



# The 20<sup>th</sup> Annual Meeting of the Israel Spine Society

10-13 April 2019  
Wednesday-Saturday  
The Royal Beach Hotel Eilat  
Israel

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## GENERAL INFORMATION

The 20<sup>th</sup> annual meeting of the Israel Spine Society  
will be held on Wednesday-Saturday,  
25<sup>th</sup> - 28<sup>th</sup> April, 2019 "Royal Beach" Hotel in Eilat.

### Acting Committee

Gad J. Velan M.D  
Chairman

Eyal Yitzchayek M.D  
Secretary

Yoram Anekstein M.D  
Treasurer

Ran Harel M.D  
Scientific officer

Joshua Shroeder M.D  
Member at large

### 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

### International Keynote Speakers

Robert Dunn Prof.  
South Africa

Yasuhisa Tanaka M.D  
Japan

Ehab Shiban M.D  
Germany

Eric J. Muehlbauer MJ, CAE  
USA

### Honored Guest Lecturer

Attila Somfalvi  
Israel

Ben Caspit  
Israel

## Dear members of ISS, distinguished guests and attendees,

I welcome you to the 20th annual meeting of the Israeli Spine Society, a celebration of our medical achievements during the last year and our main educational event.

It has been 20 years since our first inaugural meeting in 2000, and from about 30 founding members we are now over 70 strong, a testimony to the transformation from a minor subspecialty into a major field in Neurosurgery and Orthopedic surgery alike. I hope you will find this meeting as interesting and as fruitful as the 19 meetings who preceded it.

Following our collaboration with Eurospine as full members of EuSSub, in this meeting we begin a collaboration with the North American Spine Society, an organization that many of us are among its International member body. A collaboration that will enable us to continue our high scientific and educational standards.

In behalf of ISS I also would like to thank the many exhibitors participating this year, without your ongoing collaboration and support this meeting can not happen.

**Gad J. Velan MD**  
ISS President

## חברי האיגוד ואורחים נכבדים, ברוכים הבאים,

חברי האיגוד הישראלי לעמוד שדרה, אורחים נכבדים ומשתתפי הכנס.

ברוכים הבאים לכנס השנתי ה-20 של האיגוד הישראלי לעמוד השידרה, האירוע המרכזי במהלך שנת הפעילות.

חלפו 20 שנה מאז כנס היסוד של האיגוד, בו נכחו כ-30 מנתחי עמוד שדרה שיסדו את האיגוד, וכיום אנו מונים מעל 70 חברים, עדות להתפתחות התחום והפיכתו מתחום נישתי במסגרת נירוכירורגיה או כירורגיה אורתופדית, לתחום עיסוק מרכזי ועצמאי הן בנירוכירורגיה והן בכירורגיה אורתופדית.

אני מקווה שתמצאו כנס זה מעניין ומוצלח כ-19 הכנסים שקדמו לו.

בהמשך לשיתוף הפעולה שהחל עם EuroSpine, בכנס זה אנו משיקים את שיתוף הפעולה עם ה-North American Spine Society, אירגון שרבים מאיתנו חברים בו במסגרת החברות הבינלאומית, שיתוף פעולה שיאפשר לנו לקדם את מטרותינו המדעיות והחינוכיות.

בשם חברי האיגוד הישראלי לעמוד השידרה אני מודה למציגים הרבים המשתתפים בכנס זה, ללא תמיכתכם המתמשכת כנס זה לא יכול היה להתקיים.

**ד"ר גד ולן**  
נשיא האיגוד הישראלי לעמוד השידרה

## Dear friends and colleagues,

It is my honor to welcome you to the 2019 Israeli spine society meeting. The meeting is held in Eilat, where the sun, desert and red sea unite to form a marvelous retreat. This year's conference is held a day after the national elections, and while the center of Israel will be occupied with on-going news, we will enjoy to the relaxing world of spine surgery. This year's program is comprised of diverse array of spine pearls and our international honored guests arrive from several different continents. I wish all the participants a fruitful and enjoyable conference.

**Ran Harel, M.D.**  
ISS Scientific Committee

## תכנית כנס אחיות יום המישי, ה-11 באפריל 2019

08:30 - 08:35 **דברי ברכה**  
**ד"ר איל יצחיאק.**

08:36 - 09:06  
**ניתוחי עקמת במבוגרים - ד"ר חשאן מורסי,** המרכז הרפואי ת"א ע"ש סוראסקי.

09:07 - 09:27  
**"הפלישה של ניתוחים זעיר פולשניים" - ד"ר רן הראל.**

09:28 - 09:48  
**ALIF - מירב שניידר,** ראש צוות ניתוחי עמוד שידרה, המרכז הרפואי הילל יפה.

09:49 - 10:09  
**Case Presentation - Cervical spinal fusion**  
**שרי כהן,** ראש האגף האורתופדי חדר ניתוח, המרכז הרפואי הדסה עין כרם.

10:10 - 10:40 **הפסקת קפה**

10:40 - 11:00  
**Navigation in Spine procedures - ארתור אברהמוב,** ראש צוות עמוד שידרה נירוכירורגיה, המרכז הרפואי ע"ש חיים שיבא - תל השומר.

11:01 - 11:21  
**- Case Study - C1-C2 cervical fixation**  
**ארתור אברהמוב,** ראש צוות עמוד שידרה נירוכירורגיה, המרכז הרפואי ע"ש חיים שיבא - תל השומר

11:22 - 11:42  
**Magnetic Growing rode system for scoliosis**  
**ויקי דשבסקי,** ראש צוות עמוד שידרה אורתופדיה, המרכז הרפואי שיבא תל השומר.

11:43 - 12:03  
**ניתוחי עקמת בילדים - אחמד קראקרה,** ראש צוות אורתופדיית ילדים, המרכז הרפואי ת"א ע"ש סוראסקי.

12:04 - 12:24  
**MI biopsy of vertebral body navigation assisted**  
**אדוארד בקרמן,** ראש צוות ניתוחי עמוד שידרה, המרכז הרפואי ת"א ע"ש סוראסקי.

12:25 - 13:30 **הפסקת צהריים**

13:31 - 13:51  
**סיכום משלחת רפואית לאתיופיה - ניתוחים ראשונים לתיקון עקמת באתיופיה - ראובן גלפונד,** ראש ענף אורתופדיה, חדר ניתוח המרכז הרפואי הדסה הר הצופים.

# SCIENTIFIC PROGRAM

**THURSDAY, APRIL 11, 2019**

**SESSION 1: SPINE INFECTIONS**  
CHAIRMEN: Y. MIROVSKY, E. ITSHAYEK

**08:00 - 08:05 WELCOME**  
G.J. Velan

**08:05 - 08:25**  
**KEYNOTE LECTURE: SPONDYLODISCITIS: DIFFERENTIAL AND CURRENT MANAGEMENT STRATEGIES**  
R. Dunn

**08:26 - 08:34**  
**(1.1) CAN INTRA-OPERATIVE IRRIGATION WITH ANTIBIOTICS REDUCE BACTERIAL LOAD AT THE SURGICAL SITE? - AN IN-VITRO STUDY**  
R. Masarwa, O. uri, A. Athamna, S. freimann, A. Yassin, Y. Folman, G. Gutman, O. Einav, E. Behrbalk

**08:35 - 08:43**  
**(1.2) NECROTIZING FASCIITIS OF THE SPINE**  
Y. Smorgick, T. Granek, A. Dvir, S. Tal, Y. Mirovsky, Y. Anekstein

**08:44 - 08:52**  
**(1.3) POSTOPERATIVE INFECTION REDUCTION USING A DILUTE POVIDONE-IODINE SOLUTION IRRIGATION BEFORE WOUND CLOSURE IN SPINAL SURGERY**  
S. Menachem, G. Barkay, I. Caspi, M. Levinkopf, N. Ackshota, A. Friedlander

**08:53 - 08:57**  
DISCUSSION

**08:57 - 09:17**  
**KEYNOTE LECTURE: TREATMENT CONSIDERATIONS IN PYOGENIC SPINAL INFECTION**  
E. Shiban

**09:18 - 09:26**  
**(1.4) TREATMENT IN SPINE WITH RADIOLUCENT OR RADIOPAQUE IMPLANTS IN ONCOLOGY (TRANSPARENCY STUDY): A RANDOMIZED CONTROLLED TRIAL**  
E. Shiban

**09:27 - 10:00**  
**SPINAL INFECTION PANEL**  
**Participation:** R. Dunn, E. Shiban, R. Lotan, O. Hershkovich  
**Moderator:** Y. Anekstein

**10:00 - 10:30 COFFEE BREAK**

**SESSION 2: CERVICAL SPINE**  
CHAIRMEN: N. KNOLLER, A. HASHARONI

**10:30 - 10:50**  
**KEYNOTE LECTURE: MANAGEMENT ALGORITHMS IN CERVICAL RADICULOPATHY**  
Y. Tanaka

**10:51 - 10:59**  
**(2.1) CERVICAL SPINE SURGERY FOR SPONDYLOTIC MYELOPATHY: VENTRAL VS. DORSAL APPROACH**  
M. Nulman, R. Harel, N. Knoller

**11:00 - 11:08**  
**(2.2) CHIARI MALFORMATION TREATMENT IN PEDIATRIC SCOLIOSIS**  
O. Hershkovich, G. Katzouraki, D. D'Aquino, M. Tsegaye

**11:09 - 11:17**  
**(2.3) NEUROLOGICALLY INTACT PATIENTS WITH OCCIPITOCERVICAL DISLOCATION: A CASE SERIES**  
G. Kimchi, N. Knoller, R. Harel

**11:18 - 11:26**  
**(2.4) CERVICAL SPONDYLOSIS-SURGICAL STRATEGY**  
Z.J. Brodzinski

# SCIENTIFIC PROGRAM

**11:27 - 11:46**  
**KEYNOTE LECTURE: CERVICAL ROOTS AS ORIGIN OF PAIN IN THE NECK OR SCAPULAR REGIONS**  
Y. Tanaka

**11:47 - 11:51**  
DISCUSSION

**11:52 - 12:12**  
**DEBATE: CENTRAL CORD SYNDROME: ACUTE VS. CHRONIC SURGERY**  
**Acute:** N. Raz  
**Chronic:** G. Regev

**12:13 - 12:33**  
**KEYNOTE LECTURE: THE CHALLENGE OF CERVICAL SPINE TRAUMA**  
R. Dunn

**12:33 - 13:30 LUNCH BREAK**

**SESSION 3: MIS & SURGICAL GUIDANCE**  
CHAIRMEN: Z. LIDAR, L. KAPLAN

**13:30 - 13:38**  
**(3.1) APPLICATION OF NAVIGATION COMBINED WITH O-ARM IN COMPLICATED SPINAL CASES**  
M. Radek, M. Wojdyn, M. Błaszczuk, J. Jankowski

**13:39 - 13:47**  
**(3.2) LONG-TERM OUTCOMES OF MINIMALLY INVASIVE UNILATERAL APPROACH FOR BILATERAL DECOMPRESSION OF LUMBAR SPINAL STENOSIS**  
G.J. Regev, R. Ankori, M. Khashan, R. Lador, K. Salame, L. Mangel, Z. Lidar Z

**13:48 - 13:56**  
**(3.3) ROBOTIC CLOSED VS OPEN FIXATION FOR TRAUMATIC SPINE INJURIES: A CASE CONTROL STUDY**  
A. Satanovsky, H. Shear-Yeshuv, Y. Gellman, L. Kaplan, J. Schroeder

**13:57 - 14:05**  
**(3.4) DEGENERATIVE SPONDYLOLISTHESIS DOES NOT COMPROMISE OUTCOME IN PATIENTS WITH SPINAL STENOSIS UNDERGOING MINIMALLY INVASIVE - DECOMPRESSION WITHOUT FUSION**  
M. khashan, G. Regev, K. Salame, D. Ofir, A. lich, Z. lidar

**14:06 - 14:14**  
**(3.5) ONE STEP SCREWS: INITIAL EXPERIENCE REPORT**  
R. Harel, G. Kimchi, N. Knoller

**14:15 - 14:23**  
**(3.6) THE EFFECT OF BODY MASS INDEX ON THE OUTCOME OF MINIMALLY INVASIVE LUMBAR DECOMPRESSION**  
M. khashan, G. Regev, K. Salame, D. Ofir, A. lich, R. Lador, Z. lidar

**14:24 - 14:30**  
DISCUSSION

**14:31 - 14:51**  
**DEBATE: L5-S1 FUSION SURGERY: ALIF VS. TLIF**  
**ALIF:** E. Berblak  
**TLIF:** Y. Smorgick

**SESSION 4: TUMORS**  
CHAIRMEN: Y. BARZILAY, I. ENGEL

**14:52 - 15:00**  
**(4.1) SPINAL RADIOSURGERY (SRS) FOR BENIGN NERVE SHEATH TUMORS**  
R. Harel, L. Zach

**15:01 - 15:09**  
**(4.2) THREE-DIMENSIONAL PRINTING TECHNOLOGY IN COMPLEX SPINE SURGERIES**  
G.J. Regev, R. Lador, M. Khashan, K. Salame, L. Mangel, Z. Lidar

**15:10 - 15:18**  
**(4.3) CERVICAL SPINE LARGE ARACHNOID CYST**  
M. Shema, R. Djabbarov, L. Evgeny

# SCIENTIFIC PROGRAM

15:19 - 15:27

(4.4) SPINAL MENINGIOMAS - RISKS AND POTENTIAL OF AN INCREASING AGE AT THE TIME OF SURGERY

M. Schwake, P. Sporns, W. Stummer, B. Brokinkel

15:28 - 15:36

(4.5) CHORDOMA IN THE THORACOLUMBAR SPINE

R. Batash, Y. Lee, A. Simonovich, M. Schaffer, R. Debi, O. Lubovsky, R. Djabarov

15:37 - 15:45

(4.6) PREGNANT PATIENT WITH AGGRESSIVE THORACIC VERTEBRAL HEMANGIOMA CAUSING LOWER LIMBS SPASTIC PARESIS

B. Qutteineh, J. Schroeder, L. Kaplan

15:46 - 15:54

(4.7) INTRAMEDULLARY TUMORS: THE ROLE OF INTRAOPERATIVE MONITORING

G. Kimchi, N. Knoller, R. Harel

15:55 - 16:00

DISCUSSION

16:00 - 16:30 COFFEE BREAK

16:30 - 17:30 GUEST LECTURE

”שמאל, ימין ו-Fake פוליטיקה”: על תהליכי העומק בפוליטיקה הישראלית, על השתלטות הימין השמרני על הדירה הפוליטית, על המעבר מימין-שמאל לשמרנים-פרוגרסיביים, על התרסקות השמאל ועל תופעת הפייק ניוז והדיסאינפורמציה בשיח הציבורי הישראלי.

Attila Somfalvi

(lecture will be held in Hebrew)

17:30 - 18:30

BUSINESS MEETING

FRIDAY, APRIL 12, 2019

SESSION 5: RADIOLOGY & MORE

CHAIRMEN: M. MILGRAM, A. GEFTLER

08:30 - 08:50

KEYNOTE LECTURE: WHERE FIRST WORLD MEETS 3RD WORLD: THE SOUTH AFRICAN CAULDRON

R. Dunn

08:51 - 08:59

(5.1) SINGLE LEVEL ANTERIOR APPROACH ALIF USING A HYPERLORDOTIC CAGE COMBINED WITH POSTERIOR APPROACH SMITH PETERSON OSTEOTOMY AND FUSION CAN ACHIEVE THE SAME LORDOSIS CORRECTION AS PSO/VCR- A CADAVER STUDY

N. Ackshota, G. Barkay, V. Arlet

09:00 - 09:08

(5.2) CAN ANTERIOR INTERBODY LUMBAR FUSION RESTORE CENTRAL CANAL DIAMETER - MAGNETIC RESONANCE EVALUATION

R. Masarwa, O. Uri, G. Gutman, Y. Folman, O. Einav, E. Behrbalk

09:09 - 09:17

(5.3) ROUTINE ADVANCED IMAGING IN PATIENTS WITH SPINAL ANKYLOSING DISORDERS FOLLOWING MINOR TRAUMA FOR THE DIAGNOSIS OF HYPEREXTENSION TYPE THORACOLUMBAR FRACTURES - IS IT MANDATORY?

G. Barkay, K. Lanzmann, S. Menachem, I. Caspi, N. Ackshota, A. Shtewee, I. Eshed, A. Friedlander

09:18 - 09:26

(5.4) SAGITTAL WHOLE-SPINE MAGNETIC RESONANCE IMAGING SCREENING IN THE EVALUATION OF LUMBAR SPINE DISEASES AND INFECTION

Y. Smorgick, T. Granek, S. Tal, Y. Mirovsky, Y. Anekstein

# SCIENTIFIC PROGRAM

09:27 - 09:35

(5.5) COMPUTER-BASED DIAGNOSIS OF SACROILIITIS IN CT SCANS

B. Qutteineh, Y. Shenkman, Y. Azraq, A. Szeskin, A. Mayer, I. Eshed, J. Schroeder, L. Kaplan, L. Joskowicz

09:36 - 09:44

(5.6) COMPUTED TOMOGRAPHY-GUIDED MARKING OF OSTEIOD OSTEOMA OF THORACIC SPINE WITH FOLLOWING SURGICAL RESECTION: A CASE REPORT

A. Artamonov, E. Lee, M. Shema, R. Debi, R. Djabbarov

09:45 - 09:53

(5.7) MATCHING ACTUAL TREATMENT WITH PATIENT ADMINISTRATION-ROUTE-PREFERENCE IMPROVES ANALGESIC RESPONSE AMONG ACUTE-LOW-BACK-PAIN PATIENTS, POSSIBLY THROUGH PLACEBO MECHANISMS

A. Shani, M. Granot, R. Bennidor, G. Mochalov, N. Rahamimov

09:54 - 10:00

DISCUSSION

SESSION 6: MISCELLANEOUS

CHAIRMEN: A. SHPIGELMAN, N. RAHAMIMOV

10:01 - 10:09

(6.1) AGE-RELATED DIFFERENCES IN CLINICAL OUTCOMES OF LUMBAR DISCECTOMY

R. Masarwa, U. Ofir, H. Doani, T. Ohayon, M. Damary, S. Fatal, A. EHUD, E. Behrbalk, Y. Folman

10:10 - 10:18

(6.2) IDIOPATHIC VENTRAL SPINAL CORD HERNIATION: A SINGLE CENTER'S EXPERIENCE, AND PRESENTATION OF SURGICAL TECHNIQUE

S. Bejell, G.E. Svir

10:19 - 10:27

(6.3) GENDER DIFFERENCES IN INDIVIDUALS WITH NON-TRAUMATIC SPINAL CORD INJURY AND SPINE SURGERY: A SURGICAL POINT OF VIEW

E. Haber, C. Hoffmann, S. Noy, N. Knoller, G. Zeilig, R. Harel

10:28 - 10:36

(6.4) MUTUAL EFFECTS OF REHABILITATION AND THE USE OF NARCOTIC MEDICATION IN PATIENTS WITH CHRONIC LOW BACK PAIN DISABILITY

A. Catz, S.Y. Ayalon, I. Gelernter, V. Bluvshstein, D. Michaeli, K. Elkayam, A. Kfir, E. Aidinoff

10:37 - 10:45

(6.5) SCIM III (SPINAL CORD INDEPENDENCE MEASURE VERSION III): RELIABILITY OF ASSESSMENT BY INTERVIEW AND COMPARISON WITH ASSESSMENT BY OBSERVATION

V. Bluvshstein, M. Itzkovich, H. Scheffler, L. Front, K. Elkayam, R. Gor-Pollack, I. Gelernter, A. Catz

10:46 - 10:54

(6.6) POST EXERTIONAL SACROILIITIS: A CASE SERIES

A. Katzir, B. Qutteineh, S. Israel, L. Kaplan, J. Schroeder

10:55 - 11:00

DISCUSSION

11:00 - 11:30 GUEST LECTURE

PHYSICIAN BURNOUT: UNDERSTANDING THE SIGNS, RISK FACTORS AND DEVELOPING COPING STRATEGIES

E. Muehlbauer

11:30 - 12:00 COFFEE BREAK

12:00 - 13:00 GUEST LECTURE

THE BIBLIOGRAPHY OF NETANYAU

Ben Caspit (lecture will be held in Hebrew)

נתניהו/ביורגפיה: סודות המנהיגות של בנימין נתניהו בן כספית

## CAN INTRA-OPERATIVE IRRIGATION WITH ANTIBIOTICS REDUCE BACTERIAL LOAD AT THE SURGICAL SITE? - AN IN-VITRO STUDY

R. R. MASARWA, O. URI, A. ATHAMNA, S. FREIMANN, A. YASSIN, Y. FOLMAN, G. GUTMAN, O. EINAV, E. BEHRBALK

### INTRODUCTION:

Intra-operative surgical site irrigation with antibiotics and applying antibiotic powder to the surgical field before wound closure is believed to reduce the risk of infection in spine surgeries involving instrumentation. Despite being commonly practiced, the evidence in the literature supporting these methods is limited. This prospective in-vitro study evaluated the effect of short-term exposure to antibiotics on growth of common pathogens involved in wound site infection in spine surgery.

### METHODS:

A suspension of one of three micro-organisms: (1) Staphylococcus Aureus, (2) Staphylococcus Epidermidis, or (3) Pseudomonas Aeruginosa was added to 2-ml vials of enriched medium, containing one of three antibiotics: (a) Vancomycin, (b) Gentamicin, or (c) Cefazolin. The final inoculum of each micro-organism was 103 CFU/ml, representing a contaminated surgical wound in spine surgery. The antibiotic concentration was 40 times the MIC of each antibiotic. Antibiotics were washed out from the suspension by centrifugation technique after: (i) 5 minutes, or (ii) 8 hours, representing the time of tissue exposure to antibiotics after intra-operative surgical site irrigation or applying antibiotic powder to the surgical field before wound closure, respectively. The recovery of growth of micro-organisms was monitored for 24 hours by laser light scattering technology, using the Uro-Quattro HB&L automated system (AliFax S.r.l., Italy) and

compared to control vials containing micro-organisms without antibiotics.

### RESULTS:

Pseudomonas Aeruginosa inoculated in vials with Gentamicin, showed no 24-hour bacterial growth after 5-minute and 8-hour exposure to the antibiotic. Vials of all other bacteria-antibiotic combinations showed bacterial growth curves similar to the control vials after both 5-minute and 8-hour exposure to antibiotics, with no signs of bacterial growth inhibition.

### CONCLUSION:

Our findings demonstrate that a 5-minute exposure to Gentamicin may inhibit Pseudomonas Aeruginosa growth in enriched medium vials and support surgical wound irrigation with Gentamicin in spine surgery. Exposure of Staphylococcus Aureus and Staphylococcus Epidermidis to Vancomycin or Gentamicin failed to inhibit bacterial growth in this study and should be further studied.

## NECROTIZING FASCIITIS OF THE SPINE

Y. SMORGICK<sup>1</sup>, T. GRANEK<sup>2</sup>, A. DVIR<sup>3</sup>, S. TAL<sup>2</sup>, Y. MIROVSKY<sup>1</sup>, Y. ANEKSTEIN<sup>1</sup>

1. Department of Orthopedic Surgery and the Spine Unit, Assaf Harofeh Medical Center, Zerifin, Israel, affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel.
2. Department of Radiology, Assaf Harofeh Medical Center, Zerifin, Israel, affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel
3. Intensive Care Unit, Assaf Harofeh Medical Center, Zerifin, Israel, affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel

Necrotizing fasciitis (NF) is a rapidly progressive and life-threatening soft tissue infection. NF primarily involves the fascia and subcutaneous tissue along the fascial planes, with widespread tissue necrosis and associated systemic illness (1,2). Early diagnosis, emergency surgical debridement, and empirical broad-spectrum antibiotic treatment are crucial for the patient's survival.

NF involving the spine is extremely rare, with only two cases ever reported in medical literature (3,4,5).

We present 2 cases of NF involving the spinal column along with our experience in the management of this life-threatening condition.

The first Patient was a 68-year-old man with a medical history of uncontrolled type 2 diabetes mellitus. He underwent debridement of the paraspinal muscles on both sides from L1 until the sacrum along with debridement of the right gluteus muscle. Afterwards laminectomy of L1, L2, L3, L4, L5 was performed, exposing pus in the spinal canal in all operated segments. Following a discectomy at the L4-L5 level and the completion of the laminectomy, the spinal canal was irrigated up to D8 using a small feeding tube.

The second patient was a 83-year-old woman with a medical history of uncontrolled type 2 diabetes mellitus, ischemic heart disease, congestive heart failure, aortic valve replacement. When diagnosed with NF the patient was medically unstable and intubated. She was not operated.

Both patients have passed away.

Conclusion: NF of the spine is a rare disease with very poor prognosis. It is a surgical emergency which requires early and aggressive surgical treatment. Multiple teams from different specialties are necessary for proper case management, but multisystem failure may occur, nonetheless.

## POSTOPERATIVE INFECTION REDUCTION USING A DILUTE POVIDONE-IODINE SOLUTION IRRIGATION BEFORE WOUND CLOSURE IN SPINAL SURGERY

S. MENACHEM, G. BARKAY, I. CASPI, M. LEVINKOPF, N. ACKSHOTA, A. FRIEDLANDER

Infections after spinal surgery are a common complication with multiple consequences that could be devastating.

Postoperative infection can compromise the clinical outcome of the surgery causing a longer and more complex recovery process as well as economic implications.

The progress and use of advanced sterilization techniques, and the administration of preoperative antibiotics, significantly reduced the number of infections from 5.9% prior to the use of antibiotics to 2.2% after its introduction.

Despite efforts to characterize specific factors which increase the risk of infection and treat them, postoperative infections are still the most common postoperative complication.

Povidone iodine is a compound containing polyvinyl pyrrolidone and triiodine ion and is used as an antiseptic for skin, mucous membranes and wounds.

This product has extensive antibacterial activity against many pathogens, including MRSA.

There are studies that demonstrated cytotoxicity when used in concentration of 5% or above, but at low doses of 0.35% - 0.5% there are almost no toxic effects or side effects at all.

The goal of this study was to examine the effect of surgical wound irrigation with a sterile diluted

betadine solution on the rate of acute infections after spinal surgery.

Our hypothesis was that the use of a sterile betadine solution will reduce the number of acute infections postoperatively.

Patients were divided in two groups, in group 1 wounds are irrigated with diluted betadine solution prior to wound closure, in Group 2 wounds are irrigated with sterile saline alone. Otherwise, perioperative management was the same.

## TREATMENT IN SPINE WITH RADIOLUCENT OR RADIOPAQUE IMPLANTS IN ONCOLOGY (TRANSPARENCY STUDY): A RANDOMIZED CONTROLLED TRIAL

E. SHIBAN

### BACKGROUND:

With the on-going developments and improvements in oncology, the overall survival has increased markedly and patients with metastases are living much longer. Therefore a paradigm shift has occurred because management of these patients has also become an issue of long-term spinal stability as well as local tumor control. Local tumor control is mostly attributed to the extent of initial resection as well as efficacy of the adjuvant radiotherapy. The efficacy of radiotherapy is in part depended on accurate planning. Thereby fewer artifacts from the instrumentation materials near the target area are believed to be very beneficial. Using modern materials such as the radiolucent Carbon Fiber reinforced implants might add substantial value to accurate radiotherapy planning as well as higher rates of local tumor control.

### METHODS:

Patients with spinal metastases and spinal instability, spinal cord compression or axial pain unresponsive to conservative treatment will be randomized to spinal instrumentation with titanium or Carbon Fiber-reinforced implants. Primary endpoint is comparison of the dosimetric influence of uncertainties in the Hounsfield Units between both groups. Secondary endpoints are local tumor control at 12 months follow up, improvement of the VAS for pain score, improvement of SF-36 score improvement of the EuroQOL 5D index.

### CONCLUSION:

Aim of this study is to assess the added value of using radiolucent Carbon Fiber reinforced implants instead of standard titanium implants in patients with spinal metastases.

## CERVICAL SPINE SURGERY FOR SPONDYLOTIC MYELOPATHY: VENTRAL VS. DORSAL APPROACH

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### INTRODUCTION:

Cervical spine surgery is a common procedure used to treat cervical spondylitic myelopathy. We have previously demonstrated that the ventral approach is safer, but that group was operated on significantly lesser number of levels. The current study examines which approach is safer for three or more levels treated for cervical myelopathy.

### METHODS:

A retrospective evaluation of data and images of patients who underwent either a Ventral or Dorsal approach surgery to treat Myelopathy involving three or more levels. The study was conducted at the Sheba Medical Center Neurosurgery department between 2011 and 2016. We compared risk factors, number of levels treated, post-operative complications, revision of surgeries and mortality rates between the two groups.

### RESULTS:

Of 675 cervical surgeries performed during the study years, 406 patients underwent cervical spine surgery to treat myelopathy. Of these, 216 patients cleared the inclusion criteria of three or more levels (156 ventral vs. 60 dorsal). The mean age of the ventral approach group was lower by 5 years. The dorsal approach patients had higher percentage of co-morbidities including Diabetes Mellitus, IHD and HTN. Both surgical and anesthesia durations were significantly shorter in the ventral approach group and the estimated blood loss was significantly lower for this group as well (91cc vs. 161cc). The length of stay was

significantly longer for the dorsal approach. The ventral approach patients suffered higher rates of respiratory complications, while the dorsal approach patients had significantly higher rates of respiratory, urinary tract, deep wound infections and meningitis. Revisions of wound were significantly higher for the dorsal approach patients. Major and minor complication rates were higher for the dorsal approach group (13.3% vs. 7.7% & 3.3% vs. 1.9% respectively). The total rate of patients who experienced complications was lower for the ventral approach group (14.8% vs. 6.4%).

### CONCLUSIONS:

This study demonstrates that the ventral approach was associated with lower complication rates, and especially, significantly lower rates of infection related complications

## CHIARI MALFORMATION TREATMENT IN PEDIATRIC SCOLIOSIS

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### BACKGROUND:

Paediatric scoliosis and Chiari malformation type 1 (CM1) have been reported to be associated with each other. Scoliosis curvature can be found among paediatric patients operated for CM1 and curve development have been related to it. Indication for PFD in the presence of scoliosis are usually symptomatic CM1 and/or a scoliosis correction surgery planned to reduce the risk cord injury and neurological complications. We report a cohort of patients operated for posterior fossa decompression (PFD) by a single surgeon all had scoliosis with an average follow up of more than 2 years.

### METHODS:

A retrospective cohort of patients with CM1 paediatric scoliosis.

### RESULTS:

From January 2011 to December 2018 we identified 15 patients with CM1 and scoliosis, (average age 12.7 years), all had scoliosis (11 AIS, 2 congenital/EOS, 2 Syndromic). Eleven underwent posterior fossa decompression, 10 of them were symptomatic (mostly headaches), 5 were asymptomatic of them 4 were selected for conservative treatment. Average follow up time post-surgery was 26.2 months. All improved post operatively significantly, clinically as well as MRI showing reduction in the syrinx size. We identified one post-operative superficial infection treated successfully with oral antibiotics. Scoliosis surgery was performed in 7 cases, for 6, PFD was done prior to the scoliosis correction (All AIS cases). All but one case had posterior only correction. Only one case of scoliosis was operated in the presence of Chiari malformation treated conservatively. This

case was stable, asymptomatic and had an MRI demonstrating non-descending tonsils. Four cases more were scheduled for PSF and await surgery while 3 cases (2 congenital, one syndromic) were selected for conservative management. One case (Syndromic) was lost for follow up. Scoliosis curves were measured before the PFD, just before the scoliosis correction and also post-surgery. Average time between PFD and PSF was 11 months. Post PFD, MT curves were increasing by 14.5° on average (42- -3.5) and the lumbar curve by 11° (28- -10) with just one case that showed improvement in his curve although not significantly to avoid surgery (MT >50°). No case has reversed the need for scoliosis correction post PFD. Our average pre-operative curves were MT=76°, L= 50.6° and the post-operative were MT=30.4°, L= 24°. None of the cases had intraoperative monitoring alerts nor post-surgery neurological complications.

### CONCLUSION:

CM-1 and scoliosis can be found in some cases. Indication for surgery for CM1 are symptoms and the need to decrease the risk to the cord in the scoliosis correction procedure. We found that PFD was a safe procedure which allowed a following scoliosis correction with no monitoring alerts nor neurological complications.



## NEUROLOGICALLY INTACT PATIENTS WITH OCCIPITOCERVICAL DISLOCATION: A CASE SERIES

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### BACKGROUND:

Occipitocervical dislocation is considered to be a rare injury with aggravating clinical outcome, attributed to brainstem injury, respiratory failure and neurogenic shock. Early previous reports have estimated the mortality in such injuries to be as high as 90%, with a high rate of mortality occurring at the pre-hospital phase. In addition, severe neurological deficit is present at ~80% of cases. During that last year, we have treated 3 consecutive cases of neurologically intact patients who survived occipitocervical dislocation. The purpose of this report is to describe their radiological, clinical and surgical characteristics.

### METHODS:

We retrospectively evaluated the radiological characteristics of all cases (Harris classification, Traynelis classification, Occipital condyle to C1 interval measurements, Power's ratio, X-line method). Initial clinical presentation and course of hospitalization were reviewed with an emphasis on multidisciplinary approach. Surgical considerations were evaluated, and review of intraoperative imaging was performed.

### RESULTS:

We identified 3 consecutive cases of occipitocervical dislocation during 2018. Two patients were neurologically intact at presentation. All patients were hemodynamically unstable at presentation and suffered from additional significant injuries requiring emergent operation prior to occipitocervical fusion. All patients were treated surgically for occipitocervical fusion once

stabilized. By the time of latest follow up, all patients were neurologically intact.

### DISCUSSION:

Although uncommon, occipitocervical dislocation should be suspected in any high-velocity injury and screened for radiographically. Despite its reputation as a fatal injury, our case series demonstrate that an early diagnosis, immediate spinal immobilization and subsequent occipitocervical fusion together with a multidisciplinary approach allow for a favorable outcome in these complex patients.

## CERVICAL SPONDYLOSIS-SURGICAL STRATEGY

Z. J. BRODZINSKI

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### INTRODUCTION:

A variety of anterior, posterior, and combined approaches exist to decompress the spinal cord, restore sagittal alignment, and avoid kyphosis, but the optimal surgical strategy remains controversial. I compared the anterior and posterior approach used to treat multilevel cervical spondylotic myelopathy (CSM), focusing on sagittal alignment and clinical outcome.

### METHODS:

I studied 48 patients with CSM who underwent multilevel decompressive surgery using an anterior or posterior approach with instrumentation (24 patients in each group), depending on preoperative sagittal alignment and direction of spinal cord compression. In the anterior group, a 1-2-level corpectomy was followed by placement of an expandable titanium cage. In the posterior group, a multilevel laminectomy and posterior instrumentation using lateral mass screws was performed. Postoperative radiography and clinical examinations were performed after 1 week, 12 months, and at last follow-up (range 15-112 months, mean 33 months).

### RESULTS:

The radiological outcome was evaluated using measurement of the cervical and segmental lordosis. Both the posterior multilevel laminectomy (with instrumentation) and the anterior cervical corpectomy (with instrumentation) improved clinical outcome. The anterior group had a significantly lower preoperative cervical and segmental lordosis than the posterior group. The cervical and segmental lordosis improved in the anterior group by 8.8 and 6.2 degrees, respectively, and declined in the posterior group by 6.5 and 3.8 degrees, respectively. The loss of

correction was higher in the anterior than in the posterior group (-2.0 vs -0.7 degrees, respectively) at last follow-up.

### CONCLUSIONS:

These results demonstrate that both anterior and posterior decompression (with instrumentation) are effective procedures to improve the neurological outcome of patients with CSM. However, sagittal alignment may be better restored using the anterior approach, but harbors a higher rate of loss of correction. In cases involving a preexisting cervical kyphosis, an anterior or combined approach might be necessary to restore the lordotic cervical alignment.

# APPLICATION OF NAVIGATION COMBINED WITH O-ARM IN COMPLICATED SPINAL CASES

M. RADEK, M. WOJDYN, M. BŁASZCZYK, J. JANKOWSKI

## INTRODUCTION:

Navigation in spinal surgery is nowadays perceived and evaluated mainly as a tool supporting the implantation of screws.

The authors present their own experience from the use of navigation coupled with the O-Arm device in the treatment of complicated spinal pathologies.

Navigation proved to be useful not only for implantation but also significantly facilitated the implementation of the planned operational access. The assessment of the spinal cord decompression, and intraoperative control of the operation stages were carried out based on the indications of navigation connected to the O-Arm.

## MATERIAL AND METHODS:

The authors present 5 cases operated on in the Department of Neurosurgery, Surgery of Spine and Peripheral Nerves of WAM Hospital of Medical University of Lodz, Poland.

All patients were operated using navigation with O-Arm device (Medtronic).

Case I concerns a female with a cranio - cervical deformity with advanced cervical myelopathy, where access to pathology was obtained by splitting the mandible.

3D imaging with the use of O-Arm allowed for the intraoperative assessment of the spinal cord decompression, safe application and early postoperative assessment of the positioning of the implants.

Cases II and III are complicated spinal injuries of the cervical - thoracic junction. Both patients required decompression and 360 degrees stabilization. The navigation was used to implant the screws and O-Arm enabled control of the decompression as well as positioning of the screws and vertebra prosthesis.

Case IV shows a kyphotic deformity in the thoracic spine previously operated unsuccessfully with short-term posterior stabilization. The reoperation was performed from the posterior access by laminectomy, costotransversectomy, vertebrectomy and stabilization of the anterior column with the expandable cage and the rear column with pedicle screws. Thanks to navigation it was possible to plan access, assess the spinal cord decompression, implant placement and achieve immediate post-operative control.

The V case presents the critical compression of the thoracic spinal cord by the strongly calcified lesion removed from the trans - thoracic access. The use of navigation allowed to determine the access trajectory and to assess the extent of spinal cord decompression.

## RESULTS:

In all cases, the purpose of the operation was achieved. In two cases, the operations were divided into two separate stages, while the others were held simultaneously. Wound healing went well. Neurological deficits were not observed, and after rehabilitation an improvement was achieved in relation to the preoperative state.

## CONCLUSIONS:

1. Navigation combined with O-Arm is invaluable help in planning operations and intraoperative assessment of the scope of decompression of nervous system structures.

2. The use of navigation and O-Arm undoubtedly pushes the limits of our surgical capabilities in the treatment of various complicated pathologies.

3. Thanks to the use of O-Arm, the placement of implants and decompression of neural structures can be immediately checked before the end of surgery.

## LONG-TERM OUTCOMES OF MINIMALLY INVASIVE UNILATERAL APPROACH FOR BILATERAL DECOMPRESSION OF LUMBAR SPINAL STENOSIS

G.J. REGEV, R. ANKORI, M. KHASHAN, R. LADOR, K. SALAME, L. MANGEL, Z. LIDAR

### STUDY DESIGN:

A retrospective review of medical records.

### OBJECTIVE:

To evaluate long-term outcomes and the risk of repeated surgeries following MIS decompression of lumbar spinal stenosis.

### SUMMARY OF BACKGROUND DATA:

Prior studies have documented good short-term clinical results of minimally invasive spinal (MIS) decompression along with a low complication rate, but there is little information on its long-term clinical outcomes.

### METHODS:

Consecutive patients who underwent MIS lumbar decompression for spinal stenosis between 2009 and 2013 at our institute were reviewed. Outcomes assessment was performed via a telephone survey. We recorded current back and leg pain, current pain management treatment, self-rating of surgical success, and the rate of additional spinal surgeries.

### RESULTS:

Fifty patients were available for review with an average follow up of 6.2 years. Twelve patients (24%) reported no leg or back pain. Twenty four patients (48%) reported mild to moderate pain

and severe pain was reported by 14 patients (28%). Only 16% of the patient used narcotic pain medication and another 16% were treated with at least one epidural nerve block. Additional lumbar spine surgery was performed in 12 patients (24%), 3 within a short post-operative period and 9 after at least 6 months post-surgery. Surgery due to insufficient decompression or restenosis of the operated spinal segment was performed in 4 patients (8%) and the remaining patient underwent an adjacent level surgery. None of the patients underwent spinal instrumentation or fusion surgery during the follow up period.

### CONCLUSION:

Long term clinical outcome following minimally invasive spinal (MIS) decompression for lumbar spinal stenosis showed a favorable maintenance of improvement in symptoms. Long-term follow up showed a rate of 18% of surgical re-intervention at the lumbar spine level; most of them due to symptomatic adjacent-level stenosis and did not required spinal fusion.

## ROBOTIC CLOSED VS OPEN FIXATION FOR TRAUMATIC SPINE INJURIES A CASE CONTROL STUDY

A. SATANOVSKY, H. SHEAR-YESHUV, Y. GELLMAN, L. KAPLAN, J. SCHROEDER

### SCIENTIFIC BACKGROUND:

Unstable traumatic fractures of the thoracolumbar spine require surgical stabilization. The necessity to restore stability and sagittal balance after trauma is crucial for early patient mobilization and long-term spinal function. The traditional fixation method is open fixation allowing reduction and stabilization of the broken segments (OF). In recent years, several studies have indicated percutaneous fixation (PF) for traumatic thoracolumbar fractures is advantageous in aspects of infection rate, blood loss and hospitalization time. The challenge of the PF is that it is radiation heavy and requires a steep learning curve. Previous work showed that using robotic assisted pedicle screws is safe and is low on radiation. In this study, we compare our results for PF in open versus percutaneous fixation for traumatic thoracolumbar fractures in a single trauma center.

### METHODS:

All patients with traumatic vertebral fractures, who underwent fixation in a level one trauma center between 2006-2018 were enrolled. Retrospective data of demographics (age, sex, comorbidities), mechanism of injury, AO classification, level of injury, level and method of fixation, laboratory results (hemoglobin and hematocrite before and after surgery), requirement of blood products, length of hospital stay, discharge destination, change in COBB angle and complications were collected.

### RESULTS:

During the study period 88 patients who underwent fixation, were matched 44 for each group. Demographic data (age, sex, mechanism of injury) similar ( $P>0.05$ ). 29/44 in each group were male, mean age 34 in OF and 39 in PF, with leading mechanisms of injury of MVA and fall from height.

More levels of fixation were recorded in OF (4.57 levels and 3.7 in OF and PF accordingly,  $P<0.01$ ). operative parameters were significantly better in PF group in theatre time, anesthesia time, requirement of blood products ( $P<0.0001$ ). No difference was detected in pre and post-operative HB levels.

Post-operative parameters were also favorable to percutaneous group in hospital stay of 9.7 days in PF and 18.27 in OF. Normal neurological status was recorded in 40/44 patients in CF and only 27/44 in OF. Requirement of blood products, surgery and anesthesia time and hospitalization duration was significantly better in PF group. More complications were recorded in OF group (PE, wound infection, pneumonia, adverse reaction to FFP). Change in COBB angle was also higher in PF group (12.97 vs 6.76 degrees in OF)

### DISCUSSION:

The use of CF gradually became the preferred method over the last few years for surgical stabilization of thoracolumbar fractures. The main concern while using CF is the surgeon's learning curve which is included in this study. Still, overall results of CF are superior to OF. Cases requiring decompression were treated with OF.

### CONCLUSION:

We have found that robotic assisted percutaneous fixation for traumatic thoracolumbar fractures is superior to open fixation in surgical parameters, hospital stay and surgical results.

In our experience, PSF with robotic assisted percutaneous fixation is the preferred surgical method for treatment of unstable traumatic thoracolumbar fractures.

## DEGENERATIVE SPONDYLOLISTHESIS DOES NOT COMPROMISE OUTCOME IN PATIENTS WITH SPINAL STENOSIS UNDERGOING MINIMALLY INVASIVE DECOMPRESSION WITHOUT FUSION.

M. KHASHAN, G. REGEV, K. SALAME, D. OFIR, A. LICH, Z. LIDAR

### OBJECTIVES:

Recent evidence supports decompression with no fusion for the treatment of patients with low grade spondylolisthesis and spinal stenosis. In these patients, MIS decompression is particularly appealing option as it results in reduced soft tissue injury compared to open decompression. In this study, we sought to compare complication rates and outcomes after MIS surgery decompression in patient with low grade spondylolisthesis with patients without spondylolisthesis undergoing similar procedures for similar indications.

### METHODS:

We evaluated medical records of 283 consecutive patients who underwent minimally invasive lumbar decompression between November 2013 and July 2017 at our institute. S group contained 93 patients with degenerative spondylolisthesis and the control group comprised 190 patients without spondylolisthesis. Medical history, American Society of Anesthesiologists ASA score, perioperative mortality, complications, and revision surgery rates were analyzed. Patient outcomes included the Oswestry Disability Index (ODI)

### RESULTS:

The two groups were comparable in term of age, gender, ASA score. The prevalence of hypertension (p-value<0.00) and cardiovascular (p-value<0.018) comorbidities were significantly higher in S group . Length of stay was significantly in higher in the S group (2 vs 3.2 days, p-value<0.001). The two groups were comparable in terms of post-operative complications and revision surgeries. . No statistically significant difference was found in complications rate or in the surgical revision rate between the groups. Both groups showed significant improvement in their ODI scores 12 months following surgery.

### CONCLUSIONS:

Our results indicate that minimally invasive decompressive surgery is a safe and effective treatment for patients with low grade spondylolisthesis. These procedure 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.

improved fixation, perhaps decreasing hardware failure.

## ONE STEP SCREWS: INITIAL EXPERIENCE REPORT

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### INTRODUCTION:

Minimally invasive spine surgery (MIS) is continuously evolving, generating new equipment aiming to improve outcomes. Recently, one-step MIS screws were recently introduced.

### METHODS:

We retrospectively reviewed our one-step screws for MIS TLIF cases and describe our experience.

### RESULTS:

Five cases of MIS-TLIF were performed utilizing one-step navigated screws screws (ProMIS VersaLunk; Premia spine, Israel). In all cases no technical incidents were recorded and screw insertion was uneventful and quick. Post insertion O-arm scan demonstrated ideal placement in all cases.

### CONCLUSIONS:

Although MIS-TLIF was first described over 10 years ago, it is still evolving as surgical technology improves. Adoption of advance technologies can improve surgical accuracy and might improve outcomes.

## THE EFFECT OF BODY MASS INDEX ON THE OUTCOME OF MINIMALLY INVASIVE LUMBAR DECOMPRESSION

M. KHASHAN, G. REGEV, K. SALAME, D. OFIR, A. LICH, R. LADOR, Z. LIDAR

### OBJECTIVES:

Minimally invasive lumbar(MIS) decompression reduces soft tissue injury and lower infection rates compared to open decompression. Therefore MIS decompression may be particularly suitable for obese patients that are predisposed to higher wound complications. The purpose of this study is to compare complication rates and outcomes of MIS decompression in obese patients and a cohort of non-obese patients undergoing similar procedures.

### METHODS:

The medical records of 283 consecutive patients that underwent minimally invasive lumbar decompression between November 2013 and July 2017 at our institute were reviewed. The study group comprised 67 patients with BMI equal or above 30 and the control group contained 216 patients with BMI lower than 30. Past medical history, the American Society of Anesthesiologists score, perioperative mortality, complication and revision surgeries rates were analyzed. the Oswestry Disability Index (ODI) was used to evaluate functional outcome

### RESULTS:

The mean age was  $58 \pm 18$  years in the study group and  $64.5 \pm 12.5$  years in the control group ( $p$ -value<0.001). In the study group we found higher prevalence of hypertension ( $p$ -value<0.001), diabetes ( $p$ -value<0.001) and pulmonary ( $p$ -value=0.028) comorbidities. Length of stay was significantly higher in the study group (2.88 vs 2.28 days,  $p$ -value<0.012). Both groups were statistically equivalent in their postoperative complications and revision rates.

Both groups showed significant improvement in their functional outcome as measured by ODI scores following surgery.

### CONCLUSIONS:

Our results indicate that minimally invasive decompressive surgery is an effective choice for obese patients. In spite of higher comorbidity prevalence and longer hospital stay, the surgical outcome in obese patients was not inferior to that of the control group. Future prospective studies are necessary to validate the specific advantages of the minimally invasive techniques in this patient population.

## SPINAL RADIOSURGERY (SRS) FOR BENIGN NERVE SHEATH TUMORS

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### INTRODUCTION:

Peripheral nerve sheath tumors (PNST) are comprised mainly of schwannomas and neurofibromas. Fifteen percent begin their growth in the dorsal nerve and present intraforaminally. Traditionally, these tumors were treated surgically but the evolution of SRS enables non-surgical solutions for these lesions in cases of difficult surgical approach, patients' co-morbidities, residual or recurrence.

### METHODS:

Patients diagnosed with PNST 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:

15 lesions were treated in 14 sessions. Overall local control rate was 87%. All lesions were considered benign PNST; in a single case demonstrating rapid growth, surgery was performed with malignant PNST histology. Lesions location varied from the cervical, thoracic, lumbar and sacral. 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.

### CONCLUSIONS:

SRS is non-invasive treatment of spine tumors. Since this treatment modality uses accurate high dose radiation, it is a valuable tool for indicated benign tumors.

## THREE-DIMENSIONAL PRINTING TECHNOLOGY IN COMPLEX SPINE SURGERIES

G.J. REGEV, R. LADOR, M. KHASHAN, K. SALAME, L. MANGEL, Z. LIDAR

### STUDY DESIGN:

A retrospective review of medical records.

### OBJECTIVE:

Three-dimensional printing technology was used in complex spine surgical procedures.

### SUMMARY OF BACKGROUND DATA:

Medical implications of 3D printing technology have evolved and are increasingly used in recent years. Surgical spine oncology involves at times complex resection using surgical approach that is limited by adjacent important anatomical structures. Furthermore, spinal reconstruction aiming to restore function and stability of the spine is usually required. As high general complication rate including hardware failure is reported in these cases,

A careful pre-operative planning and optimized fixation techniques should be used while planning the surgical treatment.

The development of 3D printing technology allows the treating surgical team to improve their pre-operative planning, practice and explore various surgical approaches, and design customized surgical tools and patient specific implants

### METHODS:

Between 2015-2018, all complex spine oncological cases were evaluated and assessed for the possible benefit of use of 3D printing technology. For these cases, a high resolution thin sliced CT and contrast MRI were obtained. Added

contrast CT angiography was done if major blood vessel was in proximity.

A computerized integrated 3D model was created. Based on the planned surgical procedure considering the various surgical steps, a customized 3D model was planned and printed, and in select cases a 3D custom made implant was designed and printed.

For every case that required a customized 3D printed implant, several options were made in different percentage, height and angulation of the implants, these were accompanied by matching trials.

### RESULTS:

Between 2015-2017, a total of 7 cases were selected for the use of a 3D printing technology. For all, a custom-made model was created. In 3 of these cases a customized 3D printed implant was used. Special customized intraoperative instruments (JIGs) were made for 2 cases, and a simulated surgical approach was performed in 5 cases. In 2 cases, pre-bent rods were made based on the model created and were used in surgery later on.

### CONCLUSIONS:

For complex spine oncology cases the use of 3D printing allowed better pre-operative planning, simplified the operative procedure, and enabled improved fixation, perhaps decreasing hardware failure.

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# CERVICAL SPINE LARGE ARACHNOID CYST.

M. SHEMA, R. DJABBAROV, L. EVGENY

## CASE:

Case: A 51-year-old man, began suffering from shoulder and neck pain. MRI demonstrated a large epidural collection from C2 to D1 vertebrae suitable with meningeal cyst. After considering all complex factors, surgical treatment was not advised.

## CONCLUSION:

Spinal cervical meningeal cyst is a relatively rare condition. Most literature demonstrate symptomatic cases treated surgically. Asymptomatic big lesions have never been described thus patient management and treatment is very equivocal.

## INTRODUCTION:

Cystic lesions in spinal canal are relatively rare. Among them, the arachnoid derived lesions are the most common. Arachnoid cyst is benign accumulation of cerebrospinal fluid (CSF) within an extradural, intradural or perineural pouch/diverticula/cavitation. (Karim, Davis, Kобрine, Ph, & Rizzol, 1988), suggested classification based on surgical and histopathological findings- extradural meningeal cysts without spinal nerve root fibers (Type I), extradural meningeal cysts with spinal nerve fibers (Type II), and intradural meningeal cysts (Type III). (Wang, 2014) suggested another 5 types classification based on magnetic resonance imaging (MRI)- intramedullary, subdural extramedullary, subdural/epidural, intraspinal epidural, or intraspinal/extraspinal. This classification aimed to improve treatment selection.

The etiology of spinal arachnoid cysts is controversial. Congenital, idiopathic, acquired secondary to bleeding, inflammation, infection

or puncture-related traumas, familial tendency or associated congenital anomalies (bergland, 1968; Liu, Ho, Lai, Tseng, & Yip, 2005; Robinow, 1970; Schwartz, Mark, & H, 1980) Have all been suggested. A one-way valve theory tries to explain the progression and size changes of some congenital lesions (Khosla & li, 2002). it is documented that congenital asymptomatic cysts could enlarge due to trauma and become symptomatic (Kim, Bak, Kim, & Kim, 1999). The clinical course of cervical lesions may vary between asymptomatic incidentally diagnosed cases (Teng & Rudner, 1960). to severe myelopathy (Osenbach, Godersky, Traynelis, & Schelper, 1992).

According to review of literature done by (bergland, 1968), the anatomic location of arachnoid cysts may be at all spinal axis levels but most frequently documented at thoracic region (65%), followed by lumbar and lumbosacral (13%), the thoracolumbar region (12%), sacral (6.6%) and less frequent, the cervical region (3.3%). Most lesions arise in a nerve root and are either lateral, posterior-lateral or posterior.

In most published cases, symptomatic lesions have been treated surgically by different methods. Laminectomy or laminoplasty with cyst fenestration with no/parial/total resection w or w/o closure or ligation of dural defect. All methods show overall good results. One recent single center study concludes that for symptomatic patient the treatment of choice is surgical exploration with complete resection (Fam et al., 2018). Treatment of asymptomatic lesions is equivocal.

In those rare lesions mentioned above, an extensive cervical lesion in the clinical set up of shoulder pain alone, is an unusual site. In this case report we aim to describe this rare condition.

The patient was informed that data concerning the case would be submitted for publication, and he provided consent.

## DISCUSSION:

Cervical meningeal cysts are rare, and in this rare condition our patient cyst character and clinical presentation are unique. due to imaging findings such as vertebral scalloping (group picture 3), we believe the cyst is chronic- congenital or acquired due to childhood trauma. Interestingly, (Bassiouni et al., 2004) showed that, as in our case, patients with ventral cysts had more craniocaudal extension and intracystic septae than dorsal cysts, thus they raised the hypothesis that the pathogenesis of ventral cysts include adhesive arachnoiditis due to traumatic subarachnoid hemorrhage (Bassiouni et al., 2004). Our rare case led us to face few basic dilemmas regarding the management of our patient. First, how to classify the cyst. NABOR classification is relevant only when surgery procedure enables histologic sampling. QI JI MRI-based stratification system relevant to classify anatomic layer involved but completely neglect the anatomic level distribution of the cyst or clinical presentation. Thus, we couldn't find any suitable classification to guide us with prognosis or treatment of our patient condition. This leading us to the second dilemma, surgical versus conservative treatment. Most studies published till now presented a surgical treatment. Surgical treatment offered to symptomatic patients with neurologic gradual deterioration. in our case clinical symptoms were mainly shoulder pain. Is this such life quality distraction that enough to indicate surgery? Is our surgery will resolve the pain or only prevent deterioration? Is our cyst being incidental finding or the cause to the shoulder muscle atrophy? it's hard to estimate the contribution of each factor separately. On one hand, such atrophy

w/o extensive rotator cuff tears are unexpected. Furthermore, the nerves go through the cyst thus might compress it. With such atrophy minor trauma like usual heavy lifting can cause pain. On the other hand, we have no explanation to the fact that some muscles with same source innervation does not have atrophy for example the anterior part of the deltoid and infraspinatus are intact (group picture 1). the cyst might consider incidental finding as occur more often these days due to the higher availability of MRI. The pain may be contributed to the shoulder only. If surgery solution preferred, it derived the question which procedure? giant cyst that dominate few spinal axis levels will require large surgical procedure for decompression. MRI did not show one dural defect that can be ligate or closed. And another question regarding which surgical approach should be elected- anterior versus posterior. In our rare case as opposed to most cases published, the cyst is mostly anterior. large surgical procedure might cause several complications. Specific complications published before include CSF fistula or leakage (pseudomeningocele), laminectomy in many segments negatively influence spinal column stability and may cause anterior subluxation or kyphosis, cyst recurrence. As long as the etiology is not well established its impossible to know that the cyst will not recur.

To conclude, in our case, after considering the clinical presentation, the imagine findings, the procedure options and possible complication we decided on conservative management. We believe that a good classification that predict prognosis and assist with management picking mast take into account all parameters above. Further studies should be done in order to achieve this goal. We thought it's important to introduce to literature such unique case that arises questions that must be thought of when encountering meningeal cysts.



## SPINAL MENINGIOMAS - RISKS AND POTENTIAL OF AN INCREASING AGE AT THE TIME OF SURGERY

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### BACKGROUND:

Although the majority of surgeries for spinal meningiomas are performed in geriatric patients, age-related analyzes of preoperative symptoms and functional outcome are sparse.

### METHODS:

Clinical, neuropathological and radiological data of 88 patients who underwent surgery for spinal meningiomas were reviewed. Correlations between the patients' age and preoperative symptoms as well as functional outcome were investigated.

Results: 14 males (16%) and 74 females (84%) with a median age of 67 years were included. Age at the time of surgery was independent of the tumor location and volume, intra-/extradural tumor location, spinal cord compression or signal change on T2-weighted MRI ( $p > 0.05$ , each). Preoperative McCormick score ( $p = 0.001$ ), motor ( $p = 0.005$ ) and sensory ( $p = 0.025$ ) deficits and incontinence ( $p = 0.010$ ) increased, while frequency of radicular pain decreased with increasing age ( $p = 0.020$ ). Multivariate analyses confirmed an increasing risk of motor (OR: 1.05,  $p = 0.017$ ) and, with borderline significance, of sensory deficits (OR: 1.04, 95%CI 1.00-1.10;  $p = 0.056$ ) with rising age. Simpson grades I, II, III and IV were achieved in 12 (14%), 54 (64%), 14 (17%) and 4 (5%) individuals, respectively. Only 3 of 12 patients (25%) with perioperative complications were younger than 65 years. Rising age was associated with improvement of motor ( $p = 0.006$ ) and sensory deficits ( $p = 0.045$ ). In multivariate analyzes,

probability of improvement of preoperative motor weakness (OR = 1.05,  $p = 0.031$ ) and sensory deficits (OR = 1.07,  $p = 0.014$ ) increased with rising age.

Conclusion: Despite more frequent preoperative neurological deficits, older patients with spinal meningiomas recover most noticeably after surgery. However, stratification of the medical condition is urgent to reduce complications.

## CHORDOMA IN THE THORACOLUMBAR SPINE

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### INTRODUCTION:

Chordomas are rare tumors that arise from embryonic notochordal remnants along the length of the neuraxis at developmentally active sites. They constitute less than 1% of CNS tumors and rarely occur in extra axial locations. Chordoma in the thoracic spine is considered rare and compose 15% of all chordomas.

### METHODS:

a case of a 42 year old healthy male patient with a radiculating low back pain with an onset of 4 weeks prior to his examination. The patient complained about paresthesias, unstable walk patterns, difficulties in urination however no neurologic deficits were reported. On CT and MRI, a lesion was detected occupying soft tissue with pressure on the thecal sac at D6-D9 level. The lesion on the imaging was irregular and diagnosed as a dermoid lesion. After primary debulking and fixation, the pathological biopsy revealed a chordoma. The patient had a second surgery to change the primary fixators to carbon made rods prior to radiotherapy treatment.

### DISCUSSION:

In the case presented the diagnosis for chordoma in the thoracic region was not decisive according to imaging. Based on the pathological results the management was changed and the patient had underwent a revision surgery with carbon rods in preparation for radiotherapy. The patient later was received a proton beam therapy with following MRI scans. 1 year after the surgery and

radiotherapy no signs for lesion or clinical signs for thecal sac involvement.

### CONCLUSION:

When a suspicion of an irregular space occupying lesion arises always act as if malignancy is present. Gross debulking of the lesion and preparation of the patient for following treatment coordinated with the oncological and pathological team as advised.

# PREGNANT PATIENT WITH AGGRESSIVE THORACIC VERTEBRAL HEMANGIOMA CAUSING LOWER LIMBS SPASTIC PARESIS

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## INTRODUCTION:

Vertebral hemangiomas are common tumors that are benign and generally asymptomatic. Occasionally these lesions can exhibit aggressive features such as bony expansion and erosion into the epidural space resulting in neurological symptoms. Surgery is often recommended in these cases, especially if symptoms are severe or rapidly progressive. One of the greatest risks of surgical intervention is uncontrollable hemorrhage.

## SCIENTIFIC BACKGROUND:

In rare circumstances like during pregnancy, these lesions may increase in size and produce symptoms in the form of local bony pain, radicular pain or compressive myelopathy. There are few published case reports in literature regarding pregnancy related symptomatic vertebral hemangiomas with marked epidural component and only ten cases have been reported which were surgically managed during pregnancy.

## CASE REPORT:

A 24 year old generally healthy pregnant lady (gestational age 36 weeks ), 2 weeks prior to her admission complained of mid thoracic back pain, in the last few days progressive weakness in her legs and sensory deficit (Incomplete Spinal cord injury-ASIA C).

She underwent Thoracic spine- CT and subsequent MRI, which revealed an aggressive vertebral hemangioma centered within T4 vertebral body, with bony and soft tissue extension into the spinal canal and posterior elements with signs of cord compression.

Before the spine surgery, our patient underwent urgent caesarian section, followed by pre-surgical embolization of the tumor to minimize bleeding during the operation. During the angiogram, a hyper vascular mass exceeding the vertebral body limits was observed at T4 vertebral body, and following the embolization, good bilateral devascularization was achieved.

Then she underwent posterior decompression (tumor mass resection, total T4 corpectomy and laminectomy), anterior column reconstruction with cage & bone graft, and posterior fusion (T3-T5).

During the spine surgery, she received 5 units of packed RBC.

After surgery, progressive improvement in her neurological status.

She was discharged to rehabilitation. At 5 months follow up, she can walk on her both legs without assisted devices -improved to ASIA E status and her infant in good general health.

Histopathology confirmed the lesion to be a hemangioma.

## CONCLUSION:

Despite being the most common tumor of the spine, vertebral hemangioma is rarely symptomatic in adults. Pregnancy related expansion of the lesion and extra-osseous extension may lead to severe neurological deficit. They should be considered as differential diagnosis. Aggressive vertebral body hemangiomas can have epidural extension and cause paraparesis due to compressive myelopathy, which may result in permanent paraplegia and permanent disability if not managed properly. The clinical symptoms of the patient can be relieved by arterial embolization followed by surgical decompression.

## INTRAMEDULLARY TUMORS: THE ROLE OF INTRAOPERATIVE MONITORING

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### BACKGROUND:

Intramedullary spinal cord tumors (IMSCT) are rare neoplasms that pose unique challenges throughout their clinical management. Vague presenting symptoms often result in delayed diagnosis, followed by surgical resection within a dense neuronal environment that may inflict aggravating results with limited recovery. The purpose of this analysis is to describe the experience gained in our institute, focusing on the impact of intra-operative neuromonitoring fluctuations on the surgical course and decision making process, and to evaluate its reliability in predicting neurological outcome and post-operative complications.

### METHODS:

This is a retrospective analysis of all patients who were operated for the resection or biopsy sampling of IMSCT between 2011 and 2019 at the department of neurosurgery in Sheba Medical Center, Ramat-Gan, Israel. Patients in all age groups were included in the study. Pre-operative data was acquired by reviewing records of admission and outpatient files. Radiographic evaluation was based on all available imaging. Intra-operative neuromonitoring (IONM) fluctuations were noted by reviewing operative reports.

### RESULTS:

Overall, 34 patients were included in the study. Mean post-operative follow-up period was 17.5 months. Mean age at diagnosis was 45 years. The cohort included 3 pediatric cases. Mean latency to diagnosis was 9.7 months. The most common pathology was Ependymoma (20%), followed by Astrocytoma (14%) and Cavernoma

(12%). Extent of resection was complete in 50% of cases. A substantial drop in somatosensory or motor evoked potentials was witnessed in 44% of operations. D-wave monitoring was employed in 34% of patients. Decreased potentials were witnessed in 2 cases only. There was no correlation between the drop in potentials and clinical outcome. Major post-operative complication rate was 50%. No significant prognostic factors or predictors for complications were found.

### DISCUSSION:

Although challenging, IMSCT can be treated with favorable outcomes in all spinal levels. Our results indicate that IONM does not correlate reliably with long-term neurological outcome and complication rates, nor does it facilitate the decision making process during surgery. Further investigation should be performed for the re-evaluation and the improvement of IONM in these complex cases.

## MATCHING ACTUAL TREATMENT WITH PATIENT ADMINISTRATION-ROUTE-PREFERENCE IMPROVES ANALGESIC RESPONSE AMONG ACUTE-LOW-BACK-PAIN PATIENTS, POSSIBLY THROUGH PLACEBO MECHANISMS

A. SHANI, M. GRANOT, R. BENNIDOR, G. MOCHALOV, N. RAHAMIMOV

### BACKGROUND:

Accommodating a patient's treatment preference promotes greater responsiveness and better clinical outcomes. This may be attributed to cognitive processes, beliefs, learning and expectations that induce an analgesic placebo-response. The effect of administration-route-preference (ARP) on the individual analgesic response has not been extensively examined to date. The aim of this study was to explore whether ARP matched treatment, i.e. individualized intramuscular or oral analgesic administration according to a patient's choice, will increase the analgesic effect.

### METHODS:

38 patients with acute-low-back-pain (ALBP) presenting at the emergency room, reported their ARP for analgesics, and, regardless of their preference, were randomly assigned to receive either PO or IM diclofenac. Pain intensity was measured before and during the first hour after drug administration.

### RESULTS:

Both groups receiving PO or IM administration reported similar severe initial pain, (VAS  $8.63 \pm 1.5$  and  $8.74 \pm 1.6$  respectively). While both PO and

IM groups reported a similar magnitude of pain reduction, patients who received the drug in their preferred route (oral treatment or injection) had a significantly greater reduction in pain levels ( $4.05 \pm 2.8$ ) compared with patients who received the non-preferred route ( $2.08 \pm 1.8$ )  $p < 0.05$ .

### CONCLUSIONS:

These findings support our hypothesis that individualized ARP matching treatment in ALBP improves therapeutic outcomes.

We suggest that in addition to the direct pharmacological effect of analgesics, ARP is linked to previous experience, belief in the efficacy of the treatment given, and expectation of pain relief. When ARP matches the given treatment, it may trigger an analgesic placebo reaction. A study powered with more than 100 patients is needed for statistical certainty.

## SINGLE LEVEL ANTERIOR APPROACH ALIF USING A HYPERLORDOTIC CAGE COMBINED WITH POSTERIOR APPROACH SMITH PETERSON OSTEOTOMY AND FUSION CAN ACHIEVE THE SAME LORDOSIS CORRECTION AS PSO/VCR- A CADAVER STUDY

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### SCIENTIFIC BACKGROUND:

Sagittal balance in Spinal Surgery has been gaining interest due to the understanding of its importance to the patient's well-being and the final outcome of surgery. There are several Approaches to the correction of severe sagittal mal-alignment. The Popular Posterior approach suggests Pedicle subtraction osteotomies or vertebral column resection to achieve sufficient correction. An alternative Anterior-Posterior approach has been suggested. This combined approach to the L5-S1 level using an anterior hyperlordotic cage and posterior Smith-Peterson osteotomies may achieve the same correction as a posterior approach. In this study we aim to test this thesis in a cadaver model.

### METHODS:

Four fresh frozen cadaveric specimens were obtained from the willed body program at our institution. Inclusion criteria for the specimens were age 40-70 and a preliminary fluoroscopy screening demonstrating multilevel degenerative disc disease with lumbar spondylosis. All specimens included the thoracolumbar junction cranially and the mid-femur caudally. Exclusion criteria included any previous spinal surgery or surgical scar. Using fluoroscopy imaging, each

cadaver was initially assessed preoperatively. Cobb angles of L5-S1 segmental lordosis and sacral slope were measured.

### RESULTS:

Correction of lordosis and sacral slope was achieved in all specimens following the procedure. The mean correction of the segmental lordosis was 38.5 degrees. The mean correction of the sacral slope was found to be 9.5 degrees.

### DISCUSSION:

This study further elucidates the ability to achieve a distinct correction of sagittal alignment using a combined Anterior Posterior approach. Using an anterior Hyperlordotic Cage and posterior Smith Peterson Osteotomies can achieve a correction similar to that has been described using PCO or VCR with the benefit of a lower complication rate. The main disadvantage of this method may include the need for an access surgeon .

### CONCLUSION:

A combined Anterior-Posterior approach to the L5-S1 segment can achieve good correction of sagittal alignment at a specific anatomic level.

## CAN ANTERIOR INTERBODY LUMBAR FUSION RESTORE CENTRAL CANAL DIAMETER - MAGNETIC RESONANCE EVALUATION

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### INTRODUCTION:

Anterior Lumbar Interbody Fusion (ALIF) by indirect decompression can restore disc and neural canal height and might reduce ligamentum flavum flexure, by thus may increase the spinal canal diameter which correlates with the clinical outcome. Canal diameter following ALIF was evaluated previously mainly by CT scan which its disadvantages. This study evaluates the effect of ALIF on spinal canal diameter using MRI, which is more sensitive to changes in ligamentum flavum structure.

### METHOD:

We retrospectively compared the anterior-posterior spinal canal diameter before and after ALIF in 15 patients (7 females) with degenerative-disc-disease, who underwent ALIF of 26 lumbar levels in our spine surgery unit. Comparison was performed using MRI scans performed routinely preoperatively and one year postoperatively. Anterior-posterior canal diameter was measured on axial views at the center-of-disc height of each lumbar level fused.

### RESULTS:

A single level ALIF was performed in eight patients, 2-level ALIF in five patients and 4-level ALIF in two patients. At one-year follow-up spinal fusion was achieved in all patients at all levels. The mean canal diameter (posterior-longitudinal-ligament to ligamentum flavum) was  $15.3 \pm 3.5$ mm preoperative compared to  $17.2 \pm 3.6$ mm

postoperatively, a mean increase of  $13 \pm 9\%$  in canal width ( $p < 0.001$ ).

### CONCLUSION:

We found a significant increase in lumbar spinal canal anterior-posterior diameter following ALIF in our cohort at one-year follow-up.

# ROUTINE ADVANCED IMAGING IN PATIENTS WITH SPINAL ANKYLOSING DISORDERS FOLLOWING MINOR TRAUMA FOR THE DIAGNOSIS OF HYPEREXTENSION TYPE THORACOLUMBAR FRACTURES - IS IT MANDATORY?

G. BARKAY, K. LANZMANN, S. MENACHEM, I. CASPI, N. ACKSHOTA, A. SHTEWEE, I. ESHED, A. FRIEDLANDER

## SCIENTIFIC BACKGROUND:

The management of trauma patients with spinal ankylosing disorders (SAD) such as ankylosing spondylitis (AS) & diffuse idiopathic skeletal hyperostosis (DISH) continues to pose a unique challenge for the practitioner. This population is especially susceptible to vertebral column fractures, especially hyperextension type fractures, due to long lever arms secondary to multilevel fusion, severe osteoporosis and a fixed kyphotic deformity even from minor trauma. Unfortunately, vertebral fractures in these patients remain a diagnostic challenge with delays in diagnosis reported in between 15% and 41% of patients. In patients evaluated by radiographs, fractures may be especially difficult to diagnose, and several researchers have recommended routine total spine advanced imaging protocols for patients identified with SAD on radiography following even minor trauma. Unfortunately, in many centers these protocols still haven't become routine, with high rates of delays in diagnosis even in more recent series.

In this study we aim to further elucidate the limitations of plain radiography for the diagnosis of hyperextension type injuries in SAD patients with an emphasis on thoracolumbar injuries which have been less focused upon.

## METHODS:

We searched our hospital's emergency room computerized database for all patients who underwent a total spine CT following a diagnosis of SAD on plain X-rays obtained after a minor fall. Approximately 10% of these were diagnosed with unstable hyperextension type fractures by CT. A high-quality presentation with 50 randomly situated AP+LATERAL X-rays was created. Of these, 24 contained an extension type fracture diagnosed by CT. A total of ten physicians- 4 junior orthopedic residents, 3 senior orthopedic residents and 3 spine surgeons, were given the presentation and requested to identify the pathologic X-rays and note the fracture level.

## RESULTS:

Fracture diagnosis stood at a mean rate of 35% for the entire group. When examining the different subgroups. The mean rate for junior orthopedic residents was 31%, for senior orthopedic residents was 25% and for spine surgeons 54%. The interobserver agreement was found to be 57%.

## DISCUSSION:

This study further approves the premise that the simple X-ray is an inefficient modality for diagnosis of hyperextension type thoracolumbar fractures in patients with spondylotic ankylosing disorders. Even with experienced spine surgeons an unacceptable rate of fractures was left undiagnosed. The poor interobserver agreement rate further amplifies this finding. The even poorer rate of fracture diagnosis for orthopedic residents who usually treat these patients in the ER further strengthens the recommendation for advanced imaging in this patient group.

Conclusion: Sensitivity of the simple X-ray for diagnosis of hyperextension type thoracolumbar vertebral fractures in SAD patients is unacceptable. Advanced imaging in this patient group is highly recommended.

## SAGITTAL WHOLE-SPINE MAGNETIC RESONANCE IMAGING SCREENING IN THE EVALUATION OF LUMBAR SPINE DISEASES AND INFECTION

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2. Department of Radiology, Assaf Harofeh Medical Center, Zerifin, Israel, affiliated to the Sackler Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel

### PURPOSE:

Magnetic resonance imaging (MRI) of the spine is a sensitive investigation. Whole spine T2 sagittal screening may demonstrate incidental findings. Such incidental findings can be asymptomatic but significant. Whole spine T2 sagittal screening can also rapidly determine the number of lumbar spine vertebral bodies (identifying transitional vertebra). We evaluated the efficacy of whole spine T2 sagittal screening in identifying incidental findings and transitional vertebrae.

### METHODS:

All the patients who underwent lumbar MRI in our institution between August – December 2018 underwent whole-spine MR imaging in an outpatient setting.

### RESULTS:

The high-speed whole-spine evaluation was successful for determining the number of lumbar-type vertebrae. About 10% of patients had incidental findings.

### CONCLUSION:

Routine T2 whole spine screening MRI identified 10% incidental findings and it provides improved accuracy for the determination of the number of lumbar-type vertebral bodies. Its application can be considered to be incorporated in routine imaging the lumbar spine.

## COMPUTER-BASED DIAGNOSIS OF SACROILIITIS IN CT SCANS

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2. School of Computer Science and Engineering, The Hebrew University of Jerusalem
3. Sheba Medical Center, Tel Hashomer, Israel

### INTRODUCTION:

Early diagnosis of sacroiliitis, an inflammation of the sacroiliac joint characterized by a lower back pain, may lead to preventive treatment which can significantly improve the patient's quality of life in the long run. However, the detection of sacroiliitis in its early stages is a difficult and time-consuming task, as the symptoms of sacroiliitis are similar to those of more common back conditions. Oftentimes, a CT scan of the lower back is acquired for suspected back pain and can be used to detect sacroiliitis as an incidental finding. However, since the differences between a healthy and inflamed sacroiliac joint in the early stages are subtle, the condition may be missed. As a result, the mean diagnostic delay of sacroiliitis is about seven years, and many patients remain undiagnosed.

### METHODS:

We have developed a new fully automatic algorithm for the diagnosis and grading of sacroiliitis CT scans as incidental findings that is based on supervised machine learning and deep learning techniques. The input is a CT scan that includes the patient's pelvis. The output is a diagnosis for each sacroiliac joint. The algorithm consists of four steps: 1) computation of an initial region of interest (ROI) that includes the pelvic joints region using heuristics and a U-Net classifier); 2) refinement of the ROI to detect both sacroiliac joints using a four-tree random forest; 3) individual sacroiliitis grading of each sacroiliac joint in each CT slice with a custom slice CNN classifier, and; 4) sacroiliitis diagnosis and grading by combining the individual slice grades using a random forest.

Our method grades individual axial slices in CT scans and implements a new criterion for sacroiliitis case grading based on individual slice grading. The individual slice grading enables high case grading accuracy with relatively few data sets. It is the first automatic method that is intended to alert radiologists about sacroiliitis in a CT scan.

### RESULTS:

Experimental results on 242 cases (211 used for training, 31 for testing) with a total of 50,941 slices yield a 2- and a 3-class case classification accuracy of 91.9% and 80.6%, a sensitivity of 95% and 82%, and an Area-Under-the-Curve (AUC) of 0.97 and 0.57, respectively. The computed graded matches the of ones of one or two observers in 95% and 84% of the cases for the 2-and 3-class classifications.

### CONCLUSION:

Automatic computer-based analysis of CT scans has the potential of being a useful method for the diagnosis and grading of sacroiliitis. The method may be used to detect sacroiliitis as incidental findings.

## COMPUTED TOMOGRAPHY-GUIDED MARKING OF OSTEIOD OSTEOMA OF THORACIC SPINE WITH FOLLOWING SURGICAL RESECTION: A CASE REPORT

A. ARTAMONOV, E. LEE, M. SHEMA, R. DEBI, R. DJABBAROV

### INTRODUCTION:

Osteoid osteomas of the spine are rare benign bone tumors typically presenting with progressive pain without neurological deficit.

### CASE PRESENTATION:

A 13-year-old female was referred to our institution due to persistent pain in upper back for 8 months. Computed tomography and magnetic resonance imaging scans revealed a ring-shaped radiolucency consistent with a nidus of osteoid osteoma in right articular process. The lesion was marked under CT guidance with a 3.5 mm suture anchor left in place. One week later the tumor was resected in a minimally invasive manner and the histological diagnosis was compatible with osteoid osteoma. Her postoperative course was uneventful, and at close follow up the patient is symptom-free with no evidence of recurrence.

### CONCLUSIONS:

Computed tomography-guided marking of osteoid osteoma with suture anchor left in place in the spinal column is a valuable method allowing to perform safe, less invasive and more precise surgical procedure.

## MATCHING ACTUAL TREATMENT WITH PATIENT ADMINISTRATION-ROUTE-PREFERENCE IMPROVES ANALGESIC RESPONSE AMONG ACUTE-LOW-BACK-PAIN PATIENTS, POSSIBLY THROUGH PLACEBO MECHANISMS

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### BACKGROUND:

Accommodating a patient's treatment preference promotes greater responsiveness and better clinical outcomes. This may be attributed to cognitive processes, beliefs, learning and expectations that induce an analgesic placebo-response. The effect of administration-route-preference (ARP) on the individual analgesic response has not been extensively examined to date. The aim of this study was to explore whether ARP matched treatment, i.e. individualized intramuscular or oral analgesic administration according to a patient's choice, will increase the analgesic effect.

### METHODS:

38 patients with acute-low-back-pain (ALBP) presenting at the emergency room, reported their ARP for analgesics, and, regardless of their preference, were randomly assigned to receive either PO or IM diclofenac. Pain intensity was measured before and during the first hour after drug administration.

### RESULTS:

Both groups receiving PO or IM administration reported similar severe initial pain, (VAS  $8.63 \pm 1.5$  and  $8.74 \pm 1.6$  respectively). While both PO and IM groups reported a similar magnitude of pain reduction, patients who received the drug in their preferred route (oral treatment or injection) had a significantly greater reduction in pain levels ( $4.05 \pm 2.8$ ) compared with patients who received the non-preferred route ( $2.08 \pm 1.8$ )  $p < 0.05$ .

### CONCLUSIONS:

These findings support our hypothesis that individualized ARP matching treatment in ALBP improves therapeutic outcomes.

We suggest that in addition to the direct pharmacological effect of analgesics, ARP is linked to previous experience, belief in the efficacy of the treatment given, and expectation of pain relief. When ARP matches the given treatment, it may trigger an analgesic placebo reaction. A study powered with more than 100 patients is needed for statistical certainty.

## AGE-RELATED DIFFERENCES IN CLINICAL OUTCOMES OF LUMBAR DISCECTOMY

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### BACKGROUND:

Lumbar discectomy is a common and effective treatment for symptomatic disk herniation. It has been suggested that age may be a factor affecting the outcome of discectomy. The purpose of this study was to evaluate age-related differences in clinical outcomes of patients undergoing lumbar discectomy for chronic radicular pain resulting from lumbar disc herniation without neurological compromise.

### METHOD:

Seventy-three patients (25 females) with chronic lumbar radiculopathy without neurological deficit underwent non-urgent single level lumbar discectomy in our institution between 2014 and 2017. Outcomes were retrospectively reviewed after a mean of  $32 \pm 17(13-48)$  months and compared between younger patients aged 30-50 years and older patients aged 50-70 years.

### RESULTS:

Pain level, Oswestry Disability Index and SF-12 scores improved significantly after the surgery in both younger and older patient groups. There were no significant differences in the outcomes measured between the groups before the surgery and after the surgery in both early post-operative follow-up and late post-operative follow-up.

### CONCLUSION:

Lumbar discectomy improved function and decreased pain level to similar extent in both younger and older patients suffering from radicular symptoms related to lumbar disc herniation.

## IDIOPATHIC VENTRAL SPINAL CORD HERNIATION: A SINGLE CENTER'S EXPERIENCE, AND PRESENTATION OF SURGICAL TECHNIQUE

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Neurosurgery, Rambam Health Hare Campus

### BACKGROUND:

Idiopathic ventral thoracic spinal cord herniation is a very uncommon condition that commonly presents with progressive myelopathy or Brown-Séquard syndrome. Approximately 200 cases have been reported in the literature so far. Typically occurs between vertebrae T2 to T8. A variety of techniques have been reported, with varying results.

### OBJECTIVE:

To report a single centers experience treating Idiopathic ventral spinal cord herniation.

### METHODS:

A retrospective chart review of all known cases of idiopathic spinal cord herniation at Rambam medical center over the last 15 yr was performed. 17 cases have been identified.

We report our experience, outcome and surgical technique

### CONCLUSION:

Surgical treatment of Idiopathic ventral spinal cord herniation carries positive results on the symptomatic and functional outcomes of the majority of patients treated.



## GENDER DIFFERENCES IN INDIVIDUALS WITH NON-TRAUMATIC SPINAL CORD INJURY AND SPINE SURGERY: A SURGICAL POINT OF VIEW

E. HABER, C. HOFFMANN, S. NOY, N. KNOLLER, G. ZEILIG, R. HAREL

Sheba Medical Center, Tel Hashomer

### BACKGROUND:

Large retrospective studies describe an equal distribution of males and females undergoing spine surgery (lumbar and cervical) for non-traumatic causes. Data is more limited with regards to non-traumatic spinal cord injury (NTSCI). While several studies show an equal gender distribution, others display male predominance.

### METHODS:

Data was obtained from the Israeli Spinal Cord Rehabilitation Registry (ISCIR). We conducted a retrospective analysis of 114 consecutive patients with non-traumatic SCI who underwent spine surgery subsequently were admitted to the department of neurological rehabilitation in Sheba between 2012 and 2017.

### RESULTS:

Degenerative spine disease (58%) was the most common etiology, followed by tumors (33%). Mean age at the time of surgery was 53 years, 44% presented with tetraplegia.

The M:F ratio was 2:1 (P value = 0.002). Gender was not correlated with severity or level of injury and there were no significant differences in functioning or length of stay among males and females.

In light of our findings, we reviewed the gender ratio of individuals who have had cervical spinal

surgery (N=492), as well as all individuals who had cervical spine MRI during those years (N=13,165). Proportion of males undergoing spinal surgery was similar to the findings in rehabilitation settings (2:1 male), while MRI was evenly distributed (49% male).

### CONCLUSION:

Despite the equal number of MRI tests performed on both genders, men with NTSCI are more likely to undergo spine surgery. Possible reasons, such as personal and environmental factors, remain to be investigated.

## MUTUAL EFFECTS OF REHABILITATION AND THE USE OF NARCOTIC MEDICATION IN PATIENTS WITH CHRONIC LOW BACK PAIN DISABILITY

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### INTRODUCTION:

During rehabilitation for functional restoration of patients with chronic low back pain disability (CLBPD), we aim to limit the use of narcotic drugs. This study assessed the mutual effects of functional restoration and narcotic medication.

### METHODS:

Use of narcotic medication and daily function were assessed with the SPIM-Mod (modified Spinal Pain Independence Measure) scale, were monitored in 99 patients with CLBPD, who were admitted to the Spinal Department of Loewenstein Rehabilitation Hospital for a functional restoration program.

### RESULTS:

Narcotic drugs (oxycodone and/or tramadol) were used by 20% of the patients before rehabilitation and by 27% after rehabilitation. Four of the patients who used narcotics before rehabilitation (20%) did not use these drugs after rehabilitation. Use of narcotic drugs did not affect improvement in daily function ( $p>0.05$ ). Daily function scores improved in 71 patients (72%) during rehabilitation, but 11 of these, who were not using narcotics before rehabilitation (14%) required narcotics after rehabilitation. Daily function improved in 53% of patients without the use of narcotics.

### CONCLUSION:

Rehabilitation can wean a small portion of users from the use of narcotic, and achieve improvement of daily function in over half the patients without narcotics. Narcotic medication does not affect overall function, but some increase in the overall use of narcotic medication may be required to allow functional improvement in certain patients.

## SCIM III (SPINAL CORD INDEPENDENCE MEASURE VERSION III): RELIABILITY OF ASSESSMENT BY INTERVIEW AND COMPARISON WITH ASSESSMENT BY OBSERVATION

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### BACKGROUND:

To examine the reliability of the Spinal Cord Independence Measure III (SCIM III) by interview and compare findings with those of assessment by observation.

### MATERIAL AND METHOD:

Thirty-five spinal cord lesion (SCL) patients who underwent rehabilitation at Loewenstein Rehabilitation Hospital in Israel were assessed during the last week before discharge with SCIM III by observation and by interview. Nineteen of the patients were also assessed by interview by a third rater, to examine inter-rater reliability.

### RESULTS:

Total agreement between the interviewers' scores and between interviews and observations was low to moderate (kappa coefficient 0.11-0.8;  $p < 0.01$  for most tasks). Comparison between pairs of interviewers and between interviews and observations revealed high correlations between scores on SCIM III subscales and total scores ( $r = 0.65-0.92$ ,  $p < 0.001$ ). Differences between scores on SCIM III subscales were statistically non-significant, and ICC coefficients for the SCIM III subscales and total scores were high ( $r = 0.705-0.956$ ,  $p < 0.001$ ).

### CONCLUSION:

The findings of this study support the reliability and validity of SCIM III by interview, which appears to be useful for research of SCL patient groups. Individual scoring of SCIM III by interview, however, varied prominently between raters, therefore it should be used with caution for clinical purposes, probably by raters whose scoring deviation, in relation with observation scores, is known.

## POST EXERTIONAL SACROILIITIS: A CASE SERIES

A. KATZIR, B. QUTTEINEH, S. ISRAEL, L. KAPLAN, J. SCHROEDER

### OBJECTIVE:

To assess the possibility of a connection between exertional activity and infectious sacroiliitis.

### METHODS:

A retrospective case series of three patients was retrieved with post exertional infectious sacroiliitis. Clinical and laboratory data were collected.

### RESULTS:

Three patients with post exertional infectious sacroiliitis were identified between the years 2000-2019. All were healthy males without any previous medical history. Patients age was 9.5, 17.5 and 45. All patients presented at a referral center emergency department (ED), with severe back pain, within days after extreme exertional activity. Other relevant risk factors were precluded.

Labs were consistent with an acute infection. WBC ranged between 12,900 – 16,000, C reactive Protein ranged between 13.5-32, and erythrocyte sedimentation rate ranged between 60-75. Blood cultures were obtained for the two later patients that grew methicillin sensitive staph aureus (MSSA).

Imaging was performed and sacroiliitis was diagnosed - in two cases on the left side and in one on the right side.

For two of the patients the diagnosis of infectious sacroiliitis was established by obtaining tissue

cultures from the sacroiliac joint, that grew the same MSSA from the skin. In one patient blood cultures were positive for MSSA and bone scan consistent with sacroiliitis, and no further intervention was needed.

All patients completed a long term IV antibiotic treatment and made full recovery, with no long term sequela.

### CONCLUSION:

This is the first described series of cases of post exertional sacroiliitis. This rare entity needs to be thought of when presenting in the ED with severe low back pain. The mechanism of bacterial spread to this joint need still to be further investigated.

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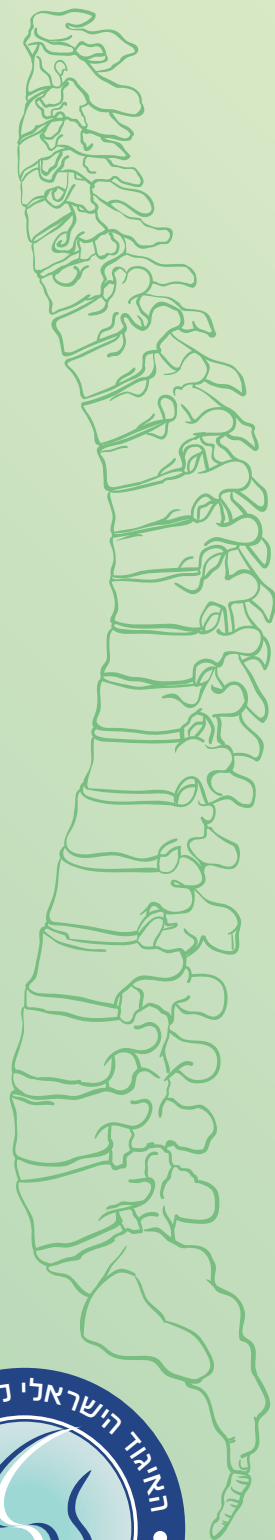
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