Message from the President

Embracing Change and Opportunity:

A Very Special Welcome to the Spine Society of Australia and to the New Zealand Orthopaedic Spine Society

The great Winston Churchill once said “To improve is to change; to be perfect is to change often”. While Winston was great, he wasn’t a surgeon. Change, especially in our surgical practice is not easy. As surgeons, we become set in our ways, and if a technique works, why would we alter it? The same can be said for our professional development; our insular success creates comfort in the status quo, and a disinclination for ongoing education and research. We as a profession must continually battle to embrace change and ensure excellence in education, research and care for our patients.

The Canadian Spine Society (CSS) and its annual national meetings have been highly productive and successful on many fronts; growing membership and attendance, acclaimed research and educational symposiums, and recently the launch of the CSS Registry, the Canadian Spine Outcomes and Research Network. Although our regional, subspecialty training, and practice differences provide a fertile educational and research environment – as time marches on, we are challenged to produce fresh ideas, energy, and most importantly new perspectives. So what changes could make the CSS better?

It was Geoff Coldham, a very talented spine surgeon, and good friend who suggested a combined meeting to me. Although I suspected ulterior motives when Geoff tagged “ski resort” on to the end of the discussion, the concept seemed a good one. Great surgeons, wonderful people, renowned academics from 3 unique countries, coming together in one place – what a rare opportunity! I brought it back to the CSS, and after ensuring the membership that Australians are not like Americans, and that the Kiwis acknowledge that hockey is a better sport than rugby, the 2014 combined meeting was a reality.

The SSA and NZS meetings are open and candid with vigorous debate, in a setting of collegiality and respect – basically the CSS with a funny accent. There is also a distinct desire and commitment to have fun with family and friends, a concept paramount to the CSS constitution… They do not, however, hold a Boat Race!

On behalf of the CSS, I have the distinct pleasure of welcoming our Australian and New Zealand colleagues to our great country, and one of the world’s most treasured locations. We thank you for taking the time and effort to travel a great distance and look forward to sharing ideas, experiences and research.

We must always strive to embrace change in our personal lives, our practice and our organizations - I am confident THIS change will lead to valuable collaboration, learning and research – with the ultimate goal of improving patient outcomes.

- Charles Fisher, CSS President

Charles Fisher, CSS President,
From the Editor

Welcome to the first issue of Spinal Columns for 2014. Once again we have included a number of varied and interesting articles. Sean Christie has returned with another fascinating case and we have a detailed report and discussion of an unusual spinal trauma. The clinical components of this issue are impressive and Ed Abraham’s typically thought provoking review of two pieces from the journals adds even more depth.

We are approaching our Annual Scientific Conference and for the first time in Spinal Columns we are advertising the educational Tier 1 Free Time Events available at Lake Louise. This is our initial Combined Conference and we want to make sure that all the aspects of the meeting are well publicized and accessible. It is shaping up to be a great success. The letter from our President, Charles Fisher, says it all. His perspective on our three Societies, from Australia, Canada and New Zealand is worth a read. I hope you will be able to join us and participate in all that is going on. Significant science and engaging interaction will combine to make this a memorable experience for everyone.

I know that all CSS members will appreciate the personal and heartfelt tribute to Bill Viviani from Paul Moroz.

Thanks to Stryker for sponsoring this issue; their paper on bone substitutes is timely and informative. Our publication is gaining popularity and readership, something we could not have achieved with the strong support of our industry partners. And that delicate relationship is the subject of this month’s Referred from the SI. It is a partnership that demands constant re-evaluation.

There is much more here, so enjoy your time with Spinal Columns. I know you will find something to keep you interested. And if you want a smile read the Anniversary Card to CSORN.

- Hamilton Hall

ABSTRACTS FOR PRESENTATION

at the 2014 Combined Spine Conference are available to download at www.spinecanada.ca

(Program CDs / handbooks will NOT be provided on site at the Conference.)
Caught in the Web

I would like to take this opportunity to wish all of my colleagues the very best for 2014. At the outset, I need to state that it was unfortunate, due to space restrictions, that I could not include all of the Canadian authors involved in podium and poster presentations at this year’s NASS meeting. You presenters, poster preparers and authors are welcome to write your own review about the work that you are doing or on any other pertinent spinal topic. This can be submitted to Spinal Columns and, undoubtedly, it will be considered for publication. Once again, my apologies for not listing all the names but please identify yourselves to either myself, Hamilton Hall (Editor-in-Chief) or Neil Barrington, Albert Yee or David Yen (Editorial Board). I believe that the editor and Editorial Board would agree with me in welcoming your contributions to Spinal Columns.

Silvestre et al., Degenerative Lumbar Scoliosis in Elderly Patients: Dynamic Stabilization without Fusion versus Posterior Instrumented Fusion, The Spine Journal, Vol.14:1, pg 1-10, January 2014. This paper from Bologna, Italy is an article worth reviewing if you are involved in treating degenerative scoliosis in the elderly. The authors make the distinction between degenerative scoliosis versus the pre-existing scoliosis that degenerates in adulthood. This is a series of patients either dynamically stabilized or fused using the strictest definition of degenerative lumbar scoliosis. They recognize the potential complications in this elderly group of patients who have associated co-morbidities and osteoporosis. It is a retrospective study but the number of patients provides reasonable power (57 in total, 45 female, 12 male, mean age 68 years). Forty two percent of these patients had an associated degenerative spondylolisthesis. Outcome measures consisted of the ODI, VAS, Roland Morris disability questionnaire, and radiological measurements of the scoliosis and lordosis corrections. They also looked at the frequency of adjacent segment degeneration. The authors’ want to compare dynamic stabilization without fusion and posterior instrumented fusion in the treatment of degenerative scoliosis in elderly patients in terms of perioperative findings, clinical outcomes and adverse events on the premise that the dynamic stabilization may be less morbid.

In the retrospective review, the two groups were identified but these patients were not randomized in any way. It was basically the surgeon’s choice to decide if they were going to have dynamic or traditional fusion. At an average followup of sixty four months clinical results improved similarly in both groups and there were no statistically superior differences between them, however, deformity correction was much better achieved in the fusion group versus the dynamically stabilized group, which incidentally was carried out with the Dynesys system. I think the most important result was that in the dynamic group the incidence of overall complications was lower (25% versus 44% in the fusion group) and fewer patients required revision surgery (6% versus 16%). Furthermore, lower average values of operative duration (190 versus 240 minutes) and blood loss (950 versus 1400cc) were ob-
Caught in the Web con’t

served in the dynamic group than in the fusion group.

The authors go on to conclude that in elderly patients with degenerative lumbar scoliosis, pedicle screw based dynamic stabilization was less invasive with shorter operative duration, less blood loss and lower adverse event rates than instrumented posterior fusion. Scoliosis curve reduction and lumbar lordosis were superior after fusion, however, dynamic stabilization achieved satisfying values for both of these parameters. The most important thing that they state was that these results were stable after an average followup of more than five years, which is impressive.

A number of interesting points come out in the article indicating the different styles of practice around the planet. First of all, with some of these elderly patients we all recognize the difficulty of making the decision to operate in the first place. The potential complication rate is always a concern. I think overall their complication rate was quite satisfactory and, in the entire group of 57 patients, only one patient had a postoperative cauda equina syndrome that required urgent surgery. There were no major complications other than that. The revisions that they refer to were relatively minor and only one of the revisions required a pedicle subtraction osteotomy, which is remarkable in this group of patients.

Perhaps not really related to the topic, these patients were treated with, on average, nine days of (prophylactic) antibiotics. I do not think that we do this in Canada but obviously that is open for discussion.

This is a difficult group of patients to study prospectively in a reasonable amount of time and I think that the paper is well done despite the negative aspects of a retrospective review. Dynamic stabilization and posterior fusions were performed in these patients by trying to preserve the pars interarticularis and not totally destabilize the spine during the decompression. I think this is an important point. Theoretically, dynamic stabilization should reduce junctional structural stresses, either proximally or distally, and hopefully reduce the need for revision surgery as a result of adjacent segment breakdown. This is just another study which is so desperately needed to help us answer the question with regards to how to prevent adjacent segment breakdown in these difficult cases.

This article is worth reading and I welcome your views on their conclusions. I would congratulate the authors for their efforts in trying to shed some light on this difficult situation.

Hoy et al., Transforaminal Lumbar Interbody Fusion (TLIF) versus Posterolateral Instrumented Fusion (PLF) in Degenerative Lumbar Disorders: A randomized clinical trial with two year followup, The European Spine Journal 2013: September No.22, Issue 9, pg 2022-29, aims to analyze the outcome with respect to functional disability, pain, fusion rate and complications of patients treated with TLIF compared to instrumented posterolateral fusion alone. The authors note that spinal fusion is a very common procedure for varying types of degenerative disorders with widely conflicting results. Some believe that circumferential fusion could improve functional outcome although this has not been proven. The methods in this paper consist of a prospective randomized clinical study with a two year followup enrolling 100 patients who had low back pain and radiculopathy. The article describes the patients being randomly selected for either “posterolateral lumbar fusion (titanium TSRH) or transforaminal lumbar interbody fusion (titanium TSRH) with anterior intervertebral support by tantalum cage (Zimmer)”. I was not clear in this article as to whether or not the TLIF group had, in addition, a posterolateral intertransverse fusion as part of what
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they called the circumferential fusion. The primary outcome scores were obtained using Dallas Pain Questionnaire (DPQ), ODI, SF36 and low back pain rating scale. All of these measures were assessed at the end point, two years after surgery. The overall follow-up rate was 94%; 51 patients had a TLIF and 47 patients had a posterolateral fusion. Mean age of TLIF was 49 years. Mean age of posterolateral fusion was 45 years. The authors stated there was no statistical difference in outcomes between groups concerning daily activities, work and leisure activities, anxiety and depression, or social interest. There was no statistical difference concerning pre or postoperative back or leg pain in both the TLIF and PLF groups. In both groups there were significant improvements in functional outcome, back pain and leg pain compared to the preoperatively scores. Operative time and blood loss in the TLIF group was significantly higher than in the posterolateral fusion group but there was no statistical difference in the fusion rate.

The authors concluded that transforaminal lumbar interbody fusion did not improve functional outcome in patients compared to posterolateral fusion. Both groups improved significantly in all categories compared to preoperatively. Operative time and blood loss were significantly higher in the TLIF group.

This argument keeps reappearing about every ten years or thereabouts. I personally believe that the difference is so small between interbody fusion and posterolateral fusion, both clinically and radiologically, that it is almost impossible to measure. I would have to take another look at the article and perhaps pose questions to the authors but one of the concerns that I have is that a specific group of spondylolisthesis patients or patients with segmental instability may have benefited more from the interbody fusion component of the operation. It is has been shown in numerous studies, and in my own experience, that spondylolisthesis improves radiographically with interbody fusion compared to posterolateral fusion alone. Whether or not this translates into a clinical improvement remains debatable however.

Once again, I strongly suggest that all the would be authors in the CSS contact me or the Editors with their thoughts or articles that they want present.

Comments always welcome!

- Ed Abraham
Dear Colleagues,

On behalf of the CSREF Executive Board, we would like to wish you all a very Happy New Year and a productive, successful 2014. In the last issue of Spinal Columns we presented a pie chart of the breakdown of CSREF donations by members, industry, patients of CSS members and the miscellaneous group. At the time of that publication, 60% of the donations were from industry, 32% from the membership.

It is obvious that, with some effort, we have the potential to tap into the patients of CSS members, many of whom would be very willing to make a donation. To take it to another level, the miscellaneous category really represents the community, local industry and corporate sponsorship outside of the orthopaedic/neurosurgical spinal industry.

First things first, however. I feel that the emphasis now needs to continue with our efforts promoting CSREF and CSORN to industry, to the membership and to our patients. The community effort will follow.

In the last issue as well, there was a pie chart of the CSS member donations by province. This was one that we were a little reluctant to publish but, nevertheless, an image of what is going on across the country is important for our membership to see. This pie chart is available for your perusal but I will indicate the provinces that have contributed more than 10% of member donations. They consist of Ontario (23%), Alberta (21%), New Brunswick (20%), British Columbia (16%) and Quebec (12%). There are some glaring results here which are open for discussion but rather than being overly critical of individual provinces, I would simply like to remind our readers and membership to take a look at this pie chart and ask yourself the question “Have I made a donation to CSREF?” If you have not then you need to seriously consider this in the near future.

My personal opinion is that it is next to impossible for you to engage your patients on a fundraising mission when you have not made a donation yourself. Furthermore, I believe it is hypocritical to talk to industry about a donation when you personally have not made a contribution.

We have a number of new initiatives to try to improve the patient aspect of our donor list that will be presented at the next annual general meeting but they are not worth much without our members support.

That is the end of my lecture. I would like to thank all of our past donors, at all levels, including the membership and industry. Finally, for your perusal, the last Spinal Columns, has a list of our donors. I would like to see this list grow longer (and it has) and ideally we need 100% of our membership on that list. In the up to $1000 column, I see four names on that list that are relatives of mine whom I canvassed to make a donation to help support our efforts in Canadian spinal surgical research. It was just a short email. So, to any member who has not yet made a donation, I would suggest that you do so and follow this up by trying to get some support from family members and patients. The instructions for donation are simple and are included with this article.

Actually as you see my lecture hasn’t ended. And before it does, our Board, Chris Bailey, Richard Fox, Jerome Paquet and Michael Johnson or Jennifer Edwards will be happy to discuss the details of your donation.

Thank you for your consideration and your financial contribution.

- Ed Abraham
As you know, the Canadian Spine Society, in conjunction with the Rick Hansen Institute, is reconstructing the National Spine Registry, which has come to be known as the Canadian Spine Outcomes and Research Network - CSORN. This is an immense task and one that will require significant monetary resources. The Canadian Spine Research & Education Fund has accepted the essential role of funding this project. To honour this commitment we require help from those most intimately involved with the provision of spinal treatment.

Please plan to make a personal annual donation and consider canvassing your patients and colleagues to join your charitable efforts. Promotional materials (patient solicitation letters, brochures, etc) are available through the CSREF office; contact us today.

CSREF EXECUTIVE BOARD 2013/14

Chair: Edward Abraham, Secretary/Treasurer: Christopher Bailey
Directors: Richard Fox, Jerome Paquet, Michael Johnson

Contact the CSREF:
Executive Assistant / Accounting: Ms. Jennifer Edwards
Email: csref@spinecanada.ca Phone: (519) 986-1459 Fax: (519) 986-2656

Canadian Paediatric Spine Study Group (CPSSG): Report to the CSS

Canadian paediatric spine surgeons are gearing up to the upcoming combined meeting at Lake Louise in Feb of 2014 with regular tele-conferences, meetings and workshops ongoing throughout the year. Listed below are a few of the highlights to date:

Ongoing discussions within the CPSSG in regards to the paediatric component of the CSS led, national-based spine-surgery fellowship education curriculum. Led by CSS Education Chair Dr. Albert Yee and his working group, which includes CPSSG member Dr. Doug Hedden, the working group has worked hard to continue development of the curriculum. Dr. Yee has circulated the curriculum outline asking for comment and while the relevant sections on paediatric spine are included, including the use of traction and closed reduction for early onset scoliosis, there are some additions required in particular in regards to knowledge of specific spinal growth issues. This discussion will take place at the Lake Louise CPSSG meeting.

Dr. Ron El-Hawary, former President of the CPSSG, hosted a Symposium in Halifax, NS, on Oct 25 – 26, 2013, entitled: “Perspectives on Paediatric Spinal Deformity”. The course focused on controversies within the subspecialty of paediatric spine deformity surgery, including early onset scoliosis. Guest faculty included Dr. Charlie Johnston from Texas Scottish Rite Hospital, Dr. Hubert Labelle from Montreal and Dr. Douglas Hedden from Edmonton.

The Canadian Spine Research and Network Outcomes (CSORN) Proj-
Canadian Paediatric Spine Study Group (CPSSG): Report to the CSS con’t

ect - is the national spine registry project started by the CSS and led by Dr C. Fischer from UBC and Greg McIntosh from Toronto who has been hired on a contract basis by the CSS to manage the registry. There are 17 adult spine sites registered with a data sharing agreement and 7 sites are collecting and entering data right now. The CPSSG discussed a paediatric registry at last year’s Mont Tremblant meeting and further discussion was held at a meeting of Drs. Stefan Parent, Paul Moroz and Michael Johnston at the Winnipeg COA to further development of a paediatric module for a national CSS registry. Dr. Michael Johnston has been a great resource for this as he spans the paediatric/adult spine population and has already started collecting data for his adult patients. Further discussion in this area will occur in Lake Louise.

Dr. Paul Moroz, current President of the CPSSG, was an invited speaker to the 6th Annual Meeting of the Canadian Association of Neurological Monitoring (CANM), held at the Chateau Laurier Hotel in Ottawa, Oct 4 – 5, 2013. Dr. Moroz spoke to the CANM membership about issues relevant to CPSSG and CANM, including issues relevant to both groups such as the role of guidelines and national standards of care for neuro-monitoring. The title of the talk was “A Plea for an Evidence-Based Approach to All Things Spine”. He also discussed the use and need of a national registry for spine patients in order to promote an evidence based approach to not only clinical care but also patient safety and quality assurance.

The CPSSG Research Committee were pleased to have selected 2 projects from 5 submissions which fulfilled criteria to win a $10,000 CPSSG research grant. The group leg by Dr. Carole Fortin including Dr. Eric Parent, Dr. Debbie Feldman and Dr. Marie-Elaine Poliquin were funded for their project: Responsiveness of a new standardized clinical photographic posture assessment method in children and adolescents with idiopathic scoliosis. The second winning submission was from the Edmonton group led by Dr Edmond Lou with Dr. James Jarvis, Dr. Marc Moreau, Dr. Doug Hedden, Dr. Jim Mahood, Doug Hill and Jim Raso, entitled “Correlation of the Brace Compliance and the In-Brace correction for the treatment of Adolescent Idiopathic Scoliosis”.

Drs Douglas Hedden and Jonathan Norton announced an Intraoperative Monitoring Course in Edmonton, January 17 – 18, 2014, including animal models and hands-on monitoring experience.

- Paul Moroz

REGISTER FOR THE
2014 Combined Spine Conference of the
Canadian Spine Society, New Zealand Orthopaedic Spine Society, Spine Society of Australia
at
www.spinecanada.ca

Navigating the Future of Minimally Invasive Spine Surgery
Inaugural World Boat Race Championship Set for Lake Louise CSS Combined Meeting

With the first ever World Boat Race Championship a little over one month away excitement is mounting to the point where they have constructed a temporary shelter at Lake Louise to host the expected overflow of overseas media personnel. Despite the media frenzy the National Teams have remained relatively calm and not strayed from their rigid training schedule; a schedule deep in tactical adjustments due to the higher altitude location. In addition to the thinner air the Kiwis and Australians also face the daunting task of dealing with the dramatic shift in ambient temperature as they leave the comforts of late summer and arrive in the frigid Rocky Mountains. This should be overcome by both the countries coming out of their peak beer drinking seasons; so no ramp up for them. For the Canadians it is a different story as Canadian Manager Sean Christie must juggle his team a bit due to some late rule changes to accommodate the visitors.

The World’s will be a 4 team competition with 5 members on each team. We hope having the extra member might reduce spillage and projecting from some of the weaker team members. Each team must have one senior attending spine surgeon age 40 or over. The Canadian contingents cannot have more than one industry representative. As a gesture of good-will the Australians and Kiwis can have two. The remainder of each team can be made up of Trainees (fellows, residents, research associates, nurses). Each team will be allowed to make one substitution for the consolation and championship final. Probably the hardest part for Dr. Christie, the defending Canadian Champion, is that to level the playing field there will be a Canada West and Canada East Team. Although he felt confident with his power house East Team anchored by their All Pro future hall of famer Guy Hogan, not being able to bolster the team with some high altitude specialist from BC and Alberta has Dr. Christie concerned. Furthermore with little help expected from chronically anaemic Ontario and Quebec, Dr. Christie has had to relinquish control of the Canada West Team to 2012 Championship Manager John Hurlbert. With the altitude and reduced travelling time, surely Canada West must be going in as the early favourites.

No matter who walks away with the first ever World Boat Race Trophy this year promises to be an entertaining, spirited and hopefully charitable event. With over $15,000 raised from the 2013 CSS Boat Race event going to bolster the CSREF, we are hopeful we can increase that amount this year. So get primed to represent or cheer for your team and your country; and to have a lot of post-banquet fun while supporting the Canadian Spine Research and Education Fund.

- Charles Fisher
What the … ?!?!?

This is the column that was first started in the February 2012 edition of Spinal Columns, that I hope has proved to be both entertaining and educational for us all. In every issue of the newsletter, I will continue to present something weird and, hopefully, wonderful. For the most part this will comprise a brief clinical history and some unusual imaging. The challenge is to correctly identify the diagnosis and propose a brief management plan. I would invite people to send me their thoughts in an email (sean.christie@dal.ca). I will provide the “answer / final diagnosis” in the following issue of Spinal Columns, along with a list of “winners” (sorry – nothing but bragging rights for this one!). Enjoy!

Case 6: (published in August 2013):
A 59-year old retired Navy radar technician presented with complaints of intermittent numbness and neuropathic pain in both thighs for 8 years. Over the previous 3 months he noticed a more rapid onset of weakness in his lower extremities, to the point that he progressed from ambulating independently to using a cane, walker then ultimately relying on a wheelchair. He also reported worsening of the numbness from his coccyx downwards. Urinary urgency and incontinence were noted, however, he did have preserved sensation of bladder fullness and emptying. He had developed erectile dysfunction over the past 5 years. Bowel function and subjective perineal sensation were normal. His past medical history is significant for type 2 diabetes, hypertension, obesity, non-alcoholic fatty liver disease, and dyslipidemia. Medications included a statin, anti-hypertensives, oral hypoglycemics, and vitamins. He is a non-smoker and does not consume alcohol. Family history is non-contributory.

On examination he is 5’10” and weighs 265 lbs (BMI 38). He was only able to walk a few feet with significant assistance. There was no tenderness to palpation of the lumbar spine. His motor examination demonstrated the following abnormalities: Right Hip Flexor (3/5), Right Knee extensor (4/5), Left Hip Flexor (4+/5), Left Knee extensor (4+/5). All other myotomes were of normal power (5/5). Sensation was diminished to light touch and pin-prick from the umbilicus downwards, including the perineal area. Knee and ankle reflexes were symmetrical bilaterally (2+). There was no clonus and the Babinski response was equivocal. Voluntary rectal tone was diminished, but involuntary tone was preserved.

His bloodwork was within normal limits and prior CTs of his thoracolumbar spine showed mild lumbar stenosis. MRI of his cervical spine was normal. Thoracic MRI is displayed in Figures 1 and 2.

What is included in your differential? What are the next steps?

Figure 1: Sagittal T2 weighted thoracic MRI image. Interpreted as showing spinal cord swelling, with edema and a small syrinx.

Figure 2: Sagittal T1 weighted thoracic MRI images, pre- (A) and post- (B) gadolinium enhancement. Interpreted as showing mild enhancement in cord (indicated by arrows).
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ANSWER – CASE 6

These reviews were prepared with the assistance of Dr. Greg Jenkins (neurosurgery resident) for Case 6 and Dr. Julia Radic (neurosurgery resident) for Case 7. Their help is acknowledged and appreciated. (published in August 2013)

Case Review

A 59-year-old male with an 8-year history of bilateral thigh numbness and paresthesias. More recently he developed constipation, urinary urgency, and bilateral lower extremity weakness such that he required a walker for ambulation. MRI revealed thoracic spinal cord edema, swelling with associated syringomyelia. There was mild enhancement within the cord.

Work-up, Treatment and Outcome

The patient underwent an open biopsy of the enhancing material within the thoracic cord. A highly vascularized cord, but no gross neoplastic lesion was identified (Figures 1 and 2). Pathology revealed thick walled hyalinized vessels with interspersed normal glial tissue; no neoplastic features were identified (Figure 3).

Post-operatively, he underwent magnetic resonance angiography (MRA). This showed normal radicular arteries without evidence of early venous filling or prominent vessels over the surface of the cord. A catheter spinal angiogram was then arranged, which revealed a fistula and early filling of the perimedullary veins (Figure 4). The fistula was embolized and a repeat angiogram demonstrated complete obliteration (Figure 5).

Immediately following embolization, the patient’s power improved in the lower extremities. He was discharged to the inpatient rehabilitation facility for further therapy. He is currently back at home, ambulating without the use of aids and independent with all activities of daily life.

Figure 1: Intra-operative photo of thoracic spinal cord demonstrating increased vascularity.

Figure 2: Intra-operative photo of thoracic spinal cord. No neoplastic lesion was identified.

Figure 3: Pathology specimen showing thick, hyalinized vessels with interspersed normal glia in keeping with vascular malformation. No neoplastic features were identified.

Figure 4: Catheter angiogram with injection into left L2 radicular artery showing a dural branch, fistula and early filling of perimedullary veins of subarachnoid space.

Figure 5: Catheter angiogram with injection into left L2 radicular artery after glue embolization showing obliteration of the dural branch and fistula.
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Case 7 - New
These reviews were prepared with the assistance of Dr. Greg Jenkins (neurosurgery resident) for Case 6 and Dr. Julia Radic (neurosurgery resident) for Case 7. Their help is acknowledged and appreciated.

History:
This 55 year old woman has a past medical history of Marfan’s syndrome, thoracolumbar scoliosis (figure 1), dural ectasia (figure 2), and aortic root surgery with an aortic valve replacement by a mechanical valve. She is maintained on warfarin. She slipped and fell while curling, and developed acute onset lower back pain, radiating down both legs to her feet. Over the next 24 hours she developed perineal numbness and tingling, and urinary incontinence. She could not feel herself voiding. She had not had a bowel movement since the fall. She had no numbness or weakness in the legs, and had no problems with walking. She presented to the emergency room 48 hours after her fall.

Physical exam/Laboratory Findings:
She had normal mental status, cranial nerve, cerebellar and motor exam. Reflexes were 2+ with downgoing toes bilaterally. Sensation was intact to S2, but she had absent light touch and sharp dull sensation in her perineum bilaterally. Voluntary rectal tone was normal. Her post void residual was 450 ml. Her INR was 2.7 and PTT was 43, both elevated.

Imaging:
A pelvic x-ray showed well corticated expansion of the sacral canal and no acute fracture (figure 3). A CT of her lower lumbar spine and sacrum (figure 4) and an MRI (figure 5) were obtained. An enhanced MRI of her entire spine did not show any enhancing lesions or vascular malformations.

Course in Hospital:
Her warfarin was held and her INR slowly weaned down in consultation with cardiology. She was started on heparin once she proved to be neurologically stable as per cardiology’s request, because of her having a mechanical heart valve. She was brought to the OR the next morning once her INR was normalized for exploration, decompression and evacuation of hematoma. She underwent L2, L5, and sacral laminectomies, and evacuation of L5 epidural hematoma (figure 6A). Her dura was purple, demonstrating significant intradural hemorrhage (figure 6B). A durotomy was performed at L5, and there was an attempted evacua-

Figure 1: X-ray showing significant thoracolumbar scoliosis

Figure 2: A) Sagittal and B) axial T2 MRI lumbosacral spine views showing dural ectasia.
tion of intradural blood at this level with irrigation through an EVD catheter and a Penfield 4 instrument. However, the clot was very thick and was embedded with nerve rootlets and so clot evacuation was limited. Because of pressure on the dura, a Duroguard patch graft was used to close the L5 durotomy. A lumbar drain was inserted under direct vision at L2 and tunneled to the skin. While performing the L2 laminectomy, the right L2/3 facet joint was entered. This was filled with autograft from the laminectomies at the end of the case, to promote fusion. No synovium or joint material was seen during the bone dissection, suggesting this joint was possibly already fused.

The lumbar drain was left in place for 7 days. After the drain was removed she was restarted on warfarin and the heparin infusion was stopped once her INR was therapeutic. She was fitted with a TLSO brace to support bony fusion of her right L2/3 facet after the drain was removed as well.

Her post-operative exam was unchanged from pre-operative, though she subjectively felt some perineal sensation and new rectal neuropathic pain. There was no return of normal sensation. She continued to require regular in and out catheterization. She was discharged to a rehabilitation facility.

Figure 3: Pelvic xray showing no acute fracture.

Figure 2: A) Sagittal and B) axial T2 MRI lumbosacral spine views showing dural ectasia.

Figure 4: A) Axial and B) sagittal CT scans showing hyperdensity in the spinal canal and a distended urinary bladder.
Figure 4: A) Axial and B) sagittal CT scans showing hyperdensity in the spinal canal and a distended urinary bladder.

Figure 5: A) Axial T2, B) sagittal T2, and C) sagittal T1 FLAIR MRI images of the lumbosacral spine.

Figure 5: A) Axial T2, B) sagittal T2, and C) sagittal T1 FLAIR MRI images of the lumbosacral spine.
ABSTRACT
Calcium-based bone void fillers have a long history of use for the repair of bone defects. Most of the calcium phosphate–based materials available for repair of bone defects in nonweight-bearing skeletal sites exhibit use- and performance-related characteristics that are less than ideal because of suboptimal porosity. Such characteristics include handling limitations, variable biologic behavior, and inadequate resorption characteristics. New generation cancellous bone void fillers have been developed that overcome many of these limitations. One ultraporous scaffold is constructed from nanometer-sized particles of synthetic β-tricalcium phosphate (β-TCP). This next-generation ultraporous β-TCP (VITOSS®) has optimal osteoconductive properties leading to more rapid new bone growth and highly efficient scaffold resorption.

INTRODUCTION
Calcium-based materials have been used as bone substitutes for over a century. Most of the available formulations are based on naturally occurring materials. Interest in bone implants with high, interconnected porosity to stimulate bone growth led to the development of constructs utilizing marine coral (calcium carbonate), which can be converted chemically into hydroxyapatite (HAP) or tricalcium phosphate (TCP). Porous TCP was first used in 1919 to promote osteogenesis. In the 1970s, animal models showed calcium phosphates to be nontoxic biocompatible materials that stimulated intraporous bone ingrowth. Although several calcareous materials are now available for repair of nonload-bearing bone defects, most of these materials have less than ideal porosity for best performance. Drawbacks include handling limitations, variable biologic behavior, and inadequate resorption characteristics. New cancellous bone void fillers have been developed to overcome these issues. One recently introduced material is ultraporous β-TCP or UP-TCP (VITOSS®). The size of its primary particles and the proprietary shape of its final structure optimize the osteoconductive properties, leading to 3-dimensional new bone formation, as opposed to creeping substitution, and a more efficient and timely scaffold resorption. This UP-TCP contains a very high degree of porosity (≈90%); its interconnecting pores of varying sizes optimize new bone growth and remodelling throughout the scaffold and facilitate concurrent resorption of the implant.

As a bone substitute, porous β-TCP can be used in the form of granules, blocks, and preformed shapes. When placed in contact with viable bone, its porous structure provides a scaffold for rapid penetration and growth of connective tissue and new bone. The ability to fashion blocks and arrange granules of this material to fill residual bone recesses of any size or shape increases the surgeon's ability to optimize bone repair.

POROSITY OF SYNTHETIC BONE SUBSTITUTES
Solubility and implant resorption are affected
Porosity as a Critical Determinant of Nextgeneration Calcium-Based Bone Substitutes con’t

by the physical properties of calcium-based bone grafting materials. Such factors include crystal and grain size, lattice defects and substitutions, origin of the material, and porosity. For calcium-based bone substitutes, dissolution and cell-based biodegradability increase with greater interconnecting porosity. The porosity of normal cancellous bone is between 70% and 95%, depending on location, with pore sizes from less than 1 to more than 600 µm. By optimizing the pore size, interconnectivity, and volume, the ingrowth of new bone can be encouraged and enhanced throughout the entire porous synthetic scaffold.

INTERCONNECTIVITY

Interconnectivity between pores has been defined as open (ie, an unobstructed direct connection between all pores contained within the material) or closed (ie, no or few open connections between any 2 individual pores). In material with open, interconnected porosity, bone formation can take place throughout the material simultaneously. In material with closed, unconnected pores, bone formation initially occurs only at the host bone/implant interface, and then slowly progresses to the deeper layers of the implant through a phenomenon called creeping substitution. This situation can also lead to newly formed bone walling off the remainder of the implant, as occurs with implanted pieces of dense HAP. In animal experiments, and especially in larger defects, the use of materials with interconnected porosity leads to noticeably faster bone formation (Figure 3).

SIZE

Pore sizes can be categorized as meso, micro, and macro. Mesopores are between approximately 10 and 100 µm in diameter. The diameter of osteoblasts and osteoclasts falls within this range, which is why mesopores play a key role in the penetration and adhesion (“seeding”) of these cells—cells that are responsible for the formation of new bone as well as the resorption of the scaffold. Micropores have a diameter less than 10 µm. These tiny openings, when present in large numbers and liberally interconnected, allow tissue fluids to freely flow throughout the defect, thus permitting the diffusion of

Figure 3. Scanning electron micrographs of (A) human cancellous bone, (B) UP-TCP (VITOSS), and (C) regular TCP (Conduit). Note the similarities between the open interconnectivity of cancellous bone and UP-TCP.
Porosity as a Critical Determinant of Nextgeneration Calcium-Based Bone Substitutes con’t

Oxygen and nutrients. The delivery of oxygen and nutrients to all cells seeded throughout the scaffold is of critical importance for bone formation and scaffold resorption. These small pores also play a role in cell-mediated scaffold resorption, protein attachment, and through their capillary effect, graft cohesion. Macropores have a diameter larger than 100 µm. These pores allow the direct ingrowth of bone and vessels from the surrounding host bone, while still permitting the seeding of bone-forming cells. Only materials with interconnected pores in all three size ranges will allow for three-dimensional regeneration of bone as opposed to creeping substitution.

VOLUME

Total volume porosity is a key determinant of how many cells and how many signal molecules can be loaded onto the scaffold. In simple terms, greater pore volume and surface area mean more space for cells and signals. Studies using TCP in a cervical fusion model in goats compared different volumes of porosity for their effectiveness. TCP with 30% porosity had a 0% fusion rate, TCP with 50% porosity had a 67% fusion rate, and bicalcium phosphate with 70% porosity had an 83% fusion rate. These numbers show that higher volume porosity produces more bone ingrowth. Higher volume porosity also leads to a reduction in mechanical strength of the bone scaffold. However, none of the calcium salt–based bone graft substitutes are sufficiently strong to withstand physiologic loads, even in the fully dense state.

They are appropriate only in stable defects or in combination with internal or external fixation. The ability to produce constructs with higher volume porosities allows synthetic scaffolds to more closely approximate the structure of cancellous bone. High volume porosity also allows the material to be packed into irregularly shaped defects, with only a very small decrease in porosity, and thus, with no loss of biologic function.

INTERCONNECTIVITY, SIZE, AND VOLUME

Pore interconnectivity, size, and volume act together to optimize the physical properties of a bone substitute. A product with a wide range in pore sizes but with little or no interconnection between the pores will not be as effective as a similar structure with interconnected pores. Increasing the volume of the porosity will do little to enhance the performance, as the additional porosity will not be accessible for tissue penetration and ingrowth. An optimized synthetic bone substitute has a high volume of pores, a wide range of pore sizes with emphasis on meso and micropores, and a high degree of interconnectivity.

Such a substitute has both the optimal specific surface area and volume porosity available for cells and signals, while allowing unobstructed fluid flow for nutrient and oxygen delivery. Lastly, by varying the degree of packing of the material in a defect, the porosity, and thus the resorption times, can be subtly optimized to address specific clinical situations.

CLINICAL USE

Besides its optimized osteoconductive properties, UP-TCP has additional advantages over other calcium based bone substitutes; these include ease of handling, radiopacity,
and a composition that is completely synthetic. Furthermore, the high porosity (90%) of UP-TCP gives surgeons substantial latitude with which to adequately pack bone voids. When reduced to half its original volume, UP-TCP still exhibits 80% porosity, with virtually all functional meso- and micropores retained. A growing number of studies have shown VITOSS to be a safe, effective bone void filler with multiple applications, including spinal fusion15-17 and traumatic injury.18

CONCLUSION

First-generation calcium-based ceramics, which are based on naturally occurring or previously available materials, exhibit significant limitations as synthetic bone substitutes. Ultraporous β-TCP is a newly designed type of bone substitute that uses nanometer-sized crystallites of β-TCP to create an ultraporous, interconnected structure that mimics natural human cancellous bone. The porosity, distribution of pore sizes, and interconnectivity of this UP-TCP have been optimized and tested in several in vivo models to produce an osteoconductive synthetic bone graft with clinically important advantages over other formulations of β-TCP, calcium carbonate, and HAP. The final product is a graft material that exhibits rapid and uniform 3-dimensional bone formation throughout the defect, with concurrent cellular resorption and extensive revascularization. These features enhance new bone formation and remodeling. As a result, soon after treatment, the repaired defect site contains bone that is very difficult to distinguish from surrounding native bone.

REFERENCES


Porosity as a Critical Determinant of Nextgeneration Calcium-Based Bone Substitutes con’t


Joan Sweeney has officially retired from the University of Calgary! However, she will be joining us as a “special guest” at this year’s Conference at the Fairmont Chateau Lake Louise.
One of our spine mentors has passed on and I am honored to give him tribute here. Guillermo “Bill” Viviani died Nov 12, 2013, at 78 years of age following a prolonged illness with multiple myeloma.

Bill completed his medical and orthopedic training at the Catholic University of Chile, in Santiago, Chile in 1963. In 1970, while he was travelling to Germany to take a staff surgeon position there, he stopped in to visit friends in Hamilton Ontario. Bill got swept up with the excitement around the radical new approaches to medical education at the new McMaster Medical School and decided to stay. He would spend his entire career at McMaster, and a generation of Canadian orthopedic residents and fellows at McMaster are grateful for this.

I was Bill’s resident at McMaster in the early 1990’s and enjoyed his easy manner and down to earth approach that he gave to everyone from all walks of life. He also wrote dozens of articles and chapters in the peer-reviewed literature and rose to the ranks of full Professor at McMaster University. Although primarily a spine surgeon for children and adolescents, Bill was ready and able to deal with any adult spine problem that came through the doors of McMaster University Medical Center, from cervical spine to coccyx. Bill thus gave me my first real notion that paediatric spine surgeons can do any spine surgery, paediatric or adult, whereas adult spine surgeons can only really do adults. While Bill himself would never say this, he demonstrated it beautifully. Furthermore, he came from an era of training and experience whereupon at rounds he gave solid opinions on the breadth of paediatric orthopaedics, not just that of the spine.

Bill Viviani also passed on to me a rare but important personal spine surgeon tradition that to this day I maintain - the concept of the 15-minute bagged lunch break during long spine cases. I do this every week, just as Bill did, and my residents and fellows today remark how rarely this is done. Other surgeons seem to relish the idea of going 8, 10, or 12 hours in the OR without any breaks - no eating, drinking, no wash-room breaks. Somehow, these human needs are perceived as signs of personal weakness in spinal surgeons. Bill Viviani, of course, thought this was folly. He used common sense and took a break which made for a saner, less stressful spine case and, in my opinion, a better outcome for his patients.

Outside of the hospital Bill loved woodwork-ing, skiing, sailing, tennis and golf. During a short-lived mid-life crisis he flew hang-gliders and rode motorcycles. Guillermo was a loving husband, father, grandfather and a friend to many. He leaves his wife Karen, children and grandchildren and many, many orthopedic trainees and colleagues who will always remember and admire him.

Paul J. Moroz, President, Canadian Pediatric Spine Study Group, University of Ottawa Ottawa, Ontario
This is the first issue of *Spinal Columns* for 2014 as well as the issue that precedes our annual meeting so it seems like a good spot to review the activities of our Society. We have been busy establishing ourselves in the world of spine and undertaking projects that will keep us relevant in the years ahead.

To begin with, the publication you are reading, *Spinal Columns*, now has solid financial support for both its online and hard copy formats. Our quarterly CSS newsletter has become increasing popular with both our membership and our industry sponsors. It has developed an informative and entertaining mix of scientific and social issues that involve all of us. Our Editorial Board of Neil Barrington, Albert Yee and David Yen are matched by an excellent group of regular contributors.

Staying with publishing, the Canadian Spine Society prepared and sponsored (with financial assistance from Medtronic) a special issue of *Current Clinical Care*, a journal for primary care physicians that reaches over 10,000 family doctors across Canada. The response to that effort was so positive that starting this year *Current Clinical Care* will run a regular section on Spine Health. It will be prepared and supervised by an editorial group led by members of the CSS and will be sponsored (at no cost to us) by the Canadian Spine Society. Our message will reach a wider audience than ever.

And speaking of messaging, our website has been completely re-done. Thanks to Karma Creative Solutions our on-line image has a whole new look and it is impressive. We have now turned our attention to the patient information site, Back Care Canada, and will be increasing our ability to inform and educate back and neck pain sufferers across the country. We are gaining credibility as an advocate for evidence-based spine surgery and treatment. Our goal is to provide a truly Canadian perspective, one that accurately reflects the practices of Canadian spine specialists.

These are the same spine specialists and CSS members who have initiated and are now expanding the Canadian Spine Outcomes and Research Network (CSORN). There are now over 15 participating centres and we are beginning to collect significant numbers of patients. Greg McIntosh (an epidemiologist, CSS member and member of the Executive Committee) has been hired as Director of Research and will oversee the preparation of publishable studies. As stated repeatedly by our President, a member of the CSORN Steering Committee along with Raj Rampersaud, Ken Thomas, Hamilton Hall and Neil Manson, we do not intend to merely collect useless data, we are amassing information that will allow us to answer important clinical questions and publish ground breaking original research.

The two preceding activities would not have been possible without the financial support of the Canadian Spine Research and Education Fund (CSREF), a registered charity whose purpose is to sustain the research and educational initiatives of the Canadian Spine Society. Under the leader-
The Canadian Spine Society: Up to Date con’t

ship of Ed Abraham, an active CSS member and regular contributor to this newsletter, the CSREF has successfully raised funds from a variety of sources, particularly from Medtronic and DePuy Synthes who have made substantial multi-year commitments.

But not all our activities require independent funding. Generously donating their time and expertise our members have made important contributions to improving spine care. Under the leadership of Albert Yee, over 30 of them have formed a Spine Fellows Education Working Group with the intention of developing a national spine-fellowship educational curriculum. Their work is ongoing but the result will be a document with the potential to enhance surgical training for years to come. They are addressing a question that will affect the future of all our practices; should spine surgery become a separate speciality independent of the orthopaedic or neurosurgical backgrounds from which we have all arrived?

A Clinical Practice Variations working group has been struck to consider the reasons for and the means to address the differences in practice patterns across regions and provinces. What are the factors involved? Is there an optimum target? How can the CSS advocate for improved healthcare delivery?

In the same vein, the Canadian Spine Society has maintained its presence as an independent entity within the CMA. We are represented on the Specialist Forum and sit at the CEO Roundtable. Our long term objective is to gain full voting rights within the Canadian Medical Association as an organization representing a recognized division of surgery.

At the same time within our organization we are expanding our interests. There is a growing awareness that if we are to speak for spine we need to be more than a group of surgeons practicing adult spine surgery. Our membership is expanding to include leaders in spine from other disciplines, chiropractic, physiotherapy and administration. As we grow we must balancing the interests of our core surgical constituency with the need to speak for a truly representative cross section of involved providers. One example is our convergence with the Canadian Paediatric Spine Study Group (CPSSG). Over the past few years they have begun to assimilate with the CSS and now hold their annual meeting as part of our Scientific Conference. Their non-surgical members are welcome to join our meeting and many of our surgeons have seized the opportunity to participate in the paediatric symposium.

Since its first meeting in 2001 the Canadian Spine Society has provided a venue for outstanding scientific presentations, the abstracts appear in the Canadian Journal of Surgery. We offer prizes for the best paper from a resident, from a fellow and for the best paper overall. The quality of the talks has always made the choice of winners challenging. Our Conference has grown in size every year and has gradually outgrown its initial meeting locations. This year at Lake Louise we are playing host to the New Zealand Orthopaedic Spine Society and the Spine Society of Australia. Organizing a meeting of this size is a major undertaking. We are again obtaining our CME accreditation from the University of Calgary who are also helping with attendee registration but most of the load is handled by the CSS itself. This includes the logistics of the academic sessions but also extends to the social functions, food services, trade show management, exhibitor registrations and the development of the exhibitor prospectus. The cost of the meeting is covered in part by registration fees but most of the expense is borne by the generous support of our industrial partners. In today’s climate of caution about potential conflicts of interest, obtaining that sponsorship is a complex and
protracted process. The meeting itself is like the tip of the iceberg, so much is out of sight.

Dealing with industry is still another dimension of the work of our Society. As we have grown in our role as an educational and advocacy organization we have had to develop an approach and guidelines for our interface with any commercial interest. The CSS has created a Code of Ethics that applies to our dealings with business, other professional organizations and even to the conduct of our own members.

We have come a long way since the Canadian Spine Society decided, in 2005, to hire an Executive Director and establish a permanent office. The Executive Committee meets twice a year to review the work of the administrative team, approve their detailed financial reports (also reviewed and approved by the Society’s accountant and auditor) and set future policy. We are very fortunate to have an exceptional Director of Operations, Jennifer Edwards.

The science and the social connections of our annual meeting remain the focus of our year but organizing that important event while maintaining and coordinating the Society’s numerous other activities is a demanding job. The Canadian Spine Society is no longer just group of spine surgeons who meet once a year to swap stories. We are committed to becoming the Canadian voice of spine.

- Hamilton Hall

CSS Staff Members

Hamilton Hall
Executive Director, CSS

Jennifer Edwards
Director of Operations, CSS

CSS Communication Chair: Report

The intent of this article is to update the CSS membership with the completed changes and upcoming opportunities from a communication perspective. The newsletter, Spinal Columns, continues to be distributed, and website re-designs have been completed, with hopeful increased usage by both members and patients. Data capture and storage for clinical, advocacy, and research purposes continues to be both a challenge and an opportunity.

From a website perspective, both the CSS main site (www.spinecanada.ca) and the Back Care Canada site (www.backcarecanada.ca) have been re-designed and are ‘live’. Besides being visually more appealing, they both have more information of potential interest to patients. On the Back Care Canada website, answers to common patient questions are updated periodically in response to questions submitted by patients. On the CSS website, there are now easily followed links to the Canadian Spine Research and Education Fund for patients who wish to donate funds. We are hopeful that the membership of the CSS continues to increasingly direct patients towards these websites.

Regarding data capture and storage, as one becomes more acquainted with informatics systems, it seems that a large pro-
portion of our clinical, research, and advocacy initiatives involve data collection and transmission. On a clinical level, we use written charts and electronic medical record programs. On an advocacy level we have databases kept largely by our health regions with sparse information on wait times. On a research level, we use our clinical charts for retrospective research, we use our national registry for prospective cohort research, and we have various methods for data storage, including the Global Research Platform (GRP) which houses both the Rick Hansen Registry and the CSS registry, and RedCap (popular among many other specialties) developed by Vanderbilt University. All of these collect similar information, but none of them communicate with each other due largely to the categorical distinction between clinical and research data.

Now that we have a good place to store our data to be used for research in the CSS Registry (CSORN), a major challenge is to use the information that we are all collecting as part of routine clinical care for other purposes such as advocacy and research, without the obstacles of additional data entry and collection. An example of this is the neurological examination in a patient with spinal cord injury, which we all do routinely. Once we denote this exam as being for research purposes, there is a required format (ASIA) in which it must be recorded, and must be entered on separate password protected system in order to be used for our national registry. The latter two are not completed as a matter of routine even though the ‘data’ in the form of the clinical exam has already been ‘collected’ by the treating house staff or surgeon.

Herein lies both the challenge and the opportunity. While it is difficult in our busy practices to routinely fill out more forms that we already must, and it is expensive to hire research personnel to do the same, a potential opportunity for the future is to identify data that is of interest to everyone, and that is collected by everyone, and for that data to be useful for all purposes without having to collect it in separate format and then re-entered. This is indeed a challenge, but I think possible. For example, a discharge summary that we all must do as part of our clinical obligations usually contains all of the information required on the form that must be filled for the CSORN. If there were a way to easily enter the data required directly on the CSS form and for it then to be exportable to the hospital EMR, this would both save time and accomplish both clinical and research goals. The similar concept applies to accepting a new consultation by fax – where the date of referral, the date of visit and the date of surgery are of interest both clinically and from an advocacy perspective.

To achieve the goal of using data for multiple purposes, data being collected for clinical purposes should largely be the same data that is of interest for research and advocacy purposes. And the data that is collected for clinical purposes must be easily transferable to research platforms, GRP and RedCap alike, once patient consent is obtained. Despite this being a significant challenge, we are making some progress. In Alberta for example, data collected for a provincial clinical degenerative spine intake program will be easily exportable to RedCap, and the intake system is being designed as such. We are also developing a mobile phone based EMR that can enter clinical data, and the clinical data that is of interest includes both the information required for the Rick Hansen and CSORN; this data will be easily exportable to the registries. If the EMR is successful it will be made available to the CSS membership. Because many of our electronic informatics systems are in their infancy, it is very important at this early stage for those of us in clinical and research leadership positions to ensure that these systems are not developed in isolation.

- Andrew Nataraj
CASE REPORT: Fracture-dislocation at the thoracolumbar junction in a patient with an associated traumatic lumbosacral spondylolisthesis
Anthony Marchie, Harsha Malempati, Joel Finkelstein, Michael Ford, Albert Yee

INTRODUCTION

Though thoracolumbar fractures may be common, an acute traumatic L5-S1 spondylolisthesis is a rare condition, almost exclusively the result of high-energy trauma. We present a case report of a thoracolumbar fracture-dislocation occurring with a traumatic spondylolisthesis in the same patient. Because most traumatic spinal injuries in younger patients are a result of falls from height or a motor vehicle crash, multiple injuries are frequent. In the spine, there may be more than one fracture and the incidence of concomitant, non-contiguous spinal injury may be increased.

CASE HISTORY

The patient was a 44-year-old female who was working on a scaffold and had fallen an estimated 15 feet. After landing on her back and lower extremities, she experienced acute pain in the thoracolumbar region, with inability to move or feel her lower extremities. The patient was assessed at our Level-I trauma centre. A CT of the cervical spine was normal but a chest CT found fractures of her ribs and left scapula. The CT of her thoracic, lumbar and sacral spine demonstrated a fracture-dislocation of T11 on T12 with canal obliteration and intra-canal bony fragments. It also showed an acute traumatic spondylolisthesis of L5 on S1 (Meyerding Grade I) with transverse process fractures of right L4 and L5, a unilateral dislocation of the right L5-S1 facet joint and a small endplate avulsion fracture of S1. The patient had a spina bifida occulta of the L5 and S1 posterior elements, however, the pars interarticularis of L5 appeared intact bilaterally. There was a mild degree of facet arthrosis, (Fig. 1-3)

On history, the patient denied any prior low back related symptoms. Physical examination demonstrated an ASIA A with complete loss of motor power in her lower extremities with no sign of sacral sparing. There was an intact bulbocavernous reflex and a sensory level at T10 with zones of partial preservation at T11 and T12.

The patient underwent an posterior open fracture reduction with instrumented fusion at the thoracolumbar junction. The T11/12 fracture-dislocation was exposed, and a laminotomy was performed to facilitate reduction and spinal realignment. The facets were completely dislocated. Pedicle screws were inserted bilaterally from T10 to L1. The fracture-dislocation was then reduced with the reduction of the facets directly visualized and rods were connected to the pedicle screws. An intra-operative radiograph ensured an adequate reduction. Local bone graft was placed posterolaterally across the injured segment.

Considering her severe neurologic injury the lumbosacral injury was treated conservatively.

Three weeks following her injury there was no significant change in her neurologic status and the...
Fracture-dislocation at the thoracolumbar junction in a patient with an associated traumatic lumbosacral spondylolisthesis con’t

patient was transferred to a spinal cord injury rehabilitation unit. At the most recent follow-up, ten months following injury, there was no significant recovery of neurologic function. X-rays demonstrated stable configuration of her thoracolumbar junction instrumentation and spinal alignment. There was also stable positioning of her lumbosacral dislocation without further progression of spondylolisthesis. (Fig. 4 & 5)

DISCUSSION

We present a rare acute traumatic lumbosacral spondylolisthesis with a unilateral facet dislocation associated with a concomitant thoracolumbar fracture-dislocation. As one of the mechanically strongest parts of the lumbar spine, traumatic spondylolisthesis of L5 on S1 is an uncommon injury [1]. When it does occur it can involve either unilateral or bilateral dislocations of the L5-S1 facet joints and may have associated fractures. Occasionally a fracture line crossing the sacrum can be observed [2]. The direction of the displacement may be anterior, posterior, or lateral depending on the vector of the deforming force [3]. There are several mechanisms that may lead to lumbosacral fracture-dislocation but a common feature is high energy trauma [4].

In our patient the fractured transverse processes might have resulted from a direct anteroposterior translation vector caused by trauma and/or by traction applied through the paraspinal muscular attachments. The unilateral dislocation favors a mechanism combining hyperflexion and rotation of the lumbar spine on a fixed pelvis [5]. The suspicion of a traumatic lumbosacral dislocation is heightened by the presence of severe multiple trauma and fractured lumbar transverse processes [6]. Transverse process fractures have been associated with lumbosacral dislocation in several reports [7,8,9].

Reported concomitant clinical injuries associated with a traumatic spondylolisthesis include: skin markings, flank hematomas, tenderness, steps, gaps or deformity at the lumbosacral junction or perineal lacerations [10]. Additional factors include positive neurological signs during physical examination and a patient history of high energy trauma [11]. Because the severity of the poly-trauma may prove fatal, the true incidence of
Traumatic lumbosacral dislocations may be underestimated [12].

The incidence of non-traumatic spondylolisthesis (i.e. isthmic types) has been reported in approximately 6% of the population [13], and may be rendered symptomatic by low energy trauma. Radiographic signs suggestive of an acute traumatic etiology in spondylolisthesis may include fractures of the transverse lumbar processes, asymmetric lumbosacral joints on the antero-posterior view, or slipping of L5 over S1 on lateral images with avulsion fractures of either the L5 inferior or S1 superior endplates [14]. A CT scan with sagittal and coronal reformats can be helpful in the evaluation to detect bone or disc fragments in the vertebral canal; a potential cause of nerve root compression or cauda equina syndrome [15], which require decompressive surgery [16]. Injury to the intervertebral disc is a frequent feature of L5–S1 facet dislocation and can be reliably assessed with preoperative MRI [17].

This case represents two non-contiguous high energy injuries at two transition zones. The observation of a pre-existing spina bifida occulta is of interest but its causal relationship to an increased likelihood for this injury is questionable. There were no other signs of pre-existing segmental instability (e.g. pars interarticularis defect, prior known spondylolisthesis, dome shaped sacrum or dysplasia of the lumbosacral facet joints) that might have contributed to the acute lumbosacral dislocation.

Because of our patient’s complete spinal cord injury at the thoracolumbar junction injury and the guarded prognosis for significant neurologic improvement, it was elected to manage the lumbosacral dislocation non-surgically. At ten months, there has been no evidence of further progression of the lumbosacral slip perhaps because of the unilateral versus bilateral dislocation.

In summary traumatic spondylolisthesis is a rare injury. Our aim in this report was to present an interesting case and to emphasize the importance of evaluating for non-contiguous spinal injury in cases of severe trauma. Treatment of multilevel spinal injuries requires consideration not only of each injury but also of the potential relationship between injuries in the context of the patient’s global spinal management.

REFERENCES


Figure 4 Post-operative CT sagittal reconstruction image at 10 months

Figure 5 Lateral view of thoracolumbar spine at 10 months
Fracture-dislocation at the thoracolumbar junction in a patient with an associated traumatic lumbosacral spondylolisthesis con’t


AWARD PRESENTATIONS

Date: Saturday, March 1st, 2014
Time: 1045 hrs
Location: Mount Temple Ballroom A/B

Awards:
Debbie Scarlett Award for Best Overall Paper
$1,000 cash prize

Fellow’s Best Paper Award - $500 cash prize

Resident’s Best Paper Award - $500 cash prize
Reflected from the SI

There is an article in the November/December 2013 issue of the Skeptical Inquirer by Ken Krause that questions the role of scepticism in healthcare. The main thrust of the paper is that the patient should not take the word of the physician on faith and that the doctor-patient relationship needs to be redefined in light of the numerous examples of doctors acting more out of self-interest than out of interest in their patient. It is a theme that is by now familiar to all of us and is reflected in the dramatically changed relationship between the surgeon and the surgical supply company.

Many of the excesses occurred in the US but the fragile connection between the patient and the physician exists on both sides of the border. The statistics in the article are American but it would be naïve to think that the same problems do not occur in Canada. One in four patients are harmed by a medical mistake (the article does not specify the degree of harm and as Canadian studies have shown the majority of cases are of a minor nature...not that this fact makes mistakes any more acceptable). Wrong side (in our case wrong level) surgery is disturbingly common, up to 40 times a week in the US and about a quarter of all prescribed medication and medical procedures are unnecessary.

Every piece on the subject of overuse mentions spine surgery and this one is no exception, “...tens of thousands of adults submit to back surgeries unsupported by evidence of success”. There are a number of other examples including one disturbing report on CTs. The article quotes a 2007 study in the New England Journal of Medicine that states one million children annually are unnecessarily exposed to CT scan radiation and an second study in 2004 Radiology that reported that one in 1,200 forty-five-year-olds who undergo a single full-body CT scan will die from radiation-induced cancer later in life.

A statistic like that is always questionable but that is not the issue. The problem is the overall tone of the article, one that puts the blame largely on physicians who will sell anything “tests, treatments and procedures that are inappropriate, unaffordable and promise more than they can deliver”.

A prime example (and again one that is depressingly familiar to spine surgeons) is surgery for degenerative disc disease, a meaningless term and a constant source of conflicting opinion. One other spine related statistic given is that only 20 percent of prospective back surgery patients were advised of potential complications.

Again a statistic that is easily disputed but one that is nevertheless frequently heard.

And the solution? According to Krause it begins with better data to track the real value of procedures. Sound like a place for our registry, CSORN? The answer extends to physician remuneration, which in Canada is not quite the problem it is in the States. Still, we are experiencing the same concerns about salary versus fee-for-service.

Finally he recommends that the patient carry “our scepticism” into the examining room. In a world where the internet is full of spine cures, where patients and third parties demand an MRI to make a diagnosis and where much spine surgery really doesn’t have a solid evidence base, we are in a tough situation.

Articles like this one need to be balanced with better patient education and information. Our role at CSS as an advocate for evidence-based care is more important, and more difficult, than ever.

- Hamilton Hall
The following are the Tier 1 *Free Time Educational Events* that are taking place during the 2014 Combined Spine Conference at the Fairmont Chateau Lake Louise – please plan to attend!

**Medtronic**

**NEW TECHNOLOGIES IN MINIMALLY INVASIVE SPINAL TECHNIQUES**

Medtronic Presents:

**MAST® MIDLF™ | DLIF | OLIF 25™**

Faculty: Chris Bailey, MD  
Ganesh Swamy, MD

Date: Thursday, February 27  
Time: 6:45PM - 8:00PM

Fairmont Lake Louise • Lake Louise, Alberta • Pipestone Room A & B

**RSVP:**  
Please email Melissa Kennedy at melissa.kennedy@medtronic.com

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**DePuy Synthes Spine Presents:**

**Clinical Observations Using Augmented Screws**

**Wednesday February 26, 2014 at 1215 – 1330**

Fairmont Chateau Lake Louise

**Speaker:** Dr Rob Kuru, MBBS, FRACS; Wamers Bay, NSW, Australia

Discussion will include clinical outcomes of using augmented screws for open and MIS spine surgery. This session will feature case presentations and Q&A with Dr Kuru; an expert in complex spine.

*A hearty pre-ski lunch will be provided*
Happy Anniversary CSORN

There were no candles, no singing, not even a cake in the shape of a database. Nevertheless, the Canadian Spine Outcomes and Research Network (CSORN) recently celebrated its one year anniversary in December (2013).

Other 2013 milestones include:

- The 500th patient has just been enrolled.
- An extensive review of the data collection forms and Global Research Platform was completed and implemented.
- The first two studies using aggregate data from CSORN are near completion with manuscript submission eminent.

These accomplishments are the direct result of the hard work and dedication of the 7 participating sites who diligently collect data, perform data entry and make follow-up calls on a weekly basis. A heartfelt thanks to the research coordinators, principal and co-investigators who managed to implement the CSORN system at their respective sites. This collective effort will produce landmark studies and significantly influence the face of Canadian and international spine research. If you are not participating in this important venture, please contact me (gmcintosh@spinecanada.ca) to find out how you can become part of this vital initiative.

The New Year (2014) will be an exciting and goal-oriented time for CSORN with many more milestones on the horizon. So if anyone knows what a database shaped cake looks like, please let me know.

- Greg McIntosh