

The 23rd Annual Meeting of the Israel Spine Society



19-21 April 2023 • Wednesday-Friday
The Royal Beach Hotel Eilat, Israel



GENERAL INFORMATION

The 23rd annual meeting of the Israel Spine Society
will be held on Wednesday-Friday,
19th - 21th April, 2023
The Royal Beach Hotel Eilat.

Acting Committee

Gad J. Velan M.D.
Chairman

Ran Harel M.D.
Secretary

Ytzhak Engel M.D.
Treasurer

Ory Keynan M.D.
Educational Committee

Eyal Itshayek M.D.
Committee Member

Nimrod Rahamimov M.D.
Elected Chairman

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



תכנית כנס אחיות

יום המישי, ה- 20 באפריל 2023

WELCOME & INTRODUCTION 09:05 - 09:20

ד"ר גד ולן ואדוארד בקרמן.

09:21 - 09:41

Robotic Assisted Spine Surgery with Mazor

ד"ר הראל ארזי, בי"ח שערי צדק.

09:42 - 10:07

הערך האנלגטי של המפגש הטיפולי

עדי שני RN.MA, אחות מתאמת מחקרים במחלקה האורתופדית ועמוד שדרה

במרכז הרפואי לגליל.

10:08 - 10:23

הצגת מקרה: ניתוח לתיקון עקמת - Case Study: Scoliosis correction surgery

מיי חמדאן RN.MA.ERP, בי"ח איכילוב סוראסקי מדיקל סנטר.

10:24 - 10:39

Spine Tumors and International MDT

שניידר מירב, סגנית אחות אחראית חדר ניתוח מרכז רפואי הלל יפה.

טקצ'מן אלכס, ראש צוות ניתוחי עמוד שדרה, מרכז רפואי הלל יפה.

הפסקת קפה 10:40 - 11:10

11:10 - 11:25

Resection of Extradural Spine Tumors by Minimal Invasive Technique

ספייב גבי R.N.B.M סגן אחות אחראית חדר ניתוח.

בי"ח איכילוב סוראסקי מדיקל סנטר.

11:26 - 11:41

Extreme lateral interbody fusion (XLIF)

מיכאל שטיין, ראש צוות אורתופדיה, בי"ח רפאל.

11:42 - 12:02

היסטוריה של סיעוד סב ניתוחי - History of Perioperative Nursing

קוסטה שטכמן פולישוק, אח אחראי חדר ניתוח כללי בית חולים איכילוב סוראסקי מדיקל סנטר.

12:03 - 12:18

Spine Intradural Tumors - גידולים אינטרהדורלים של עמוד שידרה -

ארתור אברהמוב RN.BM.ERP, ראש צוות ניתוחי עמוד שדרה, בי"ח שיבא תל השומר.

12:19 - 12:34

הצגת מקרה: ניתוח לתיקון עקמת - Case Study: Scoliosis correction surgery

אחמד קראקרה RN.BM.ERP, ראש צוות אורתופדיה ילדים

בי"ח איכילוב סוראסקי מדיקל סנטר.

12:35 - 12:50

גישה צווארית קידמית - Anterior Cervical Approach

ספיר מלול RN.BM.ERP, אח חדר ניתוח, בי"ח שיבא תל השומר.

12:51 - 13:06

קיבוע שברים בעמוד שדרה בשיטה מילעורית, כולל הזרקת צמנט.

דניס יוסוב O.R.N, B.S.N, M.E.M

אסתר בן זקן O.R.N, B.A

מרכז רפואי גליל.

DISCUSSION 13:07 - 13:12

הפסקת צהריים 13:12 - 14:12

SCIENTIFIC PROGRAM

WEDNESDAY - 19TH APRIL

19:30 WELCOME COCKTAIL

THURSDAY - 20TH APRIL

08:30 - 08:35 WELCOME NOTE

Velan G.

SESSION 1: LUMBAR

Moderators: Menachem S, Bassani R.

08:36 - 08:45

(1.1) THE SPINE EXPOSURE INDEX: EVALUATION OF EXTENT OF SOFT TISSUE DISRUPTION IN OPEN TLIF PROCEDURES.
Kimchi G, Shemesh S, Knoller N, Shtewe A, Harel R.

08:46 - 08:55

(1.2) FUSION'S LOCATION AND QUALITY WITHIN THE FIXATED SEGMENT FOLLOWING TRANSFORAMINAL INTER-BODY FUSION (TLIF).
Essa A, Shehade M, Rabau O, Smorgick Y, Mirovsky Y, Anekstein Y.

08:56 - 09:05

(1.3) ANTERIOR TO PSOAS (ATP) FUSION OF THE LUMBAR SPINE: INITIAL LOCAL EXPERIENCE.
Menachem S, Keynan O.

09:06 - 09:15

(1.4) IMPACT OF SARCOPENIA AND MULTIFIDUS ATROPHY ON OUTCOMES FROM MINIMALLY INVASIVE DECOMPRESSION SURGERY FOR LUMBAR SPINAL STENOSIS.
Chua M, Regev G, Ofir D, Salame K, Lidar Z, Khashan M.

09:16 - 09:36

KEYNOTE LECTURE: COMPLICATIONS IN ANTERIOR LUMBAR SURGERY.
Bassani R.

09:36 - 09:46

DISCUSSION

09:47 - 10:40

DEBATE: ONE LEVEL DEGENERATIVE SPONDY L4-5 – HOW I DO IT AND WHY:

1. DECOMPRESSION ALONE

Akshota N.

2. DECOMPRESSION AND POSTERIOR FUSION
Hershkovich O.

3. INDIRECT DECOMPRESSION LATERAL
Menachem S.

4. INDIRECT DECOMPRESSION ANTERIOR
Bassani R.

5. DISCUSSION

10:40 - 11:10 COFFEE BREAK

SESSION 2: DEFORMITY

Moderators: Baruch Y, Rabau O.

11:10 - 11:30

(2.1) THE ROLE OF TRACTION RADIOGRAPHS IN THE PREOPERATIVE PLANNING OF PAEDIATRIC SCOLIOSIS.

Koch J, Hershkovich O, Estefan M, Gutman N, Gessara A, Patel M.S, Grevitt M.P.

11:31 - 11:40

(2.2) ENHANCED RECOVERY AFTER SURGERY (ERAS) IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS): A META-ANALYSIS AND SYSTEMATIC REVIEW.

Koch J, Gadiya A.D, Patel M.S, Shafafy M, Grevitt M.P, Quraishi N.A.

11:41 - 12:14

DEBATE: VERTEBRAL BODY TETHERING VS FUSION FOR IDIOPATHIC SCOLIOSIS.

PRO VBT - Baruch Y.

PRO FUSION - Arzi H.

SESSION 3: SPINE DIPLOMA

Moderators: Rahamimov N.

SCIENTIFIC PROGRAM

12:15 - 13:00

SETTING INTERNATIONAL TRAINING STANDARDS IN SPINAL SURGERY: THE GLOBAL SPINE DIPLOMA.

Acaroglu E, Bransford R, Bass J.

13:00 - 14:00 LUNCH BREAK

SESSION 4: CERVICAL

Moderators: Raz N, Shteivi M.A.

14:05 - 14:14

(4.1) ARTIFICIAL INTELLIGENCE (AI) BASED DIAGNOSTIC TOOL FOR MRI CHARACTERISTICS OF CERVICAL OSSIFIED POSTERIOR LONGITUDINAL LIGAMENT (C-OPLL).

Shemesh S, Kimchi G, Harel R.

14:15 - 14:24

(4.2) EARLY EXPERIENCE OF FULL-ENDOSCOPIC POSTERIOR CERVICAL FORAMINOTOMY FOR THE TREATMENT OF CERVICAL RADICULOPATHY.

Felzensztein D, Kogan D, Hendler E, Jackson S, Hasharoni A, Abushkara R, Melke B, Harnof S, Itshayek E.

14:25 - 14:34

(4.3) CHANGES IN CERVICAL SPINE ALIGNMENT WHILE USING A SMART PHONE.

Trior Y, Haddad E, Vider S, Keynan O.

14:35 - 14:44

(4.4) HALO VEST IN THE TREATMENT OF CERVICAL SPINE FRACTURES - THE LOST ART.

Stavsky M, Hamed A, Arzi H, Kutina B, Mizrahi C, Winestone J.A, Barzilay Y.

14:45 - 14:54

(4.5) TRAUMATIC POSTERIOR ATLANTOAXIAL DISLOCATION WITH AN ASSOCIATED FRACTURE: A SYSTEMATIC REVIEW.

Essa A, Khatib S, Beit Ner E, Smorgick Y, Mirovsky Y, Anekstein Y, Rabau O.

14:55 - 15:05

DISCUSSION

SESSION 5: TUMORS

Moderators: Reynolds J, Ophir I.

15:06 - 15:26

KEYNOTE LECTURE: CURRENT CONCEPTS - PRIMARY EXTRADURAL TUMORS OF THE SPINE.

Reynolds J.

15:27 - 15:36

(5.1) FUNCTIONAL OUTCOMES FOLLOWING THE RESECTION OF INTRADURAL EXTRAMEDULLARY SPINAL TUMORS IN THE ELDERLY.

Kimchi G, Ben-Zaken S, Korn A, Knoller N, Harel R.

15:37 - 15:46

(5.2) DUAL PRIMARY MALIGNANCY IN A SINGLE PATIENT.

Vodovozov D, Saliman A, Alexandrovsky V, Shpigelman A.

15:47 - 15:56

KEYNOTE LECTURE: CURRENT CONCEPTS - METASTATIC DISEASE OF THE SPINE.

Reynolds J.

15:57 - 16:30 COFFEE BREAK

FRIDAY - 21ST APRIL

SESSION 6: LUMBAR II

Moderators: Hershkovich O, Akshota N.

08:30 - 08:39

(6.1) REDUCTION OF SURGICAL SITE INFECTION WITH A TIMED ALCOHOLIC PREPARATION IN SPINE SURGERY.

Schroeder J.E, Einav O, Kaplan L, Gagiv S, Shawan A, Sendman O, Oster Y.

08:40 - 08:49

(6.2) THE USE OF ENDOSCOPIC ASPIRATION IN THE IDENTIFICATION OF BACTERIAL PATHOGENS CAUSING DISCITIS.

Peretz A, Olshatn-Pops K, Cohen J, Einav O, Kaplan L, Schroeder J.

SCIENTIFIC PROGRAM

08:50 - 08:59

(6.3) DIAGNOSTIC UTILITY OF VERTEBRAL BIOPSIES OBTAINED IN KYPHOPLASTY PROCEDURES.

Kimchi G, Asprilla J, Maimon T, Shemesh S, Knoller N, Harel R.

09:00 - 09:10

(6.4) PREDICTORS OF RECURRENT OSTEOPOROTIC FRACTURES.

Shahwan A, Kaplan L, Sagiv S, Jose Cohen J, Einav O, Schroeder J.

09:11 - 09:20

(6.5) RADIATION EXPOSURE AND PROCEDURE DURATION ANALYSIS OF KYPHOPLASTY USING DUAL FLUOROSCOPIC GUIDANCE.

Romem R, Engel I, Segal D, Behrbalk R, Schleifer D, Koch Y, Ohana N, Baruch Y.

09:21 - 09:30

(6.6) MACHINE LEARNING-GENERATED POSTERIOR VERTEBRAL ELEMENT CLUSTERS DISTINGUISH OCCULT OSTEOPOROTIC FRACTURES FROM NORMAL VERTEBRAE USING CT SCANS ONLY.

Murad H, Abdullah L, Haj S, Arnon-Sheleg E, Rahamimov N.

09:31 - 09:40

(6.7) PERCEIVED AND OBJECTIVE MEASURES OF STRESS AND THEIR ASSOCIATIONS WITH PAIN AND PLACEBO ANALGESIA: PRELIMINARY RESULTS FROM CHRONIC BACK PAIN PATIENTS.

Shani A, Treister R, Granot M, Rahamimov N.

09:41 - 09:50

(6.8) NOL EXAMINATION DURING SPINAL SURGICAL PROCEDURES.

Grach M, Vodovozov D, Saliman A, Alexandrovsky V, Shpigelman A.

09:51 - 10:00

DISCUSSION

10:00 - 10:30 COFFEE BREAK

SESSION 7: LUMABR DEGEN

Moderators: Shpigelman A, Djabarov R,

10:30 - 10:50

(7.1) TIMING OF PREGNANCY AND CHILDBIRTH AFTER LUMBAR DISCECTOMY: A RETROSPECTIVE STUDY.

Felzensztein D, Kogan D, Hendler E, Jackson S, Hasharoni A, Abushkara R, Melke B, Harnof S, Itshayek E.

10:51 - 11:00

(7.2) CHANGES IN NERVE CONDUCTION VELOCITY IN PATIENTS WITH LOW BACK PAIN AND RADICULAR PAIN IN DIFFERENT POSITION – SLR AND SUPINE POSITION.

Vodovozov D, Saliman A, Alexandrovsky V, Shpigelman A.

11:01 - 11:10

(7.3) SCHOBER TEST AND ITS MODIFICATIONS REVISITED - WHAT ARE WE ACTUALLY MEASURING?

Hershkovich O, Grevitt M, Lotan R.

11:11 - 11:20

(7.4) INTRAVENOUS TRANEXAMIC ACID REDUCES BLOOD LOSS IN MULTILEVEL SPINE SURGERIES.

Lotan R, Lengenova S, Rijini N, Hershkovich O.

11:21 - 11:30

(7.5) ENDOSCOPIC LUMBAR SPINAL SURGERY: LEARNING CURVE AND OVERVIEW OF TRANSFORAMINAL DISCECTOMY TECHNIQUE.

Artomonov A, Lee E, Djabarov R.

11:31 - 11:40

DISCUSSION

11:41 - 12:41 GUEST LECTURE

איך להיות אדם בעידן הבינה המלאכותית?
ד"ר יובל דרור

12:42 - 13:32

BUSINESS MEETING



ABSTRACTS:

THE SPINE EXPOSURE INDEX: EVALUATION OF EXTENT OF SOFT TISSUE DISRUPTION IN OPEN TLIF PROCEDURES.

KIMCHI G, SHEMESH S, KNOLLER N, SHTEWE A, HAREL R.

Department of Neurosurgery, Sheba Medical Center.

BACKGROUND

Open Transforaminal Lumbar Interbody Fusion (TLIF) might cause significant soft tissue damage associated with adverse post-operative outcomes, such as increased blood loss, post-operative pain, wound healing disturbances and prolonged length of hospitalization. To date, the extent of soft tissue disruption was not evaluated directly, but rather assessed indirectly by recording these outcomes. This study proposes a novel index of soft tissue damage, to objectively describe the extent of exposure in navigated lumbar fusion procedures..

METHODS

A retrospective analysis of patients undergoing 1-level navigated TLIF procedures (O-arm and Stealth Systems, Medtronic Corp, USA) with either (1) One-Step self-tapping self-drilling navigated screw set (ProMIS, Premia Spine, Netanya, Israel) or (2) multi-step spinal fusion system (Solera, Medtronic Corp, USA), was performed. The Spinal Exposure Index (SEI) was defined as the average of two widths of air gaps suprajacent to the vertebral bone divided by the distances between each pair of transverse processes (TP's), and was extracted from the o-arm scan purchased after exposure. The SEI was analyzed for correlation with the outcomes of interest, including (1) estimated blood loss (EBL), (2) length of hospital stay (LOS), (3) rate of wound healing disturbances, and (4) surgery duration. All statistical analyses were performed using SPSS software. T-test was used to evaluate differences between the groups.

RESULTS

Overall, 25 patients were analyzed. SEI was calculated in all cases. The variability in measurement between two independent

measures was negligible. The overall mean SEI was 0.52 ± 0.22 . The mean SEI for the one-step screw set was 0.35, while the SEI for the multi-step screw set was 0.74 ($p = 0.03$). Increased SEI was significantly associated with higher EBL values ($p = 0.05$), but was not significantly associated with prolonged length of stay of with adverse post-operative outcomes.

CONCLUSIONS

The SEI is a reliable and valid measure of soft tissue disruption, with high inter-rater reliability and a significant association with increased blood loss. The SEI may be a valuable and reliable tool to objectively evaluate the extent of exposure in spine fusion procedures.

FUSION'S LOCATION AND QUALITY WITHIN THE FIXATED SEGMENT FOLLOWING TRANSFORAMINAL INTER-BODY FUSION (TLIF).

ESSA A^{1,3}, SHEHADE M^{1,3}, RABAU O^{1,2,3}, SMORGICK Y^{1,2,3}, MIROVSKY Y^{1,2,3}, ANEKSTEIN Y.^{1,2,3}

1. Department of Orthopedics, Shamir (Assaf Harofeh) Medical Center, Zerifin, Israel.
2. Spine Unit, Department of Orthopedic Surgery, Shamir (Assaf Harofeh) Medical Center, Zerifin, Israel.
3. Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

STUDY DESIGN

Retrospective study.

BACKGROUND

Transforaminal lumbar inter-body fusion with posterolateral fusion (TLIF) has gained an increased popularity over the last decades, and is being employed as an established surgical treatment for several lumbar spine pathologies. Despite the seemingly acceptable fusion rates after TLIF, there is still limited literature regarding the specific location and quality of fusion inside the fixated segment. This study aims to evaluate the fusion's quality and its specific location, inter-vertebral versus posterolateral fusion, following TLIF surgery.

METHODS

A retrospective population-based study was performed on all post-operative computed tomography (CT) of patients who underwent TLIF surgery at a medium size medical center between 2010 and 2019. All CT studies were performed at a minimum of 1 year following the surgery with a median of 2 years. Each CT study was evaluated for post-operative fusion, specifically in posterolateral and the inter-vertebral body areas. The fusion was determined and classified in each area according to Lee's criteria.

RESULTS

All fracture healed uneventfully, no patient required late surgical intervention and no neurological complications were noted. Two patients died in the months following the fracture from other reasons.

RESULTS

The study included 48 patients. Median age was 55.6 years (SD \pm 15.4). The median time from surgery to post-operative CT was 2 years (Range, 1-10). Full definitive fusion in both posterolateral and inter-vertebral areas was observed in 54.3% of patients, and 96% of definitive fusion in at least 1 area. When comparing the posterolateral corner and the intervertebral area fusion rates, a significantly higher definitive fusion rate was observed in the posterolateral corner as compared to the inter-vertebral body area in the long-term follow up (96% vs 52%, $p < 0.001$). In the multivariable analysis, accounting for several confounding factors including the level of the fixated segment, the number of fixated segments and cage size, the results remained statistically significant ($p < 0.05$).

CONCLUSION

A significant higher definitive fusion rate at the posterolateral corner compared to the inter-vertebral body area following TLIF surgery was found.

ANTERIOR TO PSOAS (ATP) FUSION OF THE LUMBAR SPINE: INITIAL LOCAL EXPERIENCE.

MENACHEM S, KEYNAN O

Rambam Healthcare Campus, Haifa, Israel.

BACKGROUND

Lateral interbody cages have been proven useful in spinal fusions. Spanning both lateral cortical rims while sparing the Anterior Longitudinal Ligament, the lateral interbody cages restore and maintain disc height, allowing for indirect decompression, while adding. The standard approach for their insertion is by a 90-degree lateral transpsoas method. This is relatively bloodless compared to other techniques although has its limitations, requiring neuro-monitoring and being, at times, very difficult at L4-L5 due to iliac crest obstruction or an anterior plexus position. An oblique approach, with the patient in lateral decubitus, passes anterior to the iliac crest, retroperitoneal, and being anterior to psoas, eliminates the need for neuro-monitoring while reducing the risk for neural damage. In addition, when performing an L5-S1 fusion, ALIF in the lateral position allows using a smaller incision and dissection due to the natural retraction of the peritoneum by the gravity.

METHODS

In this study we present the first ten patients who underwent an oblique access to the lumbar spine for interbody fusion using the ATP technique, facilitated by novel surgical instruments.

RESULTS

Between July 2022 and January 2023, there were 10 patient who underwent the procedure with a total number of 13 levels of which two were an L5-S1 lateral Alif and 11 ATP for levels between L2-L5.

The mean age was 70.7 (range 40-80), there were 1 male and 9 females.

There were no intraoperative or postoperative complications related to the surgical technique.

CONCLUSION

The left sided anterior to psoas approach offers the most natural corridor to the disc space. The novel instruments and method described here allows for the insertion of large lateral cages between L2 and L5, without the problems associated with the transpsoas approach, particularly at L4-L5, and allows an easier access to L5-S.

IMPACT OF SARCOPENIA AND MULTIFIDUS ATROPHY ON OUTCOMES FROM MINIMALLY INVASIVE DECOMPRESSION SURGERY FOR LUMBAR SPINAL STENOSIS.

MENACHEM S, KEYNAN O.

BACKGROUND

In order to improve outcomes for patients with lumbar spinal stenosis, identification of better prognostic factors is necessary to guide patient selection for surgery. The purpose of this study was to investigate the prognostic value of multifidus atrophy and sarcopenia on postoperative pain and disability following minimally invasive decompression for lumbar spinal stenosis.

METHODS

We retrospectively reviewed medical records and imaging studies for patients with lumbar spinal stenosis who underwent minimally invasive tubular decompression. Multifidus total cross sectional area (tCSA), multifidus functional cross sectional area (fnCSA), multifidus fatty infiltration (FI), psoas tCSA, and psoas relative cross sectional area (rCSA) were evaluated by univariable and multivariable regression to identify predictors of postoperative improvement in visual analogue scores for back pain (VASB) and leg pain (VASL) and Oswestry disability index (ODI) scores for disability.

RESULTS

In multivariable analysis, lower multifidus FI was significantly associated with 5 point improvement in ODI ($p=0.002$), 10 point improvement in ODI ($p=0.017$), and 17 point improvement in ODI ($p=0.044$). Only male gender ($p=0.030$), lower preoperative VASB ($p=0.001$), and lower preoperative VASL ($p=0.015$) were independently predictive of postoperative deterioration in ODI, VASB, and VASL, respectively.

CONCLUSIONS

Multifidus FI predicts postoperative improvement in disability following minimally invasive decompression for lumbar spinal stenosis with high accuracy. Minimally invasive decompression surgery is effective for elderly patients and sarcopenic patients, who are not at risk for poorer postoperative outcomes. Male gender and lower preoperative pain or disability are risk factors for postoperative deterioration in patient-reported outcomes.

THE ROLE OF TRACTION RADIOGRAPHS IN THE PREOPERATIVE PLANNING OF PAEDIATRIC SCOLIOSIS.

KOCH J^{1,2}, HERSHKOVICH O¹, ESTEFAN M¹, GUTMAN N¹, GESSARA A¹, PATEL M.S¹, GREVITT M.P.¹

1. Centre for Spinal Studies and Surgery, Queens Medical Centre, Nottingham, UK.
2. Spine Surgery Unit, Meir Medical Center, Kfar-Saba, Israel.

BACKGROUND

Improvement in posterior correction techniques has led to less frequent use of anterior procedures in surgical treatment of paediatric scoliosis (PS). Preoperative planning for PS requires a full understanding of the spine anatomy, magnitude of the deformity in all dimensions and an appropriate evaluation of its flexibility. Spine flexibility assessment is not always a straightforward process. Side-bending films are the most common method used to assess curve flexibility; however, the accuracy of that method was questionable and showed a great difference between pre-operative to the actual post-surgical results. Traction films under general anesthesia (TFUGA) are being used in our institute as an added tool to better assess and predict spinal flexibility, mainly for cases with high degree of curve deformity, especially when an anterior approach is being considered as a first step in the surgical correction plan or when cooperation of the patient in side-bending radiographs is not expected. The use of TFUGA allows the team to manipulate the spine similar to the surgical procedure without relying on patient cooperation. Our aim was to retrospectively study the impact of those radiographs on the preoperative planning and its ability to predict the outcome.

METHODS

Retrospective analysis of all cases underwent TFUGA in our institute since January 2012 until December 2020 based on the surgical registry records. Patients were assessed for demographics, clinical information, and measures of preoperative plain films, bending films, traction films and post-surgical films.

RESULTS

120 patients had TFUGA. Average age was 13.9 years, 78 females, 42 males. Adolescent idiopathic scoliosis 88 patients, neuro-muscular scoliosis 32. Average main curve cobb angle was 93. 109 had posterior scoliosis correction, 11 had combined approach surgery. Mean bending film cobb angle was 73 compared to TFUGA 48.8. Significant difference (mean within 10 degrees) of post op cobb angle 39.7 and TFUGA. No significant difference in correction in patients who had anterior release followed by posterior fusion and those who had posterior correction only.

CONCLUSIONS

This study has demonstrated the strength of TFUGA as a tool for flexibility assessment in extreme scoliosis cases. In those cases, it can be utilized in the prediction of the main curve cobb angle correction. Moreover, in most cases, these patients can be treated with posterior only correction without the need for the added morbidity of anterior release procedure.

ENHANCED RECOVERY AFTER SURGERY (ERAS) IN ADOLESCENT IDIOPATHIC SCOLIOSIS (AIS): A META-ANALYSIS AND SYSTEMATIC REVIEW.

KOCH J^{1,2}, GADIYA A.D², PATEL M.S², SHAFIFY M², GREVITT, M.P², QURAIHI N.A²

1. Spine Surgery Unit, Meir Medical Center, Kfar-Saba, Israel.
2. Centre for Spinal Studies and Surgery, Queens Medical Centre, Nottingham, UK.

BACKGROUND

Posterior correction of AIS is an extensive surgical procedure for an adolescent patient, and sub-optimal control of postoperative pain results in delayed mobilization. Mobility is also affected due to the morbidity associated with nausea, vomiting, sedation and ileus as a result of the use of intravenous opioid analgesia. This delayed mobilization results in increased length of stay and increased complications as well as an increased financial burden to the healthcare systems. ERAS is a multidisciplinary approach for improving perioperative outcomes of patients using evidence-based protocols in the care of the surgical patient. The implementation of an ERAS based protocol is aimed to expedite the recovery and return of function, minimize the morbidity and in turn reduce the length of stay (LOS) Reduction in time spent in hospital would also improve the over-all peri-operative experience of patients and reduce health care costs. To date, many studies across a range of specialties have highlighted the benefits of ERAS in reducing the LOS and improving the outcomes following surgery. No thorough review of available information for its use in AIS has been published.

METHODS

A systematic review of the English language literature was undertaken using search criteria (postoperative recovery and adolescent idiopathic scoliosis) using the PRISMA guidelines (Jan 1999-May 2020). Isolated case reports and case series with < 5 patients were excluded. Length of stay (LOS), complication and readmission rates were used as outcome measures. Statistical analysis was done using the random effects model.

RESULTS

Of a total of 24 articles, 10 studies met the inclusion criteria (9 were Level III and 1 of level IV evidence) and were analyzed. Overall, 1040 patients underwent an ERAS-type protocol following posterior correction of scoliosis and were compared to 959 patients following traditional protocols. There was a significant reduction in the length of stay in patients undergoing ERAS when compared to traditional protocols ($p < 0.00001$). There was no significant difference in the complication ($p = 0.19$) or readmission rates ($p = 0.30$). Each protocol employed a multidisciplinary approach focusing on optimal pain management, nursing care, and physiotherapy.

CONCLUSIONS

This systematic review demonstrates advantages with ERAS protocols by significantly reducing the length of stay without increasing the complications or readmission rates as compared to conventional protocols. However, current literature on ERAS in AIS is restricted largely to retrospective studies with non-randomized data, and initial cohort studies lacking formal control groups.

ARTIFICIAL INTELLIGENCE (AI) BASED DIAGNOSTIC TOOL FOR MRI CHARACTERISTICS OF CERVICAL OSSIFIED POSTERIOR LONGITUDINAL LIGAMENT (C-OPLL).

SHEMESH S^{1,3,4}, KIMCHI G¹, HAREL R¹.

1. Department of Neurosurgery, Sheba Medical Center, Ramat-Gan, Israel.
2. Department of Radiology, Sheba Medical Center, Ramat-Gan, Israel.
3. Sackler Faculty of Medicine, Tel Aviv University, Israel.
4. Arrow Program for Medical Research Education Sheba Medical Center, Israel.

BACKGROUND

OPLL is a multifactorial condition caused by ectopic hyperostosis and calcification of the posterior longitudinal ligament. Familial inheritance and genetic factors have been implicated in the etiology of OPLL. The most common classification of cervical OPLL is from the Investigation Committee on OPLL of the Japanese Ministry of Health and Welfare.

To date, diagnostic criteria for OPLL in MRI have not been established. The aim of this study is to develop AI software with a proven model to characterize and diagnose C-OPLL in MRI.

METHODS

A retrospective evaluation of imaging studies of all adult patients who underwent both cervical CT and MRI for all clinical indications within a span of 36 months in a single tertiary referral hospital located in central Israel was performed. To create the database, patients with CT and MRI were classified according to the accepted CT characteristics into several groups according to severity, location, thickens, symptoms and Hounsfield scale. We Used MATLAB software to create an artificial intelligence tool based on random forest learning method, which was used to find features in MRI for C-OPLL.

RESULTS

Overall, 800 subjects were radiographically evaluated. Based on the initial classification of

subjects with and without C-OPLL characteristics on CT, An AI software was developed which found a number of C-OPLL MRI imaging features and semi-automatically classified them into different severity groups.

CONCLUSION

The novel algorithm produced sensitive and reproducible semi-automated diagnosis of C-OPLL in MRI.

To our knowledge, this is the first publication to formulate robust MR criteria for this condition. Also, due to the high degree of significance, it is possible to keep developing similar AI software and consider targeting other pathological conditions.

EARLY EXPERIENCE OF FULL-ENDOSCOPIC POSTERIOR CERVICAL FORAMINOTOMY FOR THE TREATMENT OF CERVICAL RADICULOPATHY.

FELZENSZTEIN D, KOGAN D, HENDLER E, JACKSON S, HASHARONI A, ABUSHKARA R, MELKE B, HARNOF S, ITSHAYEK E.

BACKGROUND

Cervical radiculopathy can be treated conservatively with good clinical outcomes. When conservative treatment fails or neurological deficit ensues, surgical treatment offers adequate pain relief and provides optimal neurological improvement.

The surgical approach (either anterior ie ACDF, Joh's technique or posterior ie open or endoscopic foraminotomy), depends on patient characteristics and surgeon experience, with similar clinical outcomes for both approaches. Open approaches lead to increased tissue damage and postoperative neck pain.

Minimally invasive procedures aim to reduce muscle destruction, leading to a shortened hospital stay, reduced postoperative pain and increased patient satisfaction.

We present our early experience in fully endoscopic posterior cervical foraminotomy.

METHODS

Our surgical series includes 8 patients who underwent a full-endoscopic posterior cervical foraminotomy.

Surgery was performed using either Maxmorespine (Hoogland Spine GmbH) or Vertebris (RIWOSPINE GmbH) systems. The surgical technique was done in the prone position. Neuromonitoring and fluoroscopy were used in all cases. The technique is described in detail.

All patients underwent a CT and MRI examination of the cervical spine. The patients' general characteristics, including operative time, blood loss, hospital stay, complications, and recurrence,

were obtained. Clinical outcomes were evaluated using the visual analogue scale (VAS) for radicular pain, and neck disability index (NDI) for functional assessment.

RESULTS

All operations were successfully performed. There was no complication of nerve root injury, infections, epidural hematomas, or vascular or visceral injuries.

Clinical improvement was observed in all patients and reported as improved VAS and NDI scores.

CONCLUSIONS

Full-endoscopic posterior cervical foraminotomy is safe and effective in patients with cervical radiculopathy. This technique could be a safe alternative for cervical foraminotomies and improve patient outcome.

CHANGES IN CERVICAL SPINE ALIGNMENT WHILE USING A SMART PHONE.

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BACKGROUND

Never before has a technology been so universally accepted as the modern era cell phone, otherwise known as the smart phone. Spine surgeons have been noticing a rise of patients in their offices complaining of neck and upper back pain. Many patients are of the younger age group, and one thing they all seem to have in common is prolonged smart phone use. While using a smart phone the cervical spine is in a position of 15 to 60 degrees of flexion, with the greatest angles while sitting compared to standing and texting compared to web browsing or video watching.

Now days, there are strong evidence that persistent neck pain and radiculopathy is associated with time spent text messaging. While it now seems rather clear that repetitive texting, or similar activity while utilizing a forward flexed neck position, may lead to neck pain or "text neck," what is currently unknown is whether this poses a risk for intervertebral disk degeneration and consequent cervical spondylosis, and if so, at what age the condition will emerge and which levels of the cervical spine will it affect the most.

METHODS

We took lateral radiographs of the cervical spine, of healthy, less than 40 y/o volunteers. The radiographs were made while texting on a smartphone and in neutral position, sitting and standing. Then we measured the disc angles, vertebral angles and sagittal angles on each radiograph.

RESULTS

We found a strong correlation between the angles of the base of the skull and C1 and

C2 while seating and standing. Significant difference between the base of the skull and C2-5, and between C1-C6, while seating. Significant difference between the base of the skull and C2-5, C1 and C2-6, and C3 and C4-6.

CONCLUSION

Our observation shows that the most significant changes in the cervical spine while texting, occur between the supra-axial spine and the rest of the cervical spine.

HALO VEST IN THE TREATMENT OF CERVICAL SPINE FRACTURES - THE LOST ART.

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BACKGROUND

The use of Halo vest has been increasingly questioned as an acceptable treatment in upper cervical trauma due to reports of high complication rates and unacceptable treatment results, especially in old patients. Therefore, many have abandoned this treatment, and treat unstable cervical fractures with instrumented fusion. Our purpose in this study is to show that halo vest can be a good solution for unstable upper cervical fractures in selected cases.

METHODS

A retrospective study in Shaare Zedek Medical Center between 2016 -2022 with 6 patients who had upper cervical spine unstable fractures, ages 2-70 who was treated with Halo vest. Frequent follow up x rays and CT as needed was done to ensure proper reduction and stability of fractures, adjustment of the halo was done accordingly.

RESULTS

All fractures healed in acceptable alignment, halo vest was removed and patients have regained functional active range of motion. A pediatric patient remodeled and improved the cervical spine alignment, some patients ankylosed two vertebrae as part of the healing process. Pin related complications were treated locally and with oral antibiotics and resolved.

CONCLUSIONS

Halo vest treatment is not an easy treatment for the patients and the caregivers. It modifies patient's ADL, requires meticulous pin site maintenance and requires close follow up of fracture alignment followed by adjustment of the halo vest. On the other hand, it avoids surgical risks and complications, results in better range of

motion and does not necessitate cervical fusion.

In summary, unstable upper cervical spine fractures can be treated safely and successfully in selective patients with halo vest with good functional outcome, also it has some difficulties in the short term, it has several advantages in the long term.

TRAUMATIC POSTERIOR ATLANTOAXIAL DISLOCATION WITH AN ASSOCIATED FRACTURE: A SYSTEMATIC REVIEW.

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OBJECTIVE

Traumatic posterior atlantoaxial dislocation with fracture (TPAD) is an extremely rare entity, with a limited number of cases reported in literature. We conducted a systematic review of all cases of TPAD with fracture reported in literature to investigate the clinical presentation, mechanism of injury, patients' characteristics, diagnosis, treatment, and prognosis of this entity.

METHOD

This systematic review was conducted following the Preferred Reporting Items for Systematic reviews and Meta-analysis (PRISMA) guidelines. Relevant literature was retrieved from Pubmed data base from the earliest entry dates till 2021. All published English written prospective, retrospective, systematic review, meta-analysis, case series and case reports studies involving human subjects with relevant data regarding TPAD were included.

RESULTS

Two case series and 20 case reports published between 1924-2021 describing 28 patients with TPAD were included. Median age at presentation was 51.5 years, with male predominance (83%). The relevant injury history included motor vehicle accident (MVA) (45%), fall from height (41%) and other. The most common fracture pattern was Anderson and D'alozzo type II odontoid fracture (78%), followed by anterior arch of C1 fracture (18%). Neurologic exam at presentation was intact in 52% of patients. The primary diagnostic imaging was Computed tomography (CT)

employed in 96% of cases. The management consisted of 2 stages protocol, initially a temporary axial traction was employed (54%), later definitive surgical treatment was employed (93%). Posterior surgical approach was favoured in 82% of cases.

CONCLUSION

TPAD with fracture is considered a rare entity occurring in majority of cases with Anderson and D'alozzo type II odontoid fracture, predominantly in males following MVA or fall from height. Diagnosis is usually established based on CT imaging; further imaging may not be indicated as it doesn't seem to alternate patient's management course. Surgical intervention was employed in almost all cases with favoured results via posterior C1-C2 fusion.

FUNCTIONAL OUTCOMES FOLLOWING THE RESECTION OF INTRADURAL EXTRAMEDULLARY SPINAL TUMORS IN THE ELDERLY.

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BACKGROUND

Treatment for intradural extramedullary tumors (IDEMT) in the elderly pose unique clinical challenges. Facing an increasing number of well-functioning septuagenarians and octogenarians presenting with neurologically symptomatic IDEMT, the authors of this study retrospectively evaluated functional outcomes following the resection of IDEMT in the elderly population compared to a younger control group.

METHODS

All patients treated surgically for the resection of IDEMT in the years 2011 to 2020 in a single institute were identified, and divided into an elderly (≥ 75 years) and control (<75 years) groups. Recurrent tumors were excluded. Pre-operative baseline characteristics including medical history, functional status (McCormick grade), neurological deficits, tumor type and tumor size were compared between the groups. Primary outcomes were post-operative McCormick grade and neurological change at POD1 and at the latest follow up. Secondary outcomes included post-operative complications, length of stay (LoS), need for post-operative rehabilitation, duration of surgery and intraoperative neurophysiological monitoring changes. Outcomes were compared between the groups using Chi square and T test. Statistical analysis was performed with SPSS software (IBM corp).

RESULTS

Overall, twenty elderly patients were compared to 141 younger patients (mean age 80.8 \pm 4.2 vs 53.7 \pm 15.1 years respectively). The elderly group had a significantly higher McCormick

grade at baseline (50% vs. 13%, McCormick grade IV & V respectively). Duration of surgery was shorter in the elderly group (1.6 vs. 2.1 hours, $p < 0.005$). There were no statistically significant differences in post-operative functional outcome and neurological deterioration rates between the groups, albeit a higher proportion of elderly patients requiring in house rehabilitation (65% vs 32%, $p = 0.02$). Improvement of at least 1 score in the McCormick scale was noted in 58% of the elderly group vs. 47% in the controls ($P > 0.5$). Persistent intra-operative neuromonitoring attenuations occurred with similar rates (MEP 15% vs. 13%, and SSEP 5% vs 7.2% ($P > 0.05$) for the elderly and control groups, respectively). There were no differences in complications rates between the groups. Peri-operative mortality was not encountered in any of the groups.

CONCLUSION

Surgical resection of IDEMT in the elderly was not associated with increased rate of post-operative complications or with decreased functional status compared to a younger cohort. With an acceptable morbidity rate and a high proportion of patients demonstrating functional improvement following surgery, our experience supports the decision to treat elderly patients with neurologically symptomatic IDEMT surgically. Poorer status at presentation in the elderly group may indicate delayed diagnosis accounting for their poorer neurological outcomes. Clinicians are encouraged to attain a higher index of suspicion for IDEMT in that population.

DUAL PRIMARY MALIGNANCY IN A SINGLE PATIENT.

VODOVOZOV D, SALIMAN A, ALEXANDROVSKY V, SHPIGELMAN A.

BACKGROUND

Ewing sarcoma (ES) belongs to a spectrum of neoplastic diseases known as the ES family of tumors (EFT); They are considered to be derived from a common cell of origin. The EFT most often arises in long bones, the femur, and the bones of the pelvis. Spine, hands, and feet are far less common sites.

Prostate cancer is the second most common malignancy (after lung cancer) in men worldwide, with an estimated 1,600,000 cases and 366,000 deaths annually. Eleven percent of American men will be diagnosed with prostate cancer over their lifetime. The clinical behavior of prostate cancer varies widely and is often asymptomatic.

We report a case of simultaneous diagnosis of Ewing sarcoma and prostate adenocarcinoma with profound clinical manifestation..

CASE REPORT

A 53-year-old male with advanced metastatic prostate cancer (Gleason-9) admitted with classical presentation of cauda equina syndrome including incontinence, back pain, and paresis following bilateral nephrostomy insertion for the treatment of bilateral renal hydronephrosis. The patient was suspected to have an epidural abscess at the level of L5-S1 and an emergency surgical spine decompression was performed. No abscess was found, and pathology results showed a concomitant primary Ewing sarcoma in the spine.

CONCLUSIONS

Very rare occurrences of a dual primary malignancy, in this case, Ewing sarcoma and 16 prostate adenocarcinoma, should be kept in mind in patients suffering from complex clinical course of malignancy.

REDUCTION OF SURGICAL SITE INFECTION WITH A TIMED ALCOHOLIC PREPARATION IN SPINE SURGERY.

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INTRODUCTION

Surgical site infections (SSI) are the most common complication of most surgical procedures, and impose major threat on patients' health. When considering such infections in spinal surgeries, the potential risk to the patients is even higher. The medical literature states that the infection rate in spine surgery runs between 3-7%.

METHODS

In a large volume spine surgery referral center, the unit for infection prevention and control, collects all data regarding spine surgeries every six months, and analyses each case of suspected SSI per the Centers for Disease Control (CDC) strict criteria. Each case is defined as not infected, superficial infection, or deep infection. On July 1, 2021, the spine team has changed the skin preparation policy, demanding a full 4-minute of alcohol evaporation time after skin preparation, before the first incision. This before-and-after study compares the infection rates in the year before this change to the following year.

RESULTS

All open spine surgeries were collected, excluding pediatric and MIS surgeries. Overall, there were 939 open procedures during the two years that were collected. Total SSI rates decreased from 7.0% (34/484) before this intervention to 4.2% (19/455) ($p = 0.058$) in the year following the intervention.

When looking only at deep SSI, mandating an wound washout the infection rate decreased from 2.5% (12/484) before the policy change to 0.8% (4/455) in the following year ($p = 0.05$).

DISCUSSION

Many interventions were suggested previously to lower the risk of SSI. Most of them are implemented in our hospital. The addition of a 4-minute alcohol evaporation time to skin preparation has decreased the rate of deep and superficial SSI in spinal surgeries dramatically.

THE USE OF ENDOSCOPIC ASPIRATION IN THE IDENTIFICATION OF BACTERIAL PATHOGENS CAUSING DISCITIS.

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BACKGROUND

Vertebral osteomyelitis and discitis in adults are often the result of hematogenous seeding. Due to its limited vasculature and additional unique characteristics, the intradiscal space may be susceptible to infections, more often of an indolent nature. Diagnosis is difficult to establish, and even more so is achieving microbiologic identification. Identification of the etiologic organism is essential in directing antibiotic therapy, and biopsy with demonstration of the infectious organism is the gold standard for diagnosis. In many cases cultures may be negative despite the presence of infection.

OBJECTIVES

The aim of this study was to evaluate the positive culture rate in biopsies obtained by minimally invasive procedures under fluoroscopy, in cases of suspected vertebral osteomyelitis, and to identify infecting organisms. In addition, we assessed patient outcomes according to microbiologic data and baseline characteristics.

METHODS

Study cohort consists of patients with suspected discitis who underwent disc aspiration and lavage using endoscopy as a minimally invasive procedure under fluoroscopy guidance at the Hadassah Medical Center in Jerusalem, between November 2021 and September 2022. We used bacterial cultures as well as molecular techniques to characterize the intradiscal environment.

RESULTS & CONCLUSIONS

Preliminary data showed overall 56 cases of endoscopy of them 18 of whom were considered highly suspicious as vertebral osteomyelitis according to the Infectious disease Society of America definitions. In 16/25 (64%) cases a causing pathogen was identified, one of whom was identified by molecular methods. There was one case of mycobacterium tuberculosis and one case of Bartonella. This suggests a similar or even higher rate of positive cultures than reported in current literature. We also observed that all patients recovered from the procedure without need for additional surgical intervention, and there was a relatively low rate of immediate and short-term complications.

DIAGNOSTIC UTILITY OF VERTEBRAL BIOPSIES OBTAINED IN KYPHOPLASTY PROCEDURES.

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BACKGROUND

Balloon kyphoplasty is a commonly used technique for the treatment of vertebral body fractures. In addition to stabilizing the affected vertebra and reducing pain, it gives access for tissue sampling through the Jamshidi needle by extracting tissue fragments off the manual drill when pathological fractures are suspected. The object of this study is to evaluate the diagnostic utility of biopsies obtained in this fashion.

METHODS

All adult patients (>18) who underwent kyphoplasty for thoracolumbar fractures in the years 2011 to 2020 in a single institute were identified for retrospective evaluation. Pre-operative baseline characteristics included cancer history, functional status (Karnofsky Performance Scale, KPS), and imaging characteristics of the lesion. Pathology reports of samples obtained during the kyphoplasty were compared to same-patient biopsies obtained from different anatomical targets. Operative approach (transpedicular and extrapedicular), duration of surgery, and number of fluoroscopies were documented. Postoperative complications and reduction in analgesic medication were evaluated. Chi-square test was used to compare the diagnostic utility of the two samples.

RESULTS

Overall, 73 patients underwent kyphoplasty for any clinical indication. Of these, 56 patients treated for pathological fractures were identified, yielding 69 treated vertebrae. All 56 patients had additional biopsy obtained from a different anatomical region. Median pre-operative KPS was 80 (IQR 70-90). Mean post-operative length of hospital stay was 1.9 days. Post-operative neurological function improved

in 13 patients (23.6%), deteriorated 2 patients (3.5%), and remained as baseline in 40 (72.8%) patients. In 26 patients (46.6%), a substantial decrease in opioid consumption or complete cessation of use was achieved. There were 2 cases of cement leakage into the epidural space, without cord compression. The tissue sampled was nondiagnostic in 4 patients (8.5%). There was no evidence of malignancy in 24 tissue samples (51%), and in 18 cases (38.3%) the tissue sampling was synonymous with the biopsy obtained from different anatomical targets.

CONCLUSIONS

Vertebral biopsies obtained during kyphoplasty procedures by extracting tissue fragments off the manual drill without inserting additional tools were diagnostic in 91.5% of our cohort. Integrating biopsies in the kyphoplasty workflow is feasible, and holds the advantage of obviating the need for additional biopsy.

PREDICTORS OF RECURRENT OSTEOPOROTIC FRACTURES

SHAHWAN A, KAPLAN L, SAGIV S, JOSE COHEN J, EINAV O, SCHROEDER J.

With the increase of the elderly population osteoporotic compression vertebral fractures are more common every day. One of the commonly accepted treatment for this condition is kyphoplasty.

Predicting which of these patients will recur is a diagnostic challenge.

In our study we compare the adjacent level fracture after the first fracture in a 1 year period utilizing the measurement of Hounsfield units of the first CT scan.

We studied 60 pts with osteoporotic fractures of the thoracolumbar vertebrae (T10-L5) over the age of 60 with not known oncological or other previous surgical intervention.

We found that patients with average HU of the adjacent 2 or 3 vertebrae lower than 90 may suffer from a new fracture in said vertebrae, and patients with HU above 110 have a lower chance of adjacent level fracture in a period of 1 year.

RADIATION EXPOSURE AND PROCEDURE DURATION ANALYSIS OF KYPHOPLASTY USING DUAL FLUOROSCOPIC GUIDANCE.

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BACKGROUND

Vertebral compression fractures (VCF) are the most common osteoporotic fractures, responsible for significant pain, morbidity and potential mortality. Vertebral augmentation procedures, such as balloon kyphoplasty, are a viable option to treat these fractures and negate their effect on the patients' quality of life. Vertebral augmentation is performed with fluoroscopic guidance in the anteroposterior and lateral views, which is often performed with the use of a single fluoroscopy machine.

We designed and implemented a novel technique using dual fluoroscopic guidance to minimize procedure time and radiation exposure. The aim of this study was to evaluate the radiography related features of this technique, compared to the single- machine technique.

METHODS

We retrospectively reviewed the medical records of all patients who underwent kyphoplasty procedures between the years 2020 and 2022 at a single institute. We divided the patient population into two groups according to the use of one or two fluoroscopic machines during the procedure, and compared the procedure duration and radiation exposure utilizing both a univariable and a multivariable analysis. A spearman correlation coefficient was used to evaluate the correlation between the surgeon cumulative experience in the procedure and the dependent variables.

RESULTS

A total number of 117 procedures were included

in this study. 80 cases (68.3%) were performed with one machine and 37 cases (31.6%) with two machines. The average patient age was 74.36 ± 10.2 years, 71% were women, 98% with ASA score ≤ 3 , with no significant difference between the two groups. In 40 (34.2%) cases one pedicle was approached and 58 cases (49.6%) were bipedicular. Adjusted to pedicle number approached, the mean procedure time (17.42 ± 8.94 minutes), radiation duration (46.91 ± 26.5 seconds), reference air kerma (16.45 ± 12.46 mGy) and dose area product (297.79 ± 219.49 $\mu\text{Gy} \cdot \text{m}^2$), did not differ between the two groups ($P > 0.05$ for all). A significant negative correlation was found between the cumulative surgeon experience with the use of two fluoroscopic machines and the radiation exposure ($s = -0.345$, $P = 0.035$). This correlation did not exist in the one-machine group.

CONCLUSIONS

The current preliminary data presents a statistically significant learning curve with the use of dual fluoroscopy machine technique, which has already reached equivalent results when compared with the one-machine technique. We will continue to collect the data to define the plateau in the learning curve and its efficacy in radiation exposure and procedure duration.

MACHINE LEARNING-GENERATED POSTERIOR VERTEBRAL ELEMENT CLUSTERS DISTINGUISH OCCULT OSTEOPOROTIC FRACTURES FROM NORMAL VERTEBRAE USING CT SCANS ONLY.

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* Equal contribution.

BACKGROUND

Osteoporotic vertebral compression fractures (VCF) are common among the elderly population and can lead to increased disability and mortality. Diagnosis may be challenging at times since it is difficult to differentiate on plain x-rays or computerized tomography (CT) old, healed fractures from fresh VCF's while, on the other hand, some fresh VCF's may be occult in the early stages, and appear as normal vertebrae on radiographs or CT. In such cases, a TC99 bone scan or short tau inversion recovery (STIR) sequence magnetic resonance imaging (MRI) may also be required.

In this study, we aimed to differentiate between normal vertebral bodies (NVB) and those with occult vertebral fractures (OVF) using CT scan data only by applying a clustering algorithm to identify radiological patterns associated with fresh VCF's and not associated with normal bone.

MATERIALS & METHODS

We analyzed CT and Tc99 bone scans of 25 vertebrae, with 16 normal vertebrae and 9 OVF. The data was transformed into 3D arrays of Hounsfield units using the DICOM data, and the k-means clustering algorithm was applied to cluster the data into groups based on their similarity, determined by the features of location (x,y,z) and Hounsfield units (HU). The absolute and relative volume of each cluster were calculated, ranked in descending order, and the ratio

between each pair of clusters was determined. Using a decision tree classifier, a tree based on two features was constructed, which was then used to compare the resulting features with the type of fracture. The corresponding clusters of each feature were visualized by printing the vertebral CT scan with the relevant cluster marked and other clusters blurred. The printed slices were observed and analyzed by clinicians to derive clinical conclusions.

RESULTS

When analyzing the vertebral scans with a clustering of K=34 (split the CT scans into 34 different clusters), the volume ratio feature that combined volumes ranked 17 and 16 could split the cohort into a group of 11 normal vertebrae and a second heterogenous group that included 4 normal vertebrae and 8 vertebrae with OVF. The decision tree then used the volumes ranked 2 and 0 to finally split the second group into normal vertebrae and vertebrae with occult fractures.

While other volumes corresponded to various elements on the CT scan, volume 0 always corresponded to the posterior element clusters.

DISCUSSION

We compared raw CT scan data as an HU array to eliminate data loss. Analyzing the whole vertebra as a single unit allowed us to consider inter-slice relationships and continuity of each cluster. A 2-node decision tree enabled visualization

and determination of clinical application and relevance. Limitations include a small study cohort, and validation is needed using alternative methods and data.

CONCLUSIONS

This study highlights the potential of machine learning to differentiate normal vertebral bodies from OVF using only CT scans. Our findings suggest that the volume of the posterior elements of vertebral bodies may be a useful feature in diagnosing an OVF without a bone scan or MRI. Machine learning can contribute to medical imaging by finding clinically relevant features previously unnoticed. Our results demonstrate how machine learning can facilitate inter-modality capability bridging (IMCB), extending capabilities exclusive to a specific modality to other modalities and reducing reliance on more complicated and time-consuming imaging modalities.

PERCEIVED AND OBJECTIVE MEASURES OF STRESS AND THEIR ASSOCIATIONS WITH PAIN AND PLACEBO ANALGESIA: PRELIMINARY RESULTS FROM CHRONIC BACK PAIN PATIENTS.

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BACKGROUND

Current treatments for chronic back pain show in many cases little advantage over the natural history. Surgical treatment is often disappointing too, leading to failed back surgery and worsening pain and function. Chronic pain may stem from central changes (cognitive and other) in sensory regulation rather than a specific spinal organic pathology, and better understanding of pain attenuation through nonspecific components of the therapeutic encounter such as a change in stress levels may improve outcomes. This study aimed to determine whether pain and placebo-analgesia are associated with perceived stress and/or objective measures of stress such as sympathetic & parasympathetic activity assessed by Heart-rate-variability (HRV).

METHODS

Chronic back pain patients received a subcutaneous placebo (NaCl 0.9%) injection. As a baseline, the perceived stress level in the previous month was recorded. Numeric pain score (NPS) and HRV measures of low-frequency(LF), high-frequency(HF), and LF-HF ratio, were assessed before and 30 minutes following injection. NPS was further assessed 24 hours post-injection.

RESULTS

Participants (n=88) demonstrated a significant placebo response ($p < 0.001$) with a post-injection NPS reduction (mean \pm SD) of 17.86 ± 19.6 and 12.78 ± 25.05 , 30 minutes, and 24 hours respectively.

A significant decrease in LF-HRV ($p = 0.020$) an increase in HF-HRV ($p = 0.001$) and a change in LF-HF ratio ($p = 0.026$) were seen following injection. Perceived stress correlated with self-reported pain ($p = 0.036$) but not with the placebo response. Placebo response after 24 hours (but not after 30 minutes) was correlated with changes in LF-HRV ($p = 0.016$); HF-HRV ($p = 0.017$) and LF-HF ratio ($p = 0.026$).

CONCLUSIONS

Perceived stress was associated with self-reported pain intensity, but not with the placebo response. Changes in objective HRV measures, reflecting autonomic activity, were associated with delayed placebo response after 24 hours. These findings may open a pathway for better pre-operative assessment of surgical candidates by taking into account that modification of anatomical changes in imaging studies may not play a decisive role in certain patients with chronic back pain.

NOL EXAMINATION DURING SPINAL SURGICAL PROCEDURES.

GRACH M, VODOVOZOV D, SALIMAN A, ALEXANDROVSKY V, SHPIGELMAN A.

BACKGROUND

During general anesthesia, patients receive medication in order to induce unconsciousness, amnesia, and pain relief. The aspect of pain control is crucial during and after spinal surgeries which are notoriously known for pain induction.

As other neurological signals, pain may be measured via electrophysiological techniques. And thus it is possible to measure its appearance, intensification and disappearance during medical procedures.

This study was set out in order to optimize pain control medication regime during spinal surgeries, by measuring pain induction and the influence of pain control medication on its duration and intensity.

METHODS

Spinal surgeries were divided by its broader categories which included: discectomies and minimal invasive procedures, laminectomies and decompressions, and vertebral fusions and fixations. Each of these procedures was broken down into stages. In corporation with an anesthesiologist we composed a protocol for any intervention to determine the NOL measurement during the surgery. That way we were able to determine which of the stages are painful for the patient and by thus to standardize a proper medical approach for these surgeries.

RESULTS

Average values of NoL in the various stages of the surgery ranged from 18 in the discectomy stage (2.8 pts) to 30 in the screw insertion stage (13 pts). Variability was expressed in standard deviation values that ranged from 2.8 (the discectomy stage) to 27 in the flavetomy stage where an average value of 28 was sampled. With the exception of

stages, of which standard deviation values ranged from 12.6 to 19.8. The stages in which NOL values higher than 25 were sampled are the cage insertion stage (average 28.3 standard deviation 17), the flavectomy stage as mentioned above, the suturing stage of the subcutaneous tissue with an average of 25.9 (standard deviation 16.4) and the screw insertion stage with an average of 30.3 (standard deviation 13). In the stages where average NoL values were below 25, the highest averages were sampled in the tissue debridement stage with an average of 24.2 (standard deviation 13.1), the subcutaneous incision stage (average 24.4 standard deviation 15.7) and the first incision stage in the skin with an average of 24.1 (standard deviation 14). Intermediate values of NoL averages were sampled during the disc preparation phase (average 22.4 standard deviation 14), the bone graft installation phase (average 20.1 standard deviation 12.6), the fixation phase (average 20.7 standard deviation 13), the laminectomy phase (average 20.4 standard deviation 16.3), the nucleotomy phase (average 22.5 standard deviation 19.8) and the surface preparation phase with an average of 22.7 (standard deviation 13.6). The lowest values were measured in the discectomy stage with an average of 18 (standard deviation 2.8), the subcutaneous suturing stage (average 17.4 standard deviation 14.9) and the stage in which the lowest average was measured is the skin closure stage with a value of 16.6 (standard deviation 11.2).

CONCLUSION

NOL examination may be used in order to standardize analgesia in surgical procedures for the benefit of the patient as well as the medical facility in terms of duration of hospitalization. The amount and timing of the medication given can be calculated per procedure and per patient body type in order to prevent unnecessary pain for the patient, and on the other hand prevent possible overdosing.

TIMING OF PREGNANCY AND CHILDBIRTH AFTER LUMBAR DISCECTOMY: A RETROSPECTIVE STUDY.

FELZENSZTEIN D, KOGAN D, HENDLER E, JACKSON S, HASHARONI A, ABUSHKARA R, MELKE B, HARNOF S, ITSHAYEK E.

BACKGROUND

Lumbar radiculopathy affects 1.6% to 13.4% of the population. Low back pain (LBP) and leg pain (LP) are common complaints during pregnancy, affecting around half the pregnant population (4). LBP associated with true radiculopathy from disc herniation affects around 1% of women during pregnancy (5). Risk factors that increase LBP and LP include excessive weight gain, previous low back pain and a history of pelvic girdle pain. Joints can shift and press on different nerves causing motor and sensory deficits. The pain's pathophysiology remains unclear but is most likely due to biomechanical and hormonal changes that occur during pregnancy (4,6,7).

This study aims to identify the optimal timing for pregnancy and childbirth after lumbar discectomy and to identify the risk factors for lumbar back pain during or after pregnancy in women who have had a previous lumbar discectomy.

METHODS & MATERIALS

Data was extracted from Clalit Health Services (CHS) using Clalit Data Sharing platform powered by MDClone**

Query was made through the Clalit Health Services database of beneficiaries who received care in Clalit health facilities between 2010 and 2019. The population in question included women aged 18-45 who underwent lumbar discectomy up to 10 years before giving birth. Demographic data and timing from index procedure to pregnancy, and time from pregnancy to the second event (ie radiculopathy, lumbar back pain, sciatica, etc) were included in the search query. Patients were excluded if found without sufficient documentation. The obtained data were anonymised and randomly collected.

RESULTS

Overall, 59 patients were included (age 31.94 ± 5.32 years old). Out of the 59 patients, 20 experienced a second event. The average time from the first disc herniation to pregnancy was 3.25 years. No statistically significant relationship was found between the time of first disc herniation until pregnancy and the second event. ROC curves analysis showed a time frame of 0.7 years from the first disc herniation and pregnancy. Using Kaplan Mayer survival model, a trend toward reduced risk for lumbar back pain was found; the longer the time from first disc herniation to pregnancy ($p=0.7$).

CONCLUSIONS

Our findings suggest an increased risk of lumbar back pain after birth the shorter the time interval between discectomy and pregnancy. Patients should be advised a year's rest prior to pregnancy to reduce the likelihood of worsening lumbar symptomatology.

CHANGES IN NERVE CONDUCTION VELOCITY IN PATIENTS WITH LOW BACK PAIN AND RADICULAR PAIN IN DIFFERENT POSITION – SLR AND SUPINE POSITION.

VODOVOZOV D, SALIMAN A, ALEXANDROVSKY V, SHPIGELMAN A.

BACKGROUND

Approximately 70% to 80% of the adult population suffers from Low Back Pain (LBP) during their lives. LBP is the primary cause of disability in patients younger than 50 years of age. Patients with Disc Herniation can present with constellation of symptoms that range from benign LBP to Back Pain with lower extremity pain – Radicular Pain, caused by nerve root compression.

One of the methods to diagnose nerve Root compression is by electrodiagnostic method. Electrodiagnostic evaluation can be useful in distinguishing among a variety of causes for numbness, weakness and pain in lower extremity.

METHODS

We evaluated 18 patients with LBP and Radicular pain in their acute onset. Imaging study (CT of the lumbar spine in all patients) was positive for disc herniation with recess or foraminal stenosis and Root compression in different levels. We made an EMG examination on patients with LBP and Radicular syndrome in two positions: in supine position and in SLR position with entrapment nerve tension, in order to evaluate the difference or lack there off of EMG results. After the evaluation we analyzed both groups statistically, and results were registered and analyzed.

RESULTS

By examining F-min (ms) (changes in NCS of patients with low back and radicular pain) we could evaluate the nerve conduction in nerves with roots compressed by lumbar spine pathology.

We could see, changes in NCS in different positions of the patients with Back and Radicular

pain – in supine position and in Nerve Tension (SLR) position.

F-MIN measured:

For patients in supine position was 52.78

For patients in SLR position was 56.42

After statistical examination we can see statistically relevant changes of F-min. in patients in SLR position – 83%.

CONCLUSIONS

electrodiagnostic examination may be used as a tool for detection of Nerve root compression by disc herniation. our study demonstrated changes in NCS in different positions in patients with low back and radicular pain – in supine position and in Nerve Tension (SLR) position, in all patients examined. After statistical examination were able to visualize statistically relevant changes of F-min in patients in SLR position – 83%.

SCHOBER TEST AND ITS MODIFICATIONS REVISITED WHAT ARE WE ACTUALLY MEASURING?

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OBJECTIVE

Examine Schober test's (ST), Modified ST (MST), and Modified-Modified ST (MMST) surface markers' accuracy in spanning lumbar L1-S1 motion segments and repeatability related to actual patient anatomy as measured on sagittal CT scans.

METHODS

The study included 25 patients of varying heights, weights, and gender without prior spinal surgery or deformity. Researchers assessed patients' CT scans for ST, MST, and MMST skin levels of the measured cephalic and caudal endpoints.

RESULTS

The original ST failed to include at least one lumbar motion segment in all patients, omitting the L1-L2 motion segment in 17 patients and the L2-L3 in another eight. The additional cephalic length of the MST did not improve the inclusion of the actual L1-S1 components. The MMST measured 19 'patients' entire L1-S1 motion segments, reaching a 76% accuracy rate. WMST, measuring 16 cm (instead of MMST's 15 cm), improved the measurement significantly, measuring the L1-S1 motion segments in all cases (with 100% accuracy).

CONCLUSION

ST and its modifications fail to span the L1-S1 motion segments and are thus prone to underestimating lumbar spine motion. This study shows that the WMST is much more accurate than previous modifications and is a better tool for evaluating lumbar spine motion.

INTRAVENOUS TRANEXAMIC ACID REDUCES BLOOD LOSS IN MULTILEVEL SPINE SURGERIES.

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INTRODUCTION

Complex spine surgeries are associated with significant blood loss requiring numerous strategies to preserve blood volume. Tranexamic acid (TXA) is efficacious in reducing blood loss when used topically during surgery, intravenously with or without postoperative maintenance treatment.

METHODS

A retrospective cohort study comparing patients who underwent microdiscectomy, lumbar single-level fusion and multilevel laminectomies without and without preoperative IV TXA administration between 2016 to 2020.

RESULTS

210 patients underwent spine surgery without preoperative IV TXA administration between 2016 and 2018 compared to 109 patients who received preoperative IV 1 TXA gr between 2018 and 2020. Preoperative IV TXA treatment did not change blood loss following microdiscectomy, 77.2 ± 53.9 ml and 77.2 ± 95.2 ml, respectively ($p = 0.792$). Preoperative IV TXA treatment reduced blood loss following multilevel lumbar laminectomy and lumbar PSF&TLIF ($p = 0.004$ and $p=0.0001$, respectively). The same effect was found for intra-operative blood loss and postoperative drainage, with preoperative TXA administration reducing intraoperative blood loss and postoperative drainage for the multilevel lumbar laminectomy and lumbar PSF&TLIF cohorts. No IV TXA treatment adverse events were registered in all cohorts.

CONCLUSIONS

Routine administration of preoperative weight-independent 1 gram intravenous TXA protocol is efficacious and safe in reducing perioperative blood loss for lumbar multilevel laminectomies and PSF&TLIFs.

ENDOSCOPIC LUMBAR SPINAL SURGERY: LEARNING CURVE AND OVERVIEW OF TRANSFORAMINAL DISCECTOMY TECHNIQUE.

ARTOMONOV A, LEE E, DJABBAROV R.

INTRODUCTION

When treating degenerative spine conditions, conventional open laminoplasty and discectomy remain the gold standard for lumbar disc herniations and spinal stenosis. However, the advent of endoscopic lumbar decompression techniques such as intralaminar and transforaminal discectomy have presented a less invasive and effective alternative. As instruments and techniques continue to evolve, endoscopic surgery is now delivering comparable outcomes to conventional open surgery. Despite this progress, significant learning curves and endoscopy-related adverse events remain significant challenges..

OBJECTIVE

The purpose of this study was to analyze the learning curve of two surgeons in performing endoscopic lumbar spinal surgery (ELSS) and to provide a comprehensive overview of the challenging awake transforaminal discectomy technique..

METHODS

A retrospective analysis was conducted on 60 patients who underwent percutaneous endoscopic decompression for spinal stenosis, intralaminar or transforaminal discectomy between January 2021 and January 2022 at Barzilai Medical Center. The patients were divided into two groups based on the order of the surgery: early group (first 30 cases), and late group (last 30 cases). There were no significant differences in age, gender, and surgical segment distribution between the groups. The patient selection was primarily influenced by the surgeon, with a higher incidence of intralaminar discectomies in the early group and more decompression surgeries and transforaminal discectomies in the late group. Data collected included the conversion to open surgery,

operation time, hospital stay after surgery, and the incidence of perioperative complications..

RESULTS

The operation time and hospital stay were significantly higher in the early group compared to the late group. The results of the analysis provide insight into the evolution of ELSS and the mastery of the transforaminal discectomy technique over time.

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