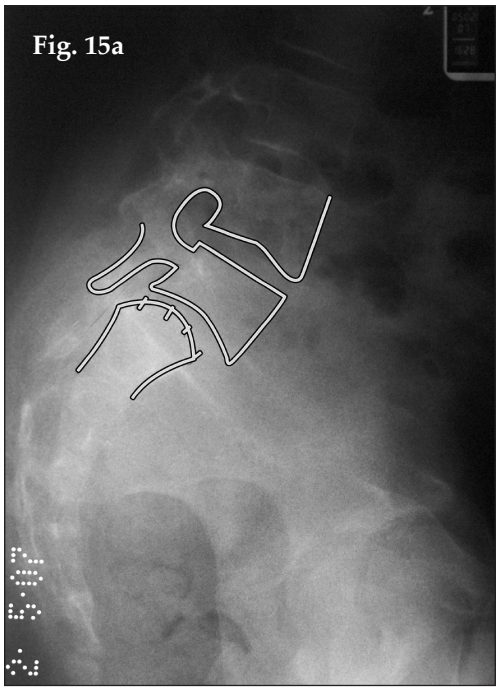


Fig. 15a

The correct answer is D.

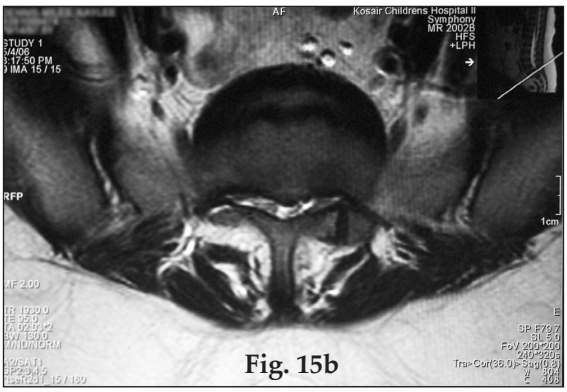


Fig. 15b

References

Cheung EV, Herman MJ, Cavalier R, Pizzutillo PD. Spondylolysis and spondylolisthesis in children and adolescents: II. Surgical management. *J Am Acad Orthop Surg.* 2006 Aug;14(8):488-98.

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CASE #16

The patient in Figure 16 is a 12 year old boy with Duchenne's Muscular Dystrophy and scoliosis measuring 24°. Regarding recommendations for spinal fusion surgery, which of the following is most appropriate to tell the family?

A. It is too late to perform surgery.
B. Surgery is recommended when the curve is 50°.
C. Surgery can wait until 60° depending on flexibility.
D. Surgery could be considered now based on the patient's pulmonary status.
E. Surgery is not recommended because of the patient's shortened lifespan.

Your Response: ___

Discussion

The critical factor regarding spinal fusion surgery in patients with Muscular Dystrophy is their pulmonary status as defined by pulmonary function tests, especially the Forced Vital Capacity (FVC) and Forced Expiratory Volume in one second (FEV1). If these values are significantly lower than 35% of the predicted values for a patient of similar age and size, the risk of the Duchenne patient failing to be successfully extubated post-operatively rises significantly, and may result in the patient requiring a tracheostomy.

Thus rather than a specific Cobb angle, the patient's pulmonary status is the critical factor determining the timing of surgery in DMD patients.

If the patient above has PFT's around 50% of predicted, surgery should be recommended even thought the scoliosis is of relatively small magnitude, and may be recommended with a curve size as low as 15°.

The correct answer is D.

References

F Shapiro and L Specht, "The diagnosis and orthopaedic treatment of inherited muscular diseases of childhood," *JBJS-A*: 75:439-454, 1993.
Mercado E, Alman B, Wright JG., "Does spinal fusion influence quality of life in neuromuscular scoliosis?" *Spine.* 2007 Sep 1;32(19 Suppl):S120-5.

CASE #16, *continued*

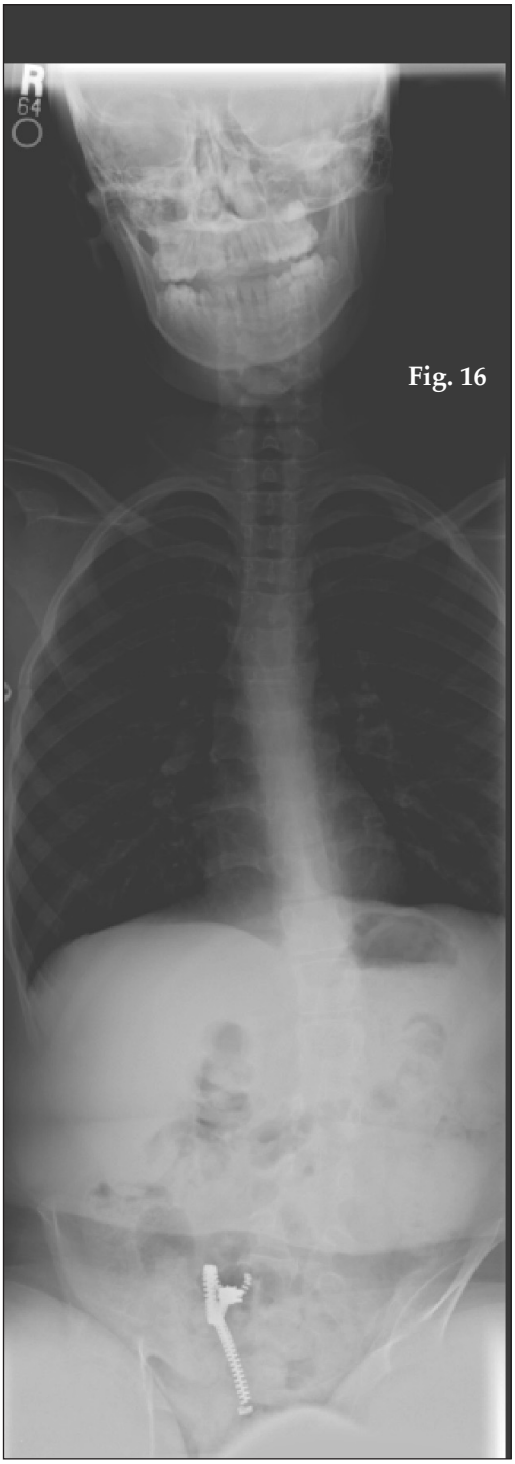

Fig. 16

CASE #17

A 16 year old male with scoliosis secondary to quadriplegic cerebral palsy has 91 degree lumbar scoliosis on sitting radiographs (Figure 17a) and which improves to 30 degrees with traction film (Figure 17b). The most reasonable treatment option is:

A. Fusion should be done anteriorly with instrumentation from T10 to L4.
B. Fusion should be done posteriorly with instrumentation from T2 to L4.
C. The patient should be started on night-time TLSO use with wheelchair bolsters during the day.
D. Fusion should be done posteriorly with instrumentation from T2 to the pelvis.
E. He should be referred to neurosurgery for consideration of baclofen pump removal.

Your Response: ___

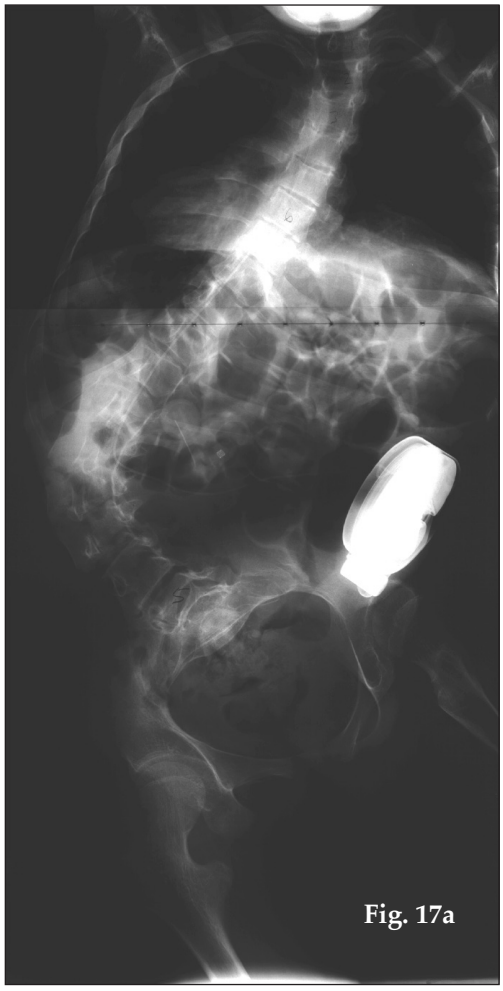

Fig. 17a

CASE #17, *continued*

Discussion

This patient has severe pelvic obliquity and since the goal of this surgery is to stabilize sitting balance, the instrumentation must include to the pelvis in order to correct the obliquity and optimize sitting posture. Non-operative methods to control this curve are fruitless and while a baclofen pump may help the patient with body spasticity: it will have no positive effect on his scoliosis if removed.

The correct answer is D.

References

James J. McCarthy, Linda P. D'Andrea, Randal R. Betz, David H. Clements, "Scoliosis in the Child With Cerebral Palsy,"
J Am Acad Orthop Surg, Vol 14, No 6, June 2006, 367-375.

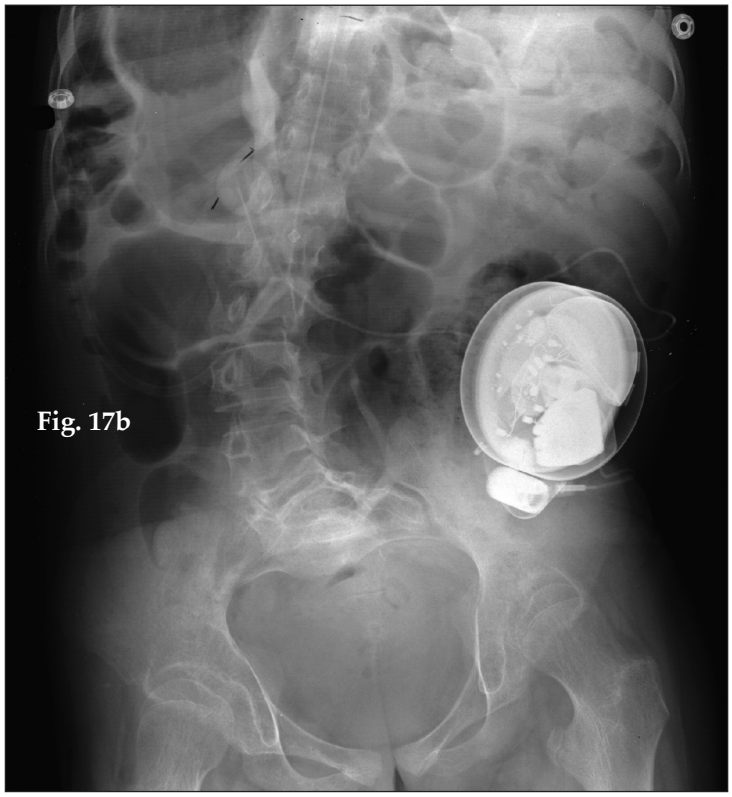

Fig. 17b