

THE 17TH ANNUAL MEETING OF THE ISRAEL SPINE SOCIETY

25-28 May 2016

Wednesday-Saturday
The Royal Beach Hotel
Eilat - Israel.



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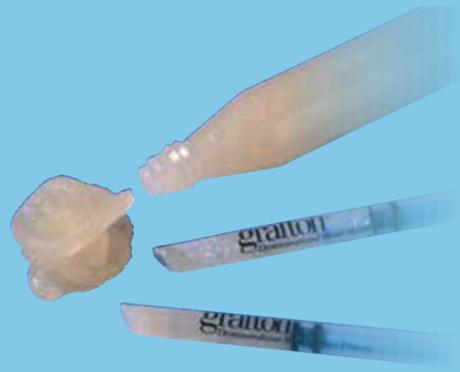
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General Information

The 17th annual meeting of the Israel Spine Society will be held on Wednesday-Saturday, 25th - 28th May, 2016 "Royal Beach" Hotel in Eilat.

Acting Committee

Nachshon Knoller M.D.
Chairman

Yoram Anekshtein M.D.
Secretary

Eyal Itshayek M.D.
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Israel Caspi M.D.
Educational Committee

Gad J. Velan M.D.
Committee Member

International Keynote Speakers

Edward C. Benzel M.D.
Chairman, Department of Neurosurgery, Cleveland Clinic, USA
Editor-in-Chief, World Neurosurgery

Frank M. Phillips M.D.
Professor, Orthopaedic Surgery
Spine Fellowship Co-Director Rush University Medical Center
Chicago IL, USA

Robert Gunzburg M.D., Ph.D.
Private practice at the Eeuwfeestkliniek, Antwerpen, Belgium
Editor-in-Chief, European Spine Journal
President, ISSLS 2014/2015
President, Spine Society of Europe 2007/8

Honored Guest Lecturer

Aaron Ciechanover Prof.
Distinguished Research Professor
Laureate, the 2004 Nobel Prize in Chemistry

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,

We meet again in our yearly meeting that has already become a tradition of both highly scientific and social event.

I would like to welcome our keynote speakers - **E.C. Benzel** and **F.M.Philips** from the USA and **R. Gunzburg** from Belgium - who are good friends of me and of other members in our society

We welcome our guests and friend from Poland - **L.F Ciupik, A. Maciejczak, D.Zarzycki** - and we hope to start a tradition of mutual meetings and cooperation.

Our sincere thanks go to our guest speakers, for devoting their precious time to attend our meeting and enrich us with their knowledge and clinical experience.

It is a huge honor for me to host **Prof. A. Ciechanover, Laureate the 2004 Noble prize in Chemistry** as our yearly Honored Guest Lecturer.

We are experienced a difficult period for medicine in Israel in general and for the physicians specifically. Those are the results of continuing pressure by the Ministry of Finance as well as a hostile media environment to our professional and moral

reputation. They try and sometimes succeed to damage the confidence of the patients in the medical community.

I am calling, again, to the leaders of our professional organizations to act together against those trends in first priority and I am calling our members to act together against those trends.

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

Nachshon Knoller M.D.
President, Israel Spine Society

חברי האיגוד ואורחים נכבדים ברוכים הבאים,

עברה שנה ושוב אנחנו נפגשים באילת לכנס השנתי שלנו, כנס שהפך למסורת של מצוינות מדעית באווירה חברתית.

ברצוני לברך את המרצים האורחים - **ד"ר אד בנזל** מקליבלנד **ד"ר פרנק פיליפס** משיקגו, ארה"ב, ו**ד"ר רוברט גינזברג** מאנטוורפן, בלגיה. תודתנו נתונה על כך שהקדישו מזמנם להגיע ולהשתתף בכנס השנתי שלנו ולהעשיר אותנו בניסיונם ובידע הקליני שלהם.

אני שמח לארח את עמיתנו מפולין **פרופ' צ'ופיק, מז'שצ'ק וזרזיקי**, תוך תקווה שביקורם יבשר תחילתה של מסורת פגישות משותפות.

כבוד מיוחד הוא לי לארח את **פרופ' אהרון צ'חנובר, חתן פרס נובל לכימיה שנת 2004**, כמרצה אורח כבוד.

עמיתי, אנחנו נמצאים בתקופה קשה לנו הרופאים ולרפואה בישראל - הציבורית והפרטית - שהיו שזורות זו בזו. חוק ההסדרים בלשונו ובתוכנו פוגע בקשר ובאמון הקיים ביננו לבין החולים, מטיל עננה מעל יושרנו המקצועי, פוגע בחופש המקצוע שלנו, ובסופו של דבר יפגע בכלל החולים בישראל בנוסף לפגיעה במוניטין המקצועי והמוסרי שלנו כרופאים.

אני פונה, שוב, בשם חברי האיגוד לראשי הארגונים המקצועיים שלנו לטפל בנושא זה בעדיפות ראשונה. באותה נשימה אני פונה לחברי האיגוד לפעול במשותף לסיקול מגמות אלו, כוחנו באחדותנו.

אני מאחל לכולנו כנס פורה ושהייה נעימה באילת בין חברים ועמיתים.

דר. נחשון קנולר
נשיא האיגוד הישראלי לעמוד השידרה

חברים ועמיתים

ברוך בואכם לכנס השנתי של האיגוד הישראלי לעמוד השידרה.

גם השנה נערך הכנס בסביבה הטבעית המקסימה של העיר אילת. בתוך הטבע הנפלא אשר סביבנו בולטת האיכות המדעית הגבוהה של הכנס.

השנה נתחיל בתוכנית המדעית כבר ביום רביעי אחר הצהריים ונשלב את הרצאות החסות בצהרי יום חמישי. התוכנית המדעית, שהינה יוצאת מן הכלל, תתפרש למעשה על פני 3 חצאי ימים.

הוועדה המדעית עברה השנה על למעלה מששים אבסטרקטים המהווים את הקצפת של מקצוענו. מתוך שלל המאמרים נבחרו כשלושים עבודות אשר תוצגנה בפני המשתתפים.

תודה על השתתפותכם הערה.

דר. ישראל כספי
הוועדה המדעית

Scientific Program

Wednesday, May 25, 2016

14.00 - 14.55

REGISTRATION

14.55 - 15.00

Opening Remarks

N. Knoller, ISS Chairman

Session 1: CERVICAL SPINE

Chairmen: E. Ashkenazy, E. Itshayek

15.00 - 15.20

Keynote Lecture: Cervical Spondylosis: Myelopathy and Deformity

E.C. Benzel

15.20 - 15.25

Discussion

15.26 - 15.34

Cervical Spine Surgery: Which Approach is Better?

R. Harel, P. Stylianou, N. Knoller

15.35 - 15.43

Neurodegenerative Biomarkers in Cervical Myelopathy Patients

N. Ackshota

15.44 - 15.52

Spine and ENT Joint Ventures in Cases Requiring Thyroidectomy and ACDF

Y. Barzilay, L. Kaplan, U. Peleg, J.M. Weinberger, H. Arzi

15.53 - 16.01

Outcome Assessment in Spine Surgery

A. Rabin, M. Levinkof, I. Caspi, N. Ackshota, A. Friedlander

16.02 - 16.10

Effectiveness of Thromboembolism Prevention During Rehabilitation After Spinal Cord Injury

E. Aidinoff, E. Shmigura, U. Birman, L. Front, I. Gelernter, A. Catz

16.10 - 16.15

Discussion

16.15 - 16.35

COFFEE BREAK

16.35 - 16.55

Keynote Lecture: Cervical TDR - is it Better than Fusion?

F.M. Phillips

16.56 - 17.06

Comments & Discussion

E.C. Benzel

Session 2: TRAUMA

Chairmen: E.C. Benzel, R. Harel

17.07 - 17.15

Management of Cervical and Thoracic Penetrating Stab Injuries with Retained Foreign Bodies

A. Hamad, H. Arzi, A. Popov, J. Winestone, Y. Barzilay

17.16 - 17.24

Efficacy, Safety and Pain Control of Vertebral Stenting for Painful Vertebral Compression Fractures: A Prospective Study with 6-Months Follow Up

O. Doron, C. Candanedo, S. Fraifeld, A. Vargas, J. Schroeder, L. Kaplan, A. Hsharoni, J. Cohen, E. Itshayek

17.25 - 17.33**Cemented Versus Uncemented Posterior Fixation for Unstable Traumatic Spinal Fractures: A One Year Follow Up Study**

Y. Gellman, J. Schroeder, H. mulla, A. Shani, S. Frieman, L. Kaplan, A. hasharoni, E. itzahyek, N. Rahamimov

17.34 - 17.38**Discussion****17.39 - 17.47****Robotic Assisted Percutaneous Pedicle Screw Fixation for Thoracolumbar Spine Fractures**

H. Shear-Yashuv, L. Kaplan, A. Hasharoni, Y. Barzilay, J.E. Schroeder

17.48 - 17.56**Low Rates of Post-Operative Complications in Patients Undergoing Percutaneous Stabilization for Thoraco-Lumbar Spine Fractures in Ankylotic Spine Disease**

R.E. Buxbaum, A. Shani, H. Mulla, N. Rahamimov

17.57 - 18.05**Clinical and Radiological Factors Affecting Progressive Collapse of Acute Osteoporotic Compression Spinal Fractures**

S. Goldstein, Y. Smorgick, Y. Mirovsky, Y. Anekstein, R. Blecher, S. Tal

18.06 - 18.12**Discussion****18.12 - 18.35****“Hok Ha’Hesderim”** - N. Rahamimov**20.00 - 22.00****OPENING RECEPTION****Thursday, May 26, 2016****07.00 - 08.00****REGISTRATION****Session 3: DEFORMITY****Chairmen: N. Ohana, A. Arzi****08.00 - 08.08****Association Between Hyperflexibility and Spinal Deformities in Adolescents**

O. Hershkovich, A. Friedlander, G. Gutman, H. Arzi, B. Gordon, E. Derazne, D. Tzur, A. Afek

08.09 - 08.19**The Use of Nitinol Rods for Scoliosis**

S. Kolesov

08.20 - 08.28**The Efficacy of Neuromonitoring in Children Under the Age of 10**

J.E. Schroeder, A. Hasharoni, A. Korn, K. Goldstein, L. Kaplan

08.29 - 08.37**Surgical Management of Moderate AIS with Fusionless Short Concave Fixation (ApiFix®) and Post-Operative Curve Reduction by Exercises: Report on 16 Operated Cases with 2 Years Follow Up**

Y. Floman, G. Burnei, S. Gavriiliu, M. Tunyogi-Csapo, T. Potaczek, Y. Mirovsky, Y. Anekstein

08.38 - 08.58**Spine Osteotomy in Treatment of Spinal Deformity**

D. Zarzycki

08.58 - 09.03**Discussion****09.03 - 09.11****Magnetic Controlled Growing Rods for the Treatment of Growing Spine Deformities, Long Term Follow Up and Report of Complication Rate**

D.E. Lebel, A. Segal, D. Ovadia

09.12 - 09.20**Robotic Assisted Scoliosis Surgery - the Learning Curve Phase**

K. Abu-Dalu, Y. Barzilay, A. Hamad, A. Popov, H. Arzi

09.21 - 09.29**Muscle Mechanosensor Dysfunction Results in Adolescent Idiopathic Scoliosis in an Animal Model**

R. Blecher, S. Krief, T. Stern, I. Biton, Y. Anekstein, E. Zelzer

09.30 - 09.38**Can MRI Predict Flexibility in Scheuermann’s Kyphosis Patients?**

R. Kaiser, E. Behrbalk, M. Walsh, P. Waldauf, A.B. Perez Romera, H. Mehdian

09.39 - 09.47**Can Spino-Pelvic Parameters Predict Hardware Failure in Surgical Correction of Scheuermann’s Kyphosis?**

E. Behrbalk, O. Uri, B. Boszczyk, H. Mehdian, M. Grevitt

09.47 - 09.53**Discussion****09.53 - 10.25****COFFEE BREAK****Session 4: TUMORS & MISCELLANEUS****Chairmen: F. M. Phillips, G. Regev****10.25 - 10.33****Spine Radiosurgery: Lessons Learned From the First 100 Sessions**

R. Harel, L. Zach

10.34 - 10.42**Are They Too Old? Decompressive Surgery May Provide Long Duration of Ambulation and Survival in Elderly Patients with Metastatic Epidural Spinal Cord Compression – Experience with 40 Operated Patients**

E. Itshayek, C. Candanedo, S. Fraifeld, A. Hasharoni, L. Kaplan, J. Schroeder, J.E. Cohen

10.43 - 10.51**Effective Cough for People with Cord Injury Using Sniff-Controlled FESS**

A. Catz, L. Haviv, H. Friedman, U. Bierman, I. Glass, A. Plotkin, A. Weissbrod, S. Shushan, V. Bluvshstein, E. Aidinoff, N. Sobel

10.52 - 11.00**Effective Dose Reduction in Spine Radiographic Imaging**

S. Shabat, Y. Leitner, G. Bartat, A. Ben-Shlomo

11.00 - 11.05**Discussion****11.05 - 11.25****Keynote Lecture: Bridging the Chasm Between Volume and Value Based Care (Chronic pain & Economic)**

E.C. Benzel

11.26 - 11.41**Keynote Lecture: What is the place for scientific journals today: the European Spine Journal’s perspective.**

R. Gunzburg

11.41 - 11.46**Discussion****SPONSORED LECTURES****11:47 - 12:07****Fix and Treat: Anabolic Treatment for the Fragility Fracture Patient**B. Liberman, **Eli Lilly****12:08- 12:28****How to Recognize Sacroiliac Joint Pain in the Chronic Nonspecific Low Back and Leg Pain Population. Six Months Outcome Data of an RCT Comparing Minimally Invasive Sacroiliac Joint Surgery Versus Non-Surgical Treatment**D. Kools, **Si-Bone****12:29 - 12:49****Brainlab Symposium**G. Stein, **Brainlab**

12:50 - 13:50

LUNCH BREAK**Session 5: NEW INSTRUMENTATION & TECHNIQUES****Chairmen: R. Gunzburg, E. Behrbalk**

13.50 - 13.58

Safety Assessment of a New Curved Powered Tissue Removal Device

R. Pflugmacher, A. Franzini, S. Horovitz, E. Ashkenazi

13.59 - 14.07

Carbon Fiber Pedicle Screws: Evolution of Spinal Fusion Hardware for Improved Patients Follow-Up

R. Gepstein, I. Engel, E. Behrbalk, Y. Folman

14.08 - 14.16

Technical Report: Pedicle Screw Distraction for MIS TLIF

J. Winestone

14.17 - 14.27

Open and Minimally Invasive Transforaminal Interbody Fusion with Self-Guided Bone Carving Cage CarRLIF/LfC. Personal Experience in Various Surgical Pathologies

A. Maciejczak

14.28 - 14.38

“Lvy-Like” Mimetic Mechanism of Osteointegration Based on 3D-Truss-Ti CarRLIF Implant

L.F. Ciupik

14.39 - 14.45

Discussion

14.46 - 15.01

Keynote Lecture: New Techniques, Always an Advancement?

R. Gunzburg

15.01 - 15.06

Discussion

15.07 - 15.30

COFFEE BREAK

15.30 - 16.30

GUEST LECTURE: The Revolution of Personalized Medicine – Are we Going to Cure all Diseases and at what Price ?

A. Ciechanover

Distinguished Research Professor

Laureate, the 2004 Nobel Prize in Chemistry

16.30

SUN & FUN**Friday, May 27, 2016****Session 6: DEGENERATIVE SPINE****Chairmen: I. Caspi, Y. Smorgick**

08.00 - 08.30

Keynote Lecture: Cervical and Lumbar Spondylosis: Management from a Biomechanics Perspective

E.C. Benzel

08.30 - 08.35

Discussion

08.36 - 08.44

Lower Extremity Motor Function 1-year Following Surgical Management of Lumbar Disc Herniation

A. Rabin, O. Hershkovitz, N. Ackshota, S. Menachem, A. Friedlander

08.45 - 08.55

The Use of Nitinol Rods for Spondylolisthesis and Lumbar Spine Instability (Multicenter Randomized Trial)

S. Kolesov

08.56 - 09.04

Is Scheuermann’s Kyphosis associated with weakness of lumbar paraspinal muscles?

R. Kaiser, E. Behrbalk, P. Waldauf, P. Rehousek, B. Perez, H. Mehdian

09.04 - 09.09

Discussion

09.10 - 09.18

A New High Speed Shielded Curved Device Facilitating Posterior Thoracic Discectomy Through a Hemilaminectomy Hemipediclectomy and Unilateral Facetectomy Approach

M. Millgram, N. Rand, B. Beutler, E. Ashkenazi

09.19 - 09.27

Hybrid Spinal Cord & Peripheral Field Stimulation for the Treatment of Failed Back Syndrome: The Sheba Medical Center Experience

Z. Zibly, R. Spiegelman, R. Goor, N. Knoller

09.28 - 09.36

Is Hydronephrosis a Complication After Anterior Lumbar Interbody Fusion?R.M. Parks, E. Behrbalk, S. Mosharraf
R.M. Müller, B.M. Boszczyk

09.36 - 09.40

Discussion

09.41 - 10.01

Debate: Spinal Fusion for Lumbar Stenosis

Con: G Sviri

Pro: E.R. Benzel

10.01 - 10.05

Discussion

10.05 - 10.35

COFFEE BREAK

10.35 - 10.55

Keynote Lecture: Lateral Interbody Fusion - Lessons Learned, Advanced Techniques

F.M. Phillips

10.55 - 11.00

Discussion

11.00 - 11.32

Keynote Lecture: From paternalism over informed consent to shared decision making, and back.

R. Gunzburg

11.32 - 11.38

Discussion

11.38 - 12.10

PROFESSIONAL MEETING**ENJOYABLE
WEEKEND
AND SEE U
ALL NEXT
YEAR.**

Cervical Spine Surgery: Which Approach is Better?

R. Harel¹, P. Stylianou², N. Knoller¹

1. Spine Surgery Unit, Department of Neurosurgery, Sheba Medical Center, Ramat-Gan, Israel
2. Department of Neurosurgery, Aretaeio Private Hospital, Nicosia, Cyprus

Introduction:

Cervical spine surgery is a common procedure for treatment of wide variety of pathologies. The debate whether anterior or posterior approach is superior dates back to the description of these approaches. In this study we try to answer this question according to our experience.

Methods:

We retrospectively evaluated patients' data treated surgically for cervical pathologies from February 2011 to October 2013. We compared anterior cervical approach to posterior cervical approach for patients operated due to all cervical pathologies and a sub-analysis was performed for cervical myelopathy patients.

Results:

The study included 251 patients, 192 were operated by an anterior approach and 59 by a posterior approach. The anterior approach group was younger in average (not significant) but the indications for surgery were significantly different. Mean number of levels treated was 2.2 and 3.5 for anterior and posterior approach respectively (statistically significant). Neurologic status change was favorable for both surgical approaches. Total infection rates (5.8% vs. 11.9%; $p=0.008$) and deep wound infection rates (0.5% vs. 8.5%; $p<0.0005$) was significantly higher for the posterior approach. Total complication rate was significantly

higher for the posterior approach (7.8% vs. 20.3%; $p=0.005$). Sub-analysis including only cervical myelopathy patients (131 anterior approach vs. 33 posterior approach) demonstrated again higher levels of deep wound infections and total infection rate in posterior approach group (0% vs. 12%; $p<0.0005$, 12% vs. 1.5%; $p<0.005$ respectively). Total complication rate in the myelopathy group was higher for posterior approach (6.1% vs. 18.1%; $p=0.026$).

Conclusions:

Cervical spine surgery is effective in preventing neurologic deterioration and in most cases improves neurological function. Both the posterior and the anterior approaches are

highly efficacious in achieving surgical goals, however complication rate varies substantially. This study demonstrates that the anterior approach is associated with significantly lower rates of complication especially infection related complications.

Neurodegenerative Biomarkers in Cervical Myelopathy Patients

N. Ackshota

Spine Surgery Unit, Sheba Medical Center, Tel-Hashomer, Israel

Background:

Cervical Spondylotic Myelopathy (CSM) is a common disorder involving chronic progressive compression of the cervical spinal cord due to degenerative disc disease, spondylosis, or other degenerative pathology, resulting in progressive neurological impairment that ranges from gait imbalance and clumsiness to quadriplegia. Damage to neuronal tissue is the endpoint of several neurodegenerative diseases. This breakdown can cause an increase in the levels of proteins specific to this tissue in the blood stream accounting for the disrupted blood brain barrier.

Objectives:

We aimed to study a large array of neurodegenerative biomarkers in the peripheral blood of patients with CSM comparing to healthy controls and to find any correlation between these biomarkers and disease severity according to mJOA and Nurick's grading.

Methods:

Peripheral blood samples obtained from 25 patients diagnosed clinically and radiographically with CSM and 13 healthy volunteers. Protein expression profiles of 15 neurodegenerative biomarkers were measured by multiplex Luminex bead assay and further analyzed by group comparison statistics, correlation studies and receiveroperating characteristic (ROC) analysis.

Results:

11 of 15 biomarkers were significantly elevated in the CSM group as compared to the healthy subjects (Pvalue <0.05). The severity of CSM on the scale of Nurick and mJOA is inversely related to NCAM levels (Nurick Correlation = 0.529, Pvalue = 0.007, mJOA correlation = 0.519, Pvalue = 0.001).

Conclusions:

Neurodegenerative biomarkers measured in the peripheral blood CSM patients might serve as a diagnostic

assistant tool and specifically NCAM can be used as an additional tool for CSM diagnosis and defining CSM severity.

Spine and ENT

Joint Ventures in Cases Requiring Thyroidectomy and ACDF

Y. Barzilay¹, L. Kaplan³, U. Peleg², J.M. Weinberger⁴, H. Arzi¹

1. The Spine Unit, Department of Orthopedic Surgery, Shaare Zedek Medical Center (SZMC), affiliated with Hebrew University School of Medicine, Jerusalem, Israel
2. The Spine Unit, Department of Orthopedic Surgery, Hadassah-Hebrew university Medical Center, Jerusalem, Israel
3. Department of ENT, Shaare Zedek Medical Center (SZMC), affiliated with Hebrew University School of Medicine, Jerusalem, Israel
4. Department of ENT, Hadassah-Hebrew university Medical Center, Jerusalem, Israel

Introduction:

The surgical field has changed from all around surgeons highly sub-specialized surgeons. This trend may result in multiple surgical procedures to resolve multiple separated pathologies. On the side of the patient, that scenario is not beneficial.

The aim of this case series was to increase the rate of cooperation between ENT and spine surgeons in case who can benefit from such cooperation.

Patients and methods:

Between 2013 and 2015, three patients, 2 females and one male underwent under the same anesthesia total thyroidectomy +/- radical neck dissection, followed by anterior cervical decompression and

fusion. A 42 year old female presented with symptomatic multinodular goiter and C5-7 herniated cervical discs causing cervical myelopathy. A 56 year old male presented with left upper extremity polyradiculopathy secondary to metastatic adenocarcinoma of the thyroid to C5. A 43 year old female presented with cervical radiculopathy secondary to herniated C5-7 discs. On the cervical imaging studies a thyroid nodule was seen, leading to the diagnosis of adenocarcinoma of thyroid with enlarged cervical lymph nodes.

Results:

The first patient underwent total thyroidectomy and ACDF C5-7

uneventfully and got rid of the symptoms related to MNG and her cervical discs. The second patient underwent preoperative embolization, followed by total thyroidectomy, corpectomy of C5 and ASF C4-6. This was followed by radiosurgery and radioactive iodine therapy. He regained full power in the left UE. The third patient underwent Radical neck dissection on the right, total thyroidectomy, and ACDF C5-6-7. Her radicular symptoms resolved, however she developed complete palsy of cranial nerve 11 on the right side. She was later radiated and treated with radioactive iodine.

Discussion:

Concomitant Thyroidectomy and ACDF is beneficial

to the patients presenting with such problems, as it saves the patient from repeat general anesthesia, results in one painful procedure, instead of two and facilitated anterior cervical spine surgery, a dangerous to impossible task after total thyroidectomy followed by radiation therapy.

Effectiveness of Thromboembolism Prevention During Rehabilitation After Spinal Cord Injury

E. Aidinoff, E. Shmigura, U. Birman, L. Front, I. Gelernter, A. Catz

Loewenstein Rehabilitation Hospital,
Tel-Aviv University

Introduction:

Thromboembolic phenomena (TP) are frequent after spinal cord injury (SCI). This study assesses the effectiveness of medication used to prevent TP and recommends a change in the protocol for TP prevention, following SCI.

Methods:

Included in the study were 356 SCI patients, admitted for rehabilitation between 2002 and 2011, and followed up for at least one year. Age was 52 ± 18 years, 56% were males, 36% of the injuries were traumatic, 41% had tetraplegia, and the rates of AIS grades A, B, C, and D were 10%, 1%, 16%, and 73%, respectively. The time from injury to rehabilitation was

20 ± 15 days, 76% were operated before admission, 4% were overweight, and 1.4% had past TP. Clinical, laboratory, and demographic data were extracted from hospital records. Effects of risk factors on the risk of TP were assessed using the Chi-square test and analysis of variance.

Results:

Clexane 40mg daily was administered to 328 patients (92%), as preventive anticoagulant medication. It was replaced by therapeutic anticoagulation after the onset of TP. Thirty five patients (9.8%) contracted DVT, 10 (2.8%) PE, and 39 (11%) DVT or PE. Median time from injury to TP diagnosis was 11 days. None of the patients who contracted

TP died during the follow-up period. Transient bleeding or thrombocytopenia was noted in 3 patients following anticoagulation. Only AIS grade, excess weight, and past TP were found to affect the risk of TP ($p < 0.001$).

Conclusions:

Most of the SCI patients in this study received conventional preventive anticoagulant medication. The rate of TP was within the limits mentioned in the medical literature. Most of the TP occurred soon after the injury, and none of them was fatal. Nevertheless, 38% of the TP occurred during rehabilitation despite the preventive anticoagulation, whereas complications of anticoagulation were

few, transient, and less risky. The finding suggest a need to consider a higher dosage of preventive anticoagulation in the first month after injury, at least in patients with AIS grades A, B, and C, who are overweight, and have a history of TP.

Management of Cervical and Thoracic Penetrating Stab Injuries with Retained Foreign Bodies

A. Hamad, H. Arzi, A. Popov, J. Winestone, Y. Barzilay

The Spine Unit, Department of Orthopedic Surgery, Shaare Zedek Medical Center (SZMC), affiliated with Hebrew University School of Medicine, Jerusalem, Israel

Background:

Background: Though spinal stab wounds presenting with a retained foreign body, (RFB) are uncommon, they may result in spinal cord injury (SCI) with catastrophic neurological consequences. The purpose of this study is to report our experience in management of these injuries.

Methods:

A retrospective review of medical records identified 5 consecutive patients with penetrating stab wounds and RFB's. They presented via the Emergency Department at SZMC between January 2014 and February 2016. The data was analyzed for patient demographics, spinal level of the RFB, neurological

status, associated injuries, radiological investigations, management, length of stay, complications and mortality.

Results:

Patients age ranged between 4 and 40, with 4 males and 1 female. 4 cases involved knives, and 1 a porcupine quill. Two RFB's were located in the cervical spine, and 3 were in the thoracic spine. Three patients were neurologically intact (ASIA E). One patient suffered partial Brown-Sequard syndrome (ASIA D, T3 level). There was one case of combined vertebral artery injury and brachial plexus injury with partial motor and sensory deficits in the left upper extremity. CT was used preoperatively in all cases, and

MRI postoperatively, based on clinical judgement. All foreign bodies were removed surgically with careful planning in a controlled fashion. Adjacent vascular structures and deciding on whether to open the spinal canal were common considerations. Length of stay was 3-10 days.

Conclusion:

While penetrating stab injuries with RFB's are uncommon, a logical systematic approach to management may avoid additional iatrogenic morbidity and optimize outcome.

Efficacy, Safety and pain control of vertebral stenting for painful vertebral compression fractures: A prospective study with 6-months follow up

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Background and Purpose:

Painful vertebral compression fractures in both cancer and osteoporotic patients reduce quality of life and may limit survival. We assessed pain relief, vertebral

height restoration, and kyphosis correction as well as 6-months pain control following vertebral augmentation using a novel expandable titanium stent implant. Stenting techniques hold a promise for improved osteointegration of the cement into the spongy bone of the vertebral body, smaller volume of cement injection and better height restoration over balloon kyphoplasty, in patients with painful vertebral compression fractures. Long term pain control was not previously tested in those patients groups.

Materials and Methods:

Patients >18 years of age with osteoporosis and/or metastatic disease, who presented symptomatic compression fractures of vertebral bodies

T5–L5 between April 2012 and December 2014 were included in the study. Patient and procedural details were retrospectively reviewed and recorded under an IRB waiver of informed consent. Back pain at presentation, immediately after vertebral stenting, and at 1-, 3- and 6-months follow-up was estimated using the visual analog scale (VAS). Vertebral height and local kyphotic angle were measured on lateral standing X-ray before and after stenting. The Wilcoxon signed rank test or the student's t-test were used for comparisons.

Results:

118 patients with painful vertebral compression fractures who underwent vertebral stenting procedures at 175 levels met inclusion

criteria. 76 patients had a metastatic disease, while had 42 osteoporotic fractures. There was no perioperative mortality and no significant complication. 83/118 patients (70.3%) were alive at the end of the study period, 20/118 (16.9%) have expired and 15/120 (9.7%) were lost to follow-up. Mean pre-operative VAS was 8.59, falling to 1.68 immediately post-op ($P<0.001$), reaching 0.58 at 3-months and 0.63 at 6-months, with no significant differences in VAS reduction between osteoporotic and metastatic patients.

Mean preoperative vertical height loss was 40.4% (range (-2.4) – 80.8%) versus a postoperative mean of 18.4% (range (-19.7) – 65.0%, $P<0.001$). Median pre- and post-

operative kyphotic angle improved from 13.6° (range 30.3°–0.5°) to 6.0° (range 0.1°–31.0°, $P<0.0001$). Osteoporotic patients tended to have a larger pre-operative kyphotic angle and larger pre-operative vertebral height loss, but the relative improvement both in kyphotic angle and in vertebral height augmentation was similar between the groups.

Conclusions: Vertebral augmentation using a novel vertebral stenting system provided immediate and enduring pain relief and improved vertebral height loss and kyphotic angle, with a lasting effect both in osteoporotic patients and metastatic cancer patients for a period of 6-months.

Cemented Versus Uncemented Posterior Fixation for Unstable Traumatic Spinal Fractures: A One Year Follow Up Study

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Background:

Traumatic unstable injuries at the thoracolumbar spine require surgical stabilization in order to stabilize the spine and restore sagittal alignment. These fixations are commonly based on posterior based implants holding in place a shattered anterior column of the spine. The use of anterior placed cement augmentation to spinal fixations has yet been studied.

Methods:

A retrospective analysis of surgically treated patients for unstable thoracolumbar injuries was performed in two level I trauma centers. Preoperative fracture pattern including AO classification and local cobb angles were assessed. Fixation methods

varied upon hospital and were divided into two groups: non-augmented pedicle fixation (NPI) and percutaneous augmented fixation (PAI). All surgical and post surgical complications within the first year were noted Restoration of sagittal balance, using the cobb angle, was assessed at a 12 month follow up.

Results:

A total of 50 patients with unstable thoracolumbar injuries underwent surgery. 24 underwent NPI fixation and 26 PAI. Average age was 34.2 year in the NPI and 38.6 in the PAI (P=NS), M:F ratio 0.9:1. Fracture patterns ranged from AO-A3 to C. PAI based fixations were shorter and spanned one level above and one below the fixation, while

18 of the NPI were longer and spanned over 4 levels. PAI was associated with shorter hospitalization days, operating time and blood loss (P<0.001) There was no significant difference in LKD in both groups in all time points. There were 23 cases of the cement leak in the PAI group (76%), which led to a cement lung emboli in three cases, In addition there was one case of CSF leakage in the PAI group. In the NPI group there were five cases of failed fixation (two cases of hardware failure and, three cases of adjacent local deformity), there was one case of infection and one case CSF pseudocyst.

Conclusions:

The use of cement spinal fixation allows shortening the length

of the spinal fixation and PAI and reduces one year hardware failure rate. However, the use of cement fixation did not affect the LKD at any time point. The high risk of cement leakage should be considered when using PAI.

Robotic Assisted Percutaneous Pedicle Screw Fixation for Thoracolumbar Spine Fractures

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Scientific Background:

Percutaneous fluoroscopy assisted pedicle screw fixation for thoracolumbar spine fractures is associated with preservation of posterior musculature, less blood loss, shorter operative time, lower infection risk, less postoperative pain, shorter rehabilitation time as well as shorter hospital stay when compared to open surgery, but with increased radiation exposure for the surgical team and patients. Robotic assisted spine surgery is an emerging field of surgery that has been shown to reduce radiation exposure with high level of safety. The purpose of this study is to evaluate the outcome of robotic assisted

percutaneous pedicle screw fixation with for thoracolumbar spine fractures.

Methods:

A ambispective review of all patients with thoracolumbar fractures who were managed with robotic assisted percutaneous transpedicular screw fixation (Renaissance, Mazor robotics, Israel) at our medical center between November 2009 and February 2016. Demographic data, accuracy rates, post operative alignment, radiation exposure were evaluated.

Results:

Nineteen patients (11 males and 8 females) underwent robotic assisted percutaneous transpedicular screw fixation between November 2009 and February 2016

for type A and B (AO) thoracolumbar fractures. The average age was 41.3 years (range 17-82). Ten cases were due to falls from height, 3 for MVA, 3 extension type injuries, and three from other mechanisms.

Two of the patients were poly trauma patients, four had rib fractures and three others had calcaneus fractures as well. 131 screws were placed in total. Levels operated ranged from 3-7 levels, with 5 to 13 screws were used per case. In three cases cemented fenestrated screws were used. Mean total case radiation time per screw was 4.4 seconds (ranged 1.8-6.2- including registration, screw and rod placement). Only one screw was removed and inserted again manually

(0.7%) because of malplacement. There were no treatment-related complications. There were no revision surgeries.

Discussion:

Robotic assisted percutaneous pedicle screw fixation for thoracolumbar spine fractures is a safe method for screw placement for thoracolumbar trauma cases. It allows restoration of the sagittal alignment with satisfactory clinical results even for geriatric patients and poly trauma patients with reduced radiation to the patient and surgeon when compared to free hand techniques. The non fusion screw fixation allows removal of the screws if needed after healing has set. A comparative study with other navigation techniques is needed.

Low Rates of Post-Operative Complications and in Patients Undergoing Percutaneous Stabilization for Thoraco-Lumbar Spinal Fractures in Ankylosing Spine Disease

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Background:

Ankylosing spondylitis (AS) and diffuse idiopathic skeletal hyperostosis (DISH) are spine disorders causing ossification of the spinal ligaments and loss of segmental motion. Both AS and DISH are associated with a significantly increased risk of spine fractures even from

relatively mild trauma due to the long lever arms caused by the ossified ligaments, in combination with reduced bone quality. Conservative and operative treatment of spine fractures in these disorders is associated with high rates of complications and neurological deficit; hence there remains some controversy about the optimal approach. Since 2007, we have been treating these fractures with percutaneous instrumentation combined with poly methyl methacrylate (PMMA) augmentation of the pedicle screws. The current study assesses the outcomes associated with this surgical technique.

Methods:

All imaging records for patients with who underwent surgery for spine fractures between 2007-

2015 at the Galilee Medical Center were reviewed, and cases with AS or DISH) were identified (n=26). For these cases, a retrospective imaging and chart review was carried out, assessing surgical parameters and outcomes.

Results:

Twenty-six (26) patients with AS or DISH underwent surgery at the Galilee Medical Center since 2007. Fourteen of the subjects had a diagnosis of AS (53.8%), and 12 had a diagnosis of DISH (46.2%). Subjects were predominantly (69.2%) male, with an average age at surgery of 74.2 years (range 41-88). Extent of vertebral involvement in ankylotic disease, as determined by review of the imaging averaged 14.8 vertebrae. Ankylosing disease was found in the thoracic vertebrae

alone (19.2%), in thoracic and lumbar vertebrae (76.9%), or in cervical thoracic, and lumbar vertebrae (3.8%).

Most (80.8%) of the patients underwent surgery within 7 days of admission, with 79.2% undergoing surgery within 48 hours. Percutaneous instrumentation spanned 2-6 levels. Surgical times ranged from 1-5 hours (average of 2:29 hours). Nine patients (34.6%) had no clinically significant changes in hemoglobin (Hg) levels; 15.4% had a loss of 0.5-0.9 g/dl, 23.1% of 1-1.9, 23.1% of 2-2.9, and 3.8% (1 patient) of >3. Five patients (19.2%) were admitted to ICU following surgery, for a duration of 1-7 days. Two patients had pneumonia and 7 had postoperative fever, typically for 1 day. There were

no re-fractures at the instrumentation sites but one patient required follow-up surgery for an additional fracture bellow the instrumentation and one patient for a misplaced screw. One patient had neurological deficits that were not improved following surgery, and one had neurological deterioration following surgery. Fifteen patients (57.7%) had no complications.

Conclusions:

This retrospective case-series of 26 consecutive patients demonstrates that percutaneous instrumentation allows rapid post-operative mobilization with few surgical and post-surgical complications. Comparison with other published retrospective reviews shows relatively favorable outcomes.

Clinical and Radiological Factors Affecting Progressive Collapse of Acute Osteoporotic Compression Spinal Fractures

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Study Design:

A retrospective cohort study.

Summary of Background Data:

Osteoporotic compression spine fractures have different clinical course and outcomes when compared to spinal fractures occurring in the younger population. Progressive collapse of the fractured vertebra with associated neurologic complications have been reported. Only few studies have investigated the risk factors for progressive osteoporotic compression spine fractures

Objective:

The purpose of this study was to investigate clinical and radiological factors related to progressive

collapse following acute osteoporotic compression spine fractures.

Methods:

We retrospectively identified all patients treated for thoracolumbar fractures in our institution between January 2008 and July 2013. Included cases were examined by plain radiographs and computed tomography. For each patient we classified the fracture according to the AOSpine Thoracolumbar Spine Injury Classification System. The difference between initial and final height loss and initial and final local kyphosis was documented as height loss difference and kyphotic angle difference. The existence of old fracture and intravertebral cleft were also

documented.

Results: The study included 153 patients, comprising 102 women and 51 men. The mean patients' age was 68.9 years. The mean length of follow up was 15 months. A statistically significant correlation was found between patients' age, final height loss, height loss difference and kyphotic angle difference. Height loss difference and kyphotic angle difference were significantly correlated to type of fracture according to the AO classification. The height loss difference was 18.1% in A1 type fractures, 27.1% in A2 type fractures, 24.2% in A3 type fractures and 25.7% in A4 type fractures

Conclusions:

During a minimum 3-month follow-

up of conservative treatment for acute osteoporotic vertebral compression fracture, age and the AOSpine Thoracolumbar Spine Injury Classification System were predictive factors for progressive collapse.

Key words:

Osteoporotic vertebral compression fracture, AOSpine Thoracolumbar Spine Injury Classification System.

Association between hyper flexibility and spinal deformities in a population of 1,217,724 adolescents

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Introduction:

The most common spinal deformities among adolescents are adolescent idiopathic scoliosis and Scheuermann's kyphosis. The association between hyper flexibility and its possible association to spinal deformities is unknown and a literature debatable issue.

Our purpose in this study was to examine the prevalence of hyper flexibility and its association to spinal deformities.

Design and Methods:

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 and hyper flexibility according to the Regulations of Medical Fitness Determination (RMFD) was retrieved.

Results:

We calculated the prevalence of hyper flexibility in 1,220,073 young adults and identified 1355 cases (0.0111%). Spinal deformities were identified in 128282 subjects. We had 96,950 subjects with mild spinal deformities, 29,539 subjects with Intermediate spinal deformities and 1793 subjects with severe spinal deformities. When examined the association between hyper flexibility and spinal deformities the Odds Ratios were 2.31 (P<0.001, 2.208 - 2.631) for all spinal deformities. Odds ratio calculated for

mild, Intermediate and severe spinal deformities were 1.226 (P=0.041, 1.012-1.485), 5.783 (P<0.001, 4.908-6.813) and 4.01 (P=0.002, 1.904-8.445) respectively. We found a strong association between hyper flexibility and spinal deformities, Intermediate and severe spinal deformities were associated more strongly compared to mild spinal deformities.

Conclusions:

Hyper flexibility is strongly associated to spinal deformities. Better understanding this association might in light our understanding of the development of spinal deformities. Further research in light of our findings is required.

Summary:

Our purpose in this

study was to examine the prevalence of hyper flexibility and its association to spinal deformities.

The study included 1,220,073 subjects; of whom 128,282 were diagnosed with spinal deformities. The prevalence of hyper flexibility was 1355 cases (0.0111%).

When examined the association between hyper flexibility and spinal deformities the Odds Ratios were 2.31 (P<0.001, 2.208 - 2.631) for all spinal deformities.

Hyper flexibility is strongly associated to spinal deformities.

Key words: spinal deformities, Hyper Flexibility, adolescents, scoliosis, Scheuermann's kyphosis.

The Efficacy of Neuromonitoring in Children Under the Age of 10

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Introduction:

In the morbidity and mortality SRS report of pediatric cases, the neurological complication rate was 10.9% in congenital cases and 17.9% in neuromuscular cases. Many of these cases are performed in children under the age of ten. Despite the extensive use of neuromonitoring in these cases, there is little evidence regarding their efficacy in preventing neurological disasters.

Material and methods:

A retrospective analysis of all deformity correction cases performed in children under the age of ten were collected. Age, sex, patient diagnosis, and surgery performed were collected. Neuromonitoring

data was gathered and analyzed for preoperative sensory and motor evoked potential data, intraoperative alarms (sensory and motor) and post-operative motor neurological status in these cases.

Results:

Twenty four surgeries of children under the age of ten were performed between the years 2008-2015. The average age was 8.1 (range 3-10). Indications for surgery were congenital deformities in 12 patients, four patients with thoracic insufficiency syndrome, two patients with occipito-cervical instability and six cases with various indications. Six osteotomies were performed and fixation ranged from four to 12 vertebrae. Preoperative SSEPs

were recorded in 15 patients, but MEPs were recorded in all 24 patients. SSEP alarms were recorded in one patient and MEPs were recorded in five patients, with resolution of the alarm in three patients by the end of the surgery. In one patient in which the MEPs disappeared it was at the closure of the skin, and was considered to be due to a change in the anasesthesia and in three cases a misplaced pedicle screw triggered the alarm in two removal of the screw improved the MEPS. In the third case the screw was removed and a wake up test was performed with full cord functionality. In the fifth MEP trigger, the MEPs were lost upon rod placement, with recovery

after reversing the deformity correction. All patients were neurologically intact after surgery.

Conclusions:

Despite the young age of the patients, with a developing neural system, the use of neuromonitoring has been shown to be efficacy as it detected neurological events in real time and prevented the development of long term neurological deficits.

Surgical Management of Moderate AIS with Fusionless Short Concave Fixation (ApiFix®) and Post-Operative Curve Reduction by Exercises: Report on 16 Operated Cases with 2 Years Follow Up

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5. Spine Unit Assaf Harofeh Hospital, Israel

Background:

The standard surgical care of adolescent idiopathic scoliosis (AIS) entails a long posterior instrumentation and fusion. Even patients with moderate AIS curves (40-60°) are subjected to an extensive surgical procedure. An intermediate step that will address moderate curves with a less extensive and fusionless surgery is lacking. The ApiFix® system is a novel less invasive short segment pedicle screw based spinal instrumentation. The system has a ratchet mechanism that enables intra-operative curve reduction and allows gradual postoperative curve correction by exercises. No fusion is performed.

Methods:

A multicenter clinical

trial with ApiFix® was realized in AIS patients with Lenke type 1 or 5 curves. The study was approved by the internal review boards. Sixteen females aged 11-17 years with curves between 40-53° (average 46°) and Risser sign of 1-4 underwent surgery with ApiFix® during a 2 year period. Two pedicle screws were inserted around the curve apex and a ratchet based device was attached with polyaxial connectors. No fusion was attempted. Operative time was around one hour. Two weeks after surgery the patients started Schroth like daily exercises. Patients were followed with Cobb angle and trunk shift measurements and SRS 22 questionnaires. All

16 patients have completed 2 years follow up.

Results:

Curves were reduced and maintained at 29° on average (20°-43°) of which 5° were gained after surgery with exercises. Patients were pain free. Trunk shift was corrected from 10.1 mm on average to 4.1mm. The average preoperative self image SRS 22 score was 3.1±0.5 (range 2.4-3.8) and improved to 3.7±0.4 (range 3.2-4.4) after surgery (p=0.0078). No screw loosening or rod breakage was observed. No adding on or curve progression was seen.

In the same time period 6 additional cases with curves exceeding 60 degrees and or with rigid curves underwent

surgery with ApiFix. Curve reduction was not maintained in those patients and 3/6 underwent conversion to long instrumentation and fusion.

Conclusions:

Surgery of moderate AIS deformities with fusionless concave instrumentation (ApiFix) proved as efficient in maintaining curve correction at 2 years follow up. The novel surgical procedure also enabled minimal intervention with minimal sacrifice of natural spinal motion.

Venture™ Anterior Cervical Plate System

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- Aquamantis® System

Magnetic Controlled Growing Rods for the Treatment of Growing Spine Deformities, Long Term Follow Up and Report of Complication Rate.

D.E. Lebel, A. Segal, D. Ovadia

Introduction:

Surgical treatment of growing spine deformities is challenging. The introduction of the magnetic controlled growing rods (MCGR) technology, reduce the need for repeated surgeries and supposedly lower the total number of un-planned surgeries. We describe our outcomes after minimum two years of follow up (average 33 months) and especially the complications with the MCGR.

Methods:

Retrospective analysis of consecutive group of patients with early onset scoliosis that were treated with magnetic growing rods. (MAGEC, Ellipse)

Results:

32 consecutive patients were operated. All patients underwent an insertion of dual rod system under general anesthesia followed by lengthening in our out patient clinic every 2 months starting two months after the index surgery. 20 patients were followed minimum 24 months (Average 33 months). Mean Age at surgery was 7.7 years (4-9.8 years). 11 were males and 9 females. Cobb angle was 64° (44-85) and reduced to 32° (16-52) following surgery. 6 patients (30%) were returned to the operating room for a total of 7 unplanned surgical procedures. One patient had rod breakage 40 months after the index surgery and

returned for rod exchange. Three of the patients had proximal anchorage failure. The rods were removed completely in three patients because of deep surgical site infection. One patient passed away from a pulmonary complication two years after insertion of the MCGR.

Conclusions:

Magnetic growing rods are safe procedure for the treatment of growing spine deformity. Overall, there is a significant reduction in the total number of surgeries; nevertheless, proximal anchorage failure remains a significant concern.

Significance:

Long term follow up and complications rate analysis of

a relatively new technology.

Robotic Assisted Scoliosis Surgery - the Learning Curve Phase

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Introduction:

Robot-guided scoliosis surgery is a novel technology; it offers increased precision of instrumentation placement and therefore increase the safety of the surgical procedure, and allows a mechanically optimal construct. Being an advanced and unfamiliar technology, concerns raises regarding the learning curve phase of the procedure. The aim of this study was to describe and assess the learning curve of robotic assisted scoliosis surgery.

Study Design:

Retrospective analysis of prospectively collected data.

Methods:

Between November 2014 and February 2016, twelve patients, 2 adults

and 10 adolescents, underwent robotic guided scoliosis correction. Data regarding the robotic procedure was collected prospectively. Data included: operation time. (min, mean + range), radiation time (sec, mean + range), number of vertebra fused (range) and number of screws used to for fixation (mean + range), guidance time (min, mean + range). For comparison, times were calculated per screw and analyzed and arranged chronologically. Trend calculations were performed for the previous data to assess the learning curve.

Results:

Mean robotic time was 121.4 minutes (58-175), mean radiation time was 35.7 seconds (13-

68) and mean operation time was 320.9 minutes (240-460). 223 out of 236 (94%) palnned screws were executed under robotic guidance, and in 13 screws (6%) robotic guidance could not be completed due to mechanical and technical difficulties. Mean radiation time per screw was 1.7 seconds (0.8-2.9), mean guidance time per screw was 6.5 minutes (5.2-7.5) and mean operation time per screw was 17.7 minutes (15-22.9). The learning phase curves showed less radiation time per screw and less total operating time per screw after gaining experience while advancing chronologically, and showed no significance change in the guidance time per screw.

Conclusion:

Robotic guidance in deformity surgery is challenging and requires acquisition of many new surgical steps and maneuvers from both the surgeon and the rest of the surgical team. We found that despite the demanding nature of the technique, even in the early learning curve phase robotic guidance could be completed in the vast majority of the screws. The learning curve trends shows a quick improvement in most parameters studied. Given the safety and mechanical advantages offered by accurate screws placed in robotic guided scoliosis surgery, our findings further support the utilization of the technique as an important surgical aid in spinal deformity surgery.

Muscle Mechanosensor Dysfunction Results in Adolescent Idiopathic Scoliosis in an Animal Model

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Summary:

The etiology of Adolescent Idiopathic Scoliosis (AIS) remains elusive. We propose to test our revolutionary hypothesis that AIS is a neurological disease. Based on convincing data, we suggest that AIS is caused by disruption in the function of muscle

mechanoreceptors. Our finding that Runx3^{-/-} mice, which lack TrkC-positive proprioceptive neurons, develop idiopathic scoliosis provides for the first time a mouse model with which to study scoliosis as well as a molecular entry point into the mechanism underlying this pathology.

Hypothesis:

AIS is a neurological disease, resulting from muscle mechanosensor dysfunction

Design:

Animal model study

Introduction:

In search for a causative anatomic element to AIS, numerous studies have cited different tissues as exhibiting abnormal features. However, because those studies were

mostly observational, disagreement exists as to whether these changes are causative or only secondary to AIS.

An important characteristic of the occurrence of AIS is the known contribution of genetic factors. As a result, a multitude of linkage analysis studies have been performed, identifying numerous loci as being possibly associated with AIS. Nevertheless, a common locus of interest replicated in a multitude of families is yet to be found. In addition, although many mutant animals are known to possess spine or tail deformities, no model that resembles the unique characteristics of AIS is yet available.

Muscle mechanosensors are specialized

organs embedded within either the muscle belly (muscle spindles) or at the muscle tendon junction (golgi tendon organs). Lately, a growing body of evidence has been accumulated on the molecular regulation of muscle spindle development, maturation and function. In the dorsal root ganglia, Runt-related transcription factor 3 (RUNX3), was found to act as a proprioceptive neuron-specific transcription factor. In its absence, proprioceptive neurons fail to survive, resulting in complete deficiency in skeletal muscle spindles.

Methods:

We examined mice lacking Runx3 (Runx3^{-/-}) using in-vivo micro-CT which served to

document spinal deformity, timing of its appearance and the exclusion of concurrent vertebral anomalies. Conditional knockout was used to assess the neural-specific role of Runx3 in Scoliosis appearance and progression.

Results:

Mice lacking Runx3 developed De-novo Scoliosis in the peri-pubertal period with most major curves being right thoracic. No osseous or intervertebral disc anomaly was noted prior to the deformity appearance.

Conclusion:

We show that impairment in the function of muscle mechanosensors in an animal model imitates the human condition known as Adolescent Scoliosis.

Can MRI Predict Flexibility in Scheuermann's Kyphosis Patients?

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Introduction:

Flexibility of thoracic curve in Scheuermann's Kyphosis (SK) is of primary importance for its pre-operative planning. Several methods have been described for SK curve flexibility measurement. The most commonly used one is lateral hyperextension radiography on hard bolster (HE). None of them used MRI for flexibility assessment. The aim of the present study was to evaluate the flexibility of SK using MRI images in compare to lateral x-rays using bolster and to assess whether MRI can be used to predict the post-operative thoracic deformity correction.

Patients and Methods:

Thirty SK patients

operated by 3 consultant firms in our university affiliated spine unit between 2012 to 2014; of which 18 met all inclusion criteria and were available for data collection. Pre and post-operative sagittal parameters radiographs of thoracic kyphosis (TK) and lumbar lordosis (LL) were collected and compared to pre-operative whole spine sagittal MRI.

Results:

We assessed 18 SK patients (14 males and 4 females) with mean age of 20.06 \pm 6.03 years. The standing TK and LL X-rays showed 83.8° \pm 6.1 and 66.7° \pm 10.4, respectively. On HE, TK curve reduced to 44.5° \pm 6.2; 39.3° (35.8-42.9, 95%CI) degrees less than the standing radiographs (p <0.001). Pre-

operative MRI images showed TK of 53.8° \pm 5.9 and LL of 54.1° \pm 9.4; 30° (26.6-33.4, 95%CI) and 12.6° (6.4-18.8, 95%CI) degrees less than the standing radiographs (p <0.001). Linear dependency between HE and MRI flexibility with a mean difference of 9.3° degrees was found ($R^2=0.61$, p <0.001). The post-operative radiography showed TK of 48.4° \pm 6.4 and LL of 50.9° \pm 11.3. Final TK was related neither to MRI ($R^2=0.03$, $p=0.49$) nor to HE flexibility ($R^2=0.035$, $p=0.46$).

Conclusion:

Our study shows that pre-operative MRI can be used for SK flexibility assessment with similar predictive value as routinely used bolster assisted hyperextension lateral radiograph. However, neither of these two

methods can reliably predict the degree of deformity correction achieved post-operatively. These can potentially reduce patients' exposure to pre-operative hyperextension ionizing radiation.

Can Spino-Pelvic Parameters Predict Hardware Failure in Surgical Correction of Scheuermann's Kyphosis?

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Introduction:

Proximal junction failure (e.g. screw pullout, rod breaking and junctional kyphosis) are of the most common complications following surgical correction of Scheuermann's Kyphosis (SK). This study investigates the relationship between patients' spino-pelvic characteristics and occurrence of proximal junctional complications.

Patients and Methods:

Spino-pelvic characteristics of 8 patients (age 20 ± 5 years, 7 males) who developed proximal-junction complications after surgical correction of SK were compared to those of 21 patients (age 21 ± 6 years, 18 males) who did not have complication

after similar operation. Measurement were performed on whole spine lateral unsupported standing radiographs preoperatively, at the first early postoperative follow-up (24 ± 15 days) and at the latest follow-up (32 ± 12 months).

Results:

The preoperative and postoperative magnitude of the thoracic-kyphosis and lumbar-lordosis were similar in the complication and non-complication groups ($p=ns$). However, the pelvic-incidence and the preoperative sacral-slope were significantly higher in the complications group (52 ± 11 vs. 42 ± 10 and 38 ± 9 vs. 27 ± 7 respectively; $p < 0.05$). Similarly, the preoperative sagittal-vertical-axis

was significantly more positive in patients who developed proximal-junction complications (24 ± 29 cm vs. -16 ± 29 cm; $p=0.002$).

Conclusion:

Patients who developed proximal-junction complications had higher pelvic-incidence, higher sacral-slope and more positive preoperative sagittal-vertical-axis. Patients with higher pelvic-incidence (and sacral-slope) should have higher expected lumbar-lordosis. When thoracic-kyphosis is corrected a compensatory decrease in lumbar-lordosis occurs. It is our opinion that as both groups had the same thoracic-kyphosis and lumbar-hyper-lordosis and underwent the

same magnitude of correction. The reduction in lumbar-lordosis beyond the expected values caused spino-pelvic mismatch and failure.

Spine Radiosurgery: Lessons Learned From the First 100 Sessions

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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 the efficacy of SRS is still to be determined.

Methods:

Patients suffering from spine tumors indicated for spine radiosurgery were treated by a single fraction of 16Gy or 18Gy 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:

117 lesions were treated in 100 sessions. 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 complications. Emphasis will on recurrence pattern will be noted

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.

Are They Too Old? Decompressive Surgery May Provide Long Duration of Ambulation and Survival in Elderly Patients with Metastatic Epidural Spinal Cord Compression – Experience with 40 Operated Patients

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Introduction:

The value of decompressive surgery in elderly patients with metastatic epidural spinal cord compression (MESCC) has been questioned. We evaluated duration of ambulation and survival in patients ≥ 65 who underwent surgery due to MESCC.

Methods:

Data for patients ≥ 65 years of age operated for MESCC from 2008–2015 was retrospectively reviewed. Pre/postoperative American Spinal Injury Association (ASIA) Impairment Scale (AIS), preoperative Spinal Instability Neoplastic Score (SINS), pre/postoperative Karnofsky Performance

Status (KPS), and preoperative Tokumashi score were assessed. The relationship between ambulation and survival (dependent variables) and scores was assessed (Kruskal-Wallis, Fisher exact, and log rank, regression, Kaplan Meier).

Results:

40 patients were included (mean age 74, range 65–87). Mean duration of ambulation was 474 days (range 0–1662, median 290); survival averaged 525 days (range 11–1662, median 393). 21/40 patients (53%) survived and 17/40 (43%) remained ambulatory for >1 year. Ambulation and survival appeared shorter with increasing age (Kaplan Meier) but differences were

not significant. AIS scores remained stable or improved in 40/40 patients ($p < 0.000$); KPS in 39/40 ($p = 0.041$). There was a significant association with duration of ambulation and pre- and postoperative AIS ($p = 0.0342$, $p = 0.0348$, respectively), and postoperative KPS ($p = 0.0221$). The relationship between preoperative AIS and postoperative KPS and survival reached borderline significance ($p = 0.0886$, $p = 0.0573$, respectively). There was no significant relationship between Tokumashi score or SINS and duration of ambulation or survival. The Tokumashi score greatly underestimated survival in the 37/40 patients with scores 0–11.

Conclusion:

Decompressive surgery for the management of MESCC led to marked improvement in neurological function and performance status for the great majority of patients. Over half of the study population survived for more than a year, some for ≥ 3 years. Preserving ambulation is critically dependent on early referral, a swift decision-making process from a well-integrated multidisciplinary team, and urgent surgical intervention.

Effective Cough for People with Cord Injury Using Sniff-Controlled FEES

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Introduction:

People with high thoracic or cervical spinal cord injury (SCI) frequently suffer from impaired coughing, which can cause severe respiratory disturbances. Individuals with SCI, who require assistance for coughing, depend on a caregiver applying intermittent manual pressure to the anterior abdominal wall. Coughing can also be assisted by functional electric stimulation (FES) applied to abdominal muscles, but this has not been found sufficiently effective, possibly because of lack of accurate synchronization in FES triggering. To enable people with upper thoracic and cervical SCL to achieve adequate, self-

initiated coughing, we developed a sniff-controlled loop that activates FES of abdominal muscles with sub-second precision, based on respiratory trace. In this study we identified the correct time-point for sniff-controlled FES activation and tested cough efficacy using the system developed for this purpose.

Methods:

First, we conducted an experiment with 16 non-paralyzed subjects to characterize the pattern of nasal respiration during the series of synchronized events that constitute cough. Next, we measured respiratory functions and evaluated the efficacy of different FES modes and of physiotherapist assistance in 14 subjects with upper-

thoracic or cervical SCL.

Results:

Analysis of the respiration pattern exposed the crucial time-point of the glottis closure, which was then used as an anchor for timing the FES triggering, and made it possible to cope with the inconsistency of the interval between events imposed by soft palate dynamics during cough.

All assistive methods showed improved cough efficacy of 25.5% compared with unassisted cough. Mean peak expiratory flow (PEF) of all assistive methods was 6.67 L/s, 76% of the mean expected values of PEF based on European Respiratory Society standards for non-paralyzed people.

Conclusions:

The assistive medical device based on sniff-controlled technology successfully activated abdominal FES and elicited automatic coughing, using a simple but highly accurate system. Our new approach enables "natural" effective cough for people with high thoracic or cervical SCL, and improves their health and quality of life.

Safety Assessment of a New Curved Powered Tissue Removal Device

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Incidental Dural Tears were used for the assessment of safety of a new curved powered tissue removal device in spinal surgery, comparing data collected in clinical cases to published literature regarding other tissue removal devices commonly used; overall ~11000 cases were reviewed, yielding a Dural Tears incidence of 1.6% for the new curved powered tissue removal device compared to an average incidence of 4.5% for other tools.

A watertight sac of tissue (dura mater) covers the spinal cord and the spinal nerves. A tear in this covering may occur during surgery. It is not uncommon to have a Dural tear during any type of spine surgery. If noticed during the surgery,

the tear is simply repaired and usually heals uneventfully. If not identified, the tear may not heal and may continue to leak spinal fluid (Cerebrospinal fluid, CSF), which may cause problems later. The leak reduces the pressure of CSF and may cause a spinal headache.

Due to their incidence and documentation, Dural Tears may be used as an indication for the surgical device safety.

The DReal™ (Carevature Medical Ltd. Rehovot, Israel) is a high-speed, drill-like bone cutter with a curved tip at its distal end; the 3mm-diameter tip is shielded on one side such that the rotating cutter can be directed towards the bony tissue to be removed while not being

exposed to the neural element.

Incidental Dural Tears are a common adverse effect of spine surgery and although usually well-treated and heals uneventfully, are well documented in the literature.

The average incidence of Dural Tears documented in ~11000 cases is 4.5% where the incidence of Dural Tears associated with the DReal™ device was found to be 1.6%.

Carbon Fiber Pedicle Screws: Evolution of Spinal Fusion Hardware for improved patients follow-up

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Background:

Spinal fusion using pedicle screws made out of stainless steel or titanium is a common practice in the past few decades. However, metal hardware interfere with current imaging modalities like CT & MRI, creating artifacts. This prohibits visualization of nerve & soft

tissue structures surrounding the pedicle screws. Clear visualization is especially important in spine tumors. These patients are treated with adjunctive radiation therapy. In case of metal hardware, radiation distribution is effected due to backscatters. Recently, a pedicle screw system made out of CFR-PEEK has been introduced (CarboFix Orthopedics Ltd.).

The system includes poly-axial carbon fiber pedicle screws, in which the screw threads are coated with an ultrathin titanium shell, to enable X-ray visualization and to improve bone integration. The screw tulip, locking element and rods are made out of carbon fibers as well, and

marked with a minute tantalum radiopaque thread. Surgical technique is similar to that of other metal systems.

In our study, performed at the Herzeliya MC & Hillel-Yaffee MC, we have evaluated the safety and efficacy of the system (CarboClear Pedicle Screw System) for thoracolumbar and sacral spine fusion.

Methods: 30 patients (15 F & 15 M) suffering from one or more of the following: Spondylolisthesis, Spinal Stenosis and Disc Herniation were enrolled. Fusion was evaluated by standard radiograms with or without MRI/CT scans. Quality of life assessed by dedicated questionnaires. These were performed at 1, 3, 6 and 12 months post-op.

Results:

First cases were performed back in 2013. All operations were completed successfully, with no device failure along the follow-up period. Blood loss, operation time, and fluoroscopy time was similar or lower to that reported in the literature for this type of surgeries. Successful fusion was defined as radiographic evidence of bridging trabecular bone between the involved motion segments, as well as translational motion <3mm; and angular motion <5°. Two patients were lost to follow-up. Of the 28 patients, 27 (96.4%) presented with fusion at 12 months. VAS for back pain, leg pain, as well as Oswestry scores and SF-12 were reduced compared to the base line. These

values compares favorably to data provided in the literature. In all cases that underwent post-operative CT/MRI, unobstructed imaging clearly demonstrated the patient anatomic structures and/or underlying pathology, with almost no artifacts.

Conclusion:

This Carbon Fibers Pedicle Screw System compare favorably to the literature, showing high fusion rates, quality of life improvement and safety. As in addition, it allows excellent MRI/CT visibility of the implanted area, with no artifacts. In case of spinal tumor patients, the system enables excellent, interference free imaging, as well as effective radiation therapy with no backscatters.

Technical Report:

Pedicle Screw Distraction for MIS TLIF

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Background:

Minimally Invasive Transforaminal Lumbar Interbody Fusion (MIS TLIF) is an effective treatment for stenosis, instability, spondylolisthesis, and foraminal stenosis. The minimally invasive surgery or less invasive (MIS/LI) approach helps decrease hospital stay and post operative pain. However, there is a learning curve associated with the technique. It is also argued that less arthrodesis surface is available with a less invasive approach. Simplifying the approach and taking steps to facilitate the decompression and interbody graft placement may avail the technique to more patients.

Technique and Illustrative Case:

With the patient positioned prone, pedicle screws are placed percutaneously. A low profile tower and driver/locking set up are used to lock the screws along the aspect of their respective rostral disc spaces, essentially converting polyaxial screws to monoaxial screws.

A bilateral low profile (to enable work through a less invasive modified Wiltzie approach) offset distractor is applied to gently open the segment. Medial lateral blade retractors (70-100 mm in length) complete the exposure of the facet and lateral lamina. This facilitates the medial facetectomy by defining the

arthritic joint via distraction. Similar to a laminar spreader in an open surgery, the distraction also facilitates the neural element decompression. Bilateral distraction opens the disc space in the superior-inferior plane, potentiating arthrodesis via placement of a larger lordotic interbody graft. A larger interbody graft aids in indirect decompression, enhanced reduction, and restoration of segmental lordosis. After the TLIF is complete, the distraction is dialed down, the locking mechanism is released to return the screws to polyaxial mode, compression is applied to optimize lordosis and the rods is secured.

This technique allows for distraction during

the decompression with all screws in place and without having to placed temporary rods or work around bulky distraction apparatus. However, careful judgement must be used while applying the distraction to avoid failure of the pedicle screws or damage.

Conclusion:

Bilateral pedicle screw distraction for MIS TLIF should be considered as an option in MIS/LI lumbar spine surgery.

Lower Extremity Motor Function 1-year Following Surgical Management of Lumbar Disc Herniation

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Background:

Previous literature suggests approximately 25% of patients undergoing surgical management of lumbar disc herniation (LDH) still experience lower extremity weakness 1 year after surgery. However, assessment of strength has been primarily limited to the various myotomes of the lower extremity, which typically does not involve more proximal muscles such as the hip extensors and abductors. Another limitation of previous studies is the use of qualitative, rather than quantitative muscle testing methods, which may lack adequate reliability and sensitivity to change. Therefore, the purpose of this study was to quantitatively assess the strength of

the hip extensors, hip abductors and knee extensors on the involved, compared with the uninvolved side, 1 year after surgical management of LDH.

Methods:

Preliminary data on the first 15 patients will be presented (total sample of 40 patients is planned). Patients underwent a series of self-reported pain and disability measures followed by a physical examination that included bilateral hip extensors, hip abductors and knee extensors muscle strength testing. All strength tests were performed by a physical therapist with the use of a hand-held dynamometer. Separate paired T-tests were used to compare the strength of each muscle between

the involved and uninvolved side. The association between the different strength measurements and self-reported pain and disability was assessed using Spearman Rho correlation coefficient.

Is Scheuermann's Kyphosis Associated with Weakness of Lumbar Paraspinal

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Introduction:

Scheuermann's kyphosis (SK) is the most common cause of structural thoracic hyper-kyphosis in adolescents. Its exact pathophysiology still remains largely unknown. Several studies showed reduction of cross-sectional area (CSA) of some or all paraspinal muscles in neuromuscular diseases as well as in degenerative spinal conditions. To the best of our knowledge no previous study investigated lumbar CSA of SK patients in compare to normal population.

Patients and Methods:

We analyzed the preoperative whole spine MRI images of 16 SK patients in compare to a group of 16 patients without

back pain or chronic spine conditions and with reported normal whole spine MRI. Both groups showed similar demographic and patients' characteristics. We measured the psoas, multifidus and extensor spinae muscle groups at the levels of L3-4 and L4-5 bilaterally.

Results:

Both SK group (SKG) and control group (CG) showed similar demographics and patient characteristics. When comparing sagittal parameters significant differences were found between the SKG and CG, [thoracic kyphosis (TK) $83.6 \pm 6.1^\circ$ and $TK=34.6 \pm 5.4^\circ$, $p<0.001$; lumbar lordosis (LL) $66.7 \pm 10.4^\circ$ and $32.5 \pm 8.4^\circ$, $p<0.001$ respectively]. The mean CSAs of psoas

muscles were not significantly different ($p>0.05$). However, multifidus muscles CSA were found to be significantly smaller in L3/4 level in SKG ($p=0.022$ on the left and $p=0.016$ on the right side in compare to CG) but no significant change in multifidus CSA found at L4-5 level. The mean CSA of the extensor spinae muscles group were significantly smaller at all levels in the SKG: $p=0.001$ bilaterally in L3/4 level and $p=0.015$ right side and $p=0.009$ left side in the L4/5 level.

Conclusion:

This study shows that in patients with SK deformity there is significant weakness of lumbar multifidus and extensor spinae muscles.

A New High Speed Shielded Curved Device Facilitating Posterior Thoracic Discectomy Through a Hemilaminectomy Hemipedicectomy and Unilateral Facetectomy Approach

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Purpose:

To present a novel curved shielded device facilitating limited posterior unilateral thoracic discectomy through a novel approach.

Study design:

Case reports and presentation of a surgical technique and a novel surgical device

Background data and summary:

The appropriate approach for surgical removal of thoracic disc herniations (TDH) is controversial. The posterior approach historically acquired a bad reputation due to high rates of neurological deterioration subsequent to spinal cord manipulation. The open and thoracoscopically assisted anterior approach has consequently gained popularity but entails

a larger magnitude of surgery if open and is technically demanding if approached thoracoscopically. Approaching the thoracic disc posteriorly following unilateral facetectomy and pediculectomy was first described in 1995 but has failed to gain popularity due to unpredictable outcomes and complications. We present a new high speed dorsally shielded curved device to facilitate posterior thoracic discectomy following a hemilaminectomy, unilateral facetectomy and hemipedicectomy. Introducing the device ventral to the dural sac allows removal of calcified and soft disc fragments without relying on forceful manual maneuvers and avoiding manipulation of the

spinal cord.

Methods:

The side of maximal disc protrusion is approached through a hemilaminectomy, unilateral facetectomy and hemipediculectomy removing the superior half of the pedicle and exposing the disc transforaminally. Disc excision is facilitated using the novel curved dorsally shielded high speed device.

Between June 2014 and August 2015 6 patients (3 males and 3 females) ages 23-62 underwent posterior thoracic discectomy applying the above approach. The affected levels were D3-4 (1), D5-6 (1), D11-12 (3) and D12-L1 (1).

Results:

All patients presented with neurological deterioration and pyramidal signs

(T12-L1?). All procedures were uneventful. No dural tears were observed. None of the patients deteriorated neurologically. Pedicle fixation and fusion concluded all procedures.

Conclusion:

We believe that this tool and approach allows for a smaller, shorter and neurologically safer procedure for thoracic disc herniation removal.

Key words:

Thoracic discectomy, DReal™, posterior approach, high speed drill

Hybrid Spinal Cord & Peripheral Field Stimulation for the Treatment of Failed Back Syndrome: The Sheba Medical Center Experience

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Failed back syndrome is a post-laminectomy/fusion syndrome characterized by persistent pain' also called "failed back surgery syndrome" (FBSS). Contributing factors include residual or recurrent spinal disc herniation, persistent post-operative pressure on a spinal nerve, altered joint mobility, joint hypermobility with instability, scar tissue (fibrosis), depression, anxiety, sleeplessness and spinal muscular deconditioning. Common symptoms associated with FBS include diffuse, dull and aching pain involving the back and/or legs. Abnormal sensibility may include sharp, pricking, and stabbing pain in the extremities. These symptoms severely impede with pt' quality of life.

Usually pt' are treated with intensive pain rehabilitation program for a few months. Unfortunately, half of these pt' develop resistant pain that does not respond adequately. A combination of a hybrid stimulation system that includes both spinal cord (SCS) and peripheral field stimulation (PFS) is the treatment of choice in these cases.

This hybrid system work in a bimanual fashion: inhibition of the spino- thalamic tract via blockage of the posterior spinal tracts, and blocking of the fascio-cutaneu- musculo pain pathway through the peripheral field stimulation. The surgery is done in a dual stage procedure: a trial period lasting 7- 10 days followed by a permanent implant (for the group

of pt' which showed good response).

We describe our experience with the use of the hybrid SCS PFS system for the treatment of FBSS. During the last 24 months, our multi-disciplinary team (Neurosurgerons & Pain) operated 37 pt with FBSS. All the pt went through the accepted medical treatment prior to surgery. 28 pt reported relief of pain (more than 50% decrease in pain severity and area of pain) during the trial period and were later transplanted with the permanent stimulation system. In this paper we describe the pt' selection criteria, the surgical technique and outcome.

Is Hydronephrosis a Complication After Anterior Lumbar Interbody Fusion?

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Introduction:

Anterior Lumbar Interbody Fusion (ALIF) is used to treat structural instability in symptomatic disc degeneration (SDD). Stand-alone ALIF offers advantages over posterior approaches to the spine, however, increased risks include damage to the great vessels and visceral organs, which are mobilised to gain access to the spine. The ureter is one such organ, however, there is no literature identifying whether this has any clinical effect. Hydronephrosis is dilation of the kidney which if untreated, may result in renal failure. This is the first study aimed to investigate whether hydronephrosis is a consequence of ALIF.

Methods:

An ultrasound evaluation of stand-alone ALIF procedures performed at our Spinal Unit, at the Queen's Medical Centre, Nottingham was conducted. Patients who had an ALIF for SDD, via anterior retroperitoneal approach, conducted by a single team, between January 2008 and March 2012, were invited to participate in the study. No other abdominal operation had been performed and all patients had normal kidney function with no evidence of renal disease prior to ALIF. Participants underwent renal doppler ultrasound scan with the aim to detect hydronephrosis.

Results:

A total of 37 participants were recruited, 24 males and 15 females with an average age of 51.8 years (range 33.2-70.8 years). Average time from surgery to follow-up ultrasound exam was 31 months (range 11 to 62 months). All participants were successfully scanned. Hydronephrosis was not detected in any of the participants.

Conclusions:

Hydronephrosis after ALIF by anterior retroperitoneal approach is not a complication found in this cohort.

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ד"ר	כספי ישראל	050-5455774	תל השומר
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