



The 15th Annual Meeting of the Israel Spine Society

14th-17th May 2014

Wednesday-Saturday

The Royal Beach Hotel, Eilat

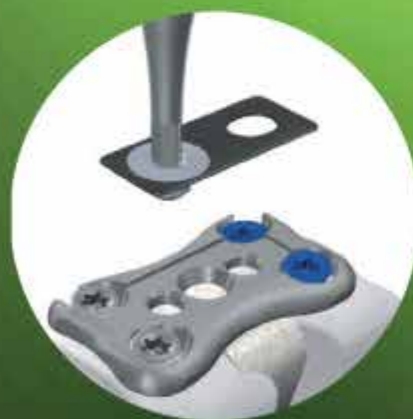
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פלטה צווארית בעלת הפרופיל
הנמוך ביותר רק 1.9 מ"מ



General Information

The 15th annual meeting of the Israel Spine Society will be held on Wednesday-Saturday, 14th-17th May, 2014 "Royal Beach" Hotel in Eilat.

Acting Committee

Yizhar Floman M.D. - Chairman

Nachshon Knoller M.D. - Secretary and Elected Chairman

Yoram Anekshtein M.D. - Elected Secretary

Eyal Itshayek M.D. - Treasurer

Israel Caspi M.D. - Educational Committee

Gad J. Velan M.D. - Committee Member

International Guests

Jean-Jacques Abitbol, M.D. - Private practice and co-founder of California Spine Group in San Diego. Holds hospital affiliations at Scripps Mercy, Scripps Memorial, and Sharp Memorial hospitals

Michael G. Fehling, M.D. - Medical Director of the Krembil Neuroscience Center and heads the Spinal Program at the Toronto Western Hospital. Professor of Neurosurgery at the University of Toronto, holds the Halbert Chair in Neural Repair and Regeneration, a Scientist at the McEwen Centre for Regenerative Medicine, and a McLaughlin Scholar in Molecular Medicine.

Pierre Roussouly, M.D. - Head of the Department of Orthopedic Surgery, Centre Médico-Chirurgical de Réadaptation des Massues, Lyon, France

Daniel Zarzycki M.D. - Professor of Orthopedic Surgery, Jagiellonian University Medical College Krakow, Director University Hospital No 2 Zakopane Poland

Conference secretary

Mrs. Shanit Twito

Official language

The official language will be English

Certificate of attendance will be provided upon request. Throughout the duration of the meeting, exhibits stands will display spine surgery systems, pharmaceutical and medical products

Dress code

Casual

Dear friends and distinguished guest speakers,

I would like to welcome our keynote speakers and guests, Prof. Roussouly from France, Drs. Fehling and Abitbol from the US and Prof. Zarzycki from Poland. Our sincere thanks go to our guest speakers for devoting their precious time to attend our meeting and enrich us with their wisdom and clinical experience.

At the end of our annual meeting, I am going to pass the chairmanship of our association to Nachshon Knoller. Nachshon is going to be our first neurosurgeon chairman emphasizing that our society is a unique association of spine surgeons with a background in either orthopedic surgery or neurosurgery.

Our society has emerged from its infancy and established itself as a solid scientific and social body of spinal medicine and surgery. Our goal of establishing board certification in spinal surgery has not been yet materialized. Our new leader Nachshon Knoller will certainly work hard to make this dream come true.

I wish you all a fruitful meeting and a pleasant stay in Eilat among friends and colleagues.

Yizhar Floman MD
President, Israel Spine Society

חברי האיגוד ואורחים נכבדים ברוכים הבאים,

ברצוני לברך את המרצים האורחים, פרופ' רוסולי מצרפת, ד"ר פהלינג וד"ר אבוטבול מארה"ב ופרופ' זרזיקי מפולין.

תודתנו נתונה על כך שהקדישו מזמנם להשתתף בכנס השנתי שלנו ולהעשיר אותנו בחכמתם ובידע הקליני שלהם.

השנה אני מעביר את הנשיאות לנחשון קנונר, שיהיה הנירוכירורג הראשון שישמש כנשיא של האיגוד שלנו.

ימי הילדות של האיגוד חלפו והפכנו לאיגוד עם מסורת מדעית מוצקה וחברות אמיצה של אורתופדים, ניורוכירורגים ומקצועות אחרים העוסקים ברפואת עמוד שדרה.

עומדת לפנינו עדיין המשימה להכרה במקצוע עמוד השדרה כמקצוע על ייחודי.

אני מאחל לכולם כנס פורה ושהיה נעימה באילת בין חברים ועמיתים.

יזהר פלומן
נשיא האיגוד הישראלי לעמוד שדרה

Dear members, guests and friends

On behalf of the organizing committee I welcome you to the 14th meeting of the Israeli Spine Society.

This year program will host several distinguished speakers from North America and Europe as well as a scientific program that represents the variety and vast interest of our members and colleagues in the dynamic and evolving field of spinal surgery and care.

I would like to extend our gratitude to the friends and exhibitors for their on going support to our annual meetings.

I wish us all a fruitful and enjoyable time in the beautiful gulf of Eilat.

Israel Caspi MD
Scientific committee

Scientific Program

Scientific Program

Wednesday, May 14, 2014

19.30 - 21.30 **Welcome reception**

Thursday, May 15, 2014

07.30 - 08.25 **Registration**

08.25 - 08.30 **Welcome address**
Y. Floman, ISS Chairman

■ Session 1: Trauma

■ Chairmen: **D. Hendel, N.Raz**

08.30 - 08.38 **Robotic assisted device for a high risk spinal pathologies**
A. Puhov, A. Suliman, B. Bernfeld, A. Bruskin

08.39 - 08.47 **Percutaneous pedicle screw instrumentation for thoracolumbar fractures**
G. Gutman, O.Hershkovich, A. Friedlander, M. Levinkopf, I. Caspi, H.Arzi

08.48 - 08.55 **Partial VBR and circumferential arthrodesis as a definitive treatment for complex fractures**
D. Sheinis, A. Amitay, N. Ohana

08.56 - 09.04 **Critical neck injuries in civilian victims of terrorist bombing: Are cervical collars causing harm**
I. Arieli, P. Ben-Galim, K. Peleg, S. Sagiv, Y. Klein

09.05 - 09.13 **Discussion**

09.14 - 09.34 **Keynote lecture: Repair and regeneration of injured spinal cord: from molecule to man**
M. Fehling

09.35 - 09.39 **Discussion**

■ Session 2: Deformity

■ Chairmen: **A. Hasharoni, Y. Smorgick**

09.40 - 09.48 **Spinal deformity surgery and blood dyscrasia**
Y.N. Gellman, B. Qutteineh, A.Hasharoni, Y. Barzilay, J.E. Schroeder, E. Itshayek, L. Kaplan

09.49 - 09.57 **The Scar in scoliosis surgery: factors influencing a favorable outcome**
R. Blecher, Y. Anekstein, Y. Mirovsky

09.58 - 10.06 **Association between body mass index, body height and the prevalence of spinal deformity**
O. Hershkovich, A. Friedlander, H. Arzi, B. Gordon, A. Shamis, A. Afek

10.07 - 10.14 **Discussion**

10.15 - 10.45 **Coffee break**

10.46 - 11.06 **Keynote lecture: Surgical management of early onset scoliosis**
D. Zarzycki

11.07 - 11.11 **Discussion**

11.12 - 11.20 **Operative management of dystrophic type scoliosis in neurofibromatosis type 1**
D. Ovadia, R. Zeller, S. Weintroub, B. Danino

11.21 - 11.29 **New emerging technology for the treatment of early onset scoliosis. A preliminary study and cost analysis**
D.E. Lebel, S. Weintroub, D. Ovadia

11.30 - 11.34 **Discussion**

11.35 - 11.55 **Keynote lecture: Biomechanical effects of sagittal spino- pelvic organization on back pain and degenerative evolution of the spine. Treatment consequences**
P. Roussouly

11.56 - 12.00 **Discussion**

12.01 - 12.21 **Keynote lecture: MISS - current status**
J.J. Abitbol

12.22 - 12.26 **Discussion**

■ Session 3: Degenerative Spine and Adult Deformity

■ Chairmen: **H. Salame, M. Levinkopf**

12.27 - 12.35 **Suitability of stand alone ALIF as replacement for supplemental posterior fixation in long fusion construct**
M. Khashan, W. Camisa, S. Berven, J.M. Leasure

12.36 - 12.44 **Predisposing factors in dural tears in patients undergoing lumbar spine surgery**
Y. Smorgick, K.C. Baker, H. Herkowitz

12.45 - 12.53 **Mechanical complications of lumbosacral fixation in surgical treatment of adult deformities and the relationship with L5-S1 disc space**
G. Gutman, C. Silvestre, P. Roussouly

12.54 - 13.02 **Outcomes of decompression and stabilization with a pedicle based semi-rigid posterior stabilization system in the lumbar spine**
A.J. Berg, J. Arad, T. Friesem

13.03 - 13.11 **Correction of adult deformity in osteoporotic patients using expandable screws-3yr. follow up**
E. Ashkenazi

13.12 - 13.20 **Oblique lumbar interbody fusion (OLIF) as a combined strategy with posterior instrumentation and fusion for the treatment of adult deformities**
G. Gutman, C. Silvestre, R. Hilmi, D. Sassi, P. Roussouly

13.21 - 13.26 Discussion
 13.27 - 14.27 Lunch break

■ **Session 4: Cervical Spine**

■ **Chairmen: N. Ohana, E. Shalmon**

14.30 - 14.38 **Anterior long construct in the treatment of multilevel cervical myelopathy of the aging spine**
 E. Ashkenazi

14.39 - 14.47 **Cervical disc arthroplasty in patients with cervical myelopathy**
 A.j. Berg, E. Ansari, T. Friesem

14.48 - 14.56 **The impact of cervical myelopathy on cortical somatotopic representation**
 N.S. Grosman, Z. Tal, A. Amedi, E. Itshayek, S. Arzy

14.57 - 15.05 **Effect of steroid placement on a gelatin sponge and soft tissue swelling following ACDF- a radiological analysis**
 J. Weinstein, J. Schroeder, A. Sama, F. Giradi

15.06 - 15.14 **Discussion**

15.15 - 15.23 **Spondylotic myelopathy: Rehabilitation outcomes after surgical intervention or without it**
 E. Aidinoff, S. Kartoon, V. Bluvstein, A. Catz

15.24 - 15.32 **The effectiveness of the sensory component of the American Spinal Cord Injury Association (ASIA) examination in prediction of central pain after spinal cord injury**
 Y. Levitan, G. Zeilig, R. Defrin

15.33 - 15.37 **Discussion**

15.38 - 15.58 **Debate: Degenerative disease of the spine. environmental Vs. genetic etiology (or is it work or my mother to blame)**
 Environmental - G.j Velan
 Genetic etiology - Y. Anekstein

15.59 - 16.04 **Discussion**

16.05 - 16.35 **Coffee break**

16.36 - 16.56 **Keynote lecture: Novel concepts in the pathophysiology and treatment of degenerative cervical myelopathy**
 M. Fehling

16.57 - 17.02 **Discussion**

17.03 - 17.23 **Keynote lecture: MISS - complications**
 J.J. Abitbol

17.24 - 17.30 **Discussion**
Adjurn

■ **Session 5: Miscellaneous**

■ **Chairmen: J. Leitner, A. Shpigman**

08.40 - 08.48 **Are expandable screws an alternative in revision case only?**
 M. Eif, H. Schenke

08.49 - 08.57 **Continous monitoring during pedicular funneling: a novel method to prevent pedicle wall breaching**
 O. Zarchi, E. Bar-On, D. Sheinis, E. Mercado, N.Ohana

08.58 - 09.06 **Intraoperative spine ultrasound: The Sheba experience**
 R. Harel, N. Knoler

09.07 - 09.27 **Debate: MIS**
 Pro - N. Rahamimov
 Con - H. Arzi

09.28 - 09.33 **Discussion**

09.34 - 09.42 **Spine radiosurgery: safety and efficacy of VMAT treatment**
 R. Harel, L. Zach

09.43 - 09.51 **Spinal intradural extramedullary tumors: The value of intraoperative neuromonitoring on surgical outcome**
 R. Harel, D. Schleifer, A. Korn, S. Appel, N. Knoller

09.52 - 10.00 **The association between body mass index, body height and the prevalence of LBP in a population of 829791 adolescents**
 O. Hershkovich, A. Friedlander, B. Gordon, H. Arzi, A. Shamis, A. Afek

10.01 - 10.21 **Keynote lecture: BMP complications - YODA study**
 J.J. Abitbol

10.22 - 10.27 **Discussion**

10.28 - 10.36 **Assesment of the net effect of rehabilitation after spinal cord injury and generalization to other areas of medicine**
 A. Catz

10.37 - 10.45 **Fulminant spondylodiscitis refractory to antibiotic treatment evolving to spinal epidural abscess: changing characteristic epidemiology and bacterial virulence**
 P. Rosinsky, S. Mandler, N. Netzer, S. Sagiv, P. Ben-Galim

10.46 - 10.54 **Sacral doming progression in developmental spondylolisthesis: A demonstrative case report**
 A.G. Gutman, C. Silvestre, P. Roussouly

10.55 - 11.01 **Discussion**

11.02 - 12.02 **Guest lecture - Forgeries in Art**
 D. J. Lurie

12.03 - 12.33 **Coffee Break**

12.34 - 13.34 **Buisness meeting**
Adjurn

מנחי הפאנל:

גב' ברזניס שמחה, אחות אחראית חדר ניתוח בית חולים לגליל מערבי נהריה
מר צאיג נסים, מתאם היחידה לניתוחי עמוד שדרה נירוכירורגיה המרכז הרפואי ע"ש שיבא תל השומר

08:50 - 09:00 **דברי כתיחה**
גב' ברזניס שמחה, מר צאיג נסים

09:00 - 09:20

כאב גב כמופע של סרטן שד גרורתי

הגב' אברמוביץ אילת, עובדת סוציאלית מדריכה, מתאמת היחידה לעיוותי שדרה המערך האורטופדי המרכז הרפואי ע"ש שיבא תל השומר.

09:20 - 09:40

טכנולוגיה וסיועוד בחדר ניתוח

הגב' בן זקן אסתי, ראש צוות עמוד שדרה בית חולים לגליל מערבי נהריה.

09:40 - 10:00

מניגימה בעמוד שדרה - תיאור מקרה

מר שמאס חלילי, ראש צוות נירוכירורגיה חדר ניתוח בית חולים לגליל מערבי נהריה.

10:00 - 10:20

סיבוכים בהשכבת מטופלים בניתוחי עמוד שדרה צוואריים

הגב' מלכי גלית, אחראית תחום אורטופדיה חדר ניתוח המרכז הרפואי הרצליה מדיקל סנטר.

10:20 - 10:45 **הכסקה**

10:45 - 11:15

טיפול זעיר פולשני בגידולי עמוד שדרה

דר' רן הראל, רופא בכיר היחידה לניתוחי עמוד שדרה נירוכירורגיה המרכז הרפואי ע"ש שיבא תל השומר

11:15 - 11:20 **דין**

11:20 - 11:40

שימוש במיקרוסקופ בניתוחי עמוד שדרה

מר בקר מרק, ראש צוות אורטופדיה חדר ניתוח המרכז הרפואי ע"ש אדית וולפסון.

11:40 - 12:00 **A PAIN IN THE NECK**

התערבות פולשנית בתעלת השדרה, נקודת מבט סיעודית

הגב' שני עדי, מתאמת מחקר מחלקה אורטופדיה ב עמוד שדרה בית חולים לגליל מערבי נהריה.

12:00 - 12:20

גידולים בעמוד שדרה מחקר

מר אדוארד בקרמן, סגן אחות אחראית חדר ניתוח ומתאם טראומה מרכז רפואי ע"ש סורסקי איכילוב.

12:20 - 12:40

ניתוח ללא סכין - טיפול ברדיוכירורגיה לעמוד שדרה

הגב' ינאי אורלי, מתאמת היחידה לרדיוכירורגיה נירוכירורגיה המרכז הרפואי ע"ש שיבא תל השומר.

12:40 - 13:00

אנשים קטנים עוצרי נשימה - הטיפול הייחודי במטופלים הלוקים בגמדות לפני ולאחר ניתוחי עמוד שדרה

מר צאיג נסים, מתאם היחידה לניתוחי עמוד שדרה נירוכירורגיה המרכז הרפואי ע"ש שיבא תל השומר.

13:00 - 13:30

מגמות חדשות בתחום עמוד השידרה

דר' יורם אניקשטיין, מנהל היחידה לניתוחי עמוד שדרה, המרכז הרפואי אסף הרופא

13:30 - 13:35 **דין**

13:35 **הכסקה צהריים**

New horizons for robotic assisted device (posterior spinal fusion for a high risk thoracolumbar fracture in ankylosing spondylitis, osteoid odteoma treatment etc)

A. Puhov¹, A. Suliman¹, B. Bernfeld², V. Alexandrovsky¹, B. Zilberstein¹, A. Bruskin¹
1. Spinal Unit, Lady Davis Carmel Medical Center, Haifa, Israel
2. Orthopaedic Department, Lady Davis Carmel Medical Center, Haifa, Israel

Introduction:

Fractures in Ankylosing Spondylitis (AS) are often difficult to identify and treat. The vertebral osteoporosis often associated with the condition can weaken the spine as well as contribute to the risk of injury, and the brittle nature of the spine predisposes to fracture with minor trauma[1]. Since the vast majority of these injuries are unstable and neurological manifestations more common, surgery is often deemed necessary [2]. Complications increase with age and the complexity of background disease [2]. Robotic assisted devices have been increasingly used for spine fusion in the attempt to minimize radiation exposure while maximizing accuracy of screw placement. The use of this technology has been shown to decrease opioid use post surgery with decreased hospitalization times and lower postoperative complication rates [3]. We describe a case of an L1 fracture in an elderly patient suffering from AS that was successfully treated with posterior fusion using a robotic assisted device. The patient presented with minimal complications in the postoperative period.

Case Report:

An 81 year old male suffering from ankylosing spondylitis presented to our emergency department with acute onset of severe lower back pain without a history of trauma. Past medical history and review of symptoms included hypertension, diabetes and chronic lymphocytic leukemia (CLL). Physical examination revealed minimal range of motion of the tenderness over the spinous processes of thoracolumbar spine, there were no neurovascular abnormalities. His initial hemoglobin (Hgb) level was 10.6 gram/deciliter (g/dL) and initial white blood cell count was 21,000 x 10⁹/Liter.

Initial radiographs demonstrated ankylosing spondylitis with a bamboo spine and a suspected fracture of L1. A computed tomography (CT) scan confirmed a new unstable compression fracture of L1. This was a chance like fracture through the disc space. Figures 1&2

The patient was admitted to the hospital and prepared for reduction and stabilization surgery. Since this is a patient with a low hemoglobin (due to his underlying hematological condition), older age and ankylosing spondylitis, with expected difficulty in identifying the anatomy, it was decided to utilize the robot since it enables a relatively short operative period, with better precision and less complications such as blood loss and infection that could be significant in this particular patient.

Technique: A new computed tomography (CT) MAZOR was used for the robot- spine assist device. Planning of the operation was performed a day before the surgery, consisting of posterior spinal fusion from T12 to L3.

The patient was operated on in a prone position. A routine posterior exposure was performed at the level of T12-L3. Calibration of the device was performed using two fluoroscopic radiographs to define the C-ARM to the spine assist device, then registration was performed by another two radiographs (AP and oblique in 60 degrees), to match the patient to the CT Mazor on the spine assist device. The robot was positioned on the spinous process of T12 by a clamp. A posterior spinal fusion T12-L2 was performed by the robot utilizing three pedicular screws and two rods. Figures 3&4 Despite planning for fusion of four levels, it was felt during surgery that 3 levels were stable enough. The operative time was 2 hours.

Post- operative course: The day after the surgery the patient was allowed to walk using a dorsolumbar spinal brace and the help of a physical therapist. The patient did lower his Hgb levels to 9.5g/DL and was therefore given a unit of packed red blood cells with a subsequent improvement in Hgb to 10.5g/DL. The patient did not have any other complications following surgery; no fever, problems with coagulation, electrolyte abnormalities or neurovascular compromise and the white blood cell count remained stable. Patient mobility progressed as expected. He was discharged to home on day 3 following the surgery. The fracture was healed 14 months after surgery

Discussion:

Elderly patients with AS and acute fractures have been shown to have better results when treated surgically. Caron et al., in their large retrospective review showed a mortality rate of 51 % in the nonoperative group versus 23 % in the operative group with age >70 being a major risk factor [2]. Our patient was elderly and presented with an unstable fracture of L1, and therefore surgery was performed. The use of the robotic assisted device allowed us to perform only 6 fluoroscopic examinations (2 in the beginning of the operation for calibration, two for registration and two at the end of the operation to check the position of our fragments and hardware). There was a relatively limited amount of blood loss, and a short operative time. Postoperatively there were no neurological deficits and no surgical complications. We believe the use of a robotic assisted device is especially useful in cases with a high potential for complications.

References:

1. Bessant R, Keat A: How should clinicians manage osteoporosis in ankylosing spondylitis? J Rheumatol 2002, 29(7):1511-1519.
2. Caron T, Bransford R, Nguyen Q, Agel J, Chapman J, Bellabarba C: Spine fractures in patients with ankylosing spinal disorders. Spine (Phila Pa 1976) 2010, 35(11):E458-464.
3. Kantelhardt SR, Martinez R, Baerwinkel S, Burger R, Giese A, Rohde V: Perioperative course and accuracy of screw positioning in conventional, open robotic-guided and percutaneous robotic-guided, pedicle screw placement. Eur Spine J 2011, 20(6):860-868.

Percutaneous Pedicle Screw Instrumentation for Thoracolumbar Fractures

G. Gutman, O. Hershkovich, A. Friedlander, M. Levinkopf, I. Caspi, H. Arzi
Department of Orthopedic Surgery, Chaim Sheba Medical Center, Tel Hashomer, Israel

Study Design:

A retrospective study of 18 cases with minimum 1 year follow up which underwent percutaneous pedicle screw instrumentation for the treatment of thoracolumbar fractures.

Objective:

To evaluate perioperative and short-term complications of thoracolumbar fractures (TLF) treated with minimally invasive percutaneous pedicle screw fixation.

Summary of Background Data:

Minimally invasive surgery including percutaneous pedicle screw instrumentation (PPSI) is gaining popularity as a simple surgical alternative for the treatment of TLF without associated neurological injury or significant canal compromise. There are few studies available in the literature regarding PPSI for the management of thoracolumbar fractures. PPSI treatment of AO/Magerl type A and B TLF, is reported to be a safe procedure that provides good short and long term results.

Methods:

Retrospective review patient data of 18 adult patients (13 males, 5 females; average age 50±21 years; range 19-87) who had a thoracolumbar AO/Magerl type A or B fracture underwent application of percutaneous pedicle screw fixation system. Radiologic parameters including kyphotic angle and or clinical data was assessed before and after surgery at a minimum 1 year follow up.

Results:

Most fractures were AO/Magerl type A3.3 and underwent a 3 level vertebrae instrumentation. 6 patients were initially multitrauma. Mean operative time was 78±12.43 minutes and mean blood loss was 21±6.13 ml. One patient was treated with kyphoplasty augmentation. Complications were registered in 3 of 18 patients. 2 patients that were multitrauma suffered from deep wound infection and require revision surgery. 1 patient with osteoporosis suffered from instrumentation loosening. No statistical significant difference in segmental kyphosis was found between perioperative and at final follow up. (P=0.975).

Conclusions:

Percutaneous short pedicle instrumentation of thoracolumbar fractures can be performed with short operative time, minimal blood loss and good maintenance of reduction. The radiographical results at 1 year show a stable segmental kyphosis. Further large-scale studies are necessary to obtain more definite results.

Key words: Minimally invasive surgery, Percutaneous pedicle screw instrumentation, Thoracic or Lumbar fracture.

Partial VBR and circumferential arthrodesis as a definitive treatment for complex thoracolumbar fractures

D. Sheinis, A. Amitay, N. Ohana.

Department of Orthopedic Surgery and spine Surgery Unit
Rabin Medical Center, Beilinson campus Petach Tikva

Background:

The question, what is the ideal treatment for complex thoracolumbar fractures remains unsolved. The unstable nature of these injuries dictates surgical stabilization. However, the appropriate method to achieve this goal is one of the open controversies in the literature. We present a preliminary report of our experience, treating these fractures in a cohort of patients, with a combination of partial VBR of the affected vertebra and circumferential, posterior only, arthrodesis.

Methods:

A retrospective analysis of 17 consecutive patients, who were diagnosed as having unstable fracture of the thoracolumbar spine and were treated surgically, was done. The patient's files were reviewed to pull out demographic data, fracture classification, clinical data and follow-up. Fractures were classified according to the AOSpine classification. Neurological status was classified according to the Frankel score. Surgical technique consists of a posterior only approach. The affected vertebra was resected partially via the same approach and a vertebral body prosthesis was used as a replacement. Circumferential arthrodesis of the affected segment was done to secure the construct and to restore sagittal alignment. Postoperatively, patients were allowed to get out of bed and to walk without any external support.

Results:

There were 10 males and 7 females in the study group with a mean age of 30 years. All patients except one, who was classified as non-walker (Frankel A-C) regained their walking ability. One patient demonstrated a new neurological deficit following surgery, aside from these there were no significant morbidities except one case of deep infection that was resolved following extensive irrigation. We haven't noticed any delay in sagittal alignment loosening.

Conclusions:

Compared to the known results in the literature, our strategy in treating these complex spinal injuries provides immediate stability, full restoration of the sagittal alignment and the best conditions for neural recovery, in the affected spine.

Critical neck injuries in civilian victims of terrorist bombing: Are cervical collars causing harm

I. Arieli¹, P. Ben-Galim¹, K. Peleg², S. Sagiv¹, Y. Klein³

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2. Gertner Institute, Chaim Sheba Medical Center, Tel Hashomer, Israel and
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Scientific background:

Cervical collars are routinely applied to victims of terrorist bombing attacks as part of the trauma extrication and evacuation protocols. Previous studies have shown that the use of cervical collars in penetrating injuries is not justified due to the potential harm of hiding critical soft tissue neck injuries that require urgent surgical treatment and a scarcity of unstable cervical spine injuries associated with this mechanism. Critical soft tissue injuries include major arterial or venous injuries, tracheal or esophageal laceration, nerve damage and subcutaneous emphysema.

The beneficial effect of cervical collar application in explosive bomb injuries where both a blast effect and shrapnel penetrating injuries occur has not yet been addressed. The purpose of this national database study was to examine if current use of semirigid cervical collar in terrorist bombing attacks is beneficial and justified.

Methods:

A retrospective national database study based upon registered blast injury patients. Blast injury patients' charts were reviewed for cervical spine fractures. The data collected included: age, sex, GCS, AIS, ISS, all recorded cervical soft tissue or bone injuries, neurological deficits using the ASIA score, cervical spine fractures or instability on X-ray/CT scan, the use of semirigid cervical collar, and the performance of general surgery or orthopedic cervical spine surgeries.

Results:

2,267 civilian victims were admitted to hospitals in Israel due to terrorist bombing attacks between the years 1998 and 2010. 43 medical records (1.89%) were registered with cervical spine fractures in 9 medical centers. 4 records were not available due to refusal of the local IRB committee to participate in this study. 9 records were not found in the different charts archives. Hence the accurate rate of unstable cervical spine fractures that was found in this sample was 0.83% (19 patients), and not 1.89% as mentioned above.

In only one case (0.088%) there was medical justification for the use of semirigid cervical collar. The other 18 patients had either stable fractures (10 patients) or unstable fracture with ASIA-A on presentation (8 patients). 151 patients (6.66%) had cervical soft tissue injuries and in the group of patients with cervical spine fractures, 15.7% (3 patients) had critical cervical soft tissue injury.

Discussion:

Unstable cervical spine injuries in victims of terrorist bombing attacks are extremely rare and the application of cervical collars did not seem to be of any benefit in this group of 2267 civilian terrorist attack injuries.

Cervical collar application was potentially harmful in 15.8% of patients with cervical spine fractures in which critical soft tissue neck injuries coexisted. In these cases collars applied in the field by paramedics were of no benefit to stability while they did hide and screen critical neck injuries from the eyes of the receiving trauma team at the hospital.

In the few rare cases of unstable cervical spine fractures the mechanism was typically high energy penetration of shrapnel associated with irreversible neurological deficits.

Conclusion:

The rate of unstable cervical spine fractures without neurological deficit that was found in this sample of blast injuries was extremely low (0.088%). Application of cervical collars for victims of blast injuries has the potential of hiding critical soft tissue neck injuries and postponing urgent surgical treatment and therefore does not seem to be justified as it may cause more harm than good.

Spinal deformity surgery and blood dyscrasia: case series

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Introduction:

Blood dyscrasia (BD) is a pathological condition in which the constituents or quantities of the blood are abnormal. These conditions require special attention and preparation prior to surgery as lack of clotting factors may cause catastrophic bleeding. Surgeries such as spinal deformity correction may cause considerable blood loss and spinal surgeons are reluctant to operate on such individuals. Here we present a case series of four patients with blood dyscrasia (not including isolated anemia) which were operated in our institute.

Methods:

A retrospective review of all patients with BD operated at a referral center between the years 2000-2012. Indication for surgery, preparation for surgery, surgical care and complications and outcome were documented.

Results:

Four patients were identified with BD, two patients with hemophilia (A and C), one with Idiopathic Thrombocytopenic Purpura (ITP) and one with familial dysautonomia with associated thrombocytopenia. Three patients were adolescents (age range 11-15) and the ITP patient was 51 years old. Three patients were female and one was male. All patients were operated for corrective deformities, either primary (n=2) or revisions (n=2). The patient with hemophilia A was treated daily with recombinant factor XIII preoperatively and required only one unit of packed cells (PC) after the surgery to maintain normal hemoglobin values. The patient with hemophilia C did not require special care since his factor XI levels were elevated enough and was treated as a regular patient with one PC alone. The ITP patients had to be aborted after deep dissection prior to laminotomy due to excessive bleeding (close to a liter and a half in 20 minutes). This patient required 3 PC, 3 fresh frozen plasma (FFP) and 12 units of platelet before bleeding was controlled. The patient with familial dysautonomia, underwent preparation with hexacaoronic acid, during the care required 4 PC and 2 FFP, for hemoglobin control.

Conclusion:

Although treating patient with blood dyscrasias is difficult and somewhat unpredictable, surgical treatment for such individuals should not be discarded and each case should be evaluated.

The Scar in Scoliosis Surgery: Factors influencing a Favorable Outcome

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Introduction:

Among the most feared consequences of Scoliosis surgery are resulting neurologic deficit and a residual deformity. Although not ranked as high, cosmetic issues such as shoulder and waist asymmetry or scar appearance, also serve as source for post-operative dissatisfaction among patients. Placement of the scar in scoliosis surgery may play a role in both the short term, as well as in the long term appearance of the residual scar and therefore potentially affect the patients' approval of the final cosmetic result.

Objective:

Our aim was to evaluate factors influencing the location and appearance of the scar in scoliosis surgery at both the short and long term follow up.

Methods:

A retrospective study was conducted, gathering the following data among scoliosis patients treated surgically: demographics, Curve and rotation degrees, Lenke type, hump severity, inclusion of thoracoplasty and whether de-rotation was performed. Initial incision was placed at halfway between the midline and the spinous processes at each of the curve apices. Incision variables included its location in relation to the spinous process and midline in the beginning of surgery, immediately post-operative and at its residual location.

Conclusion:

Overall, incision locations at the end of most surgeries was favorable, with incision's location ranging from mild correction (further towards the midline) and complete re-aligning with the midline. Relation of the incision location and the variables gathered will be discussed.

Association between body mass index, body height and the prevalence of spinal deformity

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***OH and AF contributed equally and each should be considered as first author.**

The most common spinal deformities among adolescents are adolescent idiopathic scoliosis (AIS) (2-3% prevalence) and Scheuermann's kyphosis (SK) (1%-8% prevalence). Both are believed to have a genetic influence in their etiology. The association between body mass index (BMI) and body stature and their possible association to spinal deformities is uncertain.

The data for this study were derived from a medical database containing records of 17-year-old males and females before their recruitment into mandatory military service. Information on the disability codes associated with spinal deformities according to the Regulations of Medical Fitness Determination (RMFD) was retrieved. Logistic regression models were used to assess the association between the BMI and body height to various degrees of spinal deformities by severity. The study cohort included 829,791 consecutive subjects, of whom 103,249 were diagnosed with spinal deformities (76% were mild in degree). The prevalence of spinal deformities was significantly higher among the underweight males and females ($P < 0.001$). Elevated BMIs had a protective effect for developing spinal deformities. The odds ratios for severe spinal deformities were higher compared to mild spinal deformities in the underweight groups. The risk for developing spinal deformities increased significantly with height for both genders ($P < 0.001$). An association between height and the risk for spinal deformities by severity was found for all height groups. Below normal BMI is associated with severity of spinal deformities, while above normal BMI apparently has a protective effect. Body height is also positively associated with the severity of spinal deformities.

Key words:

spinal deformities, body mass index (BMI), height, obesity, underweight, overweight, adolescents, scoliosis, Scheuermann's kyphosis.

Operative management of dystrophic type scoliosis in neurofibromatosis type 1

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Purpose:

To retrospectively analyze and describe our experience in treating dystrophic type scoliosis NF-1 patients.

Incidence of spinal deformity in children with Neurofibromatosis Type 1 (NF-1) is 15-20%. Newly developed surgical options allow better tailoring of treatment according to patient's age, severity and location of deformity.

Methods:

Thirteen NF-1 patients (six males and seven females) with dystrophic type of scoliosis were treated surgically between 2003-2012. Average age at operation was 13.5 years (range 9.8-15.9). Mean follow-up was 31 months (range 2-108).

Results:

Seven patients were treated by posterior fusion and instrumentation, four by combined anterior and posterior fusion and instrumentation, one by anterior fusion and instrumentation only, and one by a magnetically induced elongation device. Mean number of fused vertebrae was 12 (range 5-18). Mean coronal and sagittal Cobb's angle was 74 (range 56-96) and 46 (range 12-90) respectively before operation, 26 (range 14-42) and 22 (range 2-72) respectively after operation and 28.5 (range 14-45) and 23 (range 2-75) respectively at last follow up. Mean coronal and sagittal correction after operation was 65% and 58% respectively.

Two patients had rib head penetration into the spinal canal. Both were presented with various degree of neurological deficit, one with complete paralysis and the other with paraesthesia. Both were operated in two stages: surgical removal of the rib and halo traction followed by fusion which resulted in full recovery of the neurological status.

All patients returned to a very active life including sports activities; only the patient operated with a magnetically induced elongation device was treated with a post-operative brace for 4 months according to the protocol required following such operations regardless of the etiology. None of our patients showed signs of pseudoarthrosis. There were only 2 complications: an intra-operative temporary loss of bilateral MEP's which resolved during surgery, and a post-operative transient peroneal palsy which resolved spontaneously.

Conclusion:

These results ascertain the positive outcome of the use of the various stabilization methods in treatment of dystrophic type scoliosis NF-1 patients in accordance with patient's age, severity and location of deformity.

Significance:

Our experience emphasizes the importance of stabilizing the curve rather than correcting it, with regard to both neurological recovery and preventing pseudoarthrosis.

New emerging technology for the treatment of early onset scoliosis. A preliminary study and cost analysis

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Early onset scoliosis imposes challenges for the patient and surgeon.

Recently, new technology evolved and might partially reduce the need for repetitive surgeries. The MAGEC® (magnetic expandable rods) holds the promise for physiological growth without the need for distraction surgeries.

The purpose of this study was to describe the short-term experience with the device and to determine the expected cost of the novel treatment compared to traditional growing rods technique.

Methods:

Retrospective review of patient's charts operated with the MAGEC®. The device was inserted through a posterior approach. A brace was used for the first four months after index surgery. Distractions were started two months after index surgery and every two months ever since. Cost analysis and simulation was performed.

Results:

19 patients were treated with the system. All were diagnosed with early onset scoliosis. Five were with idiopathic scoliosis, 13 with neuromuscular or syndromic scoliosis and one with congenital scoliosis. The average age at index surgery was 7.95 years (4.8-9.8). The mean Cobb angle measured 65 ° (56-90) and the average Cobb angle on first postoperative x-rays was 30.6 ° (12-45) with an average correction of 55%. We followed the patients 3-24 months with minimum of one distraction and maximum 12 distractions. The average spine growth velocity is 0.7mm/month.

Two patients were revised due to proximal screw dislodgment that was attributed to misplacement at the index surgery. No complications occurred due to failure of the device.

The predicted cost per patient over 4 years of treatment is 39245\$ for MAGEC® versus 36470\$ for traditional growing rods.

Conclusions:

Magnetic growing rods for early onset scoliosis are safe and save the patients from repeated distractions under general anesthesia. Comparison between MAGEC® and traditional growing rods found that overall the cost per patient is comparable.

Suitability of stand-alone ALIF as replacement for supplemental posterior fixation in long fusion constructs

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2. SF Orthopaedic Residency Program
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4. DISC Sports and Spine Center

Introduction:

Long fusions to the sacrum generate high stresses on the sacral screws that may lead to loosening or pseudarthrosis. Techniques to reduce strain on the sacral screws on the S1 screws are anterior column support with ALIF or TLIF and iliac fixation. However, stand-alone ALIF cages, may serve to reduce the need for pelvic fixation. We hypothesized that in long L1-S1 fusion, ALIF cages reduce strain on S1 screws comparably to bilateral iliac fixation.

Methods:

7 lumbo-pelvic human cadavers were used. Each was driven under a load-controlled pure moment up to 7.5 Nm in order to measure range of motion. Pedicle and iliac screws were deployed into each prior to biomechanical testing. S1 pedicle screws were instrumented with strain gauges used to measure pullout force during testing. Posterior fixation including bilateral L1-S1, bilateral L1-S1 with uni-lateral iliac screw, and bilateral L1-S1 with bilateral iliac screw was used. These constructs were tested with and without the presence of an ALIF cage at L5-S1.

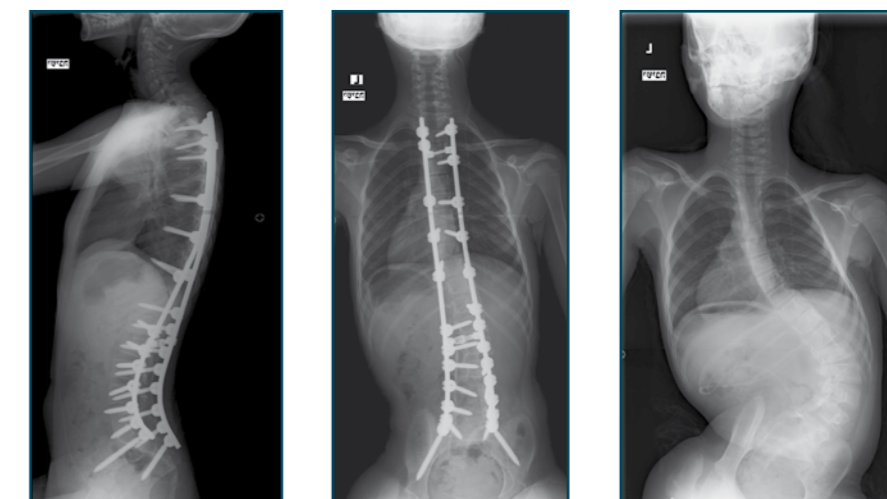
Results:

ALIF cages did not reduce L5-S1 ROM and iliac screws produced statistically significant decreases in ROM as compared to intact. Bilateral L1-S1 hardware reduced F/E ROM from an intact value of 6.7 +/- 4.2 deg to 3.1 +/- 1.3 deg. The addition of an ALIF cage resulted in 3.3 +/- 1.2 deg F/E ROM which is not statistically significantly different from w/o ALIF. Fixation with uni- and bi- lateral iliac screws decreased F/E ROM to 1.2 +/- 1.2 deg and 0.6 +/- 0.6 deg, respectively. L1-S1 posterior hardware did not decrease LB ROM compared to intact. ALIF cages during F/E significantly increased loads on the S1 screws compared to uni- and bi-lateral iliac constructs which tended to decrease loading. Only the addition of bi-lateral iliac screws lowered S1 loads compared to the L1-S1 construct.

Conclusions:

The addition of an ALIF cage to bilateral L1-S1 fusions did not increase stability or reduce mechanical loading on S1 screws compared to iliac fixation. ALIF inclusion without iliac fixation may increase risk of S1 hardware purchase and does not stabilize the column. Alternatively, iliac fixation reduces S1 screw strain and increases construct stability; yet, clinical outcomes suggest this approach lacks anterior column support.

עקמת נירו-מוסקולרית



- לאחר תיקון:
 - ▶ Rt. D10-L4 20 מעלות 80% תיקון
 - ▶ Pelvic obliquity 2 מעלות 93% תיקון
- בת 13
 - ▶ Rt. D10-L4 92 מעלות
 - ▶ Pelvic obliquity 28 מעלות

עקמת אידיופטית



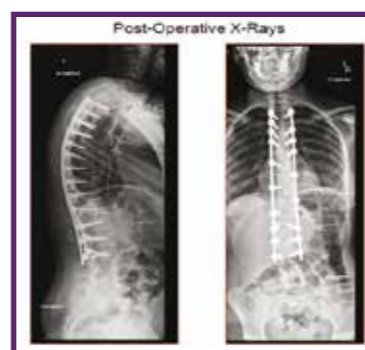
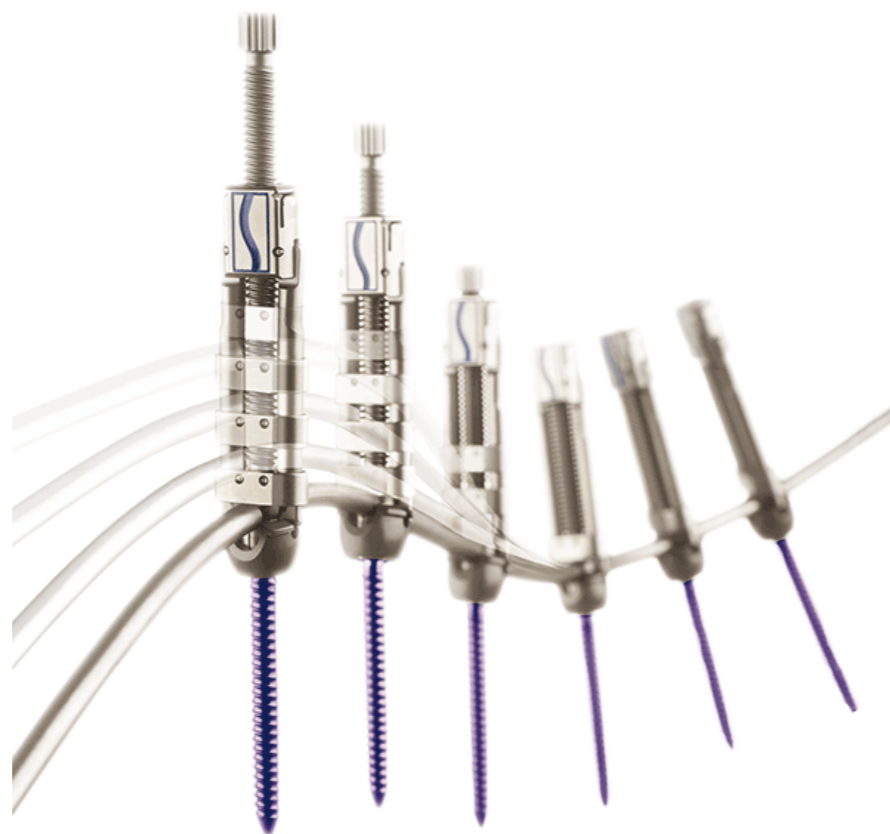
- בת 14.5
 - ▶ Lt. D6-D12 72 מעלות
 - ▶ לאחר תיקון: 78% תיקון
- ▶ Lt. D6-D12 16 מעלות

■ מערכת הדגל של חברת K2M לניתוחי עמוד שדרה מורכבים ועקמת.

■ המערכת מצטיינת בפרופיל הנמוך ביותר וללא בורג נעילה

■ השימוש בקריקטים מאפשר ביצוע תיקונים טובים יותר בכל אספקט

■ במלאי נמצאים סטים בפרופיל מוט 3.5, 4.5, 5.5 למתן מענה לפתולוגיות בעמוד שדרה מצוואר ועד סקרום



Predisposing Factors for Dural Tear in Patients Undergoing Lumbar Spine Surgery

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Objective:

The purpose of this prospective cohort study was to prospectively evaluate risk factors for incidental durotomies in lumbar spine surgery. We hypothesized that the incidence of a cerebrospinal fluid (CSF) leak would be higher in cases involving repeated operations.

Methods:

We prospectively evaluated 523 patients who underwent lumbar and thoracolumbar spine surgery. We compared data on patients in whom a dural tear occurred, and those in whom dural tear did not occur. The data included basic demographic information and clinical information regarding dural tears.

Results:

Five hundred twenty three patients participated in our study. One hundred thirty one patients underwent discectomy and 392 patients underwent laminectomies. Among the 131 patients who underwent discectomy 6 patients had dural tear. Among the 392 patients who underwent discectomy 49 patients had dural tear. Patients with incidental durotomy were older (60 ± 14 and 65 ± 13 years of age; $p = 0.044$, t-test), and had longer surgery (110 ± 54 and 146 ± 59 minutes; $p=0.025$, t-test), compared to the patients without dural tear. The incidence of dural tear was more common in patients with history of a previous spine surgery ($p<0.001$).

Conclusion:

In patients who underwent lumbar and thoracolumbar spine surgery for degenerative problems, previous surgery and older age were found to be predisposing factors for dural tear.

Mechanical complications of lumbosacral fixation in surgical treatment of adult deformities and the relationship with L5-S1 disc space

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Study Design:

Historical cohort study of mechanical complications related to sacral fixation in adult deformities with long fusion constructs.

Objectives:

To investigate the perioperative and short-term mechanical complications and instrumentation problems related to pelvis fixation in adult deformities spine surgery, to attempt to determine risk factors and to propose a solution.

Scientific Background:

Several previous studies have shown a relatively high complication rate for this select group of patients. Long fusion constructs to S1 in adult deformities have been associated with bad reputation due to this high complication rate.

Methods:

This study included 176 consecutive patients who underwent combined posterior followed by anterior surgical reconstruction for adult (mean age 56.9±9.8 years ; range 23- 82) spine deformity with long (5–17 vertebrae; mean 8.74±3.38) spinal instrumentation and fusion to the sacrum or ileum at a single institution between January 2007 to January 2011, with mean follow up 37.95±11.91 months; range 24- 72. Fisher's exact test and Cox proportional hazards models were used.

Results:

Mechanical complications directly related to sacral fixation were seen in 27 patients (15.3%). Pseudoarthrosis (PA) was seen in 10 patients (5.68%). L5-S1 PA was seen in 9 of the patients (5.11%) at a mean time of 15.4±6.8 months (range 8-24). After PA treatment all patients achieved a solid fusion. Sacral alar screw loosening was seen in 8 patients (4.54%). Painful implants requiring removal were noted in 2 patients. 1 patient had a sacral fracture after the instrumentation. 2 patients developed a junctional kyphosis (JK) due to insufficient lumbar lordosis (LL) and remained slightly unbalanced. Other 2 patients that were initially with high pelvic incidence and anteverted pelvis remained slightly unbalanced also due to inadequate LL. Cox regression results showed a positive association between L5-S1 disc space (DS, in mm) and L5-S1 PA (HR=1.274 95%CI 1.009-1.608 p=0.042). Patients with DS higher than 10 mm had HR=6.8 (95%CI 1.47-31.48 p=0.014) compared to patients with DS ≤ 10 mm. No statistical significant difference was found between patients who were treated with or without cage at L5-S1. Among 57 patients with a disc space > 10 mm, 2/21 (9.5%) and 6/36 (16.7%) patients developed PA in the patients with and without cage respectively (p=0.697)

Conclusion:

L5-S1 PA and an unbalance sagittal profile are the most common mechanical complications. High L5-S1DS should be considered a high risk for PA and be treated by a combine posterior and anterior reconstruction. Appropriate LL should be provided to this group of patients. Further large-scale studies are necessary to obtain more definite results.

Outcomes of Decompression and Stabilization with a Pedicle Based Semi-Rigid Posterior Stabilization System in the Lumbar Spine

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Introduction:

In patients who do not respond satisfactorily to non-operative measures central lumbar canal stenosis may require surgical decompression. Surgery can include laminectomies with or without fusion and instrumentation. When laminectomies are performed without instrumentation there is a risk of instability and associated symptoms. Fusion often involves multiple segments and therefore potentially increases the risks of adjacent level disease. We have therefore been using the TRANSITION® Stabilization System (Globus Medical, USA) to provide stability without fusion at the operated levels. Following insertion of pedicle screws, to which the rod is attached, a semi-rigid rod is custom built along a central cord using a combination of rigid screw head attachments, flexible spacers and a compressible bumper.

Methods:

A retrospective analysis of prospectively collected data was performed for patients who surgery using the above system between September 2011 and December 2013. Outcome measures included Oswestry Disability Index (ODI), Visual Analogue Scale (VAS) Back/Leg Pain, Hospital Anxiety and Depression Scale and complications.

Results:

Data was available for 16 patients. Five L3 – S1, three L4 – S1, two L4 – L5, two L2 – L5, two L3 – L5, one L1 – L5 and one L2 – S1 stabilisations were performed with a variety of combined central and foraminal decompressions. Average length of follow up was 39.5 weeks. The mean post-operative scores were ODI 31.63, Depression 4.6, Anxiety 5.25, VAS Back 3.63 and VAS Legs 1.88. One patient sustained an intra-operative dural tear and subsequent wound infection that required a return to theatre for wound washout and debridement. There were no implant failures or revisions in this group to date.

Conclusions:

Decompression and stabilization with a pedicle based semi-rigid posterior stabilization system provides satisfactory patient outcomes in the early post-operative period. Further research is on going to assess longer-term results and radiographic outcomes.

Correction of adult deformity in osteoporotic patients using expandable screws - 3 years follow up

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Israel Spine Center

Adult deformity treatment is becoming a rapid growing subject in spine surgery. Appreciation of the spine angulations, correction of lordosis and using long constructs for those corrections became a standard of care.

In the past 3 years, 12 patients aged 65-74 (mean 71.5) underwent adult deformity correction that included 6-19 levels. All had T score less than -2.

Follow up ranged between 6-36 months. One of the patients needed revision surgery. Two patients breakage of the screws was noticed without the need to revise the cases. One patient needed additional surgery for adjacent level disease. No hardware failure was noted. One patient needed partial removal of screws due to local pain.

It seems that expandable pedicle screws provides us with better bone purchase in patients suffering of osteoporosis & compromised bone. Reduces fusion levels & the need of cemen.

Oblique Lumbar Interbody Fusion (OLIF) as a Combined Strategy with Posterior Instrumentation and Fusion for the Treatment of Adult Deformities

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2. Department of Orthopedic Surgery, Centre Médico-Chirurgical de Réadaptation des Massues, Lyon, France

Study performed at Centre Médico-Chirurgical de Réadaptation des Massues, Lyon, France

Study Design:

A retrospective study of 116 cases with minimum 2 years follow up which underwent OLIF as a second stage surgery in combination with posterior instrumentation and fusion of the spine (first stage surgery) for the treatment of adult deformities.

Objectives:

To investigate the outcome for OLIF (in adult patients with spinal deformity) as a combined treatment, as previously described, with posterior instrumentation and fusion of the spine.

Summary of Background Data. To our knowledge, treatment of adult deformities with OLIF have never been published or presented.

Methods:

This study included 116 patients who underwent OLIF combined with posterior surgical reconstruction for adult spine deformity (average age 56.6±9.8 years; range 23-77) who underwent long (5-17 vertebrae, average 9±3.45) spinal instrumentation and fusion to the sacrum or ileum at a single institution between June 2007 and January 2011, a minimum of 24-months follow-up (average 36.9±10.94; range 24-67) was performed.

Results:

Cages were introduced from L1 to L5 by only one minimal approach at a 6.5±3.09 weeks average after the first stage surgery (range 2- 20). Mean time first stage posterior approach surgery was 178.54±62.50 minutes (range 90-300) Mean time second stage OLIF surgery was 66.81±14.77 minutes (range 40-120). Up to three cages per session were introduced. L4-5 and combined level cages were inserted in 83 and in 90 patients respectively. Mean operative blood loss was 94.90±44.55 ml (range 50-150) A bone substituted was used in every case. At final follow up there was no evidence of disc space narrowing or mobilization except for only one case of cage loosening with pseudoarthrosis that was successfully revised. There were no painful implants requiring removal or neurological complications related to the procedure. No abdominal pain and abdominal muscle palsy has occurred. In 3 patients the OLIF was done after 2 and 3 years as treatment of pseudoarthrosis after Pedicle Subtraction Osteotomy (PSO).

Conclusion:

OLIF can be easily performed in the lumbar spine from L2 to L5 with excellent outcome as a second stage combined treatment in the instrumented fused spine of adult patients suffering from spine deformities. It can also prevent disc space narrowing and loss of correction with anterior imbalance due to lack of anterior support. Due to the neurological safety no electrical survey was required.

Key words:

Anterior approach, Interbody fusion, Lumbar spine, Minimally invasive surgery, adult spinal deformities, adult scoliosis, long fusion to the sacrum.

Anterior long construct in the treatment of multilevel cervical myelopathy of the aging spine

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Israel Spine Center

Cervical spondylotic myelopathy (CSM) is the most common progressive spinal cord disorder in patients more than 55 years old (prevalence of 1: 17,000 new cases a year). This disease is also the most common cause of acquired spasticity in later life and may lead to progressive spasticity and neurologic decline.

Cervical spondylosis is part of the aging process and affects most people if they live long enough. Degenerative changes affecting the intervertebral disks, vertebrae, facet joints, and ligamentous structures encroach on the cervical spinal canal and damage the spinal cord, especially in patients with a congenitally small cervical canal. Operative management is beneficial for most patients with moderate/severe myelopathy.

Surgical results of decompression in the aged patients with cervical myelopathy showed that 68.4% of the aged patients achieved a good or excellent result. There was no statistical difference in the recovery rate of JOA score between the aged group (58.1%) and control group (67.0%).

Surgical approach to multilevel cervical spondylosis is based on: Number of involved levels. Type of pathology (OPLL or herniated disc). Cervical spine position (lordotic or kyphotic). Surgeons experience.

The two most popular ways to treat the problem in order to release pressure and restore alignment are: Anterior discectomy+ corpectomy, or laminectomy both with fusion. In both one can achieve sufficient decompression and restoration of the cervical lordosis.

The use of a "hybrid" technique & dynamic plates for anterior decompression of 3 or more levels improves the results and reduces complication in those surgeries.

Cervical myelopathy is a common disease causing disability and spasticity especially in the elderly population. Surgery is a must to improve symptoms and to slow progression.

Anterior approach is an efficient and a safe way to treat this disease.

Cervical Disc Arthroplasty in Patients with Cervical Myelopathy

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Introduction:

The most common cause of cervical myelopathy is degenerative cervical spondylosis with spinal cord compression usually caused by anterior disc osteophyte complexes. The treatment is surgical decompression either by an anterior, posterior or combined approach with the aim of arresting the progression of myelopathy and associated symptoms. Theoretical concerns have been raised regarding the use of cervical disc arthroplasty (CDA) in patients with myelopathy due to the fear that continued motion may cause continuing microtrauma to the cord. This theory is not supported at our institution. We report our clinical results of anterior cervical decompression and CDA in patients with cervical myelopathy.

Methods:

Patients who had undergone one or two level anterior cervical decompression and CDA for myelopathy were identified from the authors' institutions CDA database. Prospectively collected data including post-operative Neck Disability Index (NDI), Hospital Anxiety and Depression Scale, Visual Analogue Scale (VAS) for Neck and Arm pain and the patients reported activity level were reviewed.

Results:

24 patients were included in this study. The mean age at the time of surgery was 49 years (range 30 – 75). 11 patients had surgery at one level and 13 had surgery at two levels. Eight of the patients who underwent two level surgery had cord compression at both operated levels. The average length of follow up was 3.8 years (range 1.6 – 7.4). Mean NDI 24.1 (0 – 64.4), VAS Arm 3.2 (0 – 9), VAS Neck 2.8 (0 – 9), Depression 3.58 (0 – 16) and Anxiety 5.7 (0 – 16). 21 patients (87.5%) stated their activity level was the same or better than prior to surgery, 12 of which were back to their normal pre-morbid levels. Only 3 patients (12.5%) reported worsening of their activity level, one relating this to the development of other unrelated medical conditions.

Conclusions:

Our clinical results support the use of cervical disc arthroplasty in some patients undergoing anterior cervical decompression for cervical myelopathy.

The impact of cervical myelopathy on cortical somatotopic representation

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Background:

One of the most exciting discoveries in the neurosciences was the sensorimotor somatotopic representation of the human body in the cerebral cortex, the so-called "homunculus". Following the invention of functional neuroimaging, studies have managed to demonstrate somatotopic representation non-invasively, as well as changes in these representations in several neurological disorders. We investigated the impact of unilateral cervical myelopathy on whole body representation of the primary somatosensory cortex (S1) and the supplementary motor area (SMA).

Methods:

Bilateral repetitive tactile stimulation was performed on five patients with unilateral hemihypoesthesia under fMRI. We have developed a novel analysis which enables to quantify the quality of the cortical representation continuity ("gradient") into one quantitative value: gradient dispersion value (GDV). In view of the unilateral damage, somatotopic representations were compared between patients' two hemispheres and with five aged matched healthy control subjects.

Results:

Homunculi contralateral to disturbed body-side in both S1 and SMA were found to be less ordered and continuous (higher GDV). Contralateral right-left differences were larger for SMA than for S1, corroborating the suggested hierarchy of the somatosensory cortical processing. No differences were found in the percent signal change of the contralateral response between the two hemispheres or consistent pattern of baseline intensity signal changes.

Conclusion:

Cortical representation in response to tactile stimulation in patients with spinal cord lesions is reflected in gradient disorganization and not in power reduction of the cortical neuronal signal. This suggests that gradient organization is a fundamental and intrinsic character of the human somatotopic representation.

Effect of steroid placement on a gelatin sponge and soft tissue swelling following Anterior Cervical Discectomy and Fusion- A Radiological analysis

J. Weinstein, J. Schroeder, A. Sama, F. Girardi

Introduction:

Anterior cervical discectomy and fusion (ACDF) is the mainstay of most cervical fusions. However one of the dire complications of this procedure is post-operative soft tissue edema. After a lengthy operative time or multiple level decompression and fusion the likelihood of soft tissue edema increases. This may lead to dysphasia or difficulty in breathing.

Steroids are a known anti inflammatory agent. Local placement of steroids on a gelatin sponge adjacent to the surgical site prior to closure, has been shown to reduce inflammation in a paracrine method. We hypothesize that the placement of local steroid solution on a gelfoam® (Pfizer) will decrease post-operative edema.

Methods:

A retrospective review of 79 patients that underwent primary ACDF procedures of two-three levels between 2011-2013. In 52 cases 40mg of depo-medrol was placed in a gelfoam® sponge adjacent to the levels fused. Cervical X-rays were taken post-operative day two (range 1-5 days). Soft tissue swelling was measured on the lateral x-ray. The measurements were taken from a line drawn from the anterior cervical plate to the posterior margin of the soft tissue shadow of the esophagus. The values were compared to the 27 patients without placement of the steroids.

Results:

Soft tissue swelling after placement of steroids sponge was significantly less than the standard ACDF without local steroid placement. Soft tissue swelling was 10.28mm at C3, 11.43 at C4, 13.9 at C5, 15.54 at C6, and 15.81 at C7. These levels are lower than the control group for all levels except C3 (i.e. 10.18 at C3, 15.47 for C4, 17.96 for C5, 18.2 for C6, and 17.92 for C7) no correlation between procedure levels and swelling was found. All values besides the C3 level were statistically significant with a p of <.05.

No complications were documented with the use of steroids.

Conclusion:

Soft tissue swelling can be dramatically decreased with placement of a local steroid sponge. A large scale randomized clinical study should be undertaken.

Spondylotic myelopathy: Rehabilitation outcomes after surgical intervention or without it

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Introduction:

The evidence for the superiority of either surgery or conservative treatment in mild or severe thoracic or cervical spondylotic myelopathy (TSM or CSM) is weak. There is insufficient evidence to determine whether specific activities or minor trauma are a risk factor for neurological deterioration in spondylitic myelopathy (SM). Furthermore, studies comparing treatment results in SM do not consider the devastating nature of complications that may appear immediately after surgery, or the indolent nature of the neurological deterioration, which may or may not appear following conservative treatment. To contribute to the evidence on the roles of surgical or conservative treatment in SM, we compared neurological and functional outcomes of SM patients who underwent rehabilitation, after surgical decompressive intervention and without it.

Materials and methods:

Neurological outcomes, reflected by the American Spinal Injury Association Motor Scores (AMS), and functional outcomes reflected by scores on the Spinal Cord Independence Measure, third version (SCIM III) were compared, at admission to rehabilitation, at discharge from rehabilitation, and after the three-year follow-up, between two patient groups: 14 CSM and 13 TSM patients who had undergone decompressive spinal surgery within one month before admission, and 10 CSM and 8 TSM patients who underwent only rehabilitation.

Results:

At admission to rehabilitation AMS and SCIM III scores did not differ significantly between the two groups. Following rehabilitation both sets of scores improved significantly in both groups ($p < 0.001$), by 12.8 and 13 AMS and by 26 and 22 SCIM III points). At the three-year follow-up, both AMS and SCIM III scores deteriorated in both groups. At the follow-up SCIM III value remained higher than at admission ($p < 0.001$) and AMS value did not differ significantly from that at admission ($p > 0.08$). At all time points, AMS and SCIM III values did not differ significantly between the two groups ($p > 0.08$). The findings were similar when examined separately for TSM or CSM.

Conclusions:

We failed to demonstrate a significant effect of decompressive surgery for TSM or CSM on the neurological and functional outcome during or after rehabilitation.

Pre-surgery AMS and SCIM III scores, however, are still required to assess the overall effect of surgical treatment in SM and to separate this effect from that of rehabilitation in patients who undergo both.

Are expandable screws an alternative in revision case only?

M. Eif, H. Schenke

Due to an increase of the average age of the population in Europe and other areas of the world there is a problem with osteoporotic fractures and severe degenerative spine diseases uprising - failed fusions.

Not only the higher incidence of complications of reoperations is a topic for this, sometimes multimorbid, sometimes very active patientgroup but also the delay in their rehabilitation.

Several techniques were developed to reach the goal of an strong bony fusion, amongst them cement augmented screws and very long, bicortical screws. Until now the race between the loosening of the implants and the bony bridging or healing was won by the loosening in a lot of cases, causing reoperations, longer fusion areas and prolonged hospital stay.

Since there seems to be an evidence for a better primary fixation due to bigger diameters of the pedicle screws there is a limitation due to the thickness of the pedicles itselfs. Expandable screws seems to be for this a valuable solution.

We started the use of expandable screws nearly three years ago in the above mentioned revision cases. The encouraging results with this difficult situations led to the implantation of this screws also in a first line indication trying to prevent further operations.

Now after more than two years and no revision case we would like to report our, untill now, limited but very encouraging results with the use of expandable screws in the primary accomodation of osteoporotic and degenerative spine diseases.

Continous monitoring during pedicular funneling: a novel method to prevent pedicle wall breaching

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Background:

Neurophysiological screw testing is a routine procedure used in spine surgery to detect malpositioned screws. Yet, this testing is done after pedicular screws are already inserted and may not be effective in preventing medial or lateral wall penetration during screw placement. We present a novel neurophysiological method that helps the surgeon during pedicular funneling, in order to find the proper course into the vertebral body, without breaching its cortex.

Aim:

To develop a safe and reliable method which aids in detection of pedicular wall penetration during funneling.

Methods:

An electrical wire was attached to the standard pedicle finder (Medtronic Legacy TM and Depuy Expedium TM) used to funnel the pedicles. Assessment was made during funneling the pedicles in 8 consecutive patients who underwent surgery to correct spinal deformity (1 male and 7 female, mean age \pm SD= 17.7 \pm 8.6 years). Stimulation was delivered via the hand-held finder and the threshold required for triggering a compound muscle potential from muscle in a corresponding myotome was assessed. Following funneling of each pedicle, a manual inspection of the pedicle's internal walls was performed by the surgeon using a hand-held feeler. Neurophysiological results were compared with the results of the manual evaluation to determine the specificity and sensitivity of the neurophysiological assessment.

Results:

Preliminary results from the 145 pedicles revealed breaches in 44 of them. Using a cutoff of <10mA as a criteria for alerting the surgeon of suspected breaching, the neurophysiological assessment reached a specificity rate of 88.1% and sensitivity rate of 95.5%. A positive alarm with no identification of breach (false positive) was found in 12 pedicles, mostly in the vicinity of the apex of the scoliotic curve. No alarm despite an identified breach (false negative) was found in only two pedicular drillings, both demonstrating a violation of the lateral aspect of a high thoracic level pedicel.

Conclusions:

The method we presents in this study, can direct the surgeon during pedicular funneling, adding additional information to identify pedicular wall breaching and thus increasing patient safety and deformity correction abilities.

Intra-operative spine ultrasound: The Sheba experience

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Introduction:

Intra-operative Spine ultrasound (US) has been described in multiple papers but has not transformed into a routinely used tool in spinal surgery. The use of US has been described in spinal tumor resection, mainly of the intradural compartment, degenerative lesions and chiari malformation surgery.

Methods:

Since 2011 the authors began to routinely use the Aloka Prosound alpha 7 US in Sheba medical center for neurosurgical spinal tumor resection, thoracic disc herniation and chiari malformation. We retrospectively evaluated the volume of usage and the extent of intraoperative modification caused by the US.

Results:

During 2011-2013 there were 131 cases eligible for US utilization. In 78 cases (59.5%) US was used, 37.5% on 2011, 65% on 2012 and 71% on 2013. US was routinely performed after exposure of the dura and repeated with surgeon's request. Over all in 63% of the cases the US changed the course of surgery.

Conclusions:

Intraoperative US is safe and easy to use after a short learning curve. When used in indicated cases, it can replace cumbersome fluoroscopy, reduce the incision size and laminectomy levels and illustrate the extent of decompression.

Spine Radiosurgery: Safety and efficacy of VMAT treatment

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Introduction:

Spine Radiosurgery (SRS) is a relatively new modality for the treatment of spine tumors. Multiple studies demonstrated the safety and efficiency of this modality, however many questions are still unanswered. The efficacy VMAT protocol for spine tumors was never evaluated.

Methods:

Patients suffering from spine tumors indicated for spine radiosurgery were treated by a single fraction 16Gy dose in an ambulatory set-up by the author in Sheba Medical center or Assuta medical Center. A retrospective review of the cases was performed, examining the indications, method of treatment, side effects and response to treatment.

Results:

Overall local control rate was 94%. Only minor side effects were observed. None of the patients developed radiation induced myelopathy. Selected cases will be presented and discussed regarding the indication for treatment, treatment method and dose, and possible complications.

Conclusions:

SRS is non-invasive treatment of spine tumors. The local control rate is high with low complication rate. SRS is beneficial as a primary treatment for patients with radioresistant pathologies, oligometastatic disease, after conventional radiation failure, as an adjunct to surgical treatment and for selected benign tumors.

Spinal intradural extramedullary tumors: The value of intraoperative neuromonitoring on surgical outcome

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Background:

About two thirds of spinal cord tumors in adults are intradural extramedullary. Nerve sheath tumors (40%), meningiomas (40%) account for most extramedullary tumors. These tumors are benign and amenable to complete surgical resection. In recent years these surgeries are performed with intra-operative monitoring (IOM) in order to minimize neurological injury but the evidence for this utility are lacking. In this study we retrospectively compare surgical removal with IOM to historical controls with no IOM.

Methods:

Patients' data treated surgically for spinal intradural tumors from 1998 to 2003 was previously collected and analyzed. We retrospectively evaluated patients' charts operated in the years 2011 to 2013. Medical history, clinical and neurological findings, radiological reports, operative descriptions, electrophysiological reports, pathological diagnoses, hospital course and follow-up data were collected.

Results:

Forty-one cases of meningioma or neurinoma surgery were performed in the study period. The surgical results were compared to 70 cases of historic controls. Demographic data was similar in the 2 groups. Sensitivity specificity, positive predictive and negative predicted values of IOM were 75%, 100%, 100% and 97% respectively. Complication rate was 27% and 33% for the study and control groups respectively. New neurological deficit rate was evident in 12% and 14% for the study and control groups respectively. During follow-up 14% of the study group had deteriorated neurological examination compared to their pre-operative condition compared to 8% of the control group (not significant).

Conclusions:

While IOM predicts neurological deficits with high accuracy level, the global efficacy of IOM for intradural extramedullary tumor resection has not been evaluated. Despite this, IOM has become accepted as a de-facto standard. This study does not suggest that there is a significant global benefit of IOM in these cases. Larger randomized controlled studies are essential to evaluate the true benefit of IOM in extramedullary spinal cord surgery.

The association between body mass index, body height and the prevalence of LBP in a population of 829791 adolescents

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*OH and AF contributed equally and each should be considered as first author.

Body mass index (BMI) and height are linked to the pathogenesis of low back pain (LBP), but evidence-based confirmation is still lacking. We examined the prevalence of LBP in adolescents, and its association with BMI and height.

Disability clauses according to LBP severity were divided according to complaints of LBP alone and complaints of LBP with objective corroborating findings. All 829791 males and females undergoing mandatory pre-military recruitment examinations since 1998 were included. BMI groups were classified according to the centers for disease control percentile grading. Logistic regression models assessed the relationship between BMI and height and LBP complaints.

Prevalence of LBP was 0.2% and 5.2% for males with and without objective findings, respectively, and 0.2% and 2.7%, respectively, for females. Higher BMI was significantly associated with LBP in males (Odds Ratio(OR) 1.097 P<0.001 for overweight and 1.163, P<0.001 for obesity) and in females (OR 1.174, P<0.001 and 1.211, P<0.001, respectively). Height was associated with increased risk of LBP in both genders. ORs for LBP in the tallest group compared to the shortest group was 1.438 (P<0.001) for males and 1.224 (P<0.001) for females.

LBP with or without objective findings is associated with overweight and obesity as well as Height.

Keywords:

low back pain (LBP), body mass index (BMI), height, obesity, weight, adolescents

Abbreviations:

low back pain (LBP), body mass index (BMI), Odds Ratio (OR)

Assesment of the net effect of rehabilitation after spinal cord injury and generalization to other areas of medicine

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Introduction:

To promote the quality of rehabilitation, decisions in rehabilitation should rely on quantitative assessment of the rehabilitation potential and of the actual achievements of rehabilitation. An original approach for assessing potential and achievements is proposed. This approach is based on defining observed variables as a fraction of their maximum possible value, while controlling for confounding factors. The spinal cord injury ability realization measurement index (SCI-ARMI), is presented as a model for the application of the proposed approach.

Materials and methods:

SCI-ARMI represents the ability realization, defined as the ratio of the observed Spinal Cord Independence Measure (SCIM) III score, and the maximal possible SCIM III score, that reflects the relationship between task execution and ICF capacity. Three versions of the SCI-ARMI formula were developed. The last one is quadratic and based on the SCIM III values 95th percentile that represents capacities corresponding with given American Spinal Injury Association Motor Scores (AMS). This formula, was generalized for international populations, and adjusted for age and gender, based on data of 661 spinal cord lesion (SCL) patients, from six countries.

Results:

The SCI-ARMI formula was found valid for large SCL populations from various countries. Age and gender affected its values ($p < 0.04$), but country information, did not ($p > 0.1$).

Conclusions:

SCI-ARMI is a measure that assesses rehabilitation potential and achievements. It can be compared and summed up with other measures, which are presented as realization of maximal values, and contribute to evaluation of overall achievements of a person, a rehabilitation ward, or a hospital. The principles of this development can be generalized to other areas of rehabilitation medicine, and improve decision making and outcomes.

Fulminant spondylodiscitis refractory to antibiotic treatment evolving to spinal epidural abscess: changing characteristic epidemiology and bacterial virulence

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Scientific background:

Spondylodiscitis has traditionally been considered a disease with a benign course with the mainstay of treatment being antibiotic treatment. In contrast, spinal epidural abscess (SEA) is considered a more aggressive disease necessitating surgical debridement and prolonged antibiotic treatment.

These diseases are relatively rare, with the incidence of spondylodiscitis being 0.2 to 2 cases per 100,000 person-years and SEA being 0.9 cases per 100,000 person-years. Spondylodiscitis has a bimodal distribution with pure discitis occurring in children and vertebral osteomyelitis/discitis appearing in adults. SEA usually occurs in adults after the age of 60, typically with pre-existing co-morbidities and immune-compromised states.

The purpose of this study is to report a case series of eighteen patients presenting with spinal infections, of which fourteen presented with an aggressive form of spondylodiscitis including extension as an SEA. Characteristics, epidemiology and incidence of this disease are reviewed.

Methods:

A retrospective review of prospectively collected data was performed. The institutional records system of the Kaplan Medical Center was used to identify incident cases of spondylodiscitis and spontaneous epidural abscess admitted to our hospital between 2011-2013. Patients' medical charts, radiology, bacteriology and operative notes were reviewed. Primary outcome measures included patient survival and neurological sequelae. Secondary outcomes included patient demographics, clinical and disease course characteristics.

Results:

Over the three year study period eighteen patients were diagnosed with spondylodiscitis and SEA. This represents an increase of 350% in comparison to the prior decade. Fifteen of these patients presented with pyogenic spondylodiscitis and were initially treated with culture specific IV antibiotics, however all but one were refractory to conservative treatment and required further and often multiple surgical interventions, prolonged hospitalization, ICU admissions due to extreme deterioration and catastrophic complications. Despite aggressive medical, antibiotic and surgical treatment, one patient developed systemic sepsis and died.

These patients were characteristically young, healthy, laborers with no predisposing factors. Eight patients still had residual neurological deficits at the 6 month follow-up. One patient had classic SEA, one patient had TB spondylodiscitis and two patients transferred to another hospital, one of which died soon after.

Discussion:

While spondylodiscitis is considered a relatively benign disease, which in the vast majority of cases resolves with conservative treatment alone, our cases series demonstrates a disease with a fulminant course, refractory to appropriate IV antibiotics, requiring surgical intervention. Most case series show a high incidence of predisposing factors however our patients were relatively healthy and included many young labor workers. Despite seemingly common community acquired infectious micro-organisms the patients' disease was typically refractory to appropriate IV antibiotic treatment. Severe complications were encountered in spite of appropriate antibiotic and surgical treatment, requiring prolonged rehabilitation.

Conclusion:

Though representing one hospital's experience this study demonstrates a substantial increase in the incidence and aggressive characteristics of this fulminant subtype of spondylodiscitis. The incidence seems to be on a rise with more virulent micro-organisms and aggressive clinical course with potentially life threatening complications. Increased vigilance for this condition and its misleading initial presentations is warranted as are further studies.

**Sacral doming progression in developmental spondylolisthesis:
A demonstrative case report****A.G.Gutman^{1,2}, C.Silvestre², P.Roussouly²****1 Department of Orthopedic Surgery, Chaim Sheba Medical Center, 52621 Tel Hashomer, Israel (e-mail: gabrielgutman@hotmail.com)****2. Department of Orthopedic Surgery, Centre Médico-Chirurgical de Réadaptation des Massues, Lyon, France****Study performed at Centre Médico-Chirurgical de Réadaptation des Massues, Lyon, France****Study Design:**

A demonstrative case report of an unusual evolution in developmental spondylolisthesis.

Summary of Background Data:

To our knowledge spontaneous sacral doming reconstruction and healing has never been previously reported.

Methods:

Presentation of a developmental spondylolisthesis case with pars elongation and evolution of the sacral plateau shape during growth.

Results:

Initially, this case presented without sacral dome. At 4 years follow up sacral dome appeared and completely healed after 8 years follow up in the presence of a stable elongata pars and stable spondylolisthesis. During this follow up and growing period, pelvic Incidence changed from 40° to 70°.

Conclusion:

This special situation demonstrated that sacral doming was secondary to L5 abnormal position regarding to S1. The mechanism of sacral doming appears similar to an osteochondritis phenomenon with possible total reconstruction of the sacral plateau due to the stability of L5 on S1. In contrast, in a typical L5-S1 lytic spondylolisthesis case, loss of sacral plateau support by sacral rounding may induce increase slipping of the spondylolisthesis preventing sacral plateau reconstruction.

Key words:

developmental spondylolisthesis, sacral doming, slip progression, sagittal balance.

חברי האיגוד

תואר	שם (משפחה/פרטי)	טל' נייד	בי"ח
ד"ר	אוחנה ניסים	050-8617101	בלינסון
ד"ר	אופירם אלישע	052-5911115	מרכז רפואי תלם
ד"ר	אלכסנדרוסקי ויטלי	052-6320305	כרמל
ד"ר	אנגל יצחק	054-4642629	מאיר
ד"ר	אנקשטיין יורם	057-7345403	אסף הרופא
ד"ר	אסלאן חאלד	050-6267208	בני ציון
ד"ר	ארזי הראל	050-8685138	שערי צדק
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ד"ר	אשכנזי עוזי	052-2504922	השרון
ד"ר	בלום דנה	054-5071200	השרון
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חברי האיגוד

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פרופ'	סוירי גיל	050-2063739	רמב"ם
ד"ר	סיגל צ'וני	050-5238896	אסותא
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ד"ר	פיקרסקי איליה	054-4631076	מאיר
פרופ'	פלומן יזהר	054-4214369	אסותא
ד"ר	פרידלנדר אלון	054-6666257	תל השומר
ד"ר	פריימן שי	050-7887466	נהריה
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ד"ר	קליר ישראל	050-5286762	בילינסון
ד"ר	קנוולר נחשון	052-6666295	תל השומר
ד"ר	קפלן לאון	050-7874217	הדסה עין כרם
ד"ר	קרמר מוטי	052-6769986	סורוקה
ד"ר	רגב גלעד	052-4262357	איכילוב
ד"ר	רז נטע	052-3756293	בני ציון
ד"ר	רחמימוב נמרוד	050-7887564	נהריה
ד"ר	רייכל מיכאל	052-2361162	העמק
ד"ר	רן הראל	054-2440677	תל השומר
ד"ר	רנד נחשון	052-3691697	אסותא
פרופ'	שבת שי	054-4581605	מאיר
ד"ר	שגיב שאול	052-2232651	קפלן
ד"ר	שייניס דימיטרי	050-7968778	בילינסון
ד"ר	שלמון אהוד	057-7345868	אסף הרופא
ד"ר	שפיגלמן ארסן	054-5905593	בני ציון
ד"ר	ששון אברהם	050-5378269	סורוקה

The 15th Annual Meeting of the Israel Spine Society
14th-17th May 2014, the Royal Beach Hotel, Eilat

