

THE 18TH ANNUAL MEETING OF THE ISRAEL SPINE SOCIETY

26-29 April 2017

Wednesday-Saturday
The Royal Beach Hotel
Eilat - Israel.



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Eur. Spine Journal, 2013, Schils et al.

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General Information

The 18th annual meeting of the Israel Spine Society will be held on Wednesday-Saturday, 26th - 29th April, 2017 "Royal Beach" Hotel in Eilat.

■ Acting Committee

Nachshon Knoller M.D.
Chairman

Yoram Anekshstein M.D.
Secretary

Eyal Itshayek M.D.
Treasurer

Israel Caspi M.D.
Educational Committee

Gad J. Velan M.D.
Committee Member

■ International Keynote Speakers

Christian Mazel Prof.
France

Claudio Lamartina M.D.
Italy

Jean-Denis Laredo M.D.
France

Vincent Arlet M.D.
USA

Richard D Guyer M.D.
USA

Max Ebi M.D.
Switzerland

■ Honored Guest Lecturer

Yaacove Amidror
Israel

Yair Tauman
Israel

■ 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,

Spring is arriving and we meet again in our yearly meeting, scientific and social event that integrate professional excellence in friendly atmosphere.

The main scope of the meeting is Scoliosis and long fusions but it includes all aspects of our profession- tumors, innovations, pain, education and much more.

I would like to welcome our keynote speakers – Max Aebi from Switzerland, Christian Mazel and Denis Laredo from France, Vincent Arlet and Rick Gayer from the USA and Claudio Lamartina from Italy. All of them are distinguished opinion leaders in the world of spine surgery that are coming to enrich us with their experience and knowledge.

I am happy to host again our friend from Poland - L.F Ciupik, a fundamental partner in our relations with the Polish Spine Society.

It is an honor for me to host Prof. Y. Amidror – the chairman of the National Security Committee and Prof. Y. Tauman- Director of the Zell entrepreneurship program in the Interdisciplinary Center in Hertzelia and Director of the Stony Brook Center for Game Theory, as our yearly Honored Guest Lecturer.

We discussed for few years the need for recognition of Spine Surgery as a new subspecialty. A window of opportunity was opened in the last few months and we negotiating the subject with the scientific committee of the Israel Medical Association. It will challenge us from the academic as well as the logistic aspects.

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,

אביב הגיע ושוב אנחנו נפגשים באילת בכנס השנתי שלנו, מפגש מדעי וחברתי המחבר מצוינות מקצועית עם אוירה חברית.

השנה הכנס יהיה בדגש על סקוליוזיס וקיבועים ארוכים, אך יעסוק גם באספקטים אחרים של מקצוענו- גידולים, חידושים טכנולוגים, כאב, חינוך ועוד.

ברצוני לברך את המרצים האורחים - ד"ר **מקס אבי** מברן בשוויץ, **פרופ' קריסטיאן מאזל** וד"ר **דניס לרדו** מפריז בצרפת, **פרופ' קלאודיו למרטינה** ממילנו באיטליה, **פרופ' ארלט** מפילדלפיה וד"ר **ריק גאיר** מדאלאס טקסס מארצות הברית. כולם מומחים בולטים בתחומם בעולם, שיגיעו להעשיר אותנו בניסיונם ובידע הקליני שלהם.

גם השנה, אני שמח לארח את **פרופ' ולדיסלב צ'ופיק** מפולין, המשך להעמקת הקשר עם חברינו למקצוע מפולין.

כבוד הוא לי לארח את **פרופ' יעקב עמידרור** - ראש המועצה לביטחון לאומי, **פרופ' יאיר טאומן** מהמובילים בארץ ב"תורת המשחקים" שיחשפו טכח מעולמות שונים לחלוטין מעולמנו ובכל זאת כה קרובים אלינו.

השנה החולפת התאפיינה בשינויים פרסונלים - מינויים ותנודות גאוגרפיות. בהצלחה לעמיתנו מנהלי המחלקות החדשים, לעמיתנו ששינו מקום עבודתם וכמובן לפורשים לגמלאות שלא ממש פורשים וממשיכים ללמד ולסייע.

בשנה החולפת נפתח פתח אמיתי לשינוי והפיכת נושא ניתוחי עמוד שדרה לתת התמחות מוכרת במועצה המדעית. הדבר מציב בפנינו אתגרים חינוכיים ולוגיסטיים רציניים, במיוחד לאור הקשיים בהשתלמויות טובות בחו"ל, היכולת להשתלמות בארץ והצרכים היומיומיים.

בעמל רב זכינו, כפרטים וכאיגוד, בהכרה ביכולות המקצועיות שלנו. אל לנו להתפשר על הרמה המקצועית משיקולי כח אדם ועבודת היום יום. בשל חשיבות הנושא נעמיק בו בכנס.

אני מאחל לכולנו כנס פורה, ושהיה מהנה באילת

דר. נחשון קנולר
נשיא האיגוד הישראלי לעמוד השידרה

חברים ועמיתים

ברוך בואכם לכנס השנתי והבין לאומי של האיגוד הישראלי לעמוד השידרה. גם השנה נערך הכנס בעיר אילת המקסימה. השנה בולטת השתתפותם של אורחים רבים ומכובדים מעבר לימים ולאוקיינוסים. מתוך אוסף רב של אבסטרקטים נבחרו כשלושים עבודות אשר תוצגנה בפני המשתתפים. זו גם השנה האחרונה של הוועד הנוכחי והזדמנות טובה להודות לכל חברי האיגוד על תרומתם להצלחתו. עוד רבה העבודה העומדת בפנינו לבניית איגוד מקצועי עצמאי ואיכותי. תודה לכולם,

דר. ישראל כספי
הוועדה המדעית

SCIENTIFIC PROGRAM

Wednesday, April 26, 2017

14.00 - 14.55

REGISTRATION

14.55 - 15.00

Opening Remarks

N. Knoller, ISS Chairman

Session 1: CERVICAL SPINE

Chairmen: E. ASHKENAZI , A.AMITAI

15.00 - 15.20

Keynote Lecture: Spondylosis: "US update of Cervical Arthroplasty 2017"

R. D. Guyer

15.20 - 15.23

Discussion

15.23 - 15.31

Anterior cervical discectomy and fusion with stand alone cage as a surgical treatment for cervical myelopathy

D. Felzensztein, S. Harnof, D. Pushkov, S. Jackson

15.32 - 15.40

Safety assessment of a new curved powered tissue removal device

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

15.41 - 15.49

O-arm and Navigation Guided Cervical Spine Surgery for Axial Fusion

M. Nulman, N. Knoller, R. Harel

15.50 - 15.58

Safe and Efficient Technique for Osteophyte Removal during ACDF and ACCF Procedures using a New Device

M. Millgram, N. Rand, M. Tepper, E. Ashkenazi

15.59 - 16.14

Cervical Myelopathy - Should fusion be part of the surgery?

N. Knoller, R.Harel

16.14 - 16.19

Discussion

16.20 - 16.50

COFFEE BREAK AND EXHIBITION VISIT

Session 2: OUTCOME AND KYPHOPLASTY

Chairmen: E. ITSHAYEK, R. DJABBAROV

16.50 - 16.58

Anxiety is associated with poorer outcome of spinal surgery

Y. Leitner, L. Shushan-Amir, Y. Sela

16.59 - 17.07

The prevalence of risk factors for coronary artery disease may be lower after spinal cord injury

E. Aidinoff, V. Bluvshstein, U. Bierman, I. Gelernter, L. Front, A. Catz

17.08 - 17.16

Bacterial drain colonization and wound infection rates in volume-limited drain removal after open spine surgery

H. Mulla, A. Shani, N. Rahamimov

17.17 - 17.25

The Spine Database: A three years follow-up

L. Mangel, G. Regev, K. Salame, R. Lador, S. Sidis, Z. Lidar

17.26 - 17.41

The art of controlling neuropathic radicular pain- Guidelines and Tips

R. Gur

17.41 - 17.49

Discussion

17.49 - 18.04**Keynote Lecture:** Medical Publishing – Where are we going?

M. Aebi

18.04 - 18.06**Discussion****18.06 - 18.14****Versatility of Percutaneous Vertebroplasty procedures – Expansion of Indications**

A. Sliman, A. Bruskin, A. Puhov, V. Alexandrovsky, B. Zilberstein, B. Bernfeld

18.15 - 18.35**Keynote Lecture:** Vertebroplasty and balloon kyphoplasty in osteoporotic vertebral fractures

J. D. LAREDO

18.35 - 18.40**Discussion****19.45 - 22.00****OPENING RECEPTION**

Thursday, April 27, 2016

07.00 - 08.00**REGISTRATION****Session 3: DEFORMITY I****Chairmen: M. MILLGRAM, M. RAICHEL****08.00 - 08.20****Keynote Lecture:** Classification of adult deformity

C. Lamartina

08.21 - 08.41**Keynote Lecture:** Treatment of Sagittal Imbalance with Anterior Surgery

V. Arlet

08.42 - 09.02**Keynote Lecture:** Lumbar osteotomies in sagittal imbalance

C. Mazel

09.02 - 09.10**Discussion****Session 4: IMAGING****Chairmen: Y. BARZILAY, R. HAREL****09.10 - 09.18****Diagnostic benefits of brachial plexus high-resolution MR Neurography**

N. Berkovitz, I. Reznick, Y. Smorgick, S. Tal

09.19 - 09.27**Advanced imaging of the axial skeleton in spondyloarthritis**

I. Eshed

09.28 - 09.36**Detection of brain abnormalities by in vivo MRI may serve as a prognostic test for acquired scoliosis in proprioception-deficient animal model of AIS**

I. E. Biton, E. Assaraf, Y. Smorgick, Y. Anekstein, E. Zelzer, R. Blecher

09.37 - 09.52**Keynote Lecture:** Imaging of Vertebral

SAPHO syndrome

J. D. LAREDO

09.52 - 10.00**Discussion****10.00 - 10.30****COFFEE BREAK AND EXHIBITION VISIT****Session 5: TUMORS I****Chairmen: Y. LEITNER, A.HASHRONI****10.30 - 10.50****Keynote Lecture:** Cervicothoracic tumor's treatment

C. Mazel

10.51 - 10.59**Denosumab Treatment for inoperable Giant-Cell Tumor (GCT) and Aneurysmal Bone Cyst (ABC) of the Spine**

D. A. Schleifer, Y. Leitner

11.00 - 11.20**Keynote Lecture:** Posterior mediastinum tumor treatment

C. Mazel

11.21 - 11.26**Discussion****Session 6: EDUCATION****Chairmen: N. KNOLLER, Y.MIROVSKY****11.27 - 11.47****Keynote Lecture:** The Web-based Postgraduate Education Program for Spine Surgeons

M. Aebi

11.48 - 12.08**SYMPOSIUM – Fellowship Availability**

USA – Guyer, Arlet

FRANCE – Laredo, Mazel

EUROPE/AO – Lamartina, Aebi

12.08 - 12.18**Discussion****12.18 - 12:38****SPONSORED LECTURE:**

Building bone in spine patient

M. Zloczower, Eli Lilly

12:38 - 12:40**Discussion****12:40 - 13.40****LUNCH BREAK AND EXHIBITION VISIT****Session 7: DEGENERATIVE SPINE I****Chairmen: G. J. VELAN, A. SHPIGELMAN****13.40 - 14.00****Keynote Lecture:** From isthmus lysis to High grade spondylolisthesis

C. Mazel

14.00 - 14.02**Discussion****14.02 - 14.10****Percutaneous pedicle screw fixation- personal experience**

A. Geftler

14.11 - 14.19**Minimally Invasive Spine surgery: The learning curve of a Single surgeon**

G. Kimchi, A. Orlev, I. Ophir, N. Knoller, R. Harel

14.20 - 14.28**Minimally invasive spinal decompression surgery in diabetic patients: Perioperative risks, complications and clinical outcomes compared with non-diabetic patients' cohort**

G. Regev, A. Cohen, R. Lador, K. Salame, L. Mangel, S. Sidis, Z. Lidar

14.29 - 14.37**Inter laminar and selective nerve root blocks in cervical and lumbar spine – Review of recent Protocols**

R. Gur

14.37 - 14.41**Discussion****14.41 - 14.56****Keynote Lecture:** Update on Lumbar Total Disc Replacement

R. D. Guyer

14.56 - 15.00**Discussion****15.00 - 15.20****DEBATE: “Does size matter”?****Yes: “Big Surgery” - Long fusion and correction of Sagittal Balance**

E. Behrbalk

NO: Localized decompression and fusion
I. Engel**15.20 - 15.25****Discussion****Session 8: TUMORS II****Chairmen: I. ENGEL, Z. LIDAR****15.25 - 15.45****Keynote Lecture:** Treatment of spinal metastasis

C. Mazel

15.46 - 16.06**Keynote Lecture:** Vertebroplasty and stentoplasty in malignant vertebral lesions

J. D. LAREDO

16.07 - 16.15**3D printed custom made titanium cage for replacement of L5 vertebrae following complete resection of GCT**

R. Lador, G. Regev, K. Salame, L. Mangel, S. Sidis, Z. Lidar

16.16 - 16.24**Spine Radiosurgery and Local control rate of Vertebral Metastasis**

R. Harel, L. Zach

16.24 - 16.30**Discussion****16.30 - 17.00****COFFEE BREAK AND EXHIBITION VISIT****17.00 - 17.20****Keynote Lecture:** The power of modern medical registries , demonstrated on the the example of the “Spine Tango”

M. Aebi

17.20 - 18.20**GUEST LECTURE:** “Israel in crazy world and chaotic Middle East”Y. Amidror, M.G. Ret
Head of the Israeli N.S.C.
Between 2011-2013**GOOD EVENING.**

Friday, April 28, 2017

Session 9: DEGENERATIVE SPINE II

Chairmen: E. OFIRAM, G. SVIRI**08.00 - 08.15****Keynote Lecture:** Severe spondylolisthesis: when reduction is necessary? does L4 have to be included in the fusion?

C. Lamartina

08.16 - 08.31**Keynote Lecture:** Can we stop this nightmare Proximal Junctional Kyphosis

V. Arlet

08.31 - 08.35**Discussion**

Session 10: TECHNOLOGY AND TECHNIQUES

Chairmen: R. LOTAN, N. RAZ**08.35 - 08.50****Use of a Novel Spinal Decompression Device and Its Adoption in the US**

R. D. Guyer

08.51 - 09.16**Guest Lecture:** “PEEK or Ti-Truss LIF stabilization? Migration. Fusion. Subsidence”

L. F. Ciupik, M. K. Eichler, B. Hoelper, J. Cecek

09.16 - 09.20**Discussion****09.20 - 09.28****Carbon Fiber Reinforced PEEK Pedicle Screw System. Technical Features and Clinical Trial**E. Behrbalk , U. Ofir , O.Rabau,
R. Gepstein, I. Engel , Y. Folman**09.29 - 09.37****New Technologies in Spinal Surgery – Financial Costs vs. Clinical Outcomes**A. Sliman, A. Bruskin, A. Puhov,
V. Alexandrovsky, B. Zilberstein, B. Bernfeld**09.38-09.58****DEBATE: Navigation in Spine Surgery****Pro:** Standard of care - Y. Anekstein**Con:** Nice to have - N. Ohana**09.58 - 10.03****Discussion**

Session 11: DEFORMITY II

Chairmen: N. RAHAMIMOV, I. CASPI**10.03 - 10.18****Keynote Lecture:** Adult degenerative scoliosis: osteotomies vs anterior reconstruction

C. Lamartina

10.19-10.34**Keynote Lecture:** Sacropelvic fixation for spinal deformities

V. Arlet

10.34-10.38**Discussion****10.38-10.46****Shilla Growth Guidance system for the treatment of Early Onset Scoliosis: first cases in Israel**

Y. Anekstein

10.47-10.55**Does sagittal Spinopelvic Configuration influence Progressive Collapse of Acute Osteoporotic Compression Spinal Fractures? - A retrospective Radiological Analysis**Y. Smorgick, A. Geftler, S. Goldstein,
Y. Mirovsky, R. Blecher, Y. Anekstein**10.56-11.04****Are there any clinical and radiological differences between females and males adolescent idiopathic scoliosis surgical candidates?**Y. Smorgick, M. Nassar, Y. Mirovsky,
R. Blecher, Y. Anekstein**11.05-11.25****Keynote Lecture:** The last 25 years spinal deformity surgery - what I have learned in V. Arlet**11.25-11.30****Discussion****11.30-12.00****COFFEE BREAK AND EXHIBITION VISIT****12.00 - 13.00****GUEST LECTURE:** Game theory and its applications

Y. Tauman

13.00-14.00**PROFESSIONAL MEETING - Election**

ENJOYABLE WEEKEND AND SEE U ALL NEXT YEAR.

Spondylosis: “US update of Cervical Arthroplasty 2017”

R. D. Guyer

Texas Back Institute
Plano, Texas

Introduction:

Cervical total disc replacement (TDR) was first used in the United States in 2002 as part of an FDA-regulated trial. Since then, multiple trials have been completed and others are ongoing. Several of these studies have 5-year or longer follow-up data available. Anterior cervical fusion (ACF) has long been a widely accepted treatment for symptoms arising from cervical discs. However, intuitively stabilizing the neck

and sacrificing motion was not desirable. ACF also had potential problems of pseudoarthrosis and accelerated adjacent segment degeneration.

Clinical Studies:

To date, 8 FDA-regulated trials have been completed (Bryan, Prestige, Prestige-LP, ProDisc-C, Mobi-C (1 and 2 level), Secure-C, PCM, and Kineflex-C). Two additional trials are currently ongoing (M6, and Simplify). The FDA-regulated

trial for the Prestige LP compared prospectively collected data for this disc to ACF control data for its predecessor.¹ One 2-level FDA trial has been completed (Mobi-C). From these randomized trials, much high quality data has been generated for analysis. From all of the studies published, all having 2 to 5 year follow-up, TDR has been found to be non-inferior or superior to ACF for single-level cervical disc disease.²⁻⁸ To date, only the Mobi-C

has been evaluated for 2-level procedures, and it was found to be non-inferior/superior to ACF.⁹ More 2-level cervical TDR studies are being initiated.

Range of motion:

One of the basic objectives of TDR is to maintain motion of the operated segment. In 7 trials with 2-5 year follow-up, 5 had a mean range-of-motion that was greater than the pre-operative mean value,^{3-6,10} one was within .5o of pre-op motion⁸ and one was less.⁷

Adjacent segment degeneration (ASD):

It is known that fusion of a segment changes the disc pressure and mechanics of the adjacent levels.¹¹ A potential benefit of TDR is to reduce these biomechanical changes and possibly reduce the incidence of ASD. Several cervical TDR studies have found that while ASD is observed with TDR, the occurrence

is lower than following fusion.^{4,6}

Heterotopic ossification:

One potential problem with TDR that does not arise with ACF is heterotopic ossification (HO). One study with 5 year follow-up found the rate of HO severe enough to limit motion was 8.5%.⁴ While not desirable, the impact of HO on clinical outcomes is not well-established.

Re-operation:

In data collected at Texas Back Institute from multiple FDA trials, the re-operation rate was significantly lower for TDR than ACF, 8.3% vs. 21.2%.¹² In particular, the rate of re-operation for adjacent segment degeneration was significantly less with TDR, 4.8% vs. 13.5%. None of the US studies have found a significantly greater rate of re-operation with TDR than fusion.

Cost:

Using 7-year follow-up data of the ProDisc-C FDA trial, it was found that TDR was less costly than ACF and was more effective.¹³ Using data from Blue Cross Plans contributing to a claims database, it was found that by 36 months after surgery, TDR had lower total cost compared with ACF.¹⁴ This was related to lower index surgery costs, and lower rates of re-operation and re-admission. In another study investigating the societal costs (surgery, lost productivity, re-operations) of cervical TDR, the authors found that TDR had been associated with lower long-term societal costs compared with ACF by a substantial margin and therefore was the preferred treatment for cervical radiculopathy from an economic

perspective.¹⁵ These and other studies found TDR to be more cost-effective for single-level cervical disc disease. TDR has also been found to have a favorable cost profile for 2-level problems compared with ACF.¹⁶

Summary:

The data collected from multiple cervical TDR FDA trials and other studies have provided good evidence that this technology is similar or superior to fusion for the treatment of symptoms related to cervical disc degeneration. The re-operation rate is lower as is the rate of ASD. More 2-level trials are being initiated in the US which will provide even more data to evaluate TDR. To date, there is good evidence from Level 1 trials in the US that TDR is non-inferior or superior to fusion and is less costly.

Anterior cervical discectomy and fusion with stand alone cage as a surgical treatment for cervical myelopathy

D. Felzensztein, S. Harnof, D. Pushkov, S. Jackson

Department of Neurosurgery
Rabin Medical Center
Petach Tikva

Design:

Retrospective case cohort study

Purpose:

assessment of clinical and radiological outcome of 1 level ACDF with stand alone cage in patients presenting with cervical myelopathy.

Overview of the literature:

ACDF is the gold standard surgical treatment for cervical degenerative disease. The usual practice is to use an interdiscal cage with an anteriorly placed auxiliary plate.

Methods:

Patients diagnosed with radiological and clinical cervical myelopathy, underwent ACDF using stand alone cages. At least one year of follow up was included in the study. Patient evaluation

included neurological assessment and X-Ray imaging. Flexion extension films were performed at 3, 6, 9 and 12 months postoperatively to evaluate migration and fusion.

Results:

50 patients were included in this study. All underwent single level ACDF with out plating. Mean age was 60 years and median follow up was 12 months.

Most patient presented with radiological fusion at 6 months . Reoperation was done only once due to postoperative site hematoma which was evacuated the following day. Complications of dysphagia, dural tear, voice complaints were no greater than that which is reported

in the literature. The objective of the surgery was to arrest myelopathic neurological deterioration which was achieved in the great majority of the patients. No migration of cage was observed during the one year follow up. Radiological fusion was assessed by bony formation anterior to the cage.

Conclusions:

Our results show that surgical treatment ACDF with stand alone cages is a safe and effective treatment for single level cervical diskopathy causing radiological and clinical myelopathy. Our results show that one can safely use stand alone cages in this setting without necessitating supplementary plating and screws in

adjacent vertebra. 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.

Safety assessment of a new curved powered tissue removal device

R. Pflugmacher¹, A. Franzini², S. Horovitz³, E. Ashkenazi⁴

1. Orthopädisch-Unfallchirurgische Poliklinik, Bonn, Germany
2. Besta Institute, Milan, Italy
3. Carevature Medical Ltd. Rehovot, Israel
4. The Israeli Spine Center, Tel Aviv, Israel

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%.

O-arm and Navigation Guided Cervical Spine Surgery for Axial Fusion

M. Nulman¹, N. Knoller², R. Harel^{1,2}

1. Arrow project, Sackler Medical School, Tel-aviv University
2. Spine Surgery Unit, Department of Neurosurgery, Sheba Medical Center, Ramat-Gan, Israel

Introduction:

Cervical axial spine fusion is challenging as the anatomy is extremely variable and screw misplacement can lead to severe complications. These screws are routinely placed under fluoroscopic guidance, however the introduction of intraoperative imaging and navigation allows for better accuracy and reduction of radiation exposure. We examined whether intraoperative imaging and navigation for axial screw placement is accurate and safe.

Methods:

We retrospectively evaluated patients' data treated surgically for cervical axial pathologies from November 2014 to November 2016. We examined operative

time, EBL, screw accuracy, screw reposition rates and revision surgery rates.

Results:

The study included 12 patients, all operated by posterior cervical approach utilizing the O-arm intra-operative imaging for pre-operative scan and post instrumentation scan. Four patients were operated due to instability; four were treated for cervical myelopathy and four traumatic injuries causing instability. Four patients had undergone occipito-cervical fusion including C1 or C2 screws, seven patients had Harm's procedure (C1-C2 fusion) and one patient had C2-C3 fusion. Mean estimated blood loss was 114cc (range 0-500cc) and mean operative time was

138 minutes (range 98-220min). In one case a screw was repositioned after post-instrumentation scan and in one patient the C1 screws were slightly back-out. Complications included one CSF leak treated with continuous drainage for 5 days and one hardware failure requiring hardware removal. Neurological status either was stable or improved in all patients.

Conclusions:

Axial cervical spine instrumentation is challenging and exposes the surgical team to radiation. Utilization of imaging and navigation guidance reduces the risks for both patients and surgeons.

Safe and Efficient Technique for Osteophyte Removal during ACDF and ACCF Procedures using a New Device

M. Millgram, N. Rand, M. Tepper, E. Ashkenazi

Introduction:

Osteophytes are bony growths that commonly form along the aging spine. Occasionally, the osteophytes pressure adjacent nerves, causing pain and neurological symptoms, and have to be surgically treated. Spinal procedures' outcome can be potentially compromised due to osteophyte presence, since it can cause pain and discomfort to the patient. However, osteophytes located at the vertebral posterior side are hard to reach, complicating their removal. In addition, their proximity to neural structures holds the risk of nerve injury and epidural hematoma.

This study presents a new technique for

osteophyte removal, demonstrated during ACDF (anterior cervical discectomy and fusion) and ACCF (anterior cervical corpectomy and fusion) procedures. This method involves the use of a shielded curved high-speed drill that is used following the corpectomy or the discectomy in order to gain access to osteophytes in adjacent vertebrae. The shield protects the neural elements, thus preventing injuries. This method does not require deflection of the underlying thecal sac, therefore minimizing the risk of a compressive injury.

Methods:

12 patients, ages 42-74, were treated for osteophyte removal using this method during ACDF or ACCF

surgery. The device was inserted through the removed disc space or vertebra into the bone edge of the vertebra body where the osteophytes were located. The device was placed above the thecal sac and posterior longitudinal ligament, and used to drill above and parallel to the thecal sac, into the osteophytes. Operation length, blood loss, complication rates and symptoms relief were evaluated.

Results:

All procedures were uneventful and without major complications. At follow-up, patients showed improvement in pain and motor ability. Average operation length was 76min with minimal blood loss. Length-of-stay was 3.9 days.

Conclusion:

The suggested technique enables safe and efficient removal of osteophytes. Our experience shows that this technique can significantly improve the clinical outcome, as supported by this series.

Cervical Myelopathy - Should fusion be part of the surgery?

N. Knoller, R.Harel

Cervical myelopathy is a group of closely related disorders usually caused by spondylosis or by ossification of the posterior longitudinal ligament and is characterized by compression of the cervical spinal cord or nerve roots by varying degrees and number of levels.

The pathophysiology of cervical myelopathy involves

static factors, which result in acquired or developmental stenosis of the cervical canal and dynamic factors, which involve repetitive injury to the cervical cord. These mechanical factors in turn result in direct injury to neurons and glia as well as a secondary cascade of events including ischemia, excitotoxicity, and apoptosis; a pathobiology similar to that occurring in traumatic spinal cord injury.

Epidemiology:

Cervical spondylosis is a common condition that is estimated to account for 2% of all hospital admissions. It is the most frequent cause of spinal cord dysfunction in patients older than 55 years. On the basis of radiologic findings, 90% of men older than 50 years

and 90% of women older than 60 years have evidence of degenerative changes in the cervical spine.

Evidence from a 2009 report indicated that cervical spondylosis with myelopathy (CSM) was the most common primary diagnosis (36%) among elderly US patients admitted to the hospital for surgical treatment of a degenerative cervical spine between 1992 and 2005.[4] The study, which looked at 156,820 hospital admissions for elderly Medicare beneficiaries, also determined that fusion was the most common procedure (70%) performed in these patients for cervical spine degeneration, with 58% of the fusions being anterior.

Surgical treatment:

The primary goal of

surgery for CSM is decompression of the spinal cord. There is a secondary goal which is to stabilize the region of the spinal column where there is myelopathy and instability.

The goals of decompression are to remove the spinal cord and root impingement with the least surgical risk and the least disruption of the structural integrity of the spinal column. Decompression may be achieved using an anterior, a posterior, or a combined approach. There is debate about which is the best approach.

Whether an anterior or posterior approach is used, procedures for CSM often include spinal fusion to help stabilize the spine. Spinal fusion is essentially a “welding” process. The basic idea is to fuse together the vertebrae so that they

heal into a single, solid bone.

Fusion eliminates motion between the degenerated vertebrae and takes away some spinal flexibility. The theory is that without fusion the degenerative process will continue as well as the irritation of the injured spinal cord. In addition, fusion is mandatory when cervical pain is dominant in clinical presentation- spine segments that do not move should not hurt.

In contrast to the above theory the advocates of Laminoplasty and Total disc replacement (TDR) try to prove that those procedures, without fusion, are as good as fusion, from the recovery point of view.

The presentation will define and discuss the above mentioned controversies.

Anxiety is associated with poorer outcome of spinal surgery

Y. Leitner, L. Shushan-Amir, Y. Sela

Background:

Previous studies suggest that recovery from various surgeries is affected from psycho-social factors, such as psychopathology tendencies. The objective of this observational prospective study was to investigate the effect of psychopathology on recovery from spinal surgery.

Method:

75 patients (60% males) participated in this study, all of them went through spinal surgeries between December 2012 and August 2014. Participants reported the following measures: Oswestry Low Back Pain Scale (ODI), The Mos 36 item short form survey (SF36), Brief Symptom Inventory (BSI) and Visual

Analogue Scale (VAS). Measures were reported in two periods: several months before surgery after decision on the surgery, and several months after surgery

Results:

Results showed significant recovery after surgery in compare with measures before surgery, that is (1) lower pain levels, (2) lower functioning limitation, (3) higher physical and emotional functioning. In addition psychopathology tendencies (e.g. anxiety, emotional distress, depression and somatization) moderated recovery. Patients that are more anxious, emotionally distressed, depressed or suffer from somatization reported poorer recovery

in compare with patients low in anxiety tendency.

Conclusions:

Results suggest that although spinal surgery has beneficial effects on pain and functioning, these outcomes are depended in psychopathology tendencies. These patterns imply that a pre-surgery psycho-social assessment is required to improve treatment for that patients with low psychological resilience.

The prevalence of risk factors for coronary artery disease may be lower after spinal cord injury

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2. Loewenstein Rehabilitation Hospital, Raanana, Israel

Introduction

It is generally accepted that coronary artery disease (CAD) is more prevalent in patients after spinal cord injuries (SCI) than in the general population. We found, however, that in patients with traumatic and non-traumatic SCI the prevalence of CAD and HT was not significantly higher than in persons of the general population, who have similar background characteristics. To explain these findings, we investigated atherosclerosis risk factors in these patients.

Methods

Data of 154 traumatic and non-traumatic SCI patients were retrospectively collected. Risk factors for atherosclerotic

diseases were examined in patients with SCI for effects on coronary artery disease (CAD) and hypertension (HT), and for prevalence, and compared with published corresponding data of the general population, after adjustment for age, gender, and years of education.

Results

BMI > 30 increased the odds of acquiring CAD ($p=0.016$). Hypercholesterolemia increased the hazard for HT ($p=0.044$). In the SCI patients, BMI > 30 was evident in 14.2%, current smoking in 26.7%, past smoking in 22.5%, and hypercholesterolemia in 39.2%. Corresponding values for the general population were 20.9%, 35.5%, 22.8%, and 39.9%

in Israel, and 39.8%, 33.4%, 30.6%, and 37.1% in the US.

Conclusions

Risk factors for atherosclerosis increased the risk for CAD or HT in the examined SCI patients. The prevalence of several such factors in these patients was lower or similar, when they were compared with the general population. This may explain why CAD prevalence in our patients did not exceed that in the general population.

Bacterial drain colonization and wound infection rates in volume-limited drain removal after open spine surgery

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Galilee Medical Center, Naharia

Background:

The use of postoperative drains is a subject of ongoing debate in the literature. Proponents argue that drainage reduces surgical site seroma, wound discharge and infection, while opponents argue that drains are a port of entry for nosocomial pathogens and should be removed as soon as possible or not used at all.

Amongst surgeons who do use drains routinely, two drain removal regimens prevail. The first is time-limited removal, in which drains are left no longer than a prespecified time (usually 48 hours maximum). The second approach is volume-limited, in which drains are removed when the daily discharge is below a certain pre-specified

volume, typically 20 milliliters/24 hours to 50 milliliters/24 hours.

Currently, there is very little evidence base to support either regimen.

Materials and methods:

169 consecutive patients who underwent open posterior spine surgery were enlisted. In all patients the drain/s were removed when the daily discharge was 50 milliliters or less in 24 hours, regardless of drainage duration. The drain reservoir was emptied as need, and discharge fluid samples were taken for microbiology cultures daily, using a sterile technique.

All patients received IV antibiotics until drains were removed.

Infection rates were determined using CDC guidelines.

Results:

The overall infection rate was 7.7% (13/169). In 6.5% (11/169) of the drains a positive culture was found, but only in one patient both a surgical site infection and a positive drain culture occurred. No correlation was found between the number of days the drains remained and the colonization or infection rate.

Conclusions:

The overall infection rate with volume-limited drain removal is comparable to infection rates reported in the literature for primary open spine surgery. A randomized prospective study comparing volume limited with time limited removal in the same subset of patients is needed to reach definitive conclusions.

The Spine Database: A three years follow-up

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Background:

Benefits of spine registries are many. Its primary goal remains the documentation of spinal pathologies and surgical procedures. New innovations and technologies are continuously delivered onto the market along with promising therapeutic achievements and outcomes. There is therefore an increasing need for documentation to assess the efficiency, safety and cost effectiveness of these new techniques. In addition, the ageing of the population will result in a constant increased number of patients referred to spine surgery, these patients having numerous medical comorbidities. Two years ago we embarked in a project of creating a prospective

database, containing comprehensive patient data, that will serve as a platform for future clinical researches in addressing these new challenges. We present here an update follow-up will be a powerful tool for in-depth understanding

Aim of the study:

The aim of our Spine Database (SDB) is to record and collect demographic data about patients, pathologies, surgical interventions and surgical complications as well as pre and post-surgery validated questionnaires that measure condition-specific outcomes.

Methods:

We designed a database based on the FileMaker platform. We recruit patients planned for elective surgeries. At

admission, patients will fill out condition-specific outcome questionnaires that aim at quantifying disability for low back pain (ODI) and neck pain (NDI), the overall health and life quality (SF-12) or the health state EQ-5D and the level of pain (VAS), before and up to 2 years post-surgery. Demographic data as well as clinical data are collected.

Results:

We have recruited consecutive elective patients for the past 2 years. So far, 682 patient data have been documented and the recruitment rate in 2014 was 84%. The largest part of performed surgeries are at the lumbar level (67.5%) and mostly following a minimal invasive surgery (MIS) approach (64%). Male are slightly more represented than

female within the sub-population affected by degenerative lumbar spinal conditions (57% and 43% respectively). The mean age of this sub-population is 60 years old. A total of 382 surgeries were performed due to degenerative changes at the lumbar spine, 84% decompressions and 12% fusions. Sixty nine percent of the decompressions were done using the MIS approach, whereas most of the fusions (62%) were performed using the open approach.

Conclusions:

Continual increasing cohort number will grant evaluation results with more power and statistical significance. Furthermore, follow ups are prospectively recorded in our SDB improving the "Quality of Evidence" for all questionnaire forms.

Versatility of Percutaneous Vertebroplasty procedures – Expansion of Indications

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Background:

Percutaneous Vertebroplasty (PVP) is a procedure usually performed by percutaneous injection of an acrylic cement, polymethylmethacrylate (PMMA), into one or more vertebral bodies under fluoroscopic control. In the past years it has become a promising new interventional procedures for relieving painful vertebrae. The clinical and literature guidelines have set very specific indications for the use of PVP, such as painful osteoporotic vertebral compressive fractures or painful aggressive primary tumors or metastasis. Contraindications consist, amongst others, unstable fractures.

Due to the arrival of new technologies, which include accurate imaging, use of new cement (high viscosity) and improvement of surgical skills, we believe that expansion of indication is mandatory, in order the fully utilize this technique.

This study examines our outcomes in the past 4 years, using PVP in different cases with good clinical outcomes.

Material & Methods:

In 2012-2016 we have treated 84 cases of unstable osteoporotic fractures in septo-octogenarian women. 52 cases were treated conservatively & 32 cases were operated using PVP.

The PVP procedures used only highly viscous cement which reaches a dough-like phase immediately after the cement components have been mixed, without going through a liquid phase.

The procedures were performed in general anesthesia guided by fluoroscopic imaging.

We have also treated 1 case of painful progressive Schmorl hernia T9-T10, followed by 2 years of failed conservative treatment.

Results:

All 32 cases showed Impressive clinical improvements without notable complications. VAS changed from 8/9 to 2/3.

The patient with painful progressive Schmorl hernia showed an immediate

improvement after T9-T10 PVP. VAS reduced the next day from 8 to 2.

Conclusion:

We have noticed that improvement of technologies and materials, combined with surgical experience, skill and good patient selection, can lead to broader indications for the use of PVP. Improved clinical outcomes show that expansion of PVP to new indications, may yield a better solution for patients who suffer from failed conservative treatment.

Diagnostic benefits of brachial plexus high-resolution MR Neurography

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2. Assaf Harofeh Medical Center, Israel

Purpose:

High-resolution magnetic resonance Neurography (MRN) is an imaging technique which enables focused multiplanar imaging of peripheral nerves, as well as diagnosis and localization of entrapment and non-entrapment peripheral neuropathies related to etiologies, such as inflammation, tumor and trauma. Brachial plexus MRN is used in our institute when referral suspects a brachial plexus injury. Our purposed is to examine the diagnostic benefits of the Brachial plexus MRN.

Materials and Methods:

Our MRN protocol utilizes 3D-T1 with FS, 3D-T2 with FS, 3D STIR and 3D PD for the detection of nerve signal, contour

and size changes for the assessment of the peripheral nerve, as well as conventional sequences (T1 with and without contrast and T2) examining anatomy and nerve enhancement. We collected all cases of brachial plexus studies with the Brachial plexus MRN protocol from Jan 2012 to April 2014. Pathological studies were noted. For each MRN pathological study, the conventional sequences were retrospectively read. Whether the findings can be seen in the conventional sequences was noted.

Results:

There were 48 Brachial plexus MRN examinations, 15 male, 32 female (mean age 52 years \pm 18 std.). Fourteen were

pathological (29%). Retrospectively, tumors (n=3, 6%) could be seen on conventional sequences, yet their extent would have been underestimated. Traumatic injury (n=2, 4%) was retrospectively correlated in conventional scans, but prospective diagnosis was considered doubtful without MRN. Degenerative (n=1, 2%) or inflammatory nerve changes (n=7, 15%) were not seen on conventional scans. Distal denervation (n=1, 2%) secondary changes were seen on conventional scans. Thus for traumatic, degenerative and inflammatory injury MRN was essential. For tumor studies, MRN was additive.

Conclusions:

MRN is a helpful

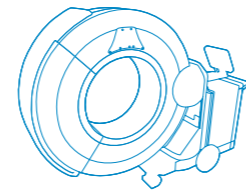
technique for the diagnosis of degenerative and inflammatory brachial plexus injuries. For tumor and trauma (10% of routine cases, 35% of abnormal studies), MRN showed added value to conventional studies.

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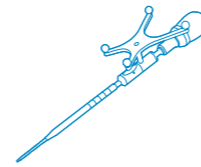
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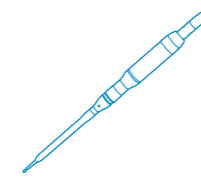
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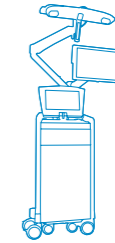
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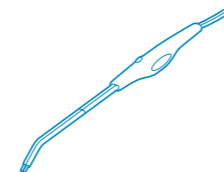
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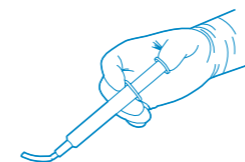
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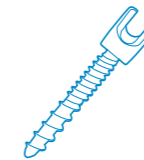
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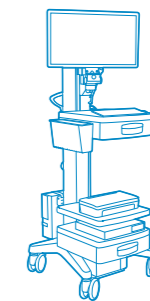
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Advanced imaging of the axial skeleton in spondyloarthritis

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Inflammation of the sacroiliac joints (SIJs) and the spine is the hallmark of spondyloarthritis (SpA), a group of diseases also characterized by back pain, HLA-B27 positivity and peripheral findings such as dactylitis, enthesitis and uveitis

The role of imaging in the diagnosis, management and follow-up of patients with SpA has become dramatically important with the introduction of new therapies such as TNF alpha inhibitors. This is especially true with respect to the clinically difficult to evaluate axial manifestations of SpA.

With effective therapy now available, an early and accurate diagnosis is crucial resulting in an

increasing clinical demand for reliable and accurate tests that can distinguish between patients that are most appropriate for biological therapy, and provide imaging insight on the immediate and long term clinical response.

MRI is currently considered the most sensitive and accurate diagnostic tool for the evaluation of early SpA by which the two main components of the disease; the active inflammatory, and the structural damage can be reliably assessed. On CT, the long-standing structural findings are apparent and should not be overlooked.

In the current presentation spinal and sacroiliac joints' characteristics on CT and MRI in SpA

as well as their differential diagnosis will be discussed.

Detection of brain abnormalities by in vivo MRI may serve as a prognostic test for acquired scoliosis in proprioception-deficient animal model of AIS

I. E. Biton, E. Assaraf, Y. Smorgick, Y. Anekstein, E. Zelzer, R. Blecher

Summary:

Efficient prognostic tools for AIS are currently lacking. Recently, we reported that mutant mice with a primary proprioceptive deficiency display an AIS-like acquired deformity. Here, we test the hypothesis that preceding brain abnormalities could predict the appearance of spinal

deformity. Using our animal model of AIS, we show that specific T2 signal brain abnormalities are detected by MRI prior to the development of scoliosis and may thus serve for early diagnosis and prognosis of the disease.

Hypothesis:

Detection of specific abnormalities of the brain by in vivo

MRI may serve as diagnostic and prognostic tests for an AIS-like spinal deformity in a proprioception deficiency animal model.

Design:

Animal model study.

Introduction:

The treatment of severe spinal deformities usually consists of major

surgery, resulting in considerable aesthetic and functional issues for patients. To date, the diagnosis of the most common form of spinal deformity, Adolescent Idiopathic Scoliosis (AIS), relies on clinical and radiographic examination of the already deformed spine. In recent years, substantial effort has been made to develop currently unavailable prognostic tests for AIS. These would allow early detection of patients at high risk for developing either a severe or a rapidly progressing curve and, in low-risk patients, prevent unnecessary radiation exposure and treatments such as bracing. Studies of patients diagnosed with AIS have reported a multitude of anatomic anomalies, including those involving the

neural, muscular and skeletal systems. However, it remains unclear whether these abnormalities are associated with the primary etiopathogenesis of AIS, thus possibly serving as diagnostic markers, or whether they represent changes secondary to the deformity. In a previous work, we reported that mice lacking key elements in the proprioceptive circuitry developed new-onset, peripubertal spinal deformity in the absence of vertebral anomalies, mimicking the onset of AIS. This similarity provides a unique opportunity to explore this animal model for prognostic markers for predicting the development of spinal deformity and its severity.

Methods:

We examined the brains of mice lacking either the

entire proprioceptive circuitry (Runx3^{-/-}) or specifically muscle spindles (Egr3^{-/-}) prior to the onset of spinal deformity. For that, we performed in vivo brain MRI scans (9.4 Tesla BioSpec) of each mutant group and control littermates (7 animals per group), acquiring transverse T2 maps. Runx3^{-/-} mice were scanned again in maturity to identify possible markers of curve severity. Co-registration (inter- and intra-subject) was applied before the analysis of MRI data. For optimal suitability to a mouse brain atlas, all images underwent atlas registration, including reslicing, realignment and smoothing, using the SPM software. Then, a voxel-by-voxel analysis was performed to identify statistically significant differences in T2 values between mutants and their

respective controls.

Results:

Primary impairments in either the entire proprioceptive pathway or specifically in muscle spindles resulted in abnormalities localized to the brain and evident in MRI, which preceded the peripubertal appearance of spinal deformity. Furthermore, abnormal T2 signals located at proprioception-related neural tracts were predictive of the development of severe curves.

Conclusion:

Specific brain abnormalities detected by in vivo T2 magnetic resonance mapping may serve both for prognostic tests and as markers predicting curve severity in proprioception-related acquired scoliosis.

Denosumab Treatment for inoperable Giant- Cell Tumor (GCT) and Aneurysmal Bone Cyst (ABC) of the Spine

D. A. Schleifer, Y. Leitner

Introduction:

GCTs and ABCs are rare and benign, but locally aggressive tumors positive for osteoclast markers with high tendency to recurrence leading to difficulty in full recovery. The first-line treatment today for GCT and ABC remains surgical resection, but recurrence is often and the treatment may be aggressive and life-threatening. Denosumab, a human antibody anti-RankL, inhibiting the differentiation of osteoclasts, could be an alternative treatment to avoid aggressive surgery as shown in previous studies.

Methods and Results:

This report describes the therapeutic use of denosumab in three patients, one

with GCT and two with ABC, who had recurrent tumors after surgery. Patients were administered denosumab monthly for the course of minimum six months, radiologic and clinical follow-up revealed recovery of pain, stagnation of neurologic symptoms and size of tumors, in all three cases.

Conclusion:

Denosumab allows bone formation and tumor regression with maximum efficacy without substituting surgery. In cases in which re-do surgery could be complicated and therefore considered inoperable, treatment with denosumab is highly indicated. Long-term results are mandatory to establish the value of denosumab in the treatment of ABC and GCT.

Percutaneous pedicle screw fixation-personal experience

A. Geftler

Background:

The first article with experience of percutaneous pedicle screw fixation was published in 2001. Percutaneous fixation minimized injury of soft tissue at operation field, risk of infection, suffering of the patient and fast recovery to daily activity.

Method:

The first percutaneous fixation for unstable thoraco-lumbar fracture in our hospital; was performed in 2008. Since then 60 patients underwent percutaneous fixation for vertebral fractures with the systems (Silverbolt, Illico, Sextant). Post-operative follow-up was from 1 year to 7 years.

Conclusions:

Our clinical results suggest that

percutaneous screw fixation can be an alternative for management of thoracolumbar fractures that have no neurologic deficits. Low risk of complications, minimal injury to soft tissue and high level of satisfaction of patients make this type of operation a good option for fixation of unstable fractures.

Minimally Invasive Spine surgery: The learning curve of a Single surgeon

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3. Department of orthopedics, hillel yaffe medical center, Hadera, Israel

Background:

Numerous publications compared results of minimal invasive surgery (MIS) to open spine surgery and describe the learning curve of a single procedure. However minimally invasive spine surgeons usually embrace a variety of MIS procedures

and the learning curve is effected by this mixture. In this study we describe a single surgeon's growing experience during initial four years of implementing minimal invasive surgical technique for treatment of various spine pathologies

Methods:

From 2012 through 2015, two hundred and thirty two patients underwent spinal surgery for thoracolumbar or sacral pathology by a single surgeon (RH) in our center. Pre-operative data was acquired by reviewing records of admission files. Radiographic evaluation prior to operation was based on all available imaging. Patient records was analyzed retrospectively and compared for demographics, indications for

surgery, surgical technique, post operative complications and finally surgical outcome as measured during post operative clinic visit. Lastly, in order to assess the learning curve associated with minimal invasive technique the cohort of minimal invasive patients was divided into three chronological groups and compared surgical results.

Results:

Insignificant age, gender and ASIA Impairment Scale differences exist between the patients' cohorts selected for open surgery compared to minimal invasive surgery. In the open surgical group 2.3 average spinal levels was treated, compared to 1.2 spinal levels in the minimal invasive

group, indicating a significant selection bias for single spinal level minimal invasive surgeries. Average blood loss was 340 ml for open surgery compared to 40 ml for minimal invasive surgery. Post operative complication rate was 18% for the open surgical group compared to 7% for the minimal invasive group. Average post operative stay at the hospital following open surgery was 7 days compared to 2.8 days following minimal invasive surgery. A significantly higher rate of infections and CSF leaks was observed in the open surgical group compared to the minimal invasive group. Learning curve associated with minimal invasive surgery showed a mild insignificant

trend of lower complications as experience was gained.

Discussion:

Minimally invasive spine surgery has been gaining popularity in recent years and new technological solutions enable wider indication range with better outcomes. The single surgeon learning curve has not been previously described. This paper demonstrates that gradual increase in surgical complexity over four years was associated with good outcomes and complication rate was lower for the MIS group. The main challenge facing the MIS community is finding the optimal tools to teach MIS techniques in order to reduce the learning curve induced complications.

Minimally Invasive Spinal decompression surgery in diabetic patients: Perioperative risks, complications and clinical outcomes compared with non-diabetic patients' cohort

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The Spine Surgery Unit, Department of Neurosurgery, Tel-Aviv Sourasky Medical Center, Israel.

Background:

Minimally invasive spinal decompression for the treatment of spinal stenosis or disc herniation is often indicated if conservative management fails. However, the influence of diabetes on the risk of postoperative complications and clinical outcome is not well understood.

Aim of the study:

We therefore, sought to compare complication rates and outcomes following MIS decompression and discectomy in diabetic patients with a cohort of non-diabetic patients undergoing similar procedures.

Methods:

We evaluated medical records of 45 patients with diabetes and 140 non

diabetic patients that underwent minimally invasive lumbar decompression between April 2009 and July 2014 at our institute. Past medical history, the American Society of Anesthesiologists (ASA) score, perioperative mortality, complication and revision surgeries rates were analyzed. Patient outcomes included: the visual analog scale (VAS) and the EQ-5D score.

Results:

The average age was 39 ± 17 years in the diabetic group and 64 ± 6.7 years in the young group. No major postoperative complications were recorded in either group, and all recruited patients were still alive at the time of the last follow-up. No statistically significant

difference existed in the surgical revision rate between the groups. Both groups showed significant improvement in their outcome scores following surgery.

Conclusions:

Our results indicate that minimally invasive decompressive surgery is a safe and effective treatment for diabetic patients and does not pose an increased risk of complications. Future prospective studies are necessary to validate the specific advantages of the minimally invasive techniques in the elderly population.

Update on Lumbar Total Disc Replacement

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Introduction

Lumbar total disc replacement (TDR) has been in use since the 1980s in Germany. In the 2000's, with the FDA trials in the United States and expanding use of the devices in Europe, there has been much published on these devices. The rationale for their use is primarily to significantly reduce pain, improve function, and allow motion of the operated segment to reduce the problem of adjacent segment degeneration associated with fusion. Now that much experience has been gained with these devices, have these goals been met?

Clinical outcomes

There is much literature published on lumbar TDR from

multiple continents and using several different designs of implants. Some were conducted under the rigor of an FDA-regulated randomized trial and other have more than 10 year follow-up. A meta-analysis of randomized controlled trials found that TDR demonstrated superiority in improved physical function, reduced pain, and shorter length of hospital stay.¹ Of note in no studies has TDR been found to be inferior to fusion. Also, among studies with the longest follow-up, sometimes more than 10 years, there has not been a rash of device failures reported.

Cost

The cost of surgery is always of concern, particularly for

new technologies. There have been several studies, using different methodologies investigating the cost of lumbar TDR.²⁻⁵ All have found TDR to be less expensive or similar in cost to fusion. The only exception was a model using ALIF with autogenous crest graft, which is rarely performed.

Adjacent segment degeneration (ASD)

One of the concerns with the stability fusion provides to the operated segment is the changes in loading and motion of the adjacent level(s) which may result in accelerated degeneration of this level. Multiple studies have been published investigating ASD in TDR and fusion. The results of a meta-analysis found that the present evidences

supports that TDR had an advantage in reducing the prevalence of ASD as well as the related re-operation rate compared with the lumbar fusion.⁶

Summary

There have been multiple prospective, randomized trials investigating the safety and efficacy of lumbar total disc replacement. The clinical results of these studies at 5-year follow-up consistently found the devices were associated with outcomes similar, or superior, to fusion. There appears to be a reduced rate of adjacent segment degeneration as well as lower re-operation rate. There is good evidence that TDR is a viable alternative to fusion in appropriately selected patients.

3D printed custom made titanium cage for replacement of L5 vertebrae following complete resection of GCT

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Background:

En-bloc resection of a vertebra involves the need for a solid anterior column support. This anterior reconstruction, is challenging when the lower vertebrae are resected, specifically the L5 vertebra. Failure of post spondylectomy instrumentations is very common, L5 being the most frequently failed level. The unique anatomical features of the transition from the lumbar spine to the sacrum requires a construct that overcomes the angular difference, the load of the upper body, as well as the transition from mobile vertebrae to a relatively non-mobile sacrum. These limitations predispose this level to a relatively higher failure rate, and require the

surgeon to use the most solid and stable construct.

Aim of the study:

A custom made 3D printed titanium cage for anterior support following L5 spondylectomy was used and both design and outcome are reported

Methods and Results:

A 22-year-old male diagnosed with GCT after failure of Denuzumab treatment was selected for this procedure. A complete imaging studies were performed prior to surgery, and a 3D custom made titanium cage was designed based on the patient's specific parameters for best fit and stability. Intraoperatively, following the completion of the

vertebrectomy, the device, filled with autologous bone graft, was implanted in a perfect fit.

Postoperative period was uneventful with mobilization and walking at POD 2, and further followup demonstrating clinical and radiographic signs of good stability.

Conclusions:

The use of a 3D printed custom made anterior support cage is a promising solution for a stable construct which might reduce the failure rate following spondylectomy surgery.

Spine Radiosurgery and Local control rate of Vertebral Metastasis

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Introduction:

Spine Radiosurgery (SRS) is a modality for the treatment of spine tumors. Multiple studies demonstrated the safety and efficiency of this treatment, however the efficacy of SRS is still to be determined. Better oncological treatment resulted higher prevalence of metastases and better treatment regimens are needed.

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. A sub-analysis of metastases only patients was undertaken.

Results:

141 lesions were treated in 121 sessions. Overall local control rate was 94%. Eighty-two Metastatic only lesion were treated in 72 treatment sessions. Local control rates were 98%. side effects observed will be discussed. 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. Discussion will emphasis on the single recurrence case.

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.

Use of a Novel Spinal Decompression Device and Its Adoption in the US

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Introduction:

Minimally invasive spine surgery (MIS) has become a very popular term in recent years. However, exactly what constitutes MIS was debatable with marketing focusing primarily on the incision size, while science demanded a definition based on more meaningful criteria. In a summary statement McAfee et al. defined MIS as a procedure that by means of the technique has less tissue damage, resulting in measurably reduced morbidity and more rapid return to activities than traditional surgery while achieving the same intended surgical goal.¹ Examples of measurable benefits were described as less blood loss, reduced hospital stay, and reduced use of post-operative

analgesics. Also, the need for an overall favorable socioeconomic impact was noted.

The concept of MIS has expanded to all types of spine surgery including discectomy, instrumented fusion, deformity, trauma, and decompression in the cervical, thoracic, and lumbar spine regions. In a recent article by Phillips et al, they reported that in 2010, approximately 17% of instrumented spine procedures in the United States were performed using MIS techniques.² In 2016, the number doubled, and they projected that by 2020 more than half of all spine surgeries will incorporate minimally invasive techniques. We are now in an era of incorporating more electronic technology to facilitate MIS techniques. These include robotics and other guidance systems, intra-

operative imaging, and endoscopes. The goals of MIS fit well with, and are a part of, the increasing use of out-patient spine surgery and the increasing use of ambulatory surgery centers in the US.

Recently entering into the spine surgery arena are single-use instruments. Originally, it was thought that such instruments were cost-prohibitive. However, when considering the total cost, particularly to the hospital, these may actually have a cost savings impact. This occurs through eliminating the need for sterilization, reducing staff time needed to arrange for instruments, handling them multiple times for each case, and other time savings. Disposables may also have the added benefits of potentially reducing infection and avoiding instruments becoming dull through

multiple uses. These also fit well with the out-patient surgery model.

DReal instrument

A new device for performing minimally invasive decompression inside-out is DReal from Carevature. It is a high-speed, shaft-like bone removal instrument with varying designs for use in the cervical and lumbar regions option of the spine. It has a curved tip with a shield on the underside to protect the neural elements from the rotating cutting burr. The tip of the device is 2-3 mm. The goal of the device is to by access to pathologic anatomy for decompression of the compressive bone/tissue away while the reducing the need while minimizing bone removal and avoiding destabilizing the spine.

Carbon Fiber Reinforced PEEK Pedicle Screw System. Technical Features and Clinical Trial

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Abstract:

Background: Hybrid constructs made of PEEK rods and titanium screws have demonstrated better physiologic loading at both the instrumented and adjacent levels. Implants made entirely of Carbon-Fiber-Reinforced (CFR)-PEEK have not been described and tested as yet.

Study Design: A prospective cohort two-center study.

Material and Methods:

Forty-nine patients with one level degenerative disc disease (DDD) were treated with a stand-alone novel pedicular screw system (PSS) made entirely of CFR-PEEK biomaterial, and were followed thereafter for 24 months. Changes in pain and disability were evaluated

using visual analog scale (VAS) and the Oswestry Disability Index (ODI). Imaging evaluation of fusion were performed with standard and dynamic radiographs.

Results:

Mean age was 58.6 ±12.5 years. The mean operating time was 113.5 ± 22.1 minutes; x-ray exposure was 38.5±17.4 seconds. No operative problems or complications were encountered. Four patients were re-operated (3 due to persisting leg pain, 2 due to late onset of back pain). Forty-five patients completed follow-up of 24 month, the mean VAS decreased by 6.3 points for lower back pain and by 4.4 points for leg pain; the mean ODI decreased

by 15 points. No screw breakage or loosening was reported. Radiological consolidation was observed in all patients within 12 months. No clinical symptoms or radiological signs of adjacent disc disease (ADD) were observed up to 24 months.

Conclusion: The all CFR-PEEK PSS is user friendly, safe and compatible with modern imaging techniques. Its bone matching elastic modules seem to contribute in the short term to fusion, and in the long term to potential prevention of adjacent disk disease.

Keywords:

degenerative disc disease. posterior lumbar fusion. pedicular screw system. CFR-PEEKIntroduction

New Technologies in Spinal Surgery – Financial Costs vs. Clinical Outcomes

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Background:

The 21st century provides fast technological improvements in surgery, particularly in spinal surgery. New technologies carry high costs to medical centers and to patients, especially in Imaging, procedures, high costly technology and age related complication rate. The benefits of new technologies are sometimes questioned by their clinical outcomes, comparing to old school but more evidenced methods.

This study aims to examine the clinical outcomes of different technological approaches in similar clinical cases – L4-L5 Discopathies and instabilities, Av. age 60-80, 61% female.

Material & Methods:

L4-L5 Laminectomy

and post-lateral fusion (bone graft) – 26 cases, Av. cost 5,000€

L4-L5 Posterior spinal fusion with pedicle screws – 52 cases, Av. cost 6,500€

L4-L5 Interbody Fusion alone (Cage) – (2000-2005) – 27 cases, Av. cost 6,100€

L4-L5 Decompression and inter-laminar U device – 45 cases, Av. cost 6,100€

L4-L5 posterior spinal fusion with interbody fusion (360) – 6 cases, Av. cost 7,800€

L4-L5 Robotic guided posterior fusion – 18 cases, Av. cost 10,000€

Procedures were compared in surgery time, hospitalization time, complication rate, fluoroscopic exposures, rehabilitation time and

procedure costs.

Results:

Procedure outcomes were similar in hospitalization time, complications rate and rehabilitation time.

We have evidenced a shorter surgery time in newer technologies as in to U device with Av. time of 55 min. compared to Laminectomy with Av. time of 86 min but shorter than 360 with Av. time of 176 min.

We have evidenced a shorter fluoroscopic exposure in Laminectomy with one shot vs. 22 shots in 360 and 29 shots in posterior spinal fusion.

We have evidenced a significant difference in procedure costs with new technologies which were 63% more costly than old school technologies.

US studies have shown an increase of adult deformity surgeries cost for Medicare from 50 K\$ in 2000 vs. 165 K\$ in 2010. It reflects an increase of 333% without any positive surgical outcome.

Conclusion:

In our experience, new technologies have not always proven a better clinical outcomes compared to older methods, while taking into consideration their significantly higher costs. Benefits of these technologies are mainly to surgical staff, but patient outcomes are similar. It is our duty to find the balance between new surgical technologies and medical benefit, without increasing the financial cost.

Does sagittal Spinopelvic Configuration influence Progressive Collapse of Acute Osteoporotic Compression Spinal Fractures? A retrospective Radiological Analysis

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Study Design:

Retrospective cohort study.

Objective:

The aim of this study was to analyze the correlations between spinopelvic configuration and progressive collapse following acute osteoporotic compression spine fractures.

Summary of Background Data:

Few studies have investigated the risk factors for progressive osteoporotic compression spine fractures. However, the correlation between the spinopelvic configuration, which is a crucial to optimize the management of lumbar degenerative diseases, and progressive collapse following

acute osteoporotic compression spine fractures was not analyzed.

Methods:

We retrospectively identified all patients treated for thoracolumbar fractures in our institution between January 2008 and July 2013. The pelvic incidence (PI), sacral slope (SS), and pelvic tilt (PT) were measured for the pelvic parameters. For each patient, we classified the fracture according to the AOSpine Thoracolumbar Spine Injury Classification System. Height loss was measured initially and at a minimum of 3 months follow up. The difference between initial and final height loss was documented as height loss difference. Results. The study

included 124 patients, comprising 86 women and 38 men. The mean patient age was 69±9.6 years. The mean length of follow up was 14±15 months. Neither a significant effect of the PI, PT and SS angles on the vertebral fracture level ($P>0.05$) nor a significant relationship between the PI, PT and SS angle and the fracture type according to the AO classification ($P>0.05$) were found. There was no correlation between PI, PT and SS angles and initial height loss, final height loss and height loss difference ($p>0.05$)

Conclusion:

The spinopelvic configuration represented by the PI, PT and SS angle does not seem to influence progressive

collapse following acute osteoporotic compression spine fractures.

Key words:

osteoporotic compression spine fractures, pelvic incidence, sacral slope, pelvic tilt, spinopelvic configuration, progressive collapse.

Are there any clinical and radiological differences between females and males adolescent idiopathic scoliosis surgical candidates?

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Objective:

To compare the sex differences in curve patterns and radiographical characteristics in patients who have adolescent idiopathic scoliosis (AIS).

Summary of Background Data:

Sex differences in AIS have been documented in the incidence of curve progression, response to bracing, and outcomes of surgical treatment. However, limited information is available about the relation between sex and scoliosis curve patterns and radiographical presentations.

Methods:

A total of 148 patients, 31 males and 117 females with AIS with major curve of 50 ° or more were recruited. Standard

posteroanterior and lateral radiographs of spine were reviewed to classify scoliosis curve patterns according to the Lenke classification and to measure curve severity and flexibility. We also compared back pain, usage of brace, and the size of the hump between females and males.

Results:

We did not find a statistically significant difference between male and female patient who were candidate for surgical treatment in the variables that were examined.

Conclusion:

According to our data there is no difference between males and females in back pain, curve pattern, curve flexibility and usage of brace before surgery.

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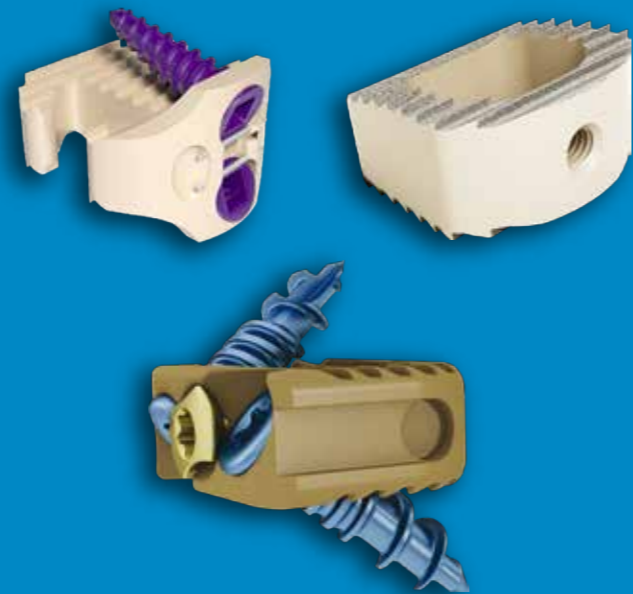
LAMINOPLASTY



POSTERIOR FIXATION



CAGES



ARTIFICIAL DISCS



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