25th Research Day of the POES

Vendredi 6 mai 2005
Auditorium
Musée des Beaux-Arts de Montréal

Friday, May 6, 2005
Museum of Fine Arts
Montréal, Qué.
Introduction

It is a pleasure to address this introductory message to the readers of the Canadian Journal of Surgery (CJS) as the President of the Research Committee of the Orthopedic Surgery Training Program (POES) of the Université de Montréal and chief organizer of our 25th Annual Research Day held at the Musée des beaux-arts in Montréal, May 6, 2005.

The POES

Forty-three years ago, the Cours d’orthopédie Édouard-Samson (COES) was founded by a handful of orthopedic surgeons willing to establish a solid and structured teaching program. In 1964, the course was recognized by the Université de Montréal, and, in 1966, the first residents from the COES went through provincial and Royal College examinations. In 1968, the Université de Montréal officially accepted the COES within its Department of Surgery. It became the Cours d’orthopédie post-universitaire Édouard-Samson (COPUES). In 1972, it was accredited by the AAOS, American Association of Orthopaedic Surgeons, and, finally, in 1976, it became the Programme d’orthopédie Édouard-Samson (POES). Its affiliated hospitals are Sainte-Justine (pediatrics), Maisonneuve-Rosemont (oncology, hip and knee reconstruction, sports medicine), Sacré-Cœur (trauma, spine, shoulder and elbow, hand and microsurgery, hip and knee reconstruction, sports medicine) and Hôtel-Dieu du Centre hospitalier de l’Université de Montréal (CHUM; sports medicine, knee and hip reconstruction). Eminent orthopedic surgeons directed the destiny of the POES, namely: Dr. Roger Gariépy (1962–1969), Dr. Edgar Lépine (1969–1974), Dr. Carroll Laurin (1974–1981), Dr. Morris Duhaime (1981–1985), Dr. John V. Fowles (1985–1992), Dr. Benoît Poitras (1992–1997) and Dr. Alain Jodoin (since 1998). Our present staff includes 31 professors, 20 residents, 2 R6 and 3 fellows.

Research and the POES

At first, research within the POES was done by a handful of orthopedic surgeons wishing to know just how good was their treatment to their patients. Residents were encouraged to participate in the work done by their professors. In 1980, under the leadership of Dr. Carroll Laurin, the program held its first official “Journée de la recherche du POES” to allow residents to present the results of the projects they had been involved with. The scope of the research within the POES gradually became much larger, and in the early 1990s it included graduate students in basic research from affiliated schools and universities. The impact and the depth of our research efforts became evident by the success of our residents at the annual Association d’orthopédie du Québec meetings, with best research presentations in 2000 (Dr. Stéfan Parent), 2002 (Dr. Marco Bérard), 2003 (Dr. Maxime Talbot) and 2004 (Dr. Patrick Lavigne). Moreover, Dr. Stéfan Parent also won the national research SCRC/MRC prize in 2002.

As years went by, our collaborative research has intensified and broadened to cover diverse research themes such as: biomedical engineering (Sacré-Cœur, Sainte-Justine, CHUM, École Polytechnique and École de Technologie Supérieure), molecular biology (Sainte-Justine and Sacré-Cœur), tissue engineering and nanotechnology-based gene therapy (Sacré-Cœur and Institut des Matériaux Industriels), imaging and modelization (Sainte-Justine, Laboratoire de recherche en imagerie et orthopédie [LIO]/CHUM) and clinical research (Maisonneuve-Rosemont). We hold 5 Research Chairs associated with the POES (one each held by Dr. Hubert Labelle, MD, PhD, Dr. Carl-Éric Aubin, Eng, PhD, Dr. Julio Fernandes, MD, MSc, and 2 chairs held by Dr. Jacques de Guise, Eng, PhD).

It has been 25 years that our research event exists. In 2005, we had all our orthopedic surgeons attending the meeting, along with molecular biologists, clinicians, engineers, radiologists, chemists and physiologists that collaborate in our research program. We hosted 185 people at this event, including senior staff and students. Also present were the representative of the Minister of Economical Development, Innovation and Export of Québec (The Honourable Mr. Claude Béchard), the President of the Fonds de la recherche en santé du Québec (Dr. Alain Beaudet), the Scientific Director of the Institute for Musculoskeletal Health and Arthritis [IMHA]/Canadian Institutes of Health Research (Dr. Cyril Frank), the President of the Canadian Orthopedic Association (Dr. Alain Jodoin), the President of the Association d’orthopédie du Québec (Dr. Raymond Hould), the newly-named Rector of the Université de Montréal, (Dr. Luc Vinet), the Dean in Research of École de Technologie Supérieure (Dr. Claude Bédard), the Vice-Dean in Research of the Faculty of Medicine of Université de Montréal (Dr. Pierre Boyle), the Director of Research of the Université de Montréal (Dr. Réal Lallier), the Director of the Oral Health Research Network of Quebec (Dr. Gilles Lavigne), the Director of the Research Centre of Hôpital du Sacré-Cœur de Montréal (Dr. René Cardinal), the Director of the Department of Surgery of the Université de Montréal (Dr. Gilles Beauchamp) and the Medical Director of the Canadian Space Agency (Dr. Jean-Marc Comtois).

You will find in this supplement the contents of 50 abstracts that represent the scope of the research done at the POES and a brief historical overview of the research winners for the last 25 years. You can hyperlink to a most interesting round-table on the strategic views on the future of research for the next 10 years, as well as all presentations, at www.crhsc.mtl.rtss.qc.ca/25thResearchDayofthePOES/.


I hope you enjoy your reading!

Julio Fernandes, MD, MSc
President, Research Committee POES
Director, Orthopedic Research Laboratory at HSC
Head, Endowed Research Chair in Orthopedics
Assistant Professor, Department of Surgery, Université de Montréal
Email: julio.c.fernandes@umontreal.ca
25th Research Day of the POES

Executive

Chief organizer
Julio Fernandes, MD, MSc. Head, Endowed Research Chair in Orthopedics of the Université de Montréal at Hôpital du Sacré-Cœur de Montréal

Our distinguished jury members
Cyril B. Frank, MD, PhD (president of the jury). Visiting Professor of the POES (November 1995 and May 2005); Professor of Orthopedic Surgery, University of Calgary, Alberta; Scientific Director of the Institute of Musculoskeletal Health and Arthritis (IMHA), the Canadian Institutes of Health Research (CIHR)

Yvan Petit, PhD, Eng. Associate Professor, École de Technologie Supérieure; Researcher, Biomechanics and Imaging, Hôpital Sainte-Justine and Hôpital du Sacré-Cœur de Montréal

Mohamed Benderdour, PhD. Junior Researcher FRSQ; Associate Researcher in Molecular Biology, Département de Chirurgie, Université de Montréal; Researcher, Research Centre, Hôpital du Sacré-Cœur de Montréal

Research Committee of the POES 2004–2005

President
Julio Fernandes, MD, MSc

Hospital representatives
HMR: Pascal-André Vendittoli, MD
HSC: G-Yves Laflamme, MD
HSJ: Guy Grimard, MD

Residents’ representatives
Seniors: Frédéric Lavoie, MD, R4
Juniors: Jean-Marc Mac-Thiong, MD, Eng, R3

Scientific committee selecting papers to be presented at the 25th Research Day of the POES
Carl-Éric Aubin, PhD, Eng. Head, Federal Chair in research “Innovations CAO in orthopedic engineering”

Nicola Hagemeister, PhD, Eng. Researcher, Department of Automated Production, École de Technologie Supérieure

Alain Moreau, PhD. Director, Molecular Genetics of the Bone Laboratory, Département de Stomatologie et Biochimie, Université de Montréal
<table>
<thead>
<tr>
<th>Hospitals</th>
<th>Staff members</th>
<th>Residents and Fellows</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHUM, campus Hôtel-Dieu</td>
<td>Dr. Nicholas Newman, Chief</td>
<td>Benoît Benoît</td>
</tr>
<tr>
<td></td>
<td>Dr. Claude Godin</td>
<td>Vincent Massé</td>
</tr>
<tr>
<td></td>
<td>Dr. Timothy Heron</td>
<td>Sophie Mottard</td>
</tr>
<tr>
<td></td>
<td>Dr. Gilles R. Tremblay</td>
<td>Louis-David Raymond</td>
</tr>
<tr>
<td></td>
<td>Dr. Alain Roy</td>
<td>Dominique Rouleau</td>
</tr>
<tr>
<td></td>
<td>Dr. Pascal-André Vendittoli</td>
<td>Ahmed Abaub</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mohammed Nahhas</td>
</tr>
<tr>
<td>Maisonneuve-Rosemont</td>
<td>Dr. Marc Isler, Chief</td>
<td>Julien Girard</td>
</tr>
<tr>
<td></td>
<td>Dr. Louis-Philippe Amiot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. David Blanchette</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Michel Fallaha</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Martin Lavigne</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Alain Roy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Pascal-André Vendittoli</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sacré-Coeur</td>
<td>Dr. Gilles Maurais, Chief</td>
<td>Elizabeth Ackerman</td>
</tr>
<tr>
<td></td>
<td>Dr. Pierre Beaumont</td>
<td>Ghassan Alami</td>
</tr>
<tr>
<td></td>
<td>Dr. Julio Fernandes</td>
<td>Mathieu Carrier</td>
</tr>
<tr>
<td></td>
<td>Dr. Sylvain Gagnon</td>
<td>Véronique Godbou</td>
</tr>
<tr>
<td></td>
<td>Dr. Alain Jodoin</td>
<td>Philippe Grondin</td>
</tr>
<tr>
<td></td>
<td>Dr. G-Yves Latamme</td>
<td>Patrick Lavigne</td>
</tr>
<tr>
<td></td>
<td>Dr. Georges-Henri Latame</td>
<td>Stéphane Leduc</td>
</tr>
<tr>
<td></td>
<td>Dr. Kim Latendresse</td>
<td>Jean-Marc Mac-Thion</td>
</tr>
<tr>
<td></td>
<td>Dr. Michel Malo</td>
<td>Patrice Makinen</td>
</tr>
<tr>
<td></td>
<td>Dr. Pierre Ranger</td>
<td>Hai Nguyen</td>
</tr>
<tr>
<td></td>
<td>Dr. Éric Renaud (sabbatical)</td>
<td>Louis Roy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kasia Arcelín</td>
</tr>
<tr>
<td></td>
<td></td>
<td>David-Olivier Chagne</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rad 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sainte-Justine</td>
<td>Dr. Hubert Labelle, Chief</td>
<td>Philippe Dahan</td>
</tr>
<tr>
<td></td>
<td>Dr. Marie-André Cantin</td>
<td>Frédéric Lavoie</td>
</tr>
<tr>
<td></td>
<td>Dr. Morris Duhaime</td>
<td>Michel-Alexandre Le Breton</td>
</tr>
<tr>
<td></td>
<td>Dr. Guy Grimard</td>
<td>Teodor Simion</td>
</tr>
<tr>
<td></td>
<td>Dr. Chantal Janelle (consultant)</td>
<td>Annie Deshaies</td>
</tr>
<tr>
<td></td>
<td>Dr. Benoit Morin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Benoit Poitras</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Charles-H. Rivard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dr. Constantin Stanciu</td>
<td></td>
</tr>
</tbody>
</table>

R1 and R2 rotating elsewhere
- Panagiotis Glavas R1, GenSurg HSL
- Zhi Wang R2, Trauma, HSC
25th Research Day of the POES

History: prizes awarded at the POES Research Days

Start of a tradition

1st Research Day of the POES, 1980

Carroll Laurin (director)
(no other detail had been filed)

2nd Research Day: June 24, 1981

Morris Duhaime (program director)
Claude Godin (research committee president)
Jury: Chiefs of Division at HDM, HMR, HSC, HSJ; honour guest
Prizes for clinical research: 1st ex-aequo Denis Mercier and Jean-Rodolphe Myniem; 2nd Pierre Ranger

3rd Research Day: November 18, 1982

Morris Duhaime (program director)
Claude Godin (research committee president)
Jury: Robert Y.M. McMurtry (president) from University of Toronto
Prizes for clinical research: 1st Myriam Fraser; 2nd Richard Gosselin; 3rd Alain Roy

4th Research Day: May 27, 1983

Morris Duhaime (program director)
Alain Jodoin (research committee president)
Jury: William R. McGraw (president) from University of Vancouver
Prizes for clinical research: 1st Alain Roy; 2nd Jean Roy

5th Research Day: September 14, 1984

Morris Duhaime (program director)
Charles-Hilaire Rivard (research committee president)
Jury: Dr. Jean-Panel Fauteux (president) from Université de Montréal; Georges-Henri Laflamme, HSC; Charles-Hilaire Rivard, HSJ
Prizes for clinical research: 1st Naji Abinader; 2nd Pierre Ranger; 3rd Serge Tohmé

6th Research Day: May 23, 1986

John V. Fowles (program director)
Hubert Labelle (research committee president)
Jury: Mohamed T. Kassab (president) from Tunisia; Carroll Laurin, Program Director, McGill University; Francis Glorieux, Director, Human Genetics Research, McGill University
Prize for fundamental research: 1st ex-aequo Olga Huk and Naji Abinader
Prizes for clinical research: 1st Richard Boisvert; 2nd Michel St-Pierre; 3rd Robert Turcotte

7th Research Day: May 22, 1987

John V. Fowles (program director)
Hubert Labelle (research committee president)
Jury: Eduardo Salvati (president) from New York; Dr. Pelletier; Carroll Laurin, Program Director, McGill University
Prizes for fundamental research: 1st Martine Roberge; 2nd Norman Murphy
Prizes for clinical research: 1st Alain Désy; 2nd Daniel Larose; 3rd Huy Trinh

8th Research Day: May 13, 1988

John V. Fowles (program director)
Hubert Labelle (research committee president)
Jury: Pierre Rigault (president) from Paris, France; Dennys Bobyn, General Hospital of Montréal; Pierre Legendre, Centre hospitalier de Jonquière
Prizes for fundamental research: 1st Norman Murphy; 2nd Lyne Blackburn
Prizes for clinical research: 1st Danielle Desloges; 2nd Charles Desautels; 3rd Guy Grimard

9th Research Day: May 12, 1989

John V. Fowles (program director)
Hubert Labelle (research committee president)
Jury: Pierre Rigault (president) from Paris, France; Dennys Bobyn, General Hospital of Montréal; Pierre Legendre, Centre hospitalier de Jonquière
Prizes for fundamental research: 1st Norman Murphy; 2nd Khalil Masri
Prizes for clinical research: 1st Charles Desautels; 2nd Olga Huk; 3rd Chaikou Bah

10th Research Day: May 11, 1990

John V. Fowles (program director)
Hubert Labelle (research committee president)
Jury: Pierre Chambat (president) from Centre des Massues, Lyon, France; Gaëtan Langlois, Chief, Centre Hospitalier Chicoutimi; Gilbert Drouin, Research Director, École Polytechnique of the Université de Montréal
Prizes for fundamental research: 1st Bernard André; 2nd Norman Murphy
Prizes for clinical research: 1st Pierrette Girard; 2nd Marc Isler; 3rd Viorel Raducan

11th Research Day: May 24, 1991

John V. Fowles (program director)
Nicholas Newman (research committee president)
Jury: Hans K. Uhthoff (president) from Ottawa University; Daniel Larose, Council Bluff, Iowa; L’Hocëine Yahia, Institut de Génie Biomédical, École Polytechnique of the Université de Montréal
Prize for fundamental research: 1st Éric Desrosiers
Prizes for clinical research: 1st Gilles Destradeur; 2nd Marc Isler; 3rd Philippe Le Noach

12th Research Day: May 21, 1992
John V. Fowles (program director)
Nicholas Newman (research committee president)
Jury: David L. Hamblen (president) from Glasgow, Scotland; Bernard Séguin, Chief, Hôpital Pierre-Boucher; Jean Dansereau, Génie Mécanique, École Polytechnique of the Université de Montréal
Prizes for fundamental research: 1st Philippe Poncet; 2nd Éric Desrosiers
Prizes for clinical research: 1st John Caputo; 2nd Alain Elbaz; 3rd Patrice Béliveau

13th Research Day: May 14, 1993
Benoît Poitras (program director)
Nicholas Newman (research committee president)
Jury: Harlan C. Amstutz (president) from Los Angeles, University of California; Carroll Laurin, McGill University; Patrick Loisel, Director, Research Project, Clinique des maux de dos, Université de Sherbrooke
Prizes for fundamental research: 1st Souad Rhalmi; 2nd Michel Arcand
Prizes for clinical research: 1st Martine Lévesque; 2nd Odette Perron; 3rd Marc Beauchamp

14th Research Day: May 10, 1994
Benoît Poitras (program director)
Nicholas Newman (research committee president)
Jury: Jean Dubousset (president) from Paris, France; Max Aebi, Chairman, Orthopaedics, McGill University; Antonio Nanci, Electrical Microscopy Lab, Médecine dentaire, Université de Montréal
Prizes for fundamental research: 1st Éric Desrosiers; 2nd Sophie Lerouge
Prizes for clinical research: 1st Pascale Vézina; 2nd Guy LeBouthillier; 3rd Martine Lévesque

15th Research Day: May 12, 1995
Benoît Poitras (program director)
Guy Grimard (research committee president)
Jury: David S. Bradford (president) from University of California; Pierre Dupuis, Jewish General Hospital, McGill University; Paul Allard, Director, Mouvement Study Lab, Research Centre of the Hôpital Sainte-Justine
Prizes for fundamental research: 1st Carl-Éric Aubin; 2nd Michel Assad
Prizes for clinical research: 1st Carl-Éric Aubin; 2nd Pascale Vézina; 3rd Ethan Lichtblau

16th Research Day: May 10, 1996
Benoît Poitras (program director)
Guy Grimard (research committee president)
Jury: Stephen Gunther (president) from University of Washington; Pierre Mercier, graduate from the POES, Québec; Jacques de Guise, École Supérieure de Technologie
Prizes for fundamental research: 1st Marwan Sati; 2nd Isabelle Catelas
Prizes for clinical research: 1st Martine Larocque; 2nd G-Yves Laflamme; 3rd David Arango

17th Research Day: May 9, 1997
Benoît Poitras (program director)
Guy Grimard (research committee president)
Jury: Pierre Lascombes (president) from Nancy, France; Carl-Éric Aubin, Institut de génie biomédical, École Polytechnique de l’Université de Montréal; François Fassier, Chief Surgeon, Montréal Hospital for Children, McGill University
Prizes for fundamental research: 1st Isabelle Catelas; 2nd Marie Beauséjour
Prizes for clinical research: 1st Pierre Duval; 2nd Jean Langevin

18th Research Day: May 8, 1998
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Peter J. Fowler (president) University of Western Ontario; Gaëtan Langlois, Université de Sherbrooke; Denis Rancourt, Département de Génie Biomécanique, Université Laval
Prizes for fundamental research: 1st Marie Beauséjour; 2nd François Poulin
Prizes for clinical research: 1st Karl Fournier; 2nd Martin Lavigne; 3rd Jacques Toueg

19th Research Day: May 7, 1999
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Ian D. Learmonth (president) from University of Bristol, England; Michael D. Buschmann, École Polytechnique of the Université de Montréal; Stéphane Ricard, Université de Sherbrooke
Prizes for fundamental research: 1st Nicola Hagemeister; 2nd Marie Beauséjour
Prizes for clinical research: 1st Louis-Philippe Amiot; 2nd Stefan Parent; 3rd Nathalie Kouncar

20th Research Day: May 12, 2000
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Marc A. Asher (president) from University of Kansas, Kansas City; François Prince, Département de kinésiologie, Université de Montréal; John V. Fowles, ex-Director of the POES
Prizes for fundamental research: 1st Qin Shi; 2nd Isabelle Villemure
Prizes for clinical research: 1st Stefan Shi; 2nd Raymond Long; 3rd Pierre-André Clermont
21th Research Day: May 11, 2001
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Guy D. Paiement (president) from University of California, San Francisco; Farida Chériet, Génie électrique et informatique, École Polytechnique de l’Université de Montréal; Danielle Desloges, Hôpital Charles-LeMoyné
Prizes for fundamental research: 1st Éric Beaumont; 2nd ex-aequo Karin Corsi and Steve Forget
Prizes for clinical research: 1st Maxime Talbot; 2nd Marco Bérard

22th Research Day: May 10, 2002
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Jesse B. Jupiter (president) Harvard Medical School, Boston; Jean Dansereau, Directeur des Études supérieures et de l’Encadrement, École Polytechnique de l’Université de Montréal; Sylvain Gagnon, Hôpital du Sacré-Cœur
Prizes for fundamental research: 1st Karin Corsi; 2nd Kajsa Duke; Honourable Mention Sumitra Rajagopalan
Prizes for clinical research: 1st Marco Bérard; 2nd Stefan Parent

23th Research Day: May 9, 2003
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Hans J. Kreder (president) from University of Toronto; François Fassier, Chief Surgeon, Shriner's, McGill University; Alain Moreau, Centre de Recherche, Sainte-Justine
Prizes in fundamental research: 1st (Sanofi-Aventis) Éric Beaumont; 2nd (Médicus) Barbara Morquette
Prizes in clinical research: 1st (Smith & Nephew) Marie Beauséjour; 2nd (Zimmer) Benoît Benoît
Best Posters by Popular Vote: 1st (Pfizer) Alexandre Fuentes-Dupré; 2nd ex-aequo (Pfizer) Caroline Auclair-Daigle and (POES) Fouad Zhim

24th Research Day: May 14, 2004
Alain Jodoin (program director)
Guy Grimard (research committee president)
Jury: Raymond T. Morrissy (president) from University of Atlanta; Robert Turcotte, Chairman, Orthopedics, McGill University; Isabelle Villemure, École Polytechnique of the Université de Montréal
Prizes for fundamental research: 1st Barbara Morquette; 2nd Sania Mansouri
Prizes for clinical research: 1st Patrick Lavigne; 2nd Jean-Marc Mac-Thiong

25th Research Day: May 6, 2005
Alain Jodoin (program director)
Julio Fernandes (research committee president)
Jury: Cyril B. Frank (president) from Orthopaedics, University of Alberta; Mohamed Benderdour, Molecular Biology, Université de Montréal; Yvan Petit, Biomechanics and Imaging, École de Technologie Supérieure
Prizes in fundamental research: 1st (Sanofi-Aventis) Éric Beaumont; 2nd (Médicus) Barbara Morquette
Prizes in clinical research: 1st (Smith & Nephew) Marie Beauséjour; 2nd (Zimmer) Benoît Benoît
Best Posters by Popular Vote: 1st (Pfizer) Alexandre Fuentes-Dupré; 2nd ex-aequo (Pfizer) Caroline Auclair-Daigle and (POES) Fouad Zhim
25th Research Day of the POES

Program, posters and prizes

Contents available at:
www.crhsc.mtl.rts.qc.ca/25thResearchDayofthePOES/

Friday May 6, 2005
Auditorium, Montréal Museum of Fine Arts

08:00 Registration and accreditation
08:30 Welcome, Alain Jodoin
    Introduction, Julio Fernandes

Each presentation will last 7 minutes and the following discussion 2 minutes.

First session  moderator Patrick Lavigne, graduate
08:40 #1 (FR) Raphaël Vazquez  Effect of the rib cage on the surgical instrumentation of the scoliotic spine
08:47 Discussion
08:49 #2 (FR) Laura Epure  New sol-gel calcium phosphate composites for bone regeneration
08:56 Discussion
08:58 #3 (CR) Véronique Godbout  Hop and step test: new functional tests for THA evaluation
09:05 Discussion
09:07 #4 (FR) Barbara Morquette  Degradation
09:14 Discussion
09:16 #5 (FR) Éric Beaumont  Rolipram maintains axonal conductivity across a cervical spinal cord contusion injury and promotes locomotion recovery
09:23 Discussion
09:25 #6 (CR) Elizabeth Ackerman  Early weight bearing in children with tibial shaft fractures
09:32 Discussion
09:34 #7 (FR) Julien Clin  Biomechanical study of the design parameters of a brace for the treatment of scoliosis
09:41 Discussion
09:43 #8 (FR) Mohamed Aoulad Aissa  Role of leptine in the pathophysiology of human osteoarthritis
09:50 Discussion
09:52 #9 (OoC) Marc Isler  Pathological fracture after radiation and surgical resection of soft tissue tumours
09:59 Discussion
10:01 Health break and poster session

Second session  moderator Stéphane Leduc, graduate
10:30 Guest resident
    Delegate from McGill University  Corey Richards  Comparison of pedicle screw spinal fixation for fractures: bridge versus tension band construct: biomechanical analysis of polyethylene and cadaveric constructs
10:37 Discussion
10:39 #10 (CR) Dominique Rouleau  Percutaneous plating of fractures of the proximal humerus: a prospective multi-centre clinical trial
10:46 Discussion
10:48 #11 (FR) Bouziane Azeddine  Molecular classification of AIS patients: towards new emerging concepts in molecular medicine to treat adolescent idiopathic scoliosis
10:55 Discussion
10:57 #12 (CR) Benoît Benoît  Surgical treatment of recurrent dislocation of the patella in children
11:04 Discussion
11:06 #13 (RF) Frédéric Lavoie  Gesture and posture as important factors in 3D kinematic assessment of the knee
11:13 Discussion
11:15 #14 (CR) Jean-Marc Mac-Thiong  Spino-pelvic balance in normal children and adolescents: a correlation study
11:22 Discussion
11:24 #15 (FR) Virginie Landreville  Role of Reg growth factors in inflammatory process associated with osteoarthritis
11:31 Discussion
11:33 #16 (FR) Louis-Olivier Lévesque  Identification of ERα gene polymorphism in adolescent idiopathic scoliosis (AIS)
11:40 Discussion
11:42 #17 (OoC) Pascal-André Vendittol  Randomized study comparing early clinical results after total hip resurfacing and total hip arthroplasty
11:49 Discussion
11:51 Lunch and poster session

Third session  moderator Hai Nguyen, graduate
13:10 Guest speaker  Dr. Cyril B. Frank  The clinician–scientist in Canada: challenges and opportunities
13:20 Discussion
13:30 #18 (OoC) Marc Isler  Radiological evaluation and follow-up of distal femoral endoprosthesis for tumour resection
13:40 Discussion

**25th Research Day of the POES**

13:49 #19 (CR) Marie Beauséjour
Appropriateness of patients referral to a scoliosis clinic
13:56 Discussion
13:58 #20 (FR) Frédéric Tanguay
Relation between pelvic geometry and lumbar lordosis following surgery in adolescent idiopathic scoliosis
14:07 #21 (FR) Mathieu Charbonneau
Knee 3D movement capture in clinical site
14:14 Discussion
14:16 #22 (CR) Sophie Mottard
Randomized study comparing whole blood metal ions after metal–metal 28-mm THA or total hip resurfacing
14:23 Discussion
14:25 #23 (FR) Jean-Marc Mac-Thiong
Assessment of the sagittal curves of the spine: comparison between the maximum Cobb angle technique, the anatomic Cobb angle technique and the tangent circles method
14:32 Discussion
14:34 #24 (CR) Véronique Godbout
Including MSK workshops in medical curriculum
14:41 Discussion
14:43 Health break and poster session

**Fourth session**
**Moderator: Patrice Makinen, graduate student**
15:15 #25 (CR) Dominique Rouleau
Hip revision — predictors of success
15:22 Discussion
15:24 #26 (FR) Hugo Boulanger
Study of pathomechanisms initiating scoliotic deformities in growing pinealecetomized chicken
15:31 Discussion
15:33 #27 (CR) Philippe Dahan
Evaluation of reconstructive surgery using LARS artificial ligaments in 64 acute knee dislocations
15:40 Discussion
15:42 #28 (RF) Mariam Zoulgami
A porous calcium phosphate based bioceramic prepared by SHS method for guided bone regeneration
15:49 Discussion
15:51 #29 (CR) Martin Robitaille
Variability in spinal instrumentation strategies for adolescent idiopathic scoliosis (AIS)
15:59 Discussion
16:01 Leaders’ forum — moderator Julio Fernandes

**Medical research 10 years from now: my vision and my strategy**
Each guest will speak for about 7 minutes. After all 4 guests have spoken, there will be a 15-minute discussion.

**Guests**
- Dr. Alain Beaudet, President, FRSQ, Fonds de la Recherche en Santé du Québec.
- Dr. Claude Bédard, Dean in Research and technological transfer, École de Technologie Supérieure.
- Dr. Pierre Boyle, Vice-dean in Research, Faculté de Médecine, Université de Montréal.
- Dr. Cyril B. Frank, Scientific Director, IMHACIHR, Institute of Musculoskeletal Health and Arthritis, Canadian Institutes of Health Research.

16:29 Discussion
16:44 Announcement of the names of the winners
16:55 Closing — Alain Jodoin

**Posters**

**Clinical research**

#30 Kajsa Duke
New positioning system for posterior spinal surgery: a preliminary report of the two first operated patients

#31 Luis Fernando Requiao
Three-dimensional knee joint linear displacements differences between genders during treadmill walking

#32 Véronique Godbout
Method for analysis of MSK educational needs in clinical years

#33 Eros de Oliveira
Acute knee dislocation: 2- and 7-year follow-up after reconstruction of ACL and PCL using artificial ligaments

**Out of competition**

#34 Martin Lavigne
Randomized study comparing biomechanical reconstruction after total hip resurfacing and total hip arthroplasty

#35 Pascal-André Vendittoli
Femoral and acetabular bone preservation with surface arthroplasty of the hip

#36 Marc Isler
Mixed tumour of bone with malignant evolution — a case report

#37 Pascal-André Vendittoli
Vertical acetabular positioning with the aid of an inclinometer in total hip arthroplasty

#38 Pascal-André Vendittoli
Randomized study comparing alumina–alumina to metal-on-polyethylene–bearing surfaces in total hip arthroplasty: 3 to 8 years’ follow-up

**Fundamental research**

#39 Katia Turcrot
3D biomechanical method for the evaluation of knee osteoarthritis patients: feasibility and preliminary results

#40 Frédéric Lavoie
Gesture standardization increases the reproducibility of 3E kinematic measurements of the knee joint

#41 Guillaume Desroches
Evaluation of the load induced to the upper limbs by different manual wheelchair propulsion patterns: literature review

#42 Fouad Zhim
Development of personalized implant for high tibial opening wedge: combination of solid freeform fabrication with combustion synthesis processes

#43 Marie-Lyne Nault
Fuzzy logic as an aid to surgery planning in idiopathic scoliosis
#44 Arnaud Barré  
Estimation of knee contact forces during gait

#45 Caroline Auclair-Daigle  
Performance optimisation of osteochondral scaffolds for tissue engineering

#46 Annie Levasseur  
Three-dimensional (3D) evaluation of the gleno-humeral joint kinematics: preliminary results

#47 Cristina Manacu  
Endothelin-1 plays a catabolic role in extracellular matrix degradation via aggrecanase-1 induction

#48 Alexandre Fuentes-Dupré  
Validation of a new exoskeleton to evaluate three-dimensional knee biomechanics

Prizes

In fundamental research

1st Prize (Sanofi-Aventis)  
Éric Beaumont, #5

2nd Prize (Laboratoire orthopédique Médicus)  
Barbara Morquette, #4

In clinical research

1st Prize (Smith & Nephew)  
Marie Beauséjour, #19

2nd Prize (Zimmer)  
Benoît Benoît, #12

For poster by popular vote

1st Prize (Pfizer)  
Alexandre Fuentes-Dupré, #48

2nd Prize ex-aequo  
(Pfizer) Caroline Auclair-Daigle, #45  
(POES) Fouad Zhim, #42
1  (fundamental research)

Effect of the rib cage on the surgical instrumentation of the scoliotic spine. R. Vazquez, BEng; C.-É. Aubin, PhD; H. Labelle, MD.

Object: Analyze the behaviour of the rib cage and its effect on a scoliotic spine during a surgery. Material and methods: A biomechanical model of the rib cage (including ribs, sternum, costal cartilages, intercostal ligaments and costo-vertebral articulations, in addition to the spine) was developed and validated by compressive loads to the sternum, a lateral squeezing load on the rib cage and different motions like flexion, extension, longitudinal twist and lateral bending. A posterior surgical instrumentation (CD Horizon) was simulated with and without the rib cage, then compared with the real surgery for 4 patients: 3 right thoracic (Cobb 23°, 52° and 77°) and 1 left thoraco-lumbar (37°). Results and discussion: The deflection of the rib cage in compression is in agreement with experimental measures. The rib cage is stiffening the spine about 43% in lateral bending, 35% in flexion/extension and 37% in axial rotation, intercostal ligaments being responsible for this stiffening effect. The rib cage doesn’t modify much the correction of the spine and the necessary loads for the execution of surgical manoeuvres. A reduction of the rib hump between 20% and 30% and an “en bloc” behaviour of the rib cage are observed after the surgery. The stiffening effect of the rib cage is not so important during a surgery because the rib cage is not very stressed. Conclusion: The rib cage doesn’t affect much the correction of the spine during a surgical instrumentation. Relevance: Once it has been validated on a sufficient number of patients, this model could be integrated in a surgical simulator, which offers the possibility to test different plan-nings and to evaluate the correction of the trunk.

Sponsored by CRSNG and by Partnership Program R & D with Medtronic Sofamor Danek.

2  (fundamental research)

New sol-gel calcium phosphate composites for bone regeneration. L. Epure, MScA; F. Chellat, PhD; M. Zoulgami, PhD; N. Camargo, PhD; Y. Merhi, PhD; L.H. Tabia, PhD.

Objective: This study was designed to investigate the potential use of new bioceramic composites reinforced with silica nanometric powder. The study focuses on phase identification, microstructural examination and biocompatibility evaluations of the samples. Methods and results: Calcium phosphate (CP) composites containing silicon oxide (SiO2) with different percentages (5, 10, 15 wt%) were elaborated by the sol-gel process, heat treated at 900°C and 1300°C sintering temperature for 2 hours and processed into both powders and dense bulk specimens. X-ray diffraction identified the phase of the tricalcium phosphate and silicon oxide, for the synthesized bioceramics at both sintering temperatures of 900°C and 1300°C. No porosity was found on the surface of any of the block specimens, as determined by scanning electron microscopy (SEM). The grain size of the 900°C heat treated samples was approximately 2–15 µm. Considerable grain growth was observed for samples sintered at 1300°C. Cell viability was evaluated using MTT (3-(4,5-dimethylthiazole-2-yl)-2,5-triphenyl tetrazolium) assay on L-929 mouse fibroblast cell line (ATCC). All the samples showed no cytotoxic effects after exposure the cells to the composite extracts for 24, 48 and 72 hours. Discussion and conclusion: Based on material characterization and biocompatibility testing, the new calcium phosphate sol-gel composites seem to be good material candidates for orthopedic applications. Our results are encouraging, but more studies are necessary. The synthesis method is simple, economic and results in a high quality powder that could be useful for hard tissue reconstruction applications.

Sponsored by Département du Génie Biomédical, Fund of the Director, Dr. L’Hocine Tabia, École Polytechnique de l’Université de Montréal.

3  (clinical research)

Hop and step test: new functional tests for THA evaluation. P.A. Vendittioli, MD; V. Godbout, MD; M. Lavigne, MD; N. Duval, MD.

Object: To assess clinical outcome following total hip arthroplasty (THA), clinicians typically uses self-evaluation or external observer tests. The objective of this study is to determine the value of the “step” and “hop” tests and to correlate their results with other outcome measures. Material and methods: We compared hop and step tests performances of 3 groups of patients. The first group was composed of 99 patients with a hybrid THA implanted via an antero-lateral approach. Second and third groups were composed of 40 uncemented THA and 40 total hip resurfacings performed via a posterior approach. Hop and step tests were supervised and graded by an independent observer. We compared the results of these 2 tests with the clinical scores (SF-36, WOMAC and MAP), patient satisfaction, biomechanical hip reconstruction, bearing surfaces, surgical approach, type of implant and other patients data. Results: The hop/step tests results correlate significantly (p < 0.005) with SF-36, WOMAC, MAP and patient satisfaction. There is a significant relation (p < 0.005) between the 3 groups and their level of performance at hop/step test, best results achieved by resurfacing, followed by uncemented and then hybrid group. Discussion: Type of reconstruction has an effect on functional test performance. The hop and step tests might be useful and sensitive clinical tests to quickly and easily determine the functional status of the patient in a clinical setting. Further evaluation in a motion laboratory will be done to
DEGRADATION. B. Morquette, BSc; Q. Shi, PhD; P. Lavigne, MD, MSc; J. Fernande, MD, MSc; M. Benderdour, PhD.

Object: This study aims to investigate the involvement of 4-hydroxynonenal (HNE) in osteoarthritic (OA) cartilage degradation through type II collagen (COLL II) and the matrix metalloproteinase-13 (MMP-13) modulation. Methods: HNE level was determined by Elisa in synovial fluids and in cellular extracts of OA chondrocytes treated with free radicals donors (FRD). The formation of the HNE/COLL II adducts was measured in cartilage explants by immunoprecipitation. Expression of COLL II and MMP-13 at mRNA, protein and activity levels was investigated by reverse transcription-polymerase chain reaction (RT-PCR), Western blotting and commercial kits. Moreover, we have evaluated the effect of HNE binding on the COLL II degradation and MMP-13 activity.

Results: Our data showed that HNE/protein adducts were higher in OA synovial fluids compared with normal subjects and in OA chondrocytes treated with FRD. In cartilage explants, HNE induces cartilage degradation as established by hydroxyproline release and COLL II fragments generation. The in vitro experiments showed that HNE binding accelerates COLL II degradation by activated MMP-13. Interestingly, we have obtained direct evidence for the increase level of HNE/COLL II adduct in OA cartilage explants incubated with FRD. In isolated OA chondrocytes, we demonstrated that HNE inhibits COLL II and TIMP-1 expression, but in contrast it induces MMP-13 activity and expression mainly through p38 activation. In vitro, proMMP-13 was identified as HNE target and was activated by this aldehyde at a molar ratio of 1:105 (MMP-13 v. HNE). Conclusion: Here, we report novel mechanisms linking oxidative stress-mediated OA cartilage degradation. These mechanisms emphasize the implication of HNE in transcriptional and post-translational modifications of COLL II and MMP-13 in OA.

Sponsored by Pfizer Canada.

ROLIPRAM MAINTAINS AXONAL CONDUCTION ACROSS A CERVICAL SPINAL CORD CONTUSION INJURY AND PROMOTES LOCOMOTION RECOVERY. E. Beaumont, PhD; C.M. Whitaker, BSc; J. Wels, BSc; D.S.K. Magnuson, PhD; M. Hetman, MD, PhD; S.M. O'Nifer, PhD.

Object: The phosphodiesterase (PDE) is expressed by injured adult rat spinal cord cells, particularly oligodendrocytes. Inhibitory PDE with systemic rolipram attenuates c-AMP hydrolysis and TNF-α increase in the injured cord and improves locomotion. The aim of this study was to evaluate if these effects of rolipram were also present following a contusion at the spinal cord cervical level. Material and methods: Twelve adult female rats received a contusion injury at their cervical level segments (C5–6). Six rats had a systemic of rolipram/dimethylsulfoxide (DMSO) treatment for 14 days, and 6 rats had DMSO treatment. During the following 6 weeks, we determined the axonal conduction through the injury site and locomotion. A histological analysis is being performed to evaluate lateral white matter area spared at the injury site. Results: Rats that received rolipram had a significantly (p < 0.05) better descending and propriospinal/ascending axonal conduction through the injury site. This was significantly correlated with improved locomotion. Discussion: Rolipram is an effective treatment for experimental spinal cord contusion injury. It appears to lead to better conductivity through propriospinal/ascending axons and supraspinal motor axons that influence locomotion, possibly by acting on oligodendrocytes and/or the injured neurons. Conclusion: Rolipram can be used to preserve the integrity of the injured spinal cord. That can be combined with other reparative strategies to minimize tissue necrosis and improve axonal growth. Relevance: Rolipram, which has been evaluated in clinical trials for psychiatric issues, can be used in a responsible manner for persons with spinal cord trauma.

Sponsored by NIH (National Institutes of Health).
BIOMECHANICAL STUDY OF THE DESIGN PARAMETERS OF A BRACE FOR THE TREATMENT OF SCOLIOSIS. J. Clin, MScA; C.-É. Aubin, PhD; H. Labelle, MD.

Objective: To study the design parameters of a brace. Material and methods: Based on a finite element (FE) patient-specific model of the human torso (spine, rib cage, abdomen, pelvis), a personalized model of a brace was created. Its geometry was based on 8 generative curves defined by 10 morphometric parameters. The shell, the openings, the pads, the straps and the interface with the torso were modelled using the FE method. A Boston brace was then modelled. The placement of the brace on a patient (Cobb 40°, apex at T9, decompensation 23 mm, rib hump 15°) was simulated. Thanks to a design of experiments, the effects of a few brace design parameters (size, shell and pads stiffness, friction, straps tension) on the brace–torso interface forces and on geometrical corrections were calculated. Results: The tension of the strap has the most influence on torso–brace interface forces. The tested parameters generated equivalent corrections: decrease of thoracic kyphosis (8°–11°), correction of frontal decompensation (9–25 mm) but weak correction of scoliotic deformities. Other design parameters, like the brace geometry, could have more influence on geometrical corrections were calculated. Conclusion and relevance: The realism of brace treatment simulations has been improved. When completely validated, this model would represent an advanced tool for the study of brace design parameters and their effects on applied forces and geometrical corrections.

9 PATHOLOGICAL FRACTURE AFTER RADIATION AND SURGICAL RESECTION OF SOFT TISSUE TUMOURS. M. Nahhas, MD; M. Isler, MD.

Object: Some controversy exists as to the risk of pathological fracture after resection of soft tissue sarcomas, particularly in the context of adjuvant radiation therapy. Some authors have advocated prophylactic intramedullary nailing in high-risk cases (in particular those in which significant periosteal stripping is required for resection). Since intramedullary nailing is associated with some risk to the patient (as well as additional cost), we studied the incidence and impact of such a complication in our patients. Material and methods: Retrospective review of a prospective database. Results: Nine pathological fractures (in 9 patients) occurred after 590 patients with soft tissue tumours were treated with radiation therapy and surgery. The fractures occurred at a mean of 29.6 months after treatment and were not associated with significant trauma. Five females and 4 males were affected. The treatment of the fractures was associated with few complications, including 2 cases of fracture nonunion. No deep infections occurred. Risk factors associated with fracture included tumour location within the anterior compartment of the thigh, extensive surgical periosteal stripping and radiation therapy. Discussion: This cohort study suggests a very low incidence of pathological fractures following resection and irradiation for soft tissue sarcomas. Conclusion: Based on this series, the small number and low morbidity associated with pathological fractures in the context of irradiated and resected soft tissue sarcoma does not warrant prophylactic intramedullary fixation of the femur at the time of sarcoma resection. Relevance: To justify our actual management strategy and to avoid overtreatment of patients with soft tissue sarcomas.

8 ROLE OF LEPTIN IN THE PATHOPHYSIOLOGY OF HUMAN OSTEOARTHRITIS. M. Aoulad Aissa, MSc; A. Delalandre; D. Lajeunesse, PhD.

Introduction: Osteoarthritis (OA) is characterized by articular cartilage loss, bone sclerosis and synovial inflammation. Since leptin plays a key role in: i) osteoblast (Ob) differentiation, which is abnormal in OA Ob, and ii) obesity, a risk factor for OA, we studied its role in OA Ob. Methods and results: We prepared primary normal and OA Ob from subchondral bone and OA chondrocytes from cartilage of tibial plateaus. The expression of leptin and its receptor (OB-RB) were determined by reverse transcription-polymerase chain reaction (RT-PCR) and their production by ELISA and Western blot. Leptin is not expressed in OA chondrocytes. However, OA Ob expressed 3–4 times more leptin than normal Ob, and they produced more leptin. The expression of OB-RB was similar between normal and OA Ob. Inhibiting leptin signaling using inactivating antibodies for OB-RB reduced alkaline phosphatase activity and osteocalcin release by 35%. The expression of leptin was stimulated by 1,25(OH)2D3 treatment and inhibited by transforming growth factor b-1 (TGF-b1), yet the expression of OB-RB was reduced by 1,25(OH)2D3 and stimulated by TGF-b1. Conclusion and pertinence: This study suggests that the endogenous production of leptin is increased in OA Ob and is responsible, in part, for their abnormal phenotypic expression.

10 PERCUTANEOUS PLATING OF FRACTURES OF THE PROXIMAL HUMERUS: A PROSPECTIVE MULTI-CENTRE CLINICAL TRIAL. D. Rouleau, MD; B. Benoit, MD; G.Y. Laflamme, MD; G. Berry, MD.

Objective: To evaluate the safety and efficacy of minimally invasive plating of the proximal humerus using validated disease-specific measures. Materials and methods: During a period of 1 year, 30 patients were operated with use of the LCP proximal humerus plate (Synthes) through a 3-cm lateral deltidio-splitting approach and a second 2-cm incision at the deltoid...
insertion. The axillary nerve was palpated and easily protected during plate insertion. Two-part (n = 22) and 3-part impacted valgus type (n = 8) were included in this study since they can be reduced percutaneously. The average follow-up was 13 months (8–20 mo). All patients had Constant and DASH evaluations. Results: All fractures healed within the first 6 months with no loss of correction. Two reoperations were needed to remove intra-articular screws placed too long. No infection or avascular necrosis were seen. At the latest follow-up, the median Constant score was 68 points, with an age-adjusted score of 76. The mean DASH score was 27 points. Only age was independently predictive of both the Constant and DASH functional scores. Discussion and relevance: Percutaneous insertion of a locking proximal humerus plate is safe and produces good early functional and radiologic outcomes. Plate fixation of proximal humerus fractures may now be more desirable with the use of a biological approach that limits surgical insult and allows accelerated rehabilitation.

No sponsor.

11 (fundamental research)
MOLECULAR CLASSIFICATION OF AIS PATIENTS: TOWARD NEW EMERGING CONCEPTS IN MOLECULAR MEDICINE TO TREAT ADOLESCENT IDIOPATHIC SCOLIOSIS. B. Azeddine, MSc; D.S. Wang, MD, PhD; H. Labelle, MD; B. Poitras, MD; C.-H. Rivard, MD; G. Grimard, MD; A. Moreau, PhD.

Object: The goals of this study were to assess the possibility of establishing a molecular classification of AIS patients and to demonstrate the feasibility of correcting this melatonin signalling defect using therapeutic compounds. Material and methods: The melatonin signal transduction pathway functionality was investigated in osteoblasts derived from biopsies taken intraoperatively from a series of patients clinically well defined with AIS (n = 36) and compared with a series of age- and gender-matched subjects presenting another type of scoliosis or none (n = 14). Osteoblast cultures were treated in presence of varying concentration of melatonin ranging from 10^{-11}M to 10^{-8}M alone or in presence of 2.5 µM of different therapeutic compounds. The cAMP content was determined in duplicate using an enzyme immunoassay kit (Amersham-Pharmacia Biosciences). Results and discussion: Osteoblasts from patients with AIS showed a lack or a markedly reduced inhibition of forskolin-stimulated adenylyl cyclase activity by melatonin when compared with normal cells. Interestingly, treatment with compound A rescued melatonin signal defect in cells derived from 36% of AIS patients while the second compound tested (B) rescued melatonin signalling in 47% of AIS patients. Overall, melatonin signal transduction was restored in cells of 64% of AIS patients (23/36) when treated by one of these therapeutic compounds. Conclusions and relevance: These results showed the feasibility of correcting the melatonin signalling dysfunction observed in cells derived from AIS patients. This study opens new clinical research avenues to assess the efficacy of therapeutic compounds to prevent or reduce scoliotic deformities.

Sponsored by Fondation Yves Cotrel and by MENTOR.

13 (clinical research)
GESTURE AND POSTURE AS IMPORTANT FACTORS IN 3D KINEMATIC ASSESSMENT OF THE KNEE. F. Lavoie, MD; M. Laplante, BEng; G. Parent, MSc; N. Duval, MD; S. Doré, PhD; J.A. de Guise, PhD.

Object: Contradictions exist between studies of the 3D kinematics of the knee. We hypothesize that they are in part due to differences in the gesture performed by the subjects during kinematic assessment. The purpose of this study is to evaluate the impact of gesture variations on knee kinematics. Material and methods: Seventeen (17) healthy male subjects performed thirteen (13) 20-second series of knee-bends in a knee-bend standardizing structure designed to stabilize the pelvis and the feet in predetermined positions. All series differed regarding either foot rotation, foot advancement, ankle flexion, knee excursion, speed of execution or the amount of weight-bearing. 3D knee kinematics were recorded using optical position sensors mounted on a skin motion-reducing harness. Kinematic comparisons were made between a gesture of reference (the standard gesture) and every other gesture. Analyses were performed on average kinematic differences. Results: Differences of more than 15° of tibial rotation were found for gestures involving different foot rotation. Gestures involving different knee excursion brought on differences of more than 4° of tibial rotation, while hip rotation variations led to differences of tibial rotation of 5°. Discussion and conclusion: It is hereby demonstrated that gesture differences can have a dramatic impact on measured knee kinematics. Relevance: Gesture performance needs to be carefully moni-
tored during 3D kinematic assessment of the weight-bearing human knee.

Sponsored by FRÉOM (Fondation de recherche et d’éducation en orthopédie de Montréal) and by MENTOR.

14 (clinical research) SPINOPELVIC BALANCE IN NORMAL CHILDREN AND ADOLESCENTS. A CORRELATION STUDY. J.-M. Mac-Thiong, MD; H. Labelle, MD; É. Berthonnaud, PhD; R.R. Betz, MD; P. Roussouly, MD.

Object: Characterize the sagittal balance in the pediatric population and evaluate the correlations between spinopelvic parameters. Material and methods: Seven parameters were evaluated from the lateral radiographs of 341 normal subjects aged 3–18 years old: thoracic kyphosis (TK), thoracic tilt (TT), lumbar lordosis (LL), lumbar tilt (LT), sacral slope (SS), pelvic tilt (PT) and pelvic incidence (PI). Results: Mean values for pelvic parameters were 49.1° ± 11.9°, 7.7° ± 8.0° and 41.4° ± 8.2° for PI, PT and SS, respectively. Mean values for spinal parameters were 48.0° ± 11.7°, 44.0° ± 10.9°, −7.3° ± 5.2° and −3.1° ± 5.2° for LL, TK, LT and TT, respectively. The spinopelvic parameters were different from those reported in normal adults. PI was significantly related to SS and PT. Significant correlations were found between parameters of adjacent anatomic regions, except between PT and LT. Discussion: Correlations between spinopelvic parameters are similar between normal pediatric and adult individuals. Pelvic morphology (PI) regulates sagittal sacro-pelvic orientation (SS and PT). Sacral orientation (SS) is correlated with the shape (LL) and orientation (LT) of the lumbar spine. Conclusion: Adjacent anatomic regions of the spine and pelvis are independent, and their relationships result in a stable and compensated posture, presumably to minimize energy expenditure. Relevance: This study documents the spinopelvic balance in normal children and adolescents, and describes a scheme of correlations between morphological, shape and orientation parameters of the spine and pelvis. It can be used as a reference when evaluating and treating children with spinal deformities.

Sponsored by FRSQ (Fonds de recherche en santé du Québec), by MENTOR-CIHR (Canadian Institute of Health Research) and by Faculté des études supérieures de l’Université de Montréal.

15 (fundamental research) ROLE OF REG GROWTH FACTORS IN THE INFLAMMATORY PROCESS ASSOCIATED WITH OSTEOARTHRITIS. V. Landreville, BSc; D.S. Wang, MD, PhD; A. Moreau, PhD.

Object: The goal of this project was to determine whether Reg I growth factor played a role in inflammation associated with osteoarthritis (OA) and to characterize the mechanisms underlying Reg I signal transduction, especially in NF-κB activation. Material and method: The level and distribution of Reg I proteins were initially determined by immunohistochemistry methods using a monoclonal antibody on histological sections prepared from human knee joint cartilages obtained from OA patients and gender- and matched-control. The effects of TNF-α (20 ng/mL) and Il-1β (2 ng/mL) on Reg I signalling were studied by transient transfection assays using various cell lines in combination of specific kinase or phosphatase inhibitors. Finally, a structure-function study was undertaken by generating deletion mutants of Reg I as well as Reg receptor to delineate their respective interacting domains. These constructs were tested by transient transfection assays by assessing their ability to activate NF-κB. Results: Immunohistochemical (IHC) analysis allowed the detection of high levels of Reg I proteins in OA cartilage when compared with matched control subjects. Blockage of Reg receptor in transient transfections assays by specific inhibitors abrogated completely the activation of NF-κB by 2 distinct pro-inflammatory cytokines (TNF-α and Il-1β) by preventing the liaison of Reg I to its receptor. Discussion: Collectively, these data strongly argue that Reg signalling is involved in the inflammatory process associated with OA suggesting the existence of a converging cross-talk between Reg I and pro-inflammatory cytokines signalling pathways in OA. Conclusion and relevance: Elucidation of these mechanisms will determine the relevance of REG growth factors in OA. If proven, these factors may become relevant markers and novel molecular targets for which better pharmacological interventions may be designed.

Sponsored by CIHR (Canadian Institute of Health Research).

16 (fundamental research) IDENTIFICATION OF ERα GENE POLYMORPHISM IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS). L.-O. Lévesque; A. Moreau, PhD; S. Leduc, PhD; H. Labelle, MD; G. Grimard, MD; F. Moldovan, MD, PhD.

Object: Our hypothesis is that the estrogens markedly contribute to the perturbation of the hypothalamo–hypophiso–gonadic regulated endocrinology leading to the deformation of the growing spine. The objective of this project is to define the contribution of both types of estrogen receptors, ERα and ERβ, since many studies have suggested that in AIS, the curve progression would be dependent on some genetic factors associated with the skeletal growth and the menarche. Material and methods: By Western blot, we have identified the 2 known estrogen receptors, ERα and ERβ, in osteoblastic cells. The ERα estrogen receptor gene, which contains polymorphism PvuII and XbaI, was amplified using the polymerase chain reaction (PCR) on genomic DNA isolated from lymphocytes of AIS patients Results and discussion: The PvuII polymorphism is present in the estrogen receptor gene (ERα) and was found in 50% of our samples. These results are only preliminary, and they will be further investigated in a larger number of patients. These results allowed us to confirm that the PvuII polymorphism, which was initially identified in Japanese girls with right thoracic type idiopathic scoliosis, also exists in our population. Relevance: The etiology of adolescent idiopathic scoliosis (AIS), the most common form of the scoliosis, is not clearly elucidated, even though it affects an important part of young adolescents (0.2%–6% of the population; in Québec only, it affects 4% of the population). Today, it is more conceivable that to the biomechanics and biochemical factors can be added up in new concepts based on signalling dysfunction of hormonal factors implicating the neuroendocrinal system.

Sponsored by the Centre de recherche de l’Hôpital Sainte-Justine.
Randomized study comparing early clinical results after total hip resurfacing and total hip arthroplasty. P.A. Vendittoli, MD; M. Lavigne, MD; A. Roy, MD.

Background and object: The dramatic improvement in clinical function and the high patient satisfaction rate after total hip arthroplasty (THA) has been well documented. However, preserving the hip anatomy and biomechanics, surface replacement arthroplasty (SRA) might offer some clinical advantages in comparison to the total hip arthroplasty. This study wants to compare the early results of the 2 techniques. Method: All patients eligible for the study were randomized to receive uncemented metal–metal total hip arthroplasty or a hybrid metal–metal surface replacement arthroplasty. Clinical data were prospectively collected preoperatively and at 3, 6 and 12 months postoperatively. The WOMAC score, SF-36, Merle D’Aubigné and other clinical data, along with patient satisfaction, were compared. Results: One hundred and fifty hips were randomized. Patients in both groups demonstrated a very high satisfaction rate and achieved similar functional scores. Three isolated dislocations occurred in the THA group and none in the SRA group. One surface replacement hip went to revision for head necrosis. No intraoperative femoral neck notching or postoperative femoral neck fracture occurred in the surface replacement group. Discussion: This study confirmed the safety and clinical benefits of metal–metal surface arthroplasty of the hip in the early postoperative period. Offering similar clinical satisfaction to the young patient, the surface arthroplasty implant preserved the proximal femoral bone stock for further surgeries. However, long-term follow-up is necessary to determine the survivorship of these implants over the total hip arthroplasty.

Sponsored by Zimmer and Warsaw Inc.

Object: Little is published about the complications of massive oncological endoprosthetic implants, in particular the rate of aseptic loosening and other indications for revision. Such data can have an impact in the choice of reconstruction methods. Material and methods: From our prospective orthopedic oncology database, we found 32 patients who had received a distal femoral reconstruction using a massive endoprosthesis, from the years 1990 to 2004. The technique and implant used were identical in all patients. Average follow-up was 3.8 years. The Musculoskeletal Tumor Society (MSTS) method of radiologic evaluation was used. Results: Thirty-two patients were included in our study. Radiological evaluation showed bone remodelling to be excellent in 31 patients and good in 1; the interface was excellent in 32; anchorage was excellent in 31 and good in 1 patient. There were no implant body problems. Evaluation of the implant articulation revealed an excellent result in 30 patients and a good result in 2 patients. Extracortical bone bridging was excellent in 6 patients, good in 4, fair in 11 and poor in 11. Discussion: In this descriptive study of complications in a prospective series of patients using a uniform reconstruction method, from a radiological point of view, certain conclusions can be drawn regarding medium and long-term outcome. Some aspects of the radiological evaluation that are not addressed by the MSTS method are discussed. Conclusion: Overall results in this series suggest that a low rate of complications can be expected from the radiological standpoint when using massive endoprostheses for the reconstruction of the distal femur after oncological resection. Relevance: We offer some scientific data regarding outcome for this implant to allow the surgeon to make an evidence-based choice of a method of reconstruction.

No sponsor.
recommended at this initial visit for more than 6% of patients and at the next visit for 3% more patients. Conclusion: Depending on the chosen criteria, between 16% and 48% of IS patients were referred late compared with 1% previously with school screening, while a high rate of unnecessary referrals, or false positives (no scoliosis at referral), still prevailed. Relevance: These findings suggest that current methods of screening and referral for IS are inappropriate both in sensitivity and specificity. The comprehension of the underlying factors leading to this situation is of great importance for the patients and the health care system.

Sponsored by CIHR (Canadian Institutes of Health Research) MENTOR and AnEIS Strategic Training Programs.

20 (fundamental research) Relation between pelvic geometry and lumbar lordosis following surgery in adolescent idiopathic scoliosis. F. Tanguay; J.-M. Mac-Thiong, MD; J.A. de Guise, PhD; H. Labelle, MD.

Object: Sixty patients with adolescent idiopathic scoliosis undergoing posterior spinal instrumentation and fusion (PSIF) were studied to evaluate the effect of PSIF on the spinopelvic relations. Material and methods: Thoracic kyphosis (TK), total lumbar lordosis (LL), LL within and below fusion, pelvic incidence (PI), sacral slope (SS) and pelvic tilt (PT) were measured on preoperative and postoperative standing lateral radiographs. Results: No significant change was found in postoperative sagittal spinopelvic parameters compared with preoperative values. Significant postoperative correlations were found between PI and total LL ($r = 0.67$), SS and total LL ($r = 0.90$), PI and LL below fusion ($r = 0.40$) and SS and LL below fusion ($r = 0.48$). Pelvic parameters did not influence LL within fusion. A strong correlation between LL below and within fusion was found ($r = -0.76$). Similar results were obtained when patients were classified according to the lowest instrumented vertebra. Discussion: Sagittal spinopelvic parameters are preserved after PSIF as well as the relation between pelvic geometry and lumbar parameters. LL below fusion is influenced by LL within fusion, which is fixed by PSIF. LL below fusion must compensate to maintain a good correlation between total LL and pelvic geometry. Relevance: PI could help to determine the adequate total and segmental LL in preoperative planning. Furthermore, since postoperative sagittal profile is significantly influenced by the preoperative profile, it must be maintained intraoperatively by an adequate positioning during surgery.

Sponsored by CRSNG-INNOV, Solution YD3, VRQ, Univalor.

22 (clinical research) Randomized study comparing whole blood metal ions after metal–metal 28-mm THA or total hip resurfacing. P.-A. Vendittoli, MD; M. Lavigne, MD; S. Mottard, MD; A. Roy, MD.

Object: Tribological studies suggest that larger metal–on-metal articulations would produce less wear than smaller diameter components. The aim of the present study is to describe whole blood chrome and cobalt ions concentration after cemented metal–metal total hip arthroplasty (THA) and hybrid metal–metal surface replacement arthroplasty (SRA). Material and method: All patients eligible for the study were randomized to receive uncemented THA or a hybrid SRA. Whole blood samples were collected preoperatively at 3 and 6 months and 1 year postoperatively. Chrome and cobalt concentration were measured using a spectrophotometer. Summary of results: At 1 year postoperatively, whole blood levels of the were Cr 2.4 umol/L, Co 0.7 umol/L and Ti 4.6 umol/L for the resurfacing group and Cr 1.8 umol/L, Co 0.8 umol/L and Ti 2.1 umol/L for the THA group. In comparison with the preoperative levels, the levels increased significantly for all elements Cr 1.4×, Co 7.3×, Ti 7.7× for the resurfacing group, and Cr 1.5×, Co 8.1×, Ti 3.7× for the THA group. Comparing both groups, at 1 year postoperatively, only the Ti whole blood level was significantly increased in the resurfacing group ($p = 0.001$; no significant difference was found for the Cr and Co). Discussion: Using these specific implants, the increases in whole blood metal ions are similar to the best results found in the literature for 28-mm
metal–metal THA. Regarding the metal ions production, the results of this study confirm the safety of large diameter metal–metal articulations.

Sponsored by Zimmer, Warsaw Inc.

23 (fundamental research) 
**Assessment of the sagittal curves of the spine: comparison between the maximum Cobb angle technique, the anatomical Cobb angle technique and the tangent circles method.** F.-M. Pinel-Giroux; J.-M. Mac-Thiong, MD; H. Labelle, MD.

**Object:** Compare the reliability and clinical usefulness of 3 measurements techniques of the sagittal curves of the spine. **Material and methods:** We used 30 sagittal radiographies of the rachis, then 3 observers measured the thoracic kyphosis (TK) and lumbar lordosis (LL) with each of the 3 evaluated techniques, twice. The measurements were taken using 2 data-processing softwares (SpineView and Sagittal OptiSoft). **Results:** The maximal Cobb angle and the anatomic Cobb angle offered similar interobserver and intraobserver reproducibility (ICC > 0.77). The tangent circles method had a much better intraobserver reproducibility for measurements of TK (ICC = 0.94) and interobserver reproducibility for measurements of LL (ICC = 0.97) than the 2 previously mentioned techniques. **Discussion:** The anatomic angle of Cobb technique does not have a better reproducibility of measurements than the maximum Cobb technique, in spite of the fact that it uses predetermined vertebrae as the starting point of its measurements. Furthermore, this technique also proves to be a more accurate representation of the curves of the spine. **Conclusion:** The maximum Cobb technique offers the advantage, compared with the anatomic Cobb technique, of assessing the maximum amplitude of the sagittal curves of the spine. The tangent circles method proves to be the most interesting technique for its good reproducibility. **Relevance:** The anatomic Cobb angle technique and the tangent circles method offer noticeable advantages compared with the anatomic Cobb technique, which is usually used by clinicians.

Sponsored by Rx&D, FRSQ (Fonds de recherche en santé du Québec) and CIHR (Canadian Institutes of Health Research).

24 (clinical research) 
**Including MSK workshops in a medical curriculum.** V. Godbout, MD; M. Malo, MD; S. Gagnon, MD; C. Stanciu, MD; S. Dubé, MD.

**Object:** Thirty percent of family medicine consultations are for musculoskeletal complaints, which constitute less than 5% of medical curriculum. This study aims to measure the effect of MSK workshops in clinical-years students. **Material and methods:** We developed 3 half-day MSK workshops based on educational needs demonstrated by a previous analysis. Three groups of 10 students volunteered to participate. General MSK basic knowledge was given in the 1st -day for groups A and B. In the second 1/2-day, group A received a shoulder workshop, group B a knee workshop. A pre/post test including general, shoulder and knee sections was written before and after the full day. A control group (C) was submitted to same pre/post test without doing the workshops. **Results:** Groups A and B significantly improved in general knowledge and in their respective sections on post-test (Student paired t test, p < 0.05) and had no significant improvement in the other section. No significant difference was observed for the control group in all sections. **Discussion:** Introduction of MSK workshops could significantly improve students’ general and specific knowledge. This form of workshop is amenable in the actual curriculum considering the number of students, teacher availability and facilities. **Relevance:** Considering the lack of MSK formation in clinical years, introduction of MSK workshops in clerkships could significantly augment students’ MSK general and specific knowledge.

Sponsored by the Département de chirurgie of the Université de Montréal and by FREOM (Fondation de recherche et d'éducation en orthopédie de Montréal).

25 (clinical research) 
**Hip revision — predictors of success.** D. Rouleau, MD; A. Roy, MD; P.A. Vendittoli, MD; M. Lavigne, MD; B. Benoit, MD.

**Objective:** Revision total hip arthroplasty in cases of proximal femoral bone loss is challenging for surgeon and implant designer alike. This study examines, in this specific situation, which patient characteristics predict success in terms of mobility, limb length, pain, bone stock and complications. **Materials and methods:** We studied retrospectively 83 cases of femoral reconstruction with the Revitan stem. The Paprosky classification was used to qualify bone defects on preoperative radiological evaluation. Demographic, clinical and intraoperative data were collected, and along with any complications, were described. Clinical (WOMAC function score) and radiological follow-up were performed at a minimum of 12 months. A multivariate analysis was undertaken in search of correlation between patient characteristics and outcome. **Results:** The mean follow-up was 44 months (23–66 mo). Forty-eight percent of patients had at least 1 previous revision. The mean postoperative WOMAC score was 83. Stabilization or regression of osteolytic lesions was observed in 75% of cases. A correlation was found between the risk of dislocation and the number of previous revision surgeries. **Discussion:** Dislocation is a major complication. The number of previous surgeries is the strongest outcome predictor of dislocation. **Conclusion and relevance:** Hip revision is associated with major complications. Predicting complications helps in choosing components (e.g., a larger femoral head) and making surgical decisions.

Sponsored by FREOM (Fondation de recherche et d'éducation en orthopédie de Montréal) and by Zimmer Canada.

26 (fundamental research) 
**Study of pathomechanisms initiating scoliotic deformities in growing pinealectomized chickens.** H. Boulanger, BSc; P.A. Mathieu, PhD; C.-É. Aubin, PhD; K.M. Bagnall, PhD; A. Moreau, PhD.

**Object:** To examine the early changes triggering the formation of spinal deformities in growing pinealectomized chickens and to identify and characterize a possible common effector found both in animal models and human scoliotic individuals.
Material and methods: One hundred and twenty-five chickens were pinealectomized and examined by the mean of complementary methods during 28 days. Circulating melatonin levels were determined at days 14, 21 and 28 in each chicken by an ELISA method. Molecular expression profiles were determined by reverse transcription-polymerase chain reaction (RT-PCR) and confirmed at the protein level by Western blot analysis. Chickens were injected with pharmacological inhibitors in order to determine the relevance of a downstream effector possibly implicated in adolescent idiopathic scoliosis (AIS) pathogenesis. Results: Pinealectomized chickens developing a scoliosis exhibited 2 different patterns of melatonin expression: group 1 showed a steady decrease of the hormone concentration while group 2 presented a severe decrease in a first phase (days 14–21) followed by a strong recovery during the second phase (days 21–28). Expression analysis allowed the detection of an effector upregulated only in pinealectomized animals developing a scoliosis. Furthermore, injection of inhibitors targeting that effector reduced by 50% the number of scoliotic animals. Conclusion: Our results showed for the first time a more dynamic variation in circulating melatonin levels among pinealectomized chickens, which was unsuspected by previous studies. Moreover, such a bi-phasic pattern strongly suggests that melatonin could play a critical developmental role post-hatching, influencing at the earliest stage possible the mechanisms regulating paraspinal musculature activity and possibly its development. Relevance: These results could shed more light on the role of melatonin in pathological mechanism leading to the asymmetric growth of the spine in human scoliotic deformities and raise also the possibility of preventing and/or reducing scoliotic deformities by pharmacological approaches.

Sponsored by the Fondation Yves Cotrel of the Institut de France and by the Training Program MENTOR.

27  (clinical research)
EVALUATION OF RECONSTRUCTIVE SURGERY USING LARS ARTIFICIAL LIGAMENTS IN 64 ACUTE KNEE DISLOCATIONS.
P. Dahan, MD; E. De Oliveira, PhB; G. Berry, MD; J. Fernandes, MD, MSc; P. Ranger, MD.

Object: Although a variety of options have been proposed for the treatment of knee dislocations, the optimal one remains controversial. Allografts and autografts have both been used for cruciate reconstruction. The goal of this study is to evaluate the outcome and survival of acute cruciate reconstruction using LARS ligaments after knee dislocations. Material and methods: Sixty-four patients with acute knee dislocations were treated with LARS artificial ligaments for bicruciate reconstruction. Physical exam, SF-36, Lhysolm, IKDC questionnaires as well as TELOS radiologic exams were used to evaluate motion, stability and functional status of all patients. The contralateral knee was the reference. Results: The 64 patients were divided into 4 subgroups of different postoperative intervals ranging from 6 months to 7 years. The overall average ROM was 120° flexion/–1.4° extension. The differential average TELOS for LCA, LCP at 30º and LCP at 90º were, respectively, 2.8 mm, 2.7 mm and 6.9 mm and their average Lhysolm, IKDC and SF-36 scores were 73.4, 64.5 and 79.2. Statistical analysis showed no significant differences (p > 0.05) between subgroups in terms of function, laxity and extension but did for flexion. Discussion: The findings demonstrated that patients treated by this method can regain a functional knee, and it does not seem to deteriorate with time. Conclusion: Knee reconstruction using LARS artificial ligaments for acute knee dislocation shows promising results for short- and long-term durations. Relevance: New advancement in the treatment of knee dislocation.

No sponsor.

28  (fundamental research)
A POROUS CALCIUM PHOSPHATE–BASED BIOCERAMIC PREPARED BY SHS METHOD FOR GUIDED BONE REGENERATION.
M. Zoulgami, PhD; L. Épure, MSc; L.H. Yahia, PhD.

Object: In orthopedics, the most common bone substitution materials are calcium phosphate ceramics (CaP). Their chemical composition is very similar to that of the main inorganic constituent of hard bones, giving them a strong osteoconductivity and a good biocompatibility in bone contact. We focus on the development of a macroporous resorbable bio-ceramic, tricalcium phosphate β-TCP:Ca₃(PO₄)₂, with a controlled pore morphology to allow bone tissue regeneration. Material and methods: In the present study, we evaluated the morphological and chemical aspects of porous β-TCP that are synthesized by the self-propagating high temperature synthesis (SHS) method. Morphological characteristics of samples were examined using LV-SEM in combination with energy dispersive x-ray spectroscopy EDS, and chemical composition was determined using wide-angle x-ray diffraction and infrared spectroscopy (IR). Results: LV-SEM showed a well-controlled pore size distribution (graded porosity ranged from 250 to 350 um in diameter), a good interconnecting porosity and homogeneous structure. X-ray diffraction revealed the presence of β-TCP with small amounts of others inorganic compounds such as α-TCP and CaO. This was also confirmed by IR spectroscopy. A preliminary evaluation of cell viability using 3-(4,5-dimethylthiazole-2yl)-2,5-triphenyl tetrazolium (MTT) assay indicated a non-cytotoxic effect over a 72-hour period. Conclusion: To conclude, the SHS process seems to be an adequate method for producing CaP bioceramics; it allows a better control of pore size and distribution, is a simple single step procedure and produces materials of high purity.

Sponsored by CRSNG, by Département du génie biomédical, and by the Director’s Fund, Dr. L’Hocine Yahia, Ecole Polytechnique de l’Université de Montréal.

29  (clinical research)
VARIABILITY IN SPINAL INSTRUMENTATION STRATEGIES FOR ADOLESCENT IDIOPATHIC SCOLOSIUS (AIS).
M. Robitaille, BEng; C.-É. Aubin, PhD; H. Labelle, MD.

Objectives: To document, analyze and classify the preoperative planning strategies for the posterior instrumentation of scoliotic spines. Material and methods: Twenty-nine SRS fellow surgeons were asked, on an individual basis, to provide their detailed preferred posterior instrumentation planning using a graphical worksheet and the usual preoperative clinical x-rays for 5 AIS patients (13–18 yr). Results: Overall, the number of implants used ranged from 8 to 30 per patient (16...
New positioning system for posterior spinal surgery: A preliminary report of the two first operative patients. K. Duke, MSc; C.-É. Aubin, PhD; J. Dansereau, PhD; H. Labelle, MD.

Object: To test the functionality and safety of a new positioning system for posterior spinal surgery. Material and methods: Two scoliotic patients (P1, P2) who underwent posterior instrumentation surgery were selected. The positioning system (New) is similar to the Relton–Hall (RH) system currently used, except the cushions are contoured to follow the patient’s sides, and their position can be easily modified to provide active corrections. Prior to surgery, the patients were placed on the RH and the New system to compare the pressures at the patient-cushion interface. During the surgery, pressures were recorded as well as standard x-rays. Results: For P1 the pre-, per- and postoperative curves (T4–T11) were 64°, 47° and 17°, respectively. For P2 the curves (T6–T12) were 62°, 36° and 16°. For P1 average (and maximum) pressures were 21 (63), 15 (35) and 26 (300) mmHg on the RH, new preoperative and new peroperative. The pressures were 21 (73), 14 (47) and 24 (300) mmHg for P2. Blood loss was 600 mL and 1300 mL for P1 and P2, respectively. Both patients had slight reddening of the right iliac crest, where the maximum pressures were observed, but no major complications from the positioning. Discussion and relevance: Previous studies have already shown that passive prone patient positioning reduces the magnitude of scoliotic curves significantly. It is the hope that this system can facilitate the instrumentation manoeuvres and provide further correction by modifying the placement of the various cushions and by adding passive and active correction forces. Conclusion: The results of the first 2 trials were promising and showed the feasibility and security of this new positioning system. A larger clinical trial is underway to determine if there is a significant improvement in the amount of correction achieved with this system.

Sponsored by NSERC/CRSNG, Medtronic Sofamor Danek.

Three-dimensional knee joint linear displacements: Differences between genders during treadmill walking. L.F. Requiao, MSc; A. Fuentes, BSc; N. Hagemeister, PhD; G. Parent, MSc; J.A. De Guise, PhD.

Object: Women have a higher incidence than men of anterior cruciate ligament (ACL) injuries in sport activities. Anterior knee laxity is proposed as an anatomic risk factor in ACL injury. Increased anterior knee laxity and higher valgus angle in females suggest that they could present higher knee joint translations than males during gait. The purpose of this study was to compare 3-dimensional (3D) knee joint linear displacements between healthy males and females during treadmill walking. Material and methods: Using an exoskeleton (developed by the LIO group) fixed on the right femur and tibia, 7 healthy males and 5 healthy females were asked to walk on a treadmill at a natural pace. The knee joint kinematics was recorded by a VICON motion analysis system during 4 trials of 20 seconds. The average anteroposterior (AP) and mediolateral (ML) linear displacement were calculated and analyzed for both groups. The amplitudes of AP and ML linear displacements were also compared. Results: Females tended to present a decrease of anterior displacement at the end of the swing phase and at early stance phase and an increase of medial displacement during the swing phase. No differences between groups for the mean of AP and ML displacement amplitude were observed. Discussion: Despite no significant difference in linear displacements amplitude, the results of this study suggest some differences in 3D linear displacement patterns between groups. A possible decrease of the ACL tension in females may affect muscle activities and then decrease the functional joint stability assured by dynamic co-contraction of muscles. Relevance: This study could present new insights about gender differences in knee biomechanical function and help to explain why females present an increased risk of ACL injury.

Sponsored by LIO (Laboratoire d’imagerie et orthopédie), CHUM, Université de Montréal.

Method for analysis of MSK educational needs in clinical years. V. Godbout, MD; J. Fernandes, MD, MSc; M. Malo, MD; S. Gagnon, MD; C. Stanciu, MD.

Object: Thirty percent of family medicine consultations are for MSK complaints, which constitutes less than 5% of medical curriculum. This study aims to determine the MSK educational needs of University of Montréal clerkship students with a method using perceived, demonstrated and normative needs. Material and methods: Characteristics of 3 groups (students, residents and attendants) and determination of educational needs by 1) perceived (survey), 2) demonstrated (pre-test,
33  
ACUTE KNEE DISLOCATION: 2- AND 7-YEAR FOLLOW-UP AFTER RECONSTRUCTION OF ACL AND PCL USING ARTIFICIAL LIGAMENTS. E. De Oliveira Junior, Pht; P. Ranger, MD; P. Dahan, MD; G. Berry, MD; M. Talbot, MD; J. Fernandes, MD.

Object: The purpose of this study is to evaluate the stability and function, at 2 and 7 years, of acute dislocated knees treated with LARS ligaments. Material and methods: Eleven patients were evaluated at 2 and 7 years postoperatively. They were submitted to a physical exam of the lower extremity, a Telos radiologic laxity exam as well as a Lysholm questionnaire. The nonoperated knee of the patient was used as a baseline for the operated knee. Results: The statistical results did not show any significant differences ($p > 0.05$) between the 2- and 7-year follow-up in terms of laxity as well as for the LCA as for the LCP. This absence of difference was also observed in the extension ROM. On the other hand, flexion ROM as well as the Lysholm scores showed a significant improvement ($p < 0.05$). Discussion: The findings demonstrate good and sustained results in terms of function, even though the differential residual laxity of the LCP between the operated and nonoperated knee at 7 years was 8.5 mm. Conclusion: The results obtained in this study reveal a good durability of LARS artificial ligaments at 7 years for acute dislocated knee reconstruction. Relevance: Moreover, we can compare this treatment option to other existing ones in the literature and hope, from our results, to be able to optimize the treatment of knee dislocations.

No sponsor.

34  
RANDOMIZED STUDY COMPARING BIOMECHANICAL RECONSTRUCTION AFTER TOTAL HIP RESURFACING AND TOTAL HIP ARTHROPLASTY. M. Lavigne, MD; P.A. Vendittoli, MD; A. Abaub, MD; A. Roy, MD.

Introduction: Reconstruction of normal hip biomechanics after total hip arthroplasty (THA) is important to optimize clinical function and to reduce wear. This study wants to compare the precision of hip biomechanics reconstruction by radiographic analysis of patients randomized between THA and surface replacement arthroplasty (SRA). Material and method: Ninety-six patients suffering from unilateral osteoarthritis of the hip joint were randomized between THA or SRA. Standardized pre- and postoperative AP radiographs of the pelvis were digitized and analyzed. Discussion: This method, analyzing 3 types of needs with multiple groups, reduces the effect of training and common problems are given priority. Ninety-five percent of attendants judge them this way. Anatomy, physical exam, imaging and pre-test validity. The pre-clinical MSK exam result is worse than other exams. Normative: One MSK mandatory objective: LBP in family medicine rotation. Discussion: These students present a lack of MSK training, justifying development of a mandatory MSK rotation during clerkship. Observations are consistent with the literature. This method, analyzing 3 types of needs with multiple groups, reduces the effect of training wishes versus real educational needs. Addition of family medicine residents and attendant groups is desirable. Relevance: Method is transferable to other specialties and environments.

Sponsored by the Département de chirurgie of the Université de Montréal and by FRÉOM (Fondation de recherche et d’éducation en orthopédie de Montréal).

35  
FEMORAL AND ACETABULAR BONE PRESERVATION WITH SURFACE ARTHROPLASTY OF THE HIP. P.A. Vendittoli, MD; M. Lavigne, MD; A. Roy, MD.

Object: Surface arthroplasty of the hip is a very promising surgical treatment for hip degeneration in the young and active adult. Because of their high susceptibility of revision surgery, bone preservation is crucial in young and active adults. In most surgery, femoral head and neck size dictate the acetabular component size. Many surgeons suggested that this limitation might favour the use of larger size acetabular component in comparison to a standard total hip arthroplasty (THA) and then removing more acetabular bone. Material and methods: One hundred and fifty subjects of less than 65 years of age with hip joint degeneration have been randomized for an uncemented metal–metal THA or a hybrid metal–metal surface arthroplasty (SRA) of the hip. We compared the component sizes of each group and evaluated the effect of different pathoanatomies of the proximal femur on the implant size selection. Results: The average acetabular component size was 55.3 mm (min 48, max 62) for the SRA and 55.1 mm (min 48, max 60) for the THA group. The majority of subjects presented femoral head retroversion associated with superolateral subluxation (impinging hips). Discussion: This study...
shows that using specific implants and following careful surgical planning and technique, surgeons can preserve femoral and acetabular bone stock with SRA of the hip. **Relevance:** The information brought by this randomized study will enhance surgeons and patients to take a better informed decision regarding the pros and cons of the resurfacing of the hip versus total hip prosthesis.

**Sponsored by Zimmer and Warsaw Inc.**

36 (out of competition poster)
**MIXED TUMOUR OF BONE WITH MALIGNANT EVOLUTION — A CASE REPORT.** **M. Nahhas, MD; M. Isler, MD.**

**Object:** Mixed tumour, a term described by Minssen in 1874, is characterized by the coexistence of epithelial and mesenchymal features on histopathology. Mixed tumours of the salivary glands and skin are relatively common and have been reported to metastasize to bone. The behaviour of such lesions is generally thought to be indolent. Mixed tumour of bone is very rare, and we found only 1 report in the literature. **Material and methods:** Case report and literature review **Results:** We report a patient with primary mixed tumour of the proximal femur with rapid infiltrative growth, that recurred despite aggressive curtailage and also following wide resection, finally causing massive pulmonary metastasis and death. **Conclusion and relevance:** Mixed tumour of bone of this type has not been reported, and its behaviour warrants particular attention.

**No sponsor.**

37 (out of competition poster)
**VERTICAL ACETABULAR POSITIONING WITH THE AID OF AN INCLINOMETER IN TOTAL HIP ARTHROPLASTY.** **P.A. Vendittoli, MD; M. Lavigne, MD; A. Roy, MD; N. Duval, MD.**

**Objective:** Vertical acetabular cup positioning is an important technical aspect in total hip arthroplasty (THA). It has been reported that acetabular component malpositioning is associated with an increased risk of dislocation, limited range of motion and impingement. A high vertical acetabular angle is correlated positively with premature polyethylene wear, osteolysis and early aseptic loosening in metal–polyethylene and ceramic–ceramic interface. **Methods:** To evaluate the potential benefit of using an inclinometer in vertical acetabular cup positioning, 101 hips were randomized to have acetabular cup insertions with an inclinometer or by visuo-spatial perception. The surgeries were performed by 7 surgeons. **Results:** Acetabular cup vertical angles averaged 43.6° ± 6.8° with the inclinometer, and 42.7° ± 6.7° by visuo-spatial perception (VSP) ($p = 0.506$); 57.4% of the cups were positioned within the desirable angle range of 40°–49° with the inclinometer compared with 50.0% by VSP ($p = 0.454$). The proportion of cup positioned outside a safe angle range of 30°–55° was low in both groups: 6.4% ($n = 3/47$) for the inclinometer group versus 3.8% ($n = 2/53$) for the VSP group ($p = 0.536$). **Conclusion:** In THA performed by dedicated hip surgeons, the inclinometer did not significantly reduce the variability of the cup abduction angle compared with the VSP method. However, the inclinometer might be a valuable tool in difficult cases or for surgeons performing a low volume of hip surgery.

**Sponsored by Zimmer and Warsaw Inc.**

38 (out of competition poster)
**RANDOMIZED STUDY COMPARING ALUMINA–ALUMINA TO METAL-ON-POLYETHYLENE-BEARING SURFACES IN TOTAL HIP ARTHROPLASTY: 3 TO 8 YEARS’ FOLLOW-UP.** **P.A. Vendittoli, MD; M. Lavigne, MD; P. Lavoie, MD; N. Duval, MD.**

**Purpose:** The excellent results obtained with metal-polyethylene (M-P) bearing surfaces in total hip arthroplasty are still limited by the production of polyethylene wear debris, osteolysis and aseptic loosening. This study compares early results and complication of M-P and alumina-on-alumina (AL-AL) total hip arthroplasty. **Materials and methods:** One hundred and forty hips (92 unilateral, 24 bilateral) in patients of 18–70 years old undergoing hybrid primary total hip arthroplasty were randomized to M-P or AL-AL bearing surfaces. We report the clinical and radiological results after an average follow up of 67 (36–96) months. **Results:** At last follow-up, 99 patients were evaluated. No significant difference was found on clinical scores. No specific complication associated with alumina components was observed. However, polyethylene linear wear of 1 mm or more was found in 57% (28/49) of M-P cases. Three M-P total hip arthroplasties are pending revision for severe polyethylene wear. **Conclusion:** Although early clinical results of AL-AL bearing surfaces were similar to M-P, the M-P group already shows significant bearing wear in this young population group. This is suggesting that AL-AL should be considered as a bearing surface of choice for total hip arthroplasty in the young patient.

**Sponsored by Ceraver Osteal, Roissy, France.**

39 (fundamental research poster)
**3D BIOMECHANICAL METHOD FOR THE EVALUATION OF KNEE OSTEOARTHRITIS PATIENTS: FEASIBILITY AND PRELIMINARY RESULTS.** **K. Turcot, MScA; K. Boivin, MSc; R. Aissaoui, PhD; M. Pelletier, MD; N. Hagemeister, PhD; G. Parent, MSc; J. de Guise, PhD.**

**Object:** Knowing the influence of biomechanical factors in the development and progression of knee osteoarthritis, the quantification of their impact on the dynamic knee function after a treatment becomes essential. Nevertheless, the current clinical outcomes do not provide this information. Thus, the purpose of this project is to develop a new biomechanical evaluation for patients’ physiotherapy follow-up. Specific objectives are to determine: (1) the feasibility of the method, (2) reliability of biomechanical parameters, (3) their construct validity and (4) their sensibility to change after a physiotherapy treatment. **Material and methods:** Sixty participants older than 50 years old are included in this project (30 asymptomatic, 30 osteoarthritis). The proposed biomechanical method consists in the measurement of 3D parameters (kinematic, kinetic, accelerometric) during treadmill gait walking. During the evaluation, the participants wear a knee harness (developed at the LIO) where sensors of movements are rigidly fixed. Their trajectories are collected by VICON motion analysis system. The knee harness allows an accurate measurement of small magnitude movements of the knee. The treadmill is instrumented of force plate forms to measure 3D ground reaction forces. Two triaxial accelerometers are used to measure femoral and tibial linear accelerations. **Results:** First results demonstrate the fea-
sibility of the method in tasks execution and in pain sensation with the use of the knee harness. **Discussion and conclusion:** Next objectives of the project will determine the reliability, validity and sensitivity to change of biomechanical parameters. **Relevance:** The identification of relevant biomechanical parameters for patients' physiotherapy follow-up will be beneficial to improve knee osteoarthritis treatments.

**Sponsored by CIHR, FRSQ, CRSNG, MENTOR (CIHR).**

40 (fundamental research poster)

**Gestation standardization increases the reproducibility of 3D kinematic measurements of the knee joint.**

F. Lavoie, MD; M. Laplante, Blng; G. Parent, MSc; N. Duval, MD; S. Doré, PhD; J.A. de Guise, PhD.

**Object:** The literature on the 3-dimensional (3D) kinematics of the knee suggests that the gesture accomplished during kinematic assessment might play a significant role in the values measured. The purpose of this study is to demonstrate that a standardized gesture leads to an increased reproducibility in 3D kinematic measurements of the knee. **Material and methods:** Seventeen healthy male subjects performed series of knee-bends in standardized and unconstrained conditions while their left knee’s 3D kinematics were recorded using an optical motion-recording system. Standardized knee-bends were performed in a specially designed structure stabilizing the shoulders, pelvis and feet. Coefficient of multiple correlation (CMCs) were calculated for the ascent and the descent phases of the knee-bends for the tibial rotation and abduction/adduction components of the knee movement. **Results:** Comparisons between CMCs of the different gesture conditions showed a statistically significant increase in reproducibility for the tibial rotation during the standardized knee-bends. Between-subject variability was also decreased when kinematics were recorded during a standardized knee-bend. **Discussion and conclusion:** It is hereby demonstrated that gesture standardization leads to more reproducible knee kinematics values for the same subject and for different subjects. **Relevance:** Gesture standardization is an important point to consider for precise and relevant kinematic assessment of the living human knee.

**Sponsored by FRÉOM and by MENTOR.**

41 (fundamental research poster)

**Evaluation of the load induced to the upper limbs by different manual wheelchair propulsion patterns: Literature review.**

G. Desroches, BSc; R. Aissaoui, PhD; D. Bourbonnais, PhD.

**Objective:** Present the latest developments in research on manual wheelchair propulsion evaluation and its incidence on upper extremities injury. **Material and method:** Through a review of the literature previously published in scientific journals. **Results:** According to the National Health Interview Survey on Disability (NHIS-D), more than 1.6 million American citizens were, in 2001, frequent users of a manual wheelchair (MWU). For this specific group, the incidence of shoulder injury is between 31% and 73%. The most common injuries recorded are the impingement syndrome and tears of the rotator cuff. During the propulsion phase, the rotator cuff muscles produce forces 30% higher than their maximal isometric force. This load, combined with the repetitive task of manual wheelchair propulsion, could increase the risk of injuries. **Discussion:** The magnitude of the resulting forces and moments are highly dependent upon the direction of the propulsive force at the wheel as well as the propulsion patterns. An investigation of the forces and moments produced at the upper extremities during the propulsion phase could give an insight on the mechanical load sustained by the shoulder for different propulsion patterns. **Conclusion:** Our hypothesis states that a certain force direction and propulsion pattern could yield lower joint forces and moments at the shoulder without diminishing the power output of the propulsion. This would result in a possible decrease of upper limb pain prevalence and/or injury. **Relevance:** These findings will help to teach MWU to propel adequately their wheelchair using a technique that would decrease the risks of injury.

**Sponsored by the Fonds du Directeur, Dr. Rachid Aissaoui.**

42 (fundamental research poster)

**Development of personalized implant for high tibial opening wedge: combination of solid freeform fabrication with combustion synthesis processes.**

F. Zhim, MScA; J. Pegna, PhD; J. Moore, PhD; R. Ayers, PhD; G.Y. Lafortune, MD; L.H. Yahia, PhD.

**Object:** A new technique for making bioceramic and bioglass personalized implants is developed. This technique combines the processes of solid freeform fabrication (SFF) and combustion synthesis (CS). A personalized implant with tricalcium phosphate and bioglass was used to fill the gap in the opening wedge high tibial osteotomy (HTO). **Material and methods:** Fabrication of personalized implant with functionally graded characteristics using freeform fabrication and combustion synthesis was investigated. A three-dimensional printing (3DP) technique was used to fabricate the mould with the same shape required to fill the gap in the opening wedge osteotomy. The mould was used to fabricate the personalized implant with the combustion synthesis technique. The mould was designed on 3D CAD software. The final implant was developed with the combustion synthesis technique. This technique was chosen because it exploits the exothermic reaction between P2O5 and CaO. The distribution of the composition and the pores in the implant can be controlled. To determine the mechanical properties of the implant, cylindrical shapes were fabricated. Mechanical properties were determined by an MTS system. **Results:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Stiffness, N/mm</th>
<th>Load of failure, N</th>
<th>Displacement to failure, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioceramic</td>
<td>167.27</td>
<td>58</td>
<td>0.40</td>
</tr>
<tr>
<td>Bioglass</td>
<td>250.45</td>
<td>84</td>
<td>0.35</td>
</tr>
</tbody>
</table>

**Discussion and conclusion:** Finally, this personalized implant can favour the regeneration of the bone in the gap created by the opening wedge osteotomy and provides additional strength to allow accelerated rehabilitation.

**Sponsored by CRSNG.**
Fuzzy Logic as an Aid to Surgery Planning in Idiopathic Scoliosis. M.L. Nault, BSc; H. Labelle, MD; C.-É. Aubin, PhD; M. Balazinski, PhD.

Object: To develop a fuzzy logic model that facilitates decision making for the selection of fusion and instrumentation levels in adolescent idiopathic scoliosis (AIS) surgery. Material and methods: Fuzzy logic deals with vagueness and imprecision, 2 characteristics intrinsic to scoliosis surgery planning. Two models (lumbar and proximal thoracic curves) were developed using data extracted from a literature review and from expert knowledge based on the opinions of senior scoliosis surgeons. Thirty surgery cases of AIS were used for the validation of this software. Five expert surgeons, blinded to the purpose of the study, evaluated each case and selected the levels of instrumentation for the proximal thoracic and lumbar curves (the gold standard). Kappa statistics were made between the model output obtained from the computer software and the mean decision from the surgeons. Results: Kappa values were for proximal thoracic curves of 0.71 and of 0.64 for lumbar curve. Both kappa values were in the good range for concordance of data between models and surgeons’ decision.

Discussion: The variations expressed in the surgeons’ responses, regardless of their expertise, was significant enough to warrant a reconsideration of the gold standard. Although presently this method provides the best comparative value, it exposes the inconsistencies of this decision-making process and demonstrates exactly where the fuzzy logic stands. Conclusion: Modelling of fusion and instrumentation levels decision is possible with the help of fuzzy logic. The models developed appear to be valid tools when compared with a gold standard of 5 expert surgeons. Relevance: The decision to instrument scoliotic curves relies mostly on surgeon experience. We present the first application of a tool that takes into account the fuzziness of surgical decisions and that can appropriately help to select the curve that should be instrumented and fused in surgery for AIS.

Sponsored by MENTOR.

Estimation of Knee Contact Forces during Gait. A. Barré; R. Aissaoui, PhD; N. Nuño, PhD.

Object: Tibiofemoral contact forces are defined as constraints due to impact and loads at the interface between femur and tibia segment. The estimation of contact forces is an important indicator of joint stress in dynamic activities such as walking. However, there is a large variation in the literature in the ability of musculoskeletal models to estimate accurately contact forces (i.e., their magnitude, orientation and point of application). This is largely due to muscular forces and moment arms estimation. The aim of this project is to develop an accurate musculoskeletal model able to estimate knee contact forces during gait. We hypothesized that tibiofemoral contact forces in an osteoarthritis knee will be higher than in an asymptomatic knee due to the degenerative cartilage. Material and methods: The first step is to define knee muscular forces and moment arms relative to knee-complex during the gait cycle. The second step is to use these muscular forces with net forces and net moments, as obtained from inverse dynamics analysis, to estimate the vector contact forces. The third step is to validate the model in a simulation study using AnyBody software (AnyBody, v.2). This model will be applied to 2 groups: asymptomatic (control) group and osteoarthritis (grade-II) group during gait. Results: Currently, the estimation of tibiofemoral contact forces peak magnitude varies between 1.7 of body weight (BW) and 7.1 of BW during gait cycle. Discussion and conclusion: Direct and noninvasive measurement of muscular forces and tibiofemoral contact forces in the complex of the knee remains impossible. Current models estimated knee contact forces between 3 and 4 of BW. Relevance: The findings of this work will provide insights on the biomechanical behaviour of sound and osteoarthritis knee during impact loading in gait.

Sponsored by FQRNT and PSIRE-ÉTS.
Object: The aim of this cadaveric study was to reproduce the arm’s abduction movement in order to evaluate the 3D kinematics of the glenohumeral joint. **Material and methods:** This study was carried out on 2 fresh frozen cadaver shoulders. All the soft tissues surrounding the glenohumeral joint were dissected except for the capsule, the ligaments, the rotator cuff and the deltoid muscle. The specimens were stored in a freezer at –20°C and thawed at room temperature 11 hours before the experimentation. The procedure consisted of mounting the shoulder on a testing device developed by our research group. With this apparatus, we reproduced 5 abduction movements. A magnetic tracking device recorded the abduction angle and the humeral head displacement while a load cell recorded the corresponding forces generated by the deltoid muscle. **Results:** A 39.9° abduction movement generated 3.3-mm, 3.4-mm and 13.8-mm humeral head displacements according to the frontal, sagittal and transverse plane respectively. The associated deltoid muscle force was 101 N. **Discussion:** In spite of the presence of small displacements due to inactive rotator cuff muscle, the humeral head remained centred in the glenoid. **Conclusion:** Using 3D measurement, the present study confirms that during the arm’s abduction movement, the glenohumeral rotation centre is constrained, enabling the humeral head to swivel. **Relevance:** This study gives a better understanding of the glenohumeral joint’s function during the abduction movements of the arm. The results obtained will be used as comparative data in order to determine the effects of a rotator cuff tear on 3D glenohumeral joint kinematics. 

**Sponsored by CRSNG and by FQRNT.**

---

**Objective:** An exoskeleton was developed by our research group to evaluate the effects of different pathologies and treatments on 3D knee kinematics. This device is composed of a femoral and tibial attachment system that allows us to fix markers rigidly to the femur and the tibia. The validation process of the exoskeleton consists of evaluating the reliability, reproducibility and accuracy of its measurement. The goal of this study is to compare the reproducibility of 3D knee kinematics during treadmill walking measured by our exoskeleton with that of a well-known method of marker placement described in the literature. **Material and methods:** A group of 12 healthy subjects (26 ± 3 years old) participated in the study. One evaluator randomly installed the markers with the 2 methods (1-LIO’s exoskeleton 2-unconstrained markers mounted method [UMM]). A 6-camera VICON motion analysis system was used to capture 3D marker displacements during 4 trials of walking of 20 seconds. The calibration of the 2 systems followed the CAST procedure. For all subjects, an adjusted multiple correlation coefficient (MCC) was calculated to compare the level of reproducibility of gait cycles obtained by each system. **Results:** Mean MCC values obtained for rotation in the transverse plane were 0.92 and 0.86 and for rotation in the frontal plane 0.87 and 0.81 with the exoskeleton and the UMM method, respectively. Reproducibility of the rotation in the sagittal plane was excellent (0.99) for both methods. **Discussion:** Intra-subject reproducibility of kinematics data measured with the LIO’s exoskeleton is comparable to superior compared with the unconstrained mounted marker method. **Relevance:** This study is an essential step in the validation process of the exoskeleton.

**Sponsored by Canada Research Chair in 3D Imaging and Biomedical Engineering.**
# Leaders’ forum

**Moderator:** Dr. Julio Fernandes

**Theme:** Medical research 10 years from now: my vision and my strategy

**Format:** Each guest will speak for about 7 minutes. After all 4 guests have spoken, a general discussion will take place (15 min).

**Guests:**

- **Dr. Alain Beaudet**, President, FRSQ  
  Fonds de la recherche en santé du Québec
  
- **Dr. Claude Bédard**, Dean, ETS  
  Recherche et transfert technologique  
  École de Technologie Supérieure
  
- **Dr. Pierre Boyle**, Vice-Dean, Université de Montréal  
  Research, Faculté de Médecine  
  Université de Montréal
  
- **Dr. Cyril B. Frank**, Scientific Director, IALA-CIHR  
  Institute of Musculoskeletal Health and Arthritis  
  Canadian Institutes of Health Research

Power Point presentations and full transcript available at:  
25e journée de la recherche du POES

Le vendredi 6 mai 2005
Musée des Beaux-Arts de Montréal

Laboratoire Orthopédique Médicus
Département de chirurgie de l’Université de Montréal
Stryker Canada
Réseau de recherche en santé buccodentaire du FRSQ
Medtronic Sofamor Danek
Association d’orthopédie du Québec
Faculté de médecine de l’Université de Montréal
Autonomie santé
Genzyme
Merck Frosst Canada
Synthes
Depuy Spine Johnson & Johnson
Linvatec
Ortho Biotech
Wright Médical Technologies
Orthosoft
J.E. Hanger Ltée
Force 3 Médicale

Produit par le Service des communications de l’Hôpital du Sacré-Cœur de Montréal