

RESEARCH TO PRACTICE
Michael Colgan, MD, MSc
Current Concepts in Spinal Oncology April 24

Sound Check
11:55

Start Time
12:00

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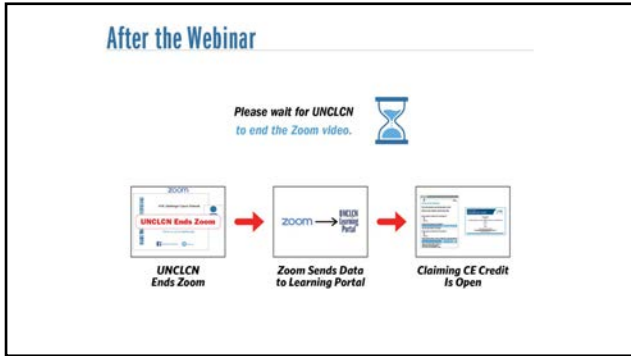
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Thank you for spreading the word!

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Our Presenter



Michael Galgano, MD, FACS

Dr. Michael Galgano is a board-certified neurosurgeon specializing in complex spinal surgery.

While Dr. Galgano treats a variety of spinal conditions such as trauma, degenerative disease, and infections, his clinical and academic interest has focused on spinal oncology and deformity surgery.

Dr. Galgano first developed an interest in spinal conditions while working as a nurse attendant on the spinal cord and traumatic brain injury unit at Burke Rehabilitation Hospital in White Plains, NY. He then became a clinical research associate there, engaging in research projects focusing on both stroke and spinal cord injury rehabilitation with robotic applications.

After attending medical school at St. George's University, Dr. Galgano completed his neurosurgical residency at Upstate Medical University. During his final year of training, Dr. Galgano completed a complex and oncological spine surgery fellowship under the world-renowned spinal tumor surgeon, Dr. Ziya Gokasian at Brown University.

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Our Presenter

9

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5. Michael Galgano, MD, FAANS, was a nurse attendant for TBI/SCI patients prior to medical school.
4. He has a very robust surgical video library.

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2. Dr. Galgano is a part time basketball coach for 7th/8th grade girls. He has been a basketball junkie his entire life.

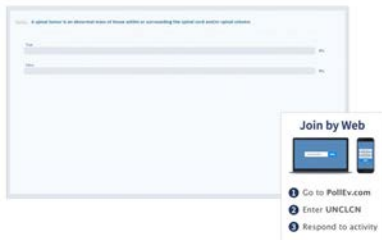
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2. Dr. Galgano is a part time basketball coach for 7th/8th grade girls. He has been a basketball junkie his entire life.
1. His favorite part of the day is coming home to his beautiful wife Jessica & 4 kids (Caroline, Bella, Charlotte, and Mikey)!

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Sample Poll Everywhere Question



The screenshot shows a poll question interface with a 'Join by Web' overlay. The overlay includes a QR code and instructions: 'Go to PollEv.com', 'Enter UNCLCN', and 'Respond to activity'.

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ACCME Disclosure

This activity has been planned and implemented under the sole supervision of the Course Director, Stephanie Wheeler, M.D., M.H., in association with the UNC Office of Continuing Professional Development (CPD). The course director received research support from AstraZeneca (ended June 2023) and Pfizer Medical Foundation (ended December 2023). These financial relationships have been mitigated. CPD staff have no relevant financial relationships with ineligible companies as defined by the ACCME.

A potential conflict of interest occurs when an individual has an opportunity to affect educational content about health-care products or services of a commercial interest with which he/she has a financial relationship. The speakers and planners of this learning activity have not disclosed any relevant financial relationships with any commercial interests pertaining to this activity.

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Relevant Financial Relationship:
 No one with the ability to control content of this activity has a relevant financial relationship with an ineligible company.

Criteria for Activity Completion:
 Criteria for successful completion requires attendance at the NCPD activity and submission of an evaluation within 30 days.

Approved Provider Statement:
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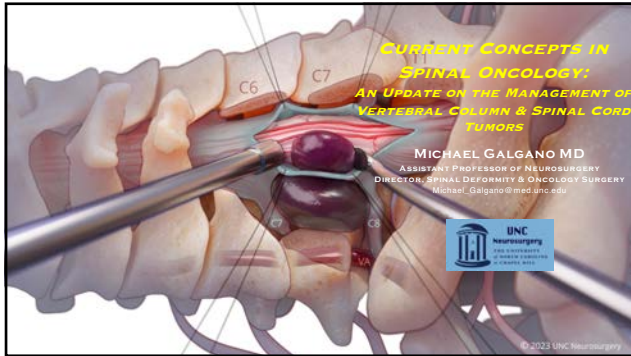
A spinal tumor is an abnormal mass of tissue within or surrounding the spinal cord and/or spinal column.

True

False

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MICHAEL_GALGANO@MED.UNC.EDU

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• Nurse Attendant, Clinical Research Associate
- 2006 – 2010: St. George's University
• MD
- 2010 – 2017: SUNY Upstate University
• Neurosurgery Residency
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- 2018 – 2022: SUNY Upstate University
• Neurosurgery Faculty
- 2022 – Present: University of North Carolina
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(845)-608-3193
MICHAEL_GALGANO@MED.UNC.EDU

ZIYA GOKASLAN MD

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• Nurse Attendant, Clinical Research Associate
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SPINE TUMOR PROGRAM



Spine Tumor Program



Scan the QR code to visit the spine tumor program's page on our website. Learn about our multidisciplinary team, read about spine tumors, and watch our spine tumor program video that was created by the program's director, Dr. Michael Galgano.



Questions? Call our spine surgery nurse coordinator, Katie McDonnell, at 984-974-4325.

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Objectives

- UNDERSTAND THE DIFFERENT MANAGEMENT STRATEGIES FOR SPINAL CORD & VERTEBRAL BODY TUMORS AS THEY RELATE TO LOCATION, NEUROLOGICAL EXAM, HISTOLOGY, AND OVERALL PROGNOSIS
- RECOGNIZE THE MULTI-FACETED PROCESS OF EXECUTING A PATIENT-SPECIFIC TREATMENT PLAN
- UNDERSTAND THE CONTRIBUTION OF CO-MORBIDITIES AND FRAILTY TO THE MANAGEMENT OF PATIENTS WITH SPINAL TUMORS

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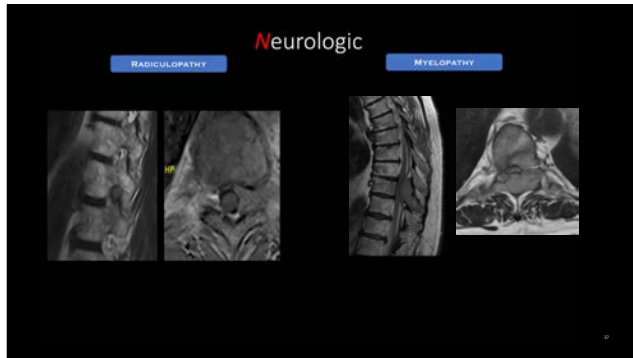
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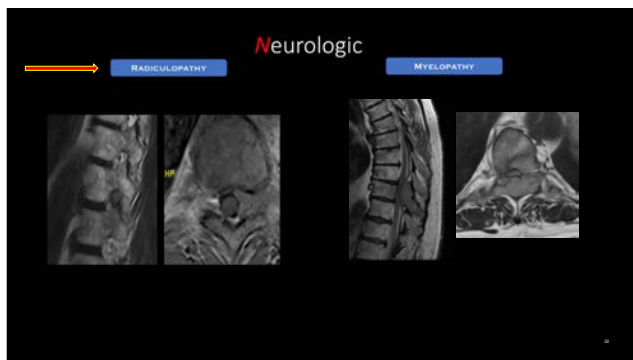
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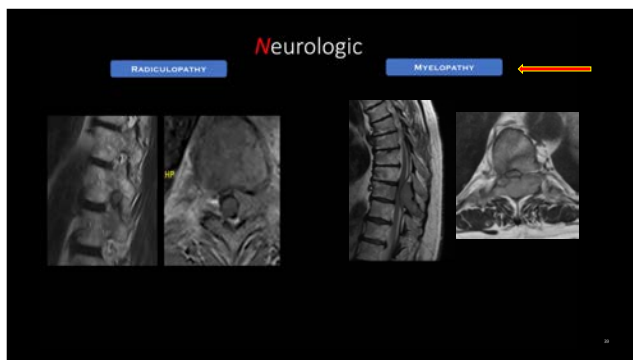
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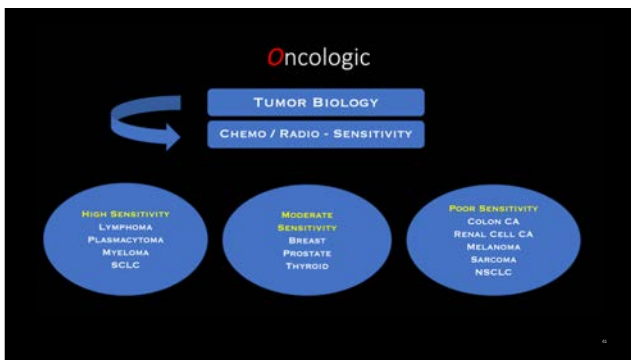
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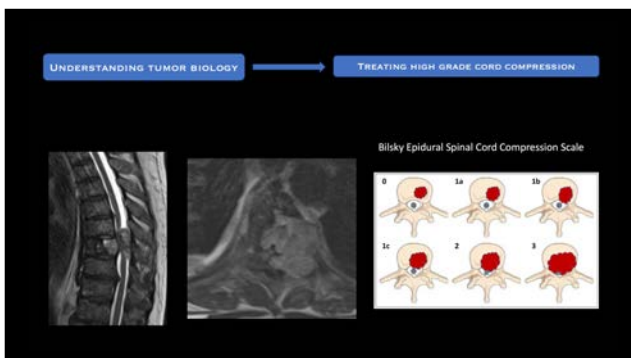
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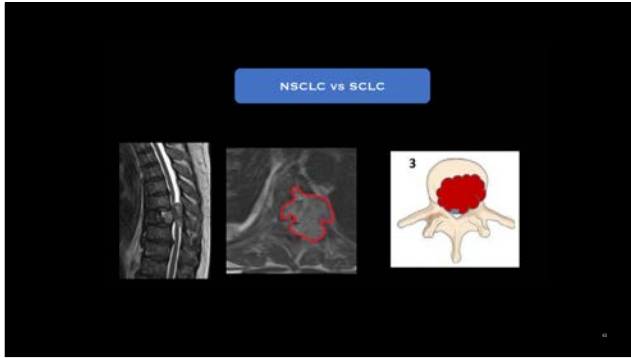
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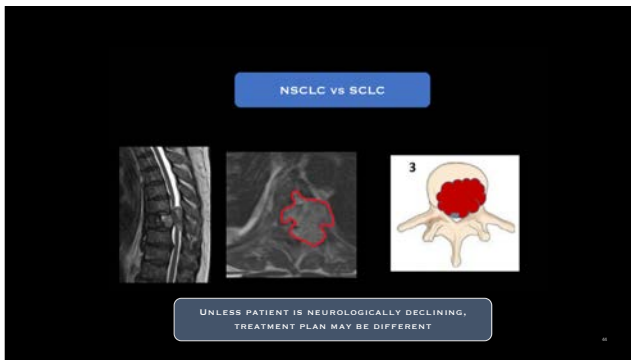
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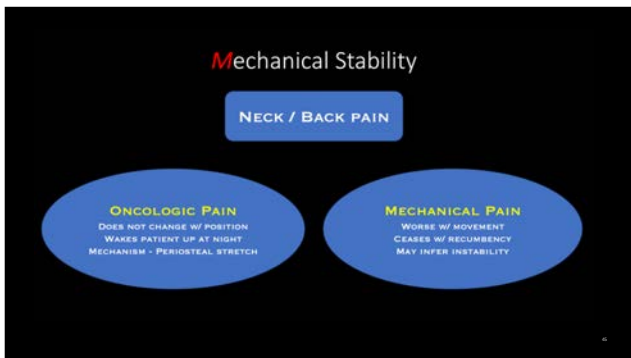
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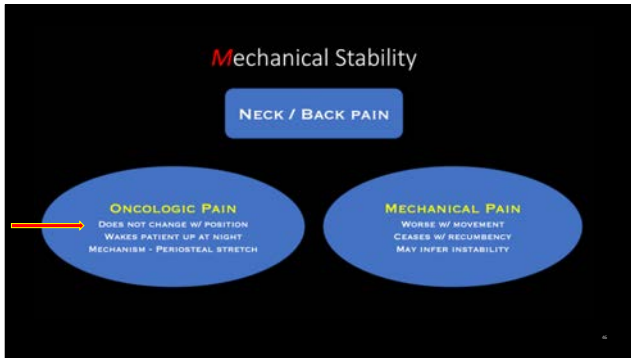
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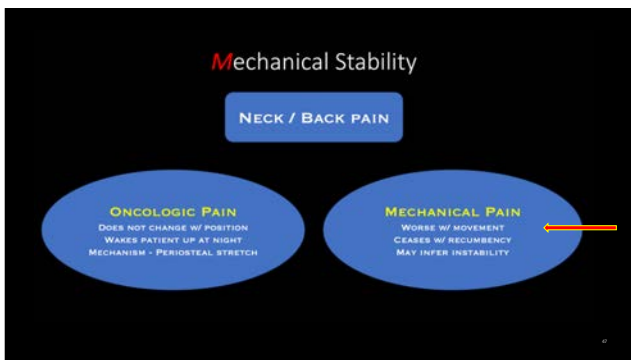
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Original Article

Spinal Instability Neoplastic Score (SINS): Reliability Among Spine Fellows and Resident Physicians in Orthopedic Surgery and Neurosurgery

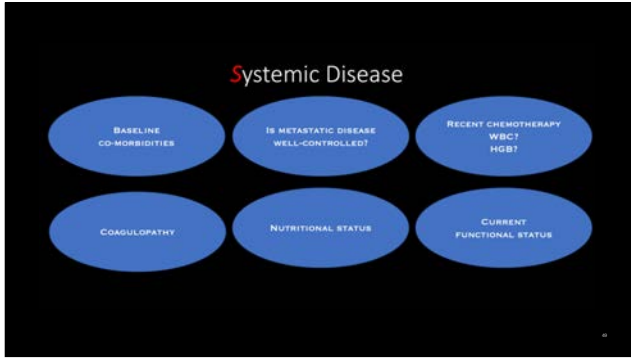
Shandy Fox, MD¹, Michael Spina, MD, FRCS¹, Luke Heston, MD, FRCS¹, and Daryl R. Fournier, MD, FRCS, FACS¹

Table 1. Spinal Instability Neoplastic Score (SINS) System.^a

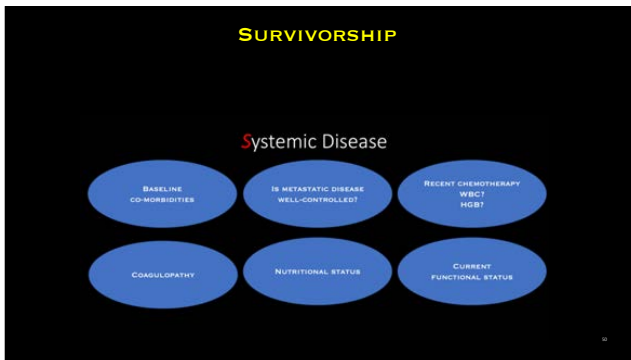
Component	Score
Location	
Junctional (C2-C3, C7-T2, T11-L1, L5-S1)	3
Mobile spine (C3-6, L2-4)	2
Semi-rigid (T3-10)	1
Rigid (C3-S3)	0
Mechanical pain	
Yes	3
No	2
Pain free lesion	1
Bone lesion	
Lytic	2
Mixed (lytic/blastic)	1
Blastic	0
Radiographic spinal alignment	4
Subluxation/translation present	2
Deflexion (kyphosis/lethosis)	2
Normal	0
Vertebral body collapse	
>50% collapse	3
~50% collapse	2
No collapse with >50% body involved	1
None of the above	0
Posterolateral involvement	
Bilateral	3
Unilateral	1
None of the above	0

^aThis adapted from Fisher et al.⁸

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WHY DO WE CARE ABOUT ACCURATE SURVIVORSHIP PREDICTION?

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STRATIFY TREATMENT OPTIONS FROM AGGRESSIVE TO PALLIATION

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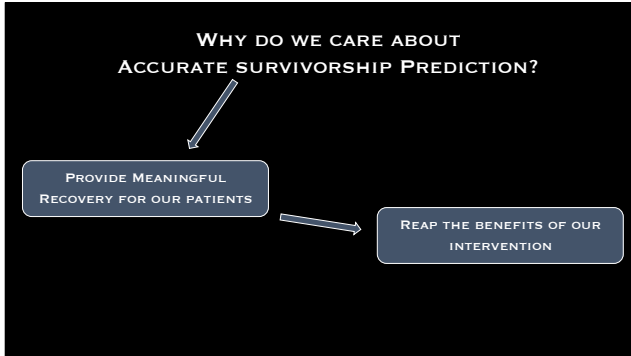
STRATIFY TREATMENT OPTIONS FROM AGGRESSIVE TO PALLIATION

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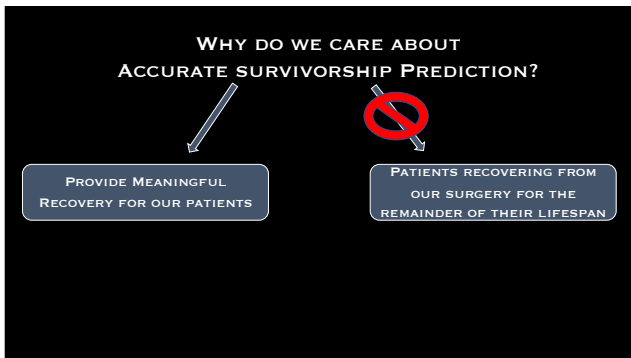
WHY DO WE CARE ABOUT ACCURATE SURVIVORSHIP PREDICTION?

PROVIDE MEANINGFUL RECOVERY FOR OUR PATIENTS

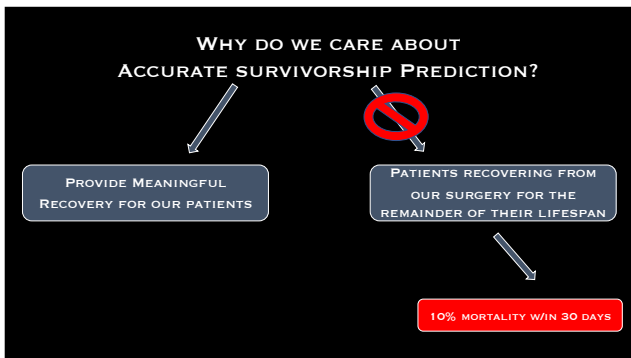
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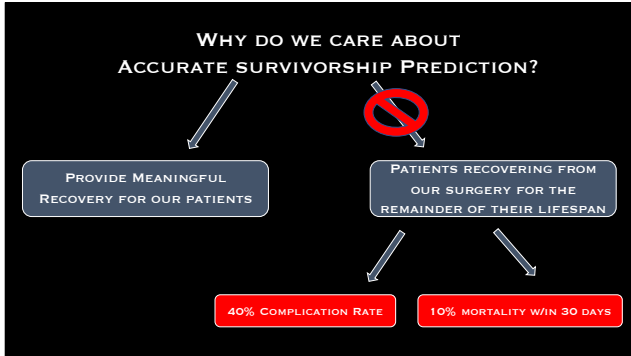
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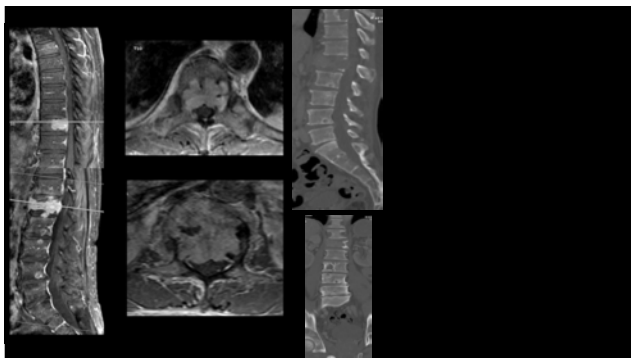
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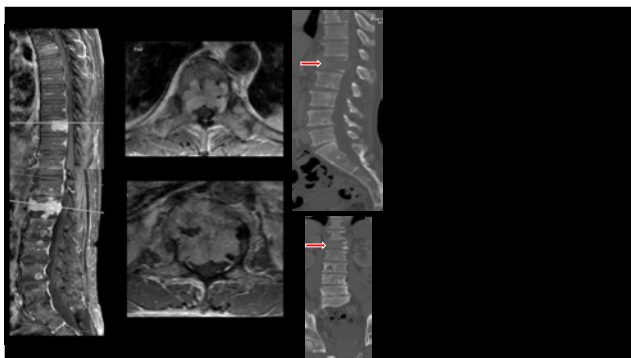
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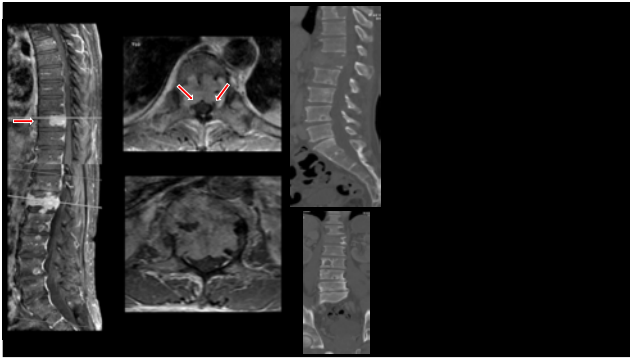
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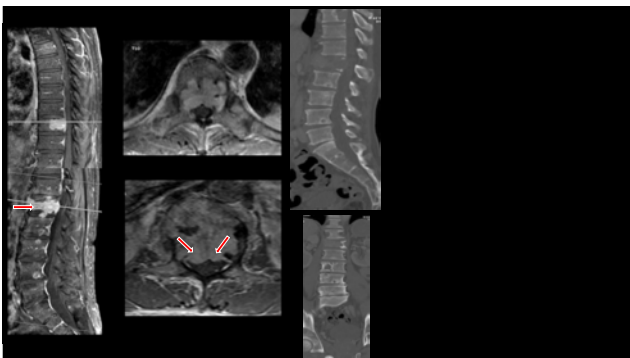
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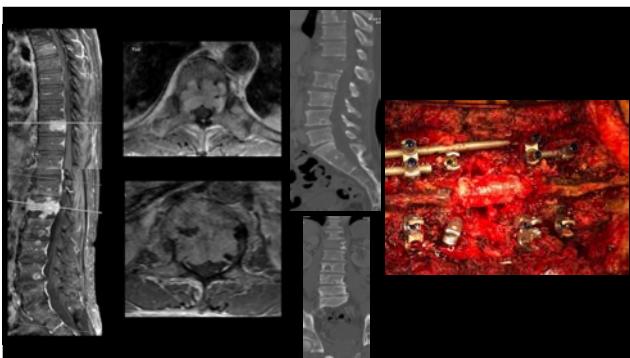
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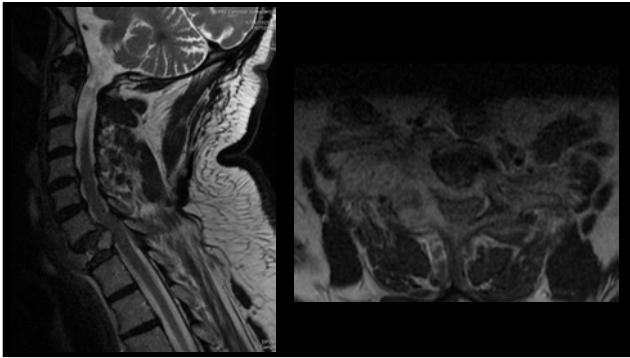
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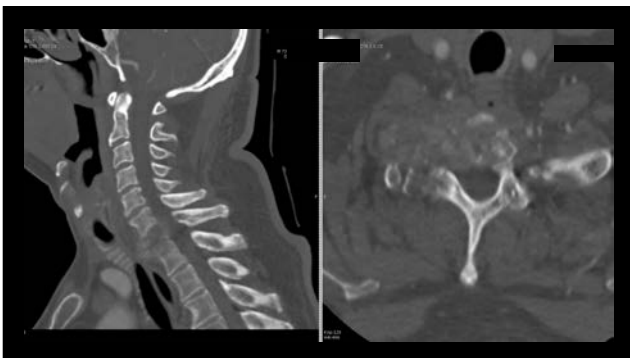
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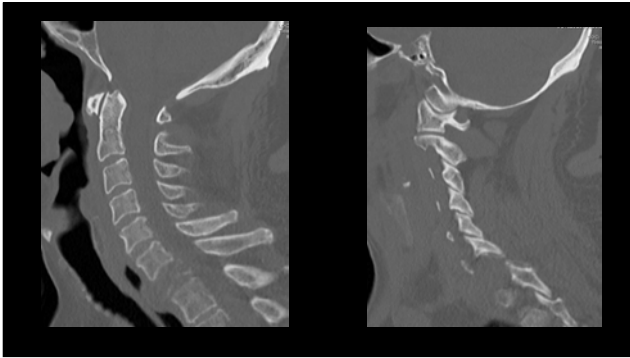
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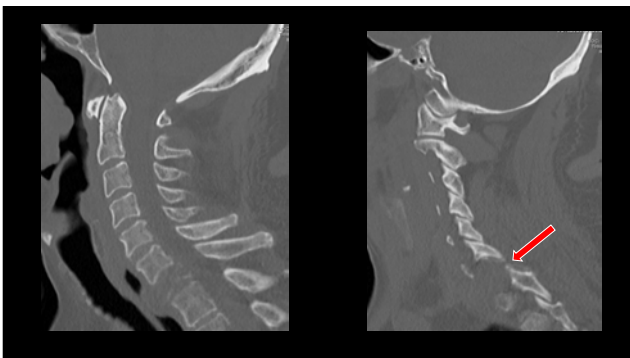
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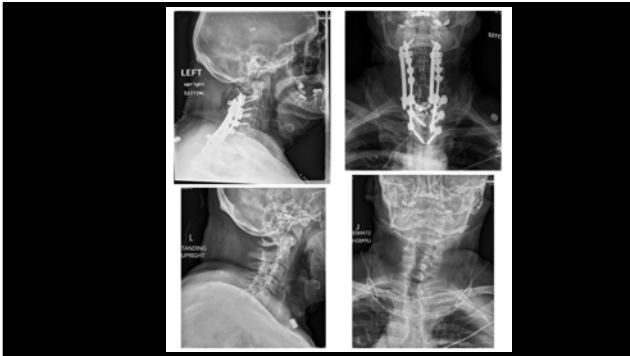
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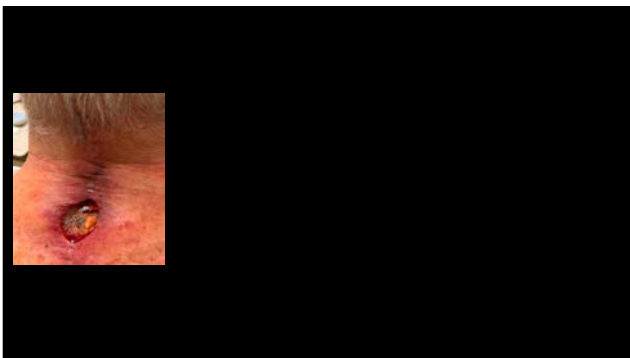
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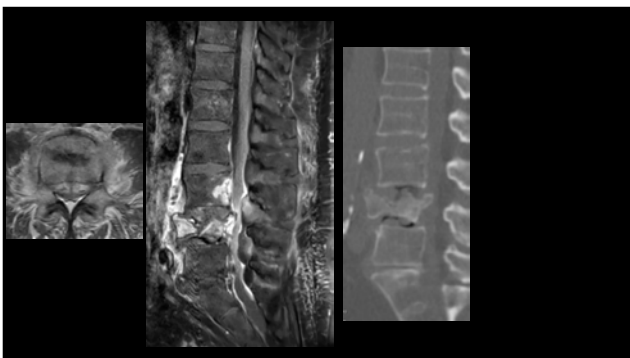
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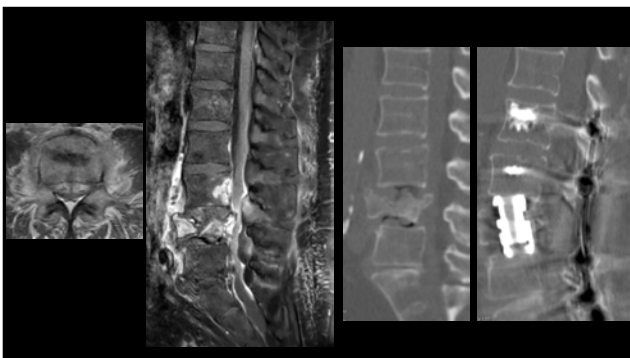
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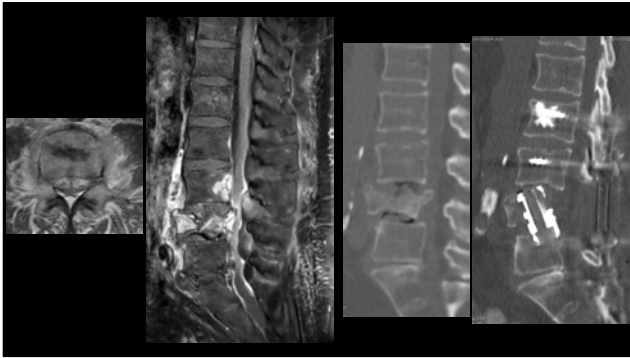
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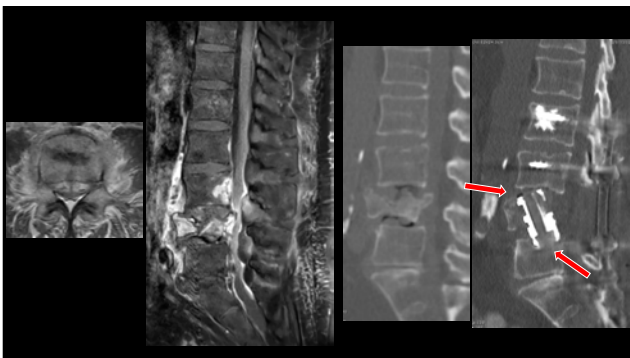
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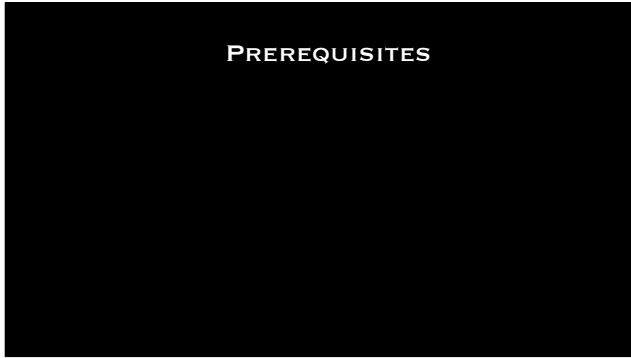
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HOW DO WE PREDICT PATIENT MORTALITY?

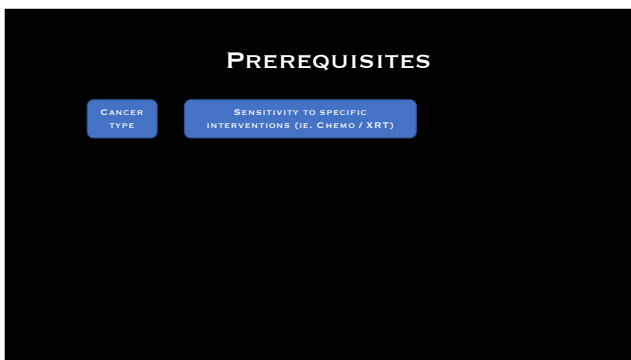
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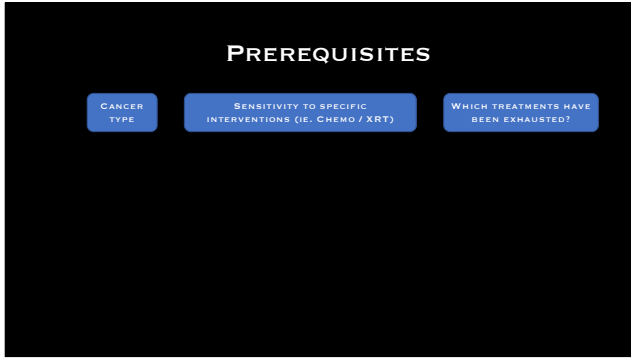
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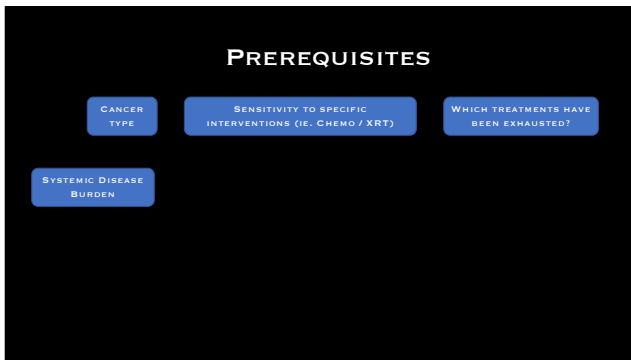
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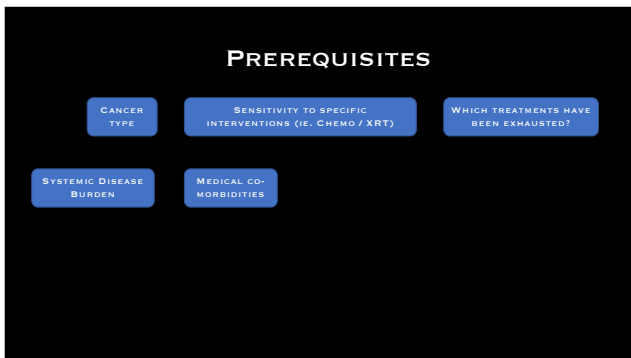
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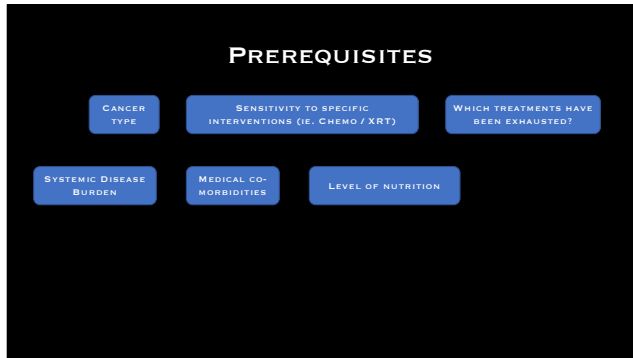
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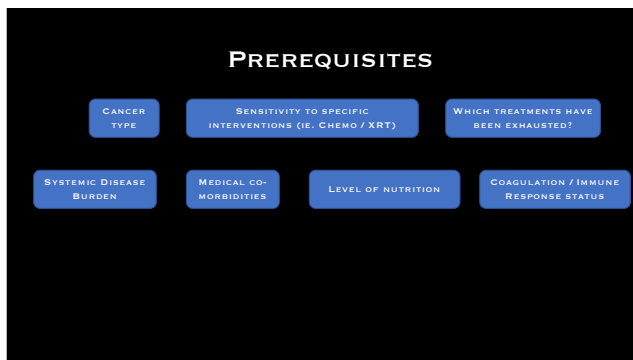
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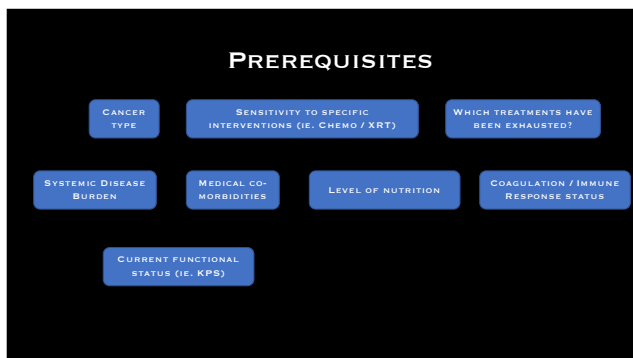
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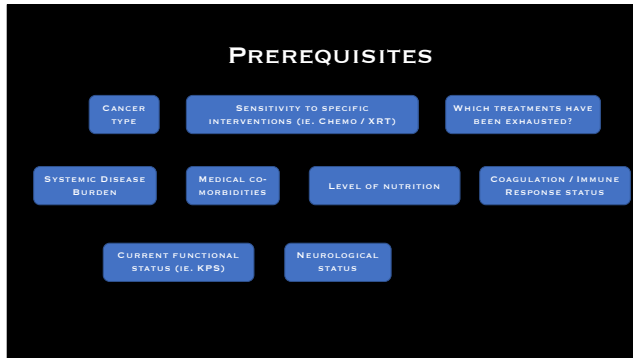
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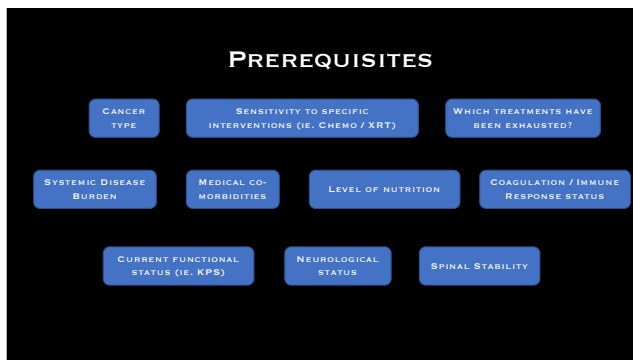
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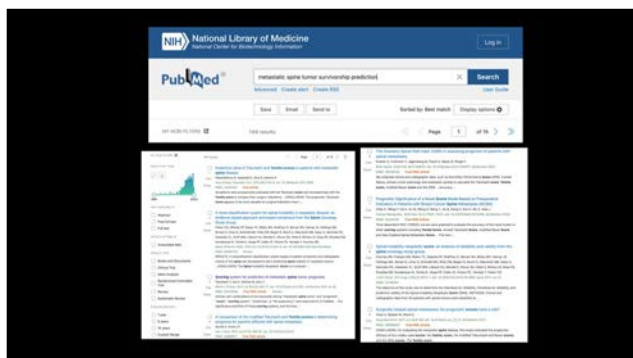
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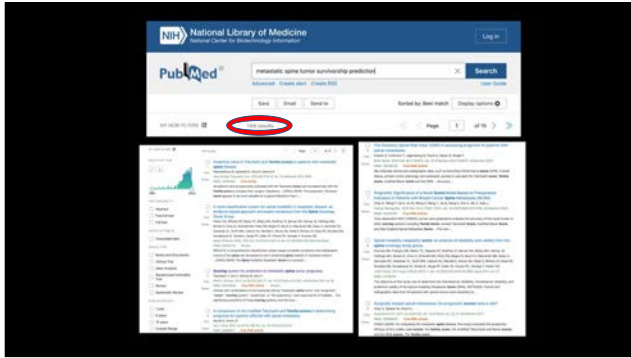
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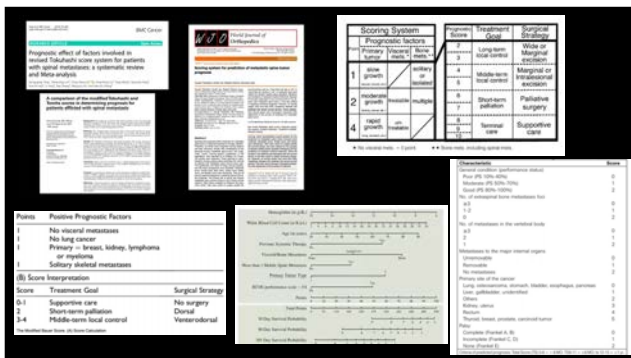
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94



95



96

Points: Positive Prognostic Factors

- 1 No visceral metastases
- 1 No lung cancer
- 1 Primary = breast, larynx, lymphoma or myeloma
- 1 Solitary skeletal metastases

(B) Score Interpretation

Score	Treatment Goal	Surgical Strategy
0-1	Supportive care	No surgery
2	Short-term palliation	Distal
3-4	Mid-to-term local control	Ventrodorsal

PROGNOSTIC SCALES THEMSELVES HAVE A FINITE LIFESPAN OF RELEVANCE AND ACCURACY

97

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PROGNOSTIC SCALES THEMSELVES HAVE A FINITE LIFESPAN OF RELEVANCE AND ACCURACY

↓

WHEN DO THEY STOP REFLECTING THE CURRENT TRENDS IN SYSTEMIC CANCER CARE?

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JNS SPINE

Are spine metastasis survival scoring systems outdated and do they underestimate life expectancy? Caution in surgical recommendation guidance

Geunho Yoo, MD, PhD, Louis-Marie Turcotte, MD, Arnold Dubory, MD, PhD, Joseph Chazin, MD, Louis-Romaine La Nau, MD, Ann Rose Cook, MD, Kevin Buffenham, MD, PhD, Jacques Pasquier, MD, PhD, Alexander Caporaso, MD, PhD, Bernard Mathias, MD, and Aymeric Abouali, MD, PhD

OBJECTIVE: Survival scoring systems for spine metastases (SSM) were designed to help surgical practice. The authors sought to evaluate the prognostic accuracy of the most preservative scoring systems for SPM.

METHODS: In an exploratory study, the authors compared the prognostic accuracy of SPM scoring systems using preservative systems to investigate the hypothesis. The authors designed a French national retrospective study of a prospectively collected multicenter database involving 73 patients treated by SPM between 2014 and 2021.

RESULTS: In this series, the median survival time for all patients from an SPM diagnosis was 17.2 (± 1.5) months. Scoring and specificity were estimated using the area under the curve (AUC). The AUC of the most preservative score was the lowest and poorest (0.4 ± 0.02), range 0.35-0.45, whereas the AUC of the Takami score was the highest (0.62), the Lu score presented an AUC of 0.58 (± 0.02), range 0.51-0.65, and the Miller score showed a score of 0.59 (± 0.02), range 0.54-0.65. Differences among AUCs were statistically significant (p < 0.001). The Miller-Bauer score and the Miller score had the highest rate of agreement in predicting survival with a weighted Cohen's kappa of 0.39 and 0.41, respectively, whereas a moderate agreement was observed between the Takami score and the Miller-Bauer score (weighted Cohen's kappa = 0.28 and 0.32, respectively). The use of the Lu score and Takami score demonstrated the worst performance, with only a 0.207 rate of agreement (weighted Cohen's kappa = 0.18 and 0.18, respectively) between what was predicted and the actual survival.

CONCLUSIONS: The use of preservative scoring systems in the evaluation of survival in patients with SPM has become obsolete and therefore underestimated survival. Surgical treatment decisions should no longer be based on survival estimates that may also take the associated symptoms, neural integrity, and quality of life.

https://www.eurospine.org/10.21767/10.10.2024.0019

KEYWORDS: prognostic score, survival, spine metastases, ROC curves, area under the curve, oncology

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JNS SPINE
Journal of Neurological Surgery, Part B

Are spine metastasis survival scoring systems outdated and do they underestimate life expectancy? Caution in surgical recommendation guidance

Gaston Taboares, MD,¹ Louis-Marie Terrier, MD,¹ Arnaud Dubory, MD, PhD,¹ Joseph Grider, MD,¹ Louis-Romaine La Nati, MD,¹ Ann-Rose Cook, MD,¹ Kevin Buffenham, MD, PhD,² Hugues Pascal-Moussard, MD, PhD,² Alexandre Casperand, MD, PhD,² Bertrand Mathon, MD,² and Aymeric Artaix, MD, PhD²

OBJECTIVE: Survival scoring systems for spine metastases (SPM) were designed to help surgical practice. The authors sought to evaluate the prognostic accuracy of the most parsimonious scoring systems for SPM.

METHODS: It was hypothesized that the most parsimonious SPM was better than that predicted using prognostic systems. To investigate this hypothesis, the authors designed a French national retrospective study of a prospectively collected multicenter database involving 730 patients treated for SPM between 2014 and 2017.

RESULTS: In this series, the median survival time for all patients from an SPM diagnosis was 17.2 (± 1.3 months). Survival and quality of life were evaluated using the area under the curve (AUC). The AUC of Terrier's prognostic score was the best and closest to 1 (AUC of 0.82, range 0.78–0.86), whereas the AUC of the Takahashi score was the highest (0.82). The Lu score presented an AUC of 0.68 (± 0.02) (range 0.64–0.7), and the Rubin score showed a smaller AUC (0.58 ± 0.02, range 0.54–0.62). Differences among AUCs were all statistically significant ($p < 0.001$). The model that Rubin score and the Rubin score had the highest rate of agreement in predicting survival, with a weighted Cohen's kappa of 0.58 and 0.47, respectively, indicating a moderate agreement. The model Takahashi and Lu scores had a fair rate of agreement (weighted Cohen's kappa = 0.28 and 0.22, respectively). The use of the Terrier and Terrier scores demonstrated the best performance, with only a fair rate of agreement (weighted Cohen's kappa = 0.18 and 0.16, respectively) between what was predicted and the actual survival.

CONCLUSIONS: The use of prognostic scoring systems in the estimation of survival in patients with SPM has become obsolete and therefore underestimates survival. Surgical treatment decisions should no longer be based on survival estimates but must also take into account patient symptoms, spinal mobility, and quality of life.

KEYWORDS: prognostic score, cancer, survival, spine metastases, ROC curves, area under the curve, oncology

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SMALL # OF PATIENTS

TOMITA - 97
 TOUGHIANI - 128
 LU - 206
 BAUER - 208



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SMALL # OF PATIENTS

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REPRODUCED BY TOMITA & CO. ORIGINAL NOT WELL REPRESENTED



JNS SPINE
 Are spine metastasis survival scoring systems outdated and do they underestimate life expectancy? Caution in surgical recommendation guidance

Small # of Patients
 Tumor = 67
 T1 = 128
 L1 = 208
 B1 = 208

Intersubjectivity of Scores is poor (Subgroup not well represented)

Scores Generated from Retrospective Data

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Scores Generated from Retrospective Data

Selection Bias with Score Generation
 → Surgical Series Alone
 → Nonsurgical Series Alone

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THE SPINE JOURNAL
 2020 Outstanding Paper Award Winner
 Prospective validation of a clinical prediction score for survival in patients with spinal metastases: the New England Spinal Metastasis Score


The New England Spinal Metastasis Score (NESMS)

NESMS characteristic	Points assigned
1. Modified Bauer Score	-
No osseous metastases (1 point)	-
Primary tumor is not lung cancer (1 point)	-
Primary tumor is breast, renal, lymphoma or myeloma (1 point)	-
Single skeletal metastasis (1 point)	-
Modified Bauer Score ≥2	2
2. Ambulatory function	0
Dependent ambulatory	0
Independent ambulate	1
3. Serum albumin	0
<3.5 g/dL	0
≥3.5 g/dL	1

Unadjusted patient mortality at 6-months, 1-year and overall by New England Spinal Metastasis Score (NESMS) designation

NESMS	6-month mortality (%)	1-year mortality (%)	Overall mortality (%)
0	23 (85)	27 (100)	27 (100)
1	26 (63)	32 (78)	34 (83)
2	20 (27)	35 (48)	44 (60)
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The Spine Journal 23(20):20-28
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Andrew J. Schoenfeld, MD, MSc^{1,2*}, Marco L. Ferrone, MD³, Joseph H. Schwab, MD, MS^{1,2}, Justin A. Blachon, MS¹, Lauren B. Barton, BS¹, Daniel G. Tobert⁴, John H. Chi, MD, MPH⁵, John H. Shin, MD⁶, James D. Kang, MD⁷, Michael B. Harris, MD⁸


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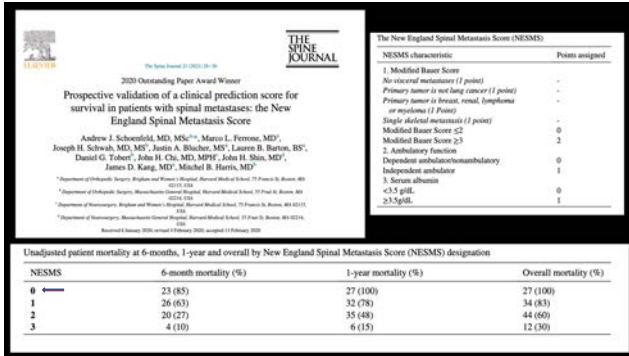
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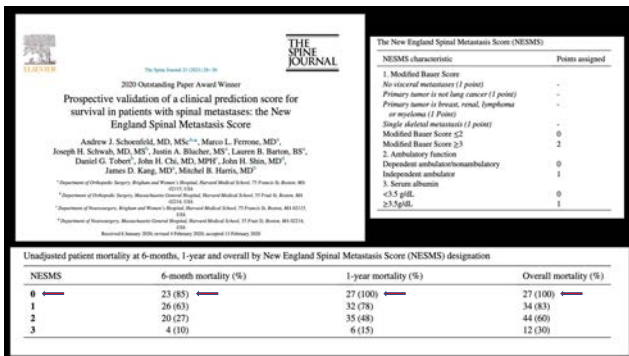
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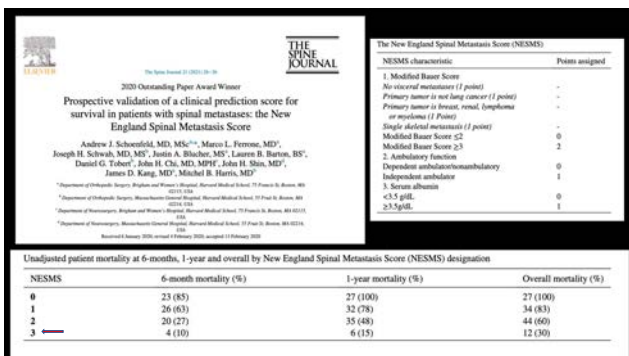
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PRIMARY TUMOR BEHAVIOR

SYSTEMIC CA BURDEN

AMBULATORY STATUS -> PROXY FOR PRE-TREATMENT FUNCTION

ALBUMIN LEVEL -> PROXY FOR GENERAL HEALTH & ABILITY TO TOLERATE TREATMENT

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PRIMARY TUMOR BEHAVIOR

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PROSPECTIVELY VALIDATED AT 3 ACADEMIC CENTERS

PRIMARY TUMOR BEHAVIOR

SYSTEMIC CA BURDEN

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ALBUMIN LEVEL → PROXY FOR GENERAL HEALTH & ABILITY TO TOLERATE TREATMENT

118

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PRIMARY TUMOR BEHAVIOR

SYSTEMIC CA BURDEN

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PREDICTIVE FACTORS LEADING TO SURVIVORSHIP AT 1 YEAR

HIGHER PERFORMANCE STATUS

BETTER NEUROLOGICAL STATUS

ABSENCE OF VISCERAL METS

120

PREDICTIVE FACTORS LEADING TO SURVIVORSHIP AT 1 YEAR

Table 1: Predictive Factors

Factor	Number of Patients	Survival Rate (%)
Higher Performance Status	10	20.0%
Better Neurological Status	10	20.0%
Absence of Visceral Mets	10	20.0%

Table 2: Survival Rates

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SYSTEMIC CA BURDEN

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ALBUMIN LEVEL → PROXY FOR GENERAL HEALTH & ABILITY TO TOLERATE TREATMENT

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PRIMARY TUMOR BEHAVIOR

SYSTEMIC CA BURDEN

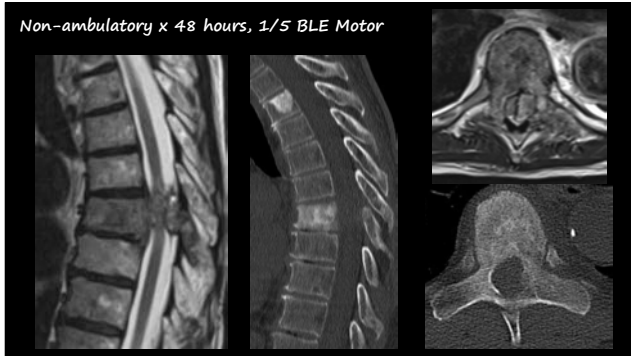
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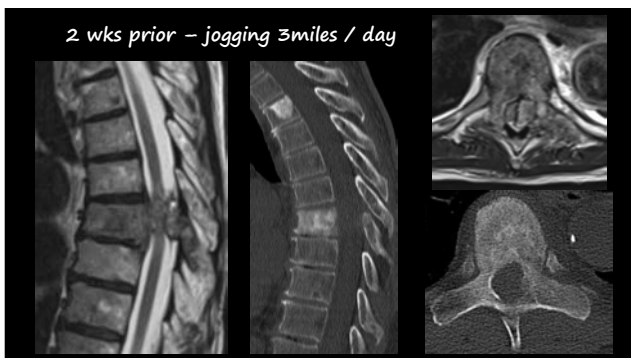
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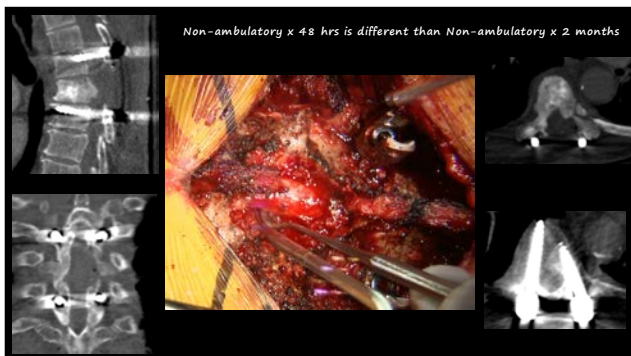
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• MD Anderson Spine Tumor Database
 –Median survival after treatment

- Lung CA → 4 months
- Breast CA → 24-36 months
- Prostate CA → 12 months
- Renal cell CA → 12-13 months
- Melanoma → 4 months
- Sarcoma → 8-12 months
- Lymphoma → > 48 months
- Myeloma → > 48 months
- Thyroid CA → > 48 months

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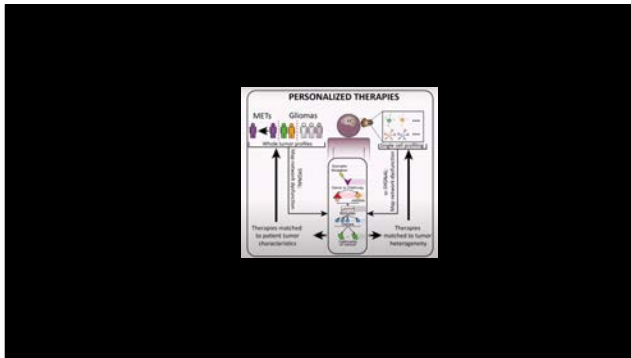
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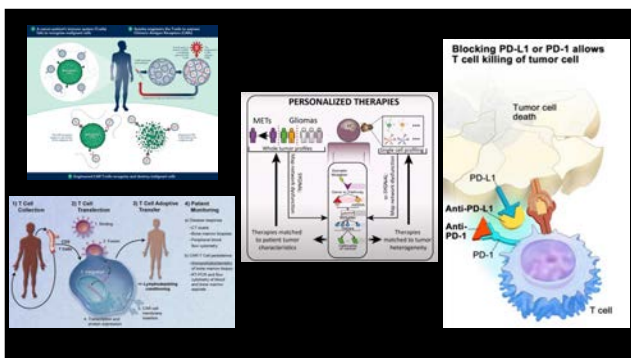
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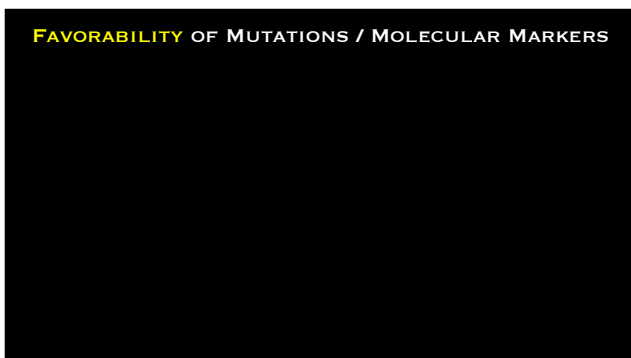
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FAVORABILITY OF MUTATIONS / MOLECULAR MARKERS

TUMORS W/ MUTATIONS AMENABLE TO TARGETED THERAPY TEND TO BE ASSOCIATED WITH LONGER SURVIVAL

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FAVORABILITY OF MUTATIONS / MOLECULAR MARKERS

TUMORS W/ MUTATIONS AMENABLE TO TARGETED THERAPY TEND TO BE ASSOCIATED WITH LONGER SURVIVAL

HARBORING FAVORABLE AND ACTIONABLE MUTATIONS GENERALLY MAKES A PATIENT A MORE SUITABLE SURGICAL CANDIDATE

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CERTAIN TARGETED THERAPIES MAY NEGATE THE NEED FOR SURGERY >>
SOME TREATMENTS CAN RAPIDLY STABILIZE THE DISEASE AND BUY TIME FOR OTHER TREATMENT OPTIONS

Adapted from Dr. Ray Gaddath's Lecture at Spine Section 2024

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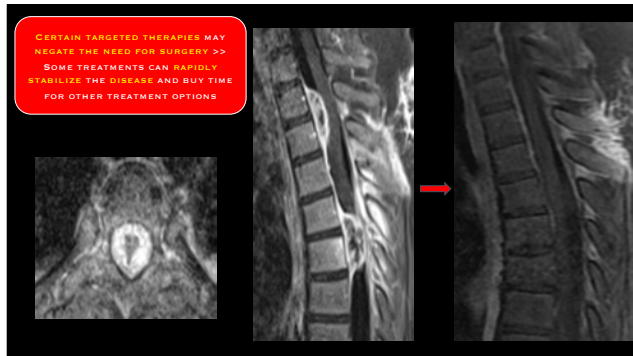
Adapted from Dr. Ray Gaddath's Lecture at Spine Section 2024

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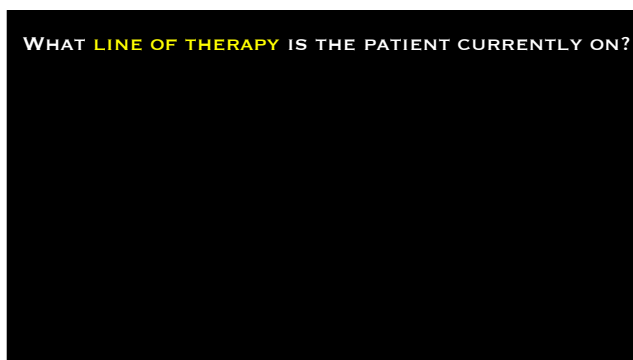
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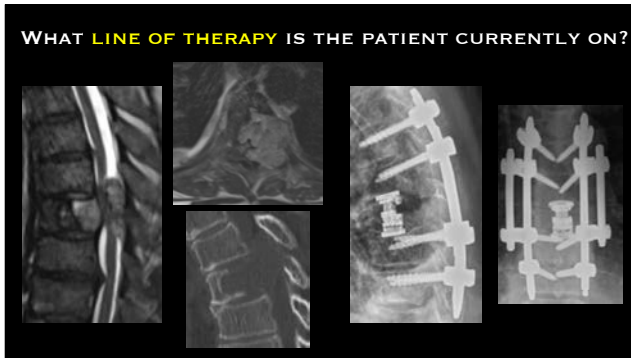
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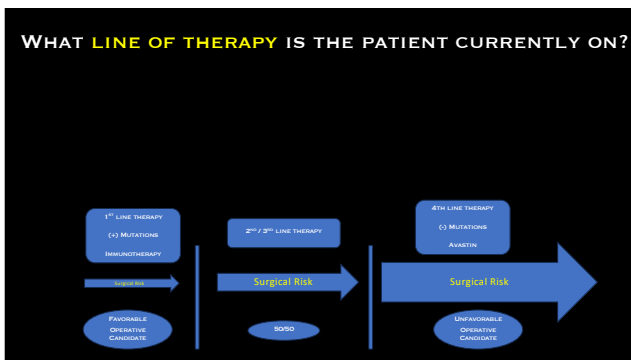
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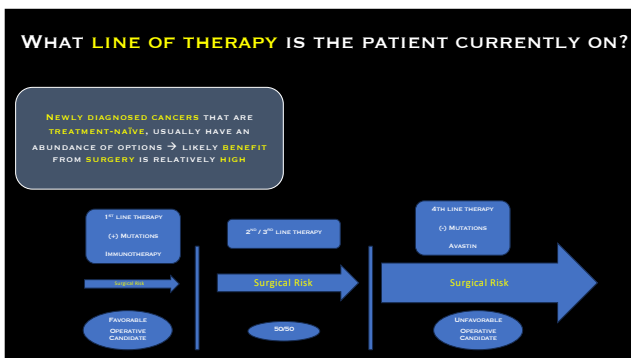
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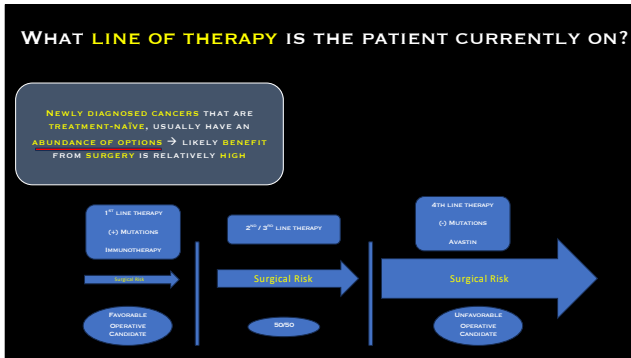
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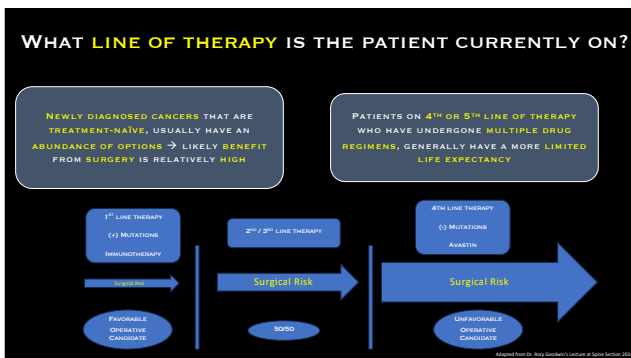
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IF A PATIENT IS ON TARGETED THERAPY, ARE THERE ASSOCIATED RISKS THAT COULD HEIGHTEN THE CHANCES OF SURGICAL COMPLICATIONS?

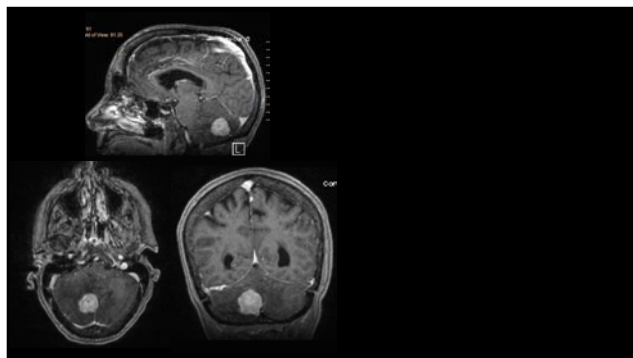
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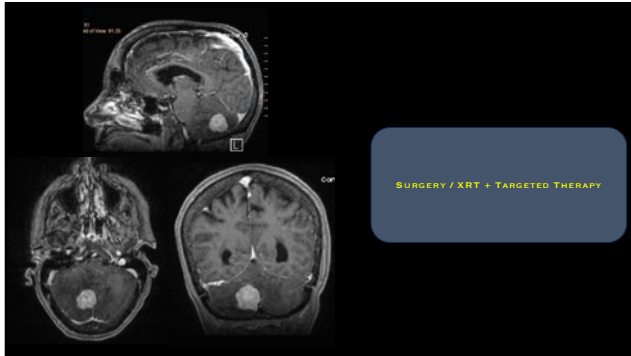
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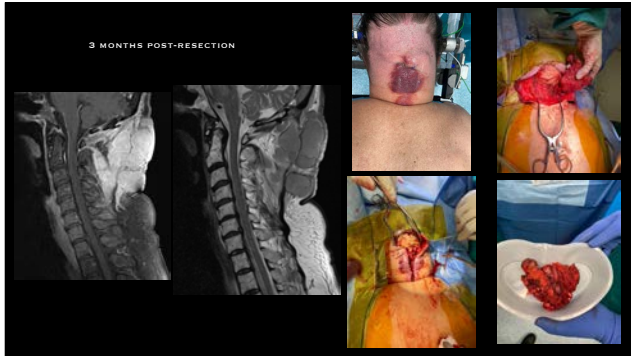
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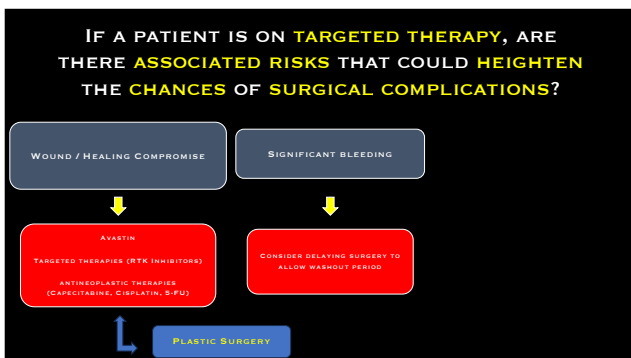
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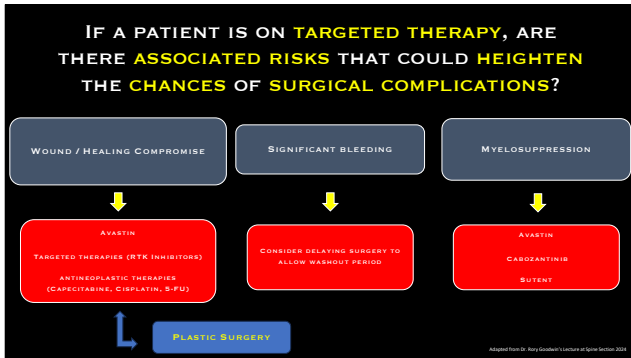
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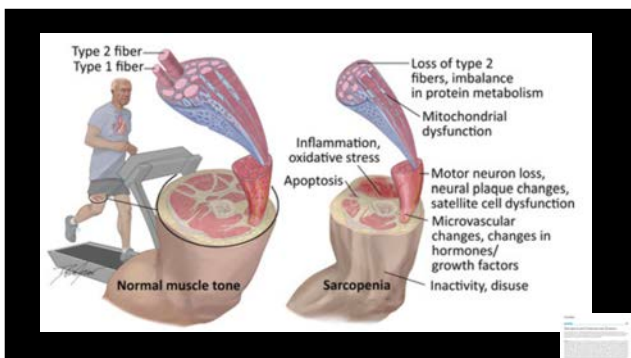
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JNS
Evaluating frailty, mortality, and complications associated with minimally invasive spine tumor surgery using machine learning-derived body composition analysis

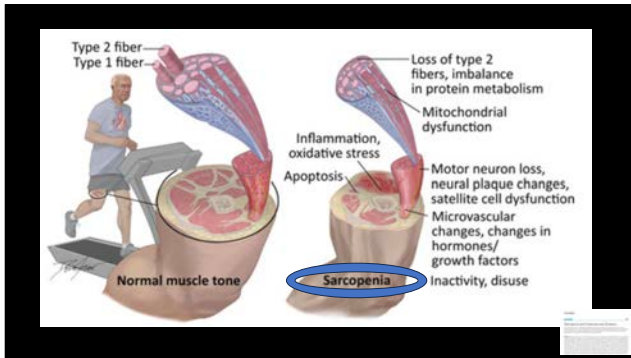
THE JOURNAL OF NEUROSURGERY
Saropenia, but not frailty, predicts early mortality and adverse events after emergent surgery for metastatic disease of the spine

THE SPINE JOURNAL
A novel scoring system incorporating sarcopenia to predict post-operative survival in spinal metastasis

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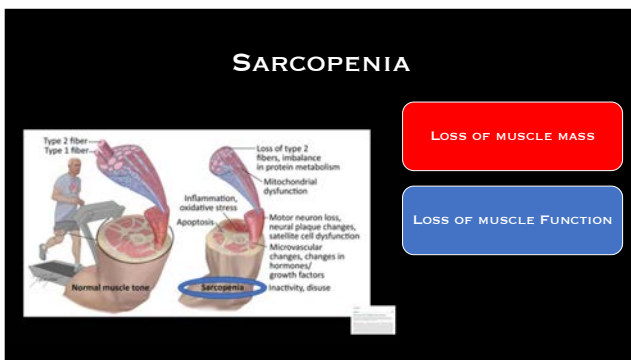
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SARCOPENIA

LOSS OF MUSCLE MASS

LOSS OF MUSCLE FUNCTION

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SARCOPENIA
Accurate predictor of overall health and ability to survive malignancy

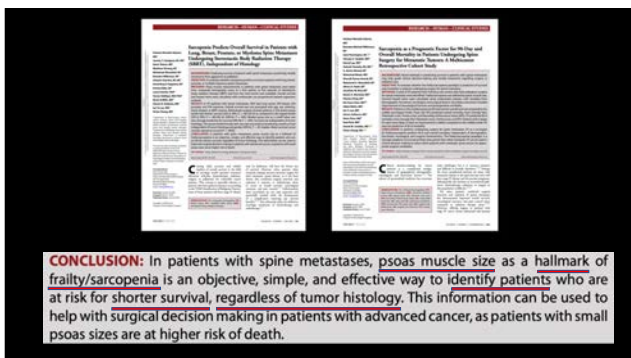
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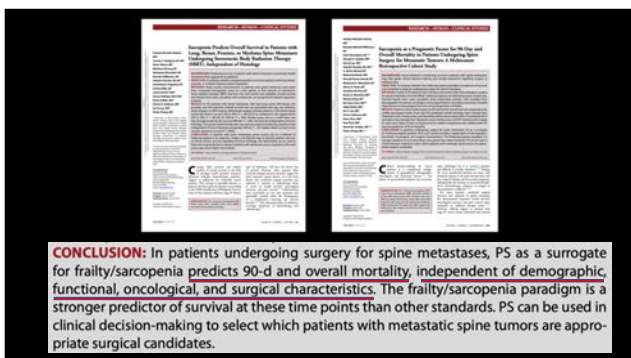
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HOW CAN WE QUANTIFY SARCOPENIA?

FIGURE 1. Methodology for psoas measurement. A, Example patient without sarcopenia and within the third tertile for psoas area. B, Example patient with sarcopenia and within the first tertile for psoas area.

Measurements of the PS (a continuous variable) were divided into 3 equal tertiles to provide a clinically meaningful interpretation of the associated odds ratio (OR) and HR. To account for differences in gender differences, the 3 tertiles were calculated independently for males and females. The male mean PS \pm standard deviation, with minimum and maximum (range), were 8.59 cm² \pm 1.31, 5.45-10.47 cm² for tertile 1 (T1), 11.99 cm² \pm 0.80, 10.50-13.36 cm² for tertile 2 (T2), and 15.50 cm² \pm 1.85, 13.37-17.08 cm² for tertile 3 (T3). For females, measurements were 6.53 cm² \pm 0.80, 4.20-7.22 cm² for T1, 8.04 cm² \pm 0.51, 7.24-9.05 cm² for T2, and 10.68 cm² \pm 1.61, 9.56-14.95 cm² for T3. Table 1 compares the 3 psoas tertiles.

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IS THERE A MORE GRANULAR APPROACH TO MEASURING SARCOPENIA?

BODY COMPOSITION

- SKELETAL MUSCLE MASS
- SKELETAL MUSCLE RADIODENSITY
→ MUSCLE QUALITY
- VISCERAL ADIPOSITY
- SUBCUTANEOUS ADIPOSITY

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IS THERE A MORE GRANULAR APPROACH TO MEASURING SARCOPENIA?

DECREASED 1-YEAR SURVIVAL

BODY COMPOSITION

- SKELETAL MUSCLE MASS
- SKELETAL MUSCLE RADIODENSITY
→ MUSCLE QUALITY
- VISCERAL ADIPOSITY
- SUBCUTANEOUS ADIPOSITY

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IS THERE A MORE GRANULAR APPROACH TO MEASURING SARCOPENIA?

DECREASED 1-YEAR SURVIVAL

BODY COMPOSITION

- SKELETAL MUSCLE MASS ↓
- SKELETAL MUSCLE RADIODENSITY
→ MUSCLE QUALITY ↓
- VISCERAL ADIPOSITY ↓
- SUBCUTANEOUS ADIPOSITY ↓

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IS THERE A MORE GRANULAR APPROACH TO MEASURING SARCOPENIA?

DECREASED 1-YEAR SURVIVAL

BODY COMPOSITION

- SKELETAL MUSCLE MASS
- SKELETAL MUSCLE RADIODENSITY → MUSCLE QUALITY
- VISCERAL ADIPOSITY
- SUBCUTANEOUS ADIPOSITY

QUANTIFICATION OF CACHEXIA

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INTERNATIONAL SOCIETY for the ADVANCEMENT of SPINE SURGERY
THE INNOVATION SOCIETY

Artificial Intelligence and Machine Learning Applications in Spine Surgery

ABSTRACT

INTRODUCTION

WHAT IS ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING?

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THE INNOVATION SOCIETY

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ABSTRACT

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THE INNOVATION SOCIETY

Artificial Intelligence and Machine Learning Applications in Spine Surgery

ABSTRACT
The application of artificial intelligence (AI) and machine learning (ML) in spine surgery has the potential to revolutionize patient care, from diagnosis to treatment and follow-up. This presentation will explore the current state of AI and ML in spine surgery, highlighting the challenges and opportunities associated with their implementation. We will discuss the use of AI and ML in various aspects of spine surgery, including preoperative planning, intraoperative navigation, and postoperative outcome prediction. We will also discuss the ethical and regulatory considerations surrounding the use of AI and ML in spine surgery.

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WHY IS ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING?
As the demand for spine surgery continues to grow, the need for more efficient and accurate diagnostic and treatment tools is becoming increasingly apparent. AI and ML offer a promising solution to this challenge, as they can analyze large amounts of data and identify patterns that are difficult for humans to detect. This can lead to improved patient outcomes and reduced costs.

Flowchart: Data (MRI, CT, X-ray, Patient History) → Feature Extraction → Model Training → Model Validation → Model Deployment → Clinical Practice.

Characteristic	Mean	SD	Min	Max
Age	64.8	12.5	45	85
Sex	50%	0%	0%	100%
Level	C5-C6	0%	0%	100%
Grade	1.5	0.5	1	3
Time	12.5	3.5	5	25
Outcome	85%	5%	70%	100%

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INTERNATIONAL SOCIETY for the ADVANCEMENT of SPINE SURGERY
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ONCOCAST

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INTERNATIONAL SOCIETY for the ADVANCEMENT of SPINE SURGERY
THE INNOVATION SOCIETY

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ONCOCAST

MACHINE-LEARNING PROGNOSTIC TOOL

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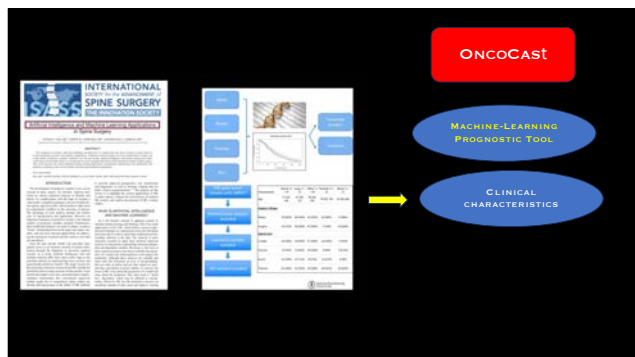
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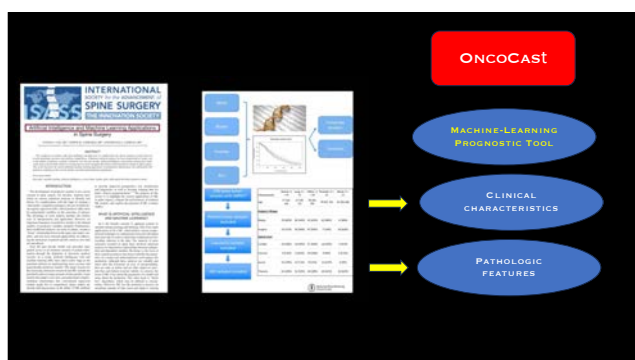
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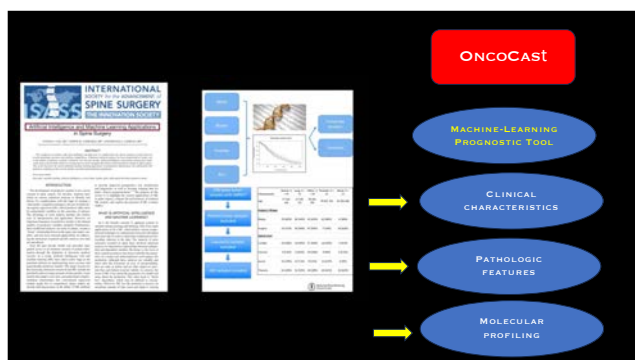
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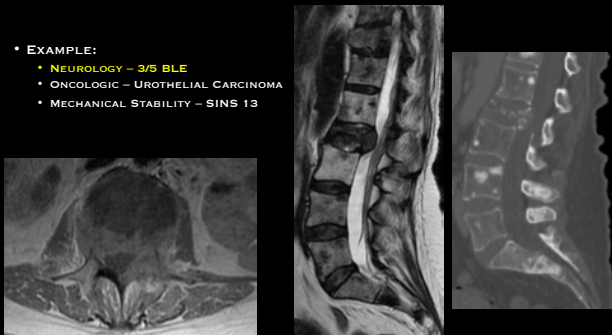


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- EXAMPLE:
 - NEUROLOGY – 3/5 BLE
 - ONCOLOGIC – UROTHELIAL CARCINOMA
 - MECHANICAL STABILITY – SINS 13

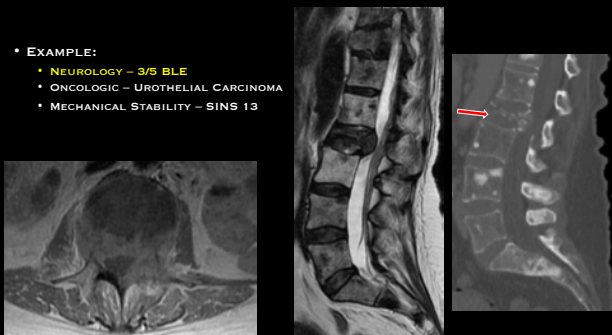
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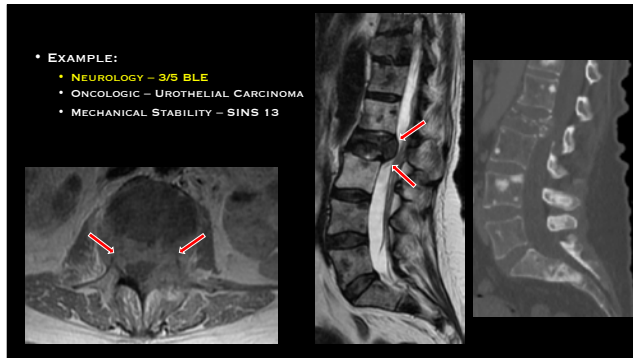


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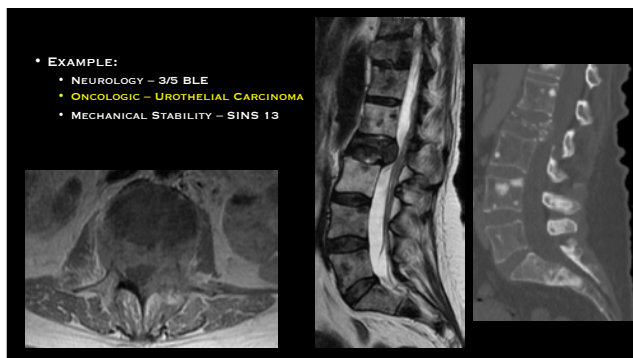
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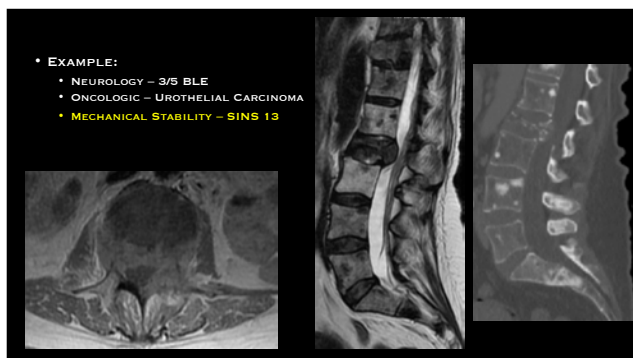
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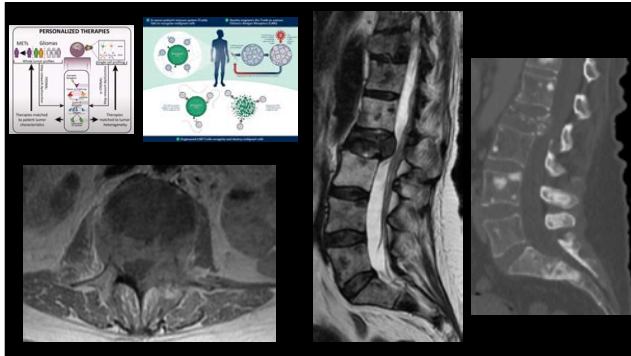
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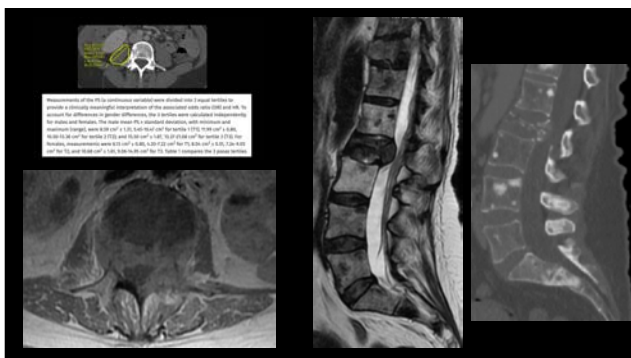
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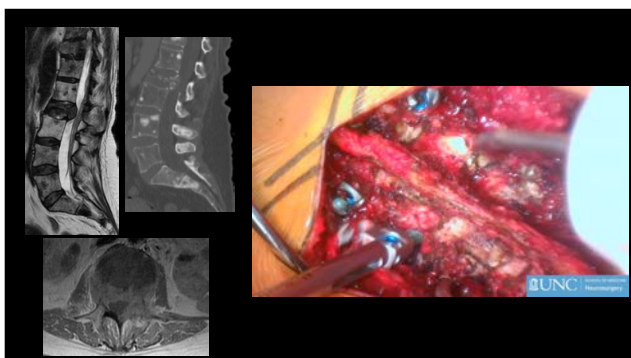
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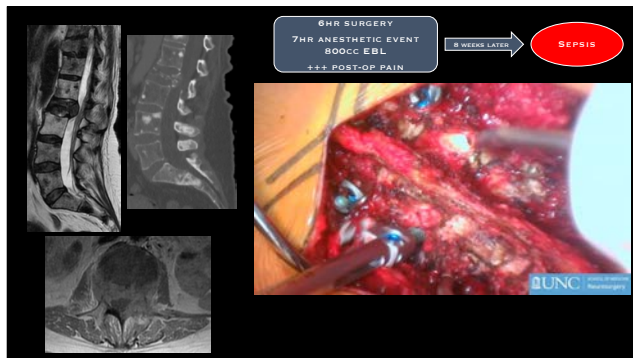
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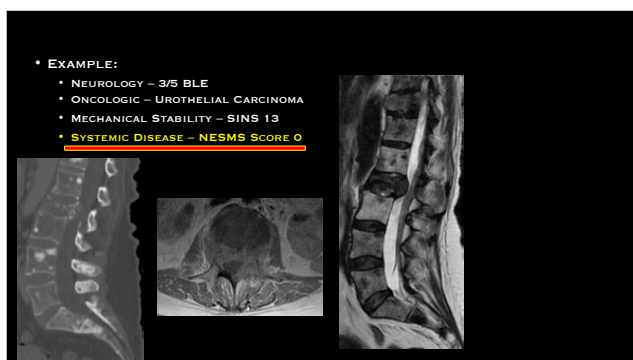
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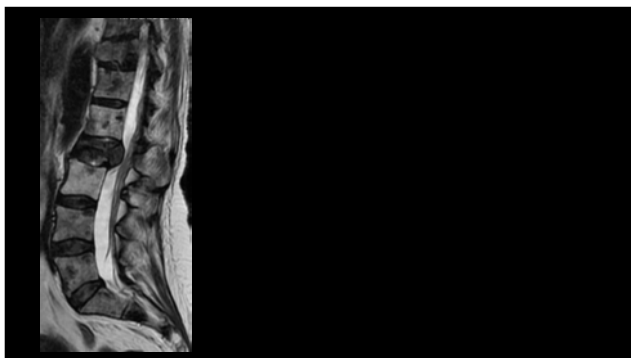
THE SPINE JOURNAL
 2020 Outstanding Paper Award Winner
Prospective validation of a clinical prediction score for survival in patients with spinal metastases: the New England Spinal Metastasis Score
 Andrew J. Schoenfeld, MD, MSc^{1,2*}, Marco E. Ferraro, MD³, Joseph H. Schwab, MD, MSc⁴, Justin A. Buckner, MD⁵, Lauren B. Rutka, BS⁶, Daniel G. Fisher⁷, John H. Chi, MD, MPH⁸, John H. Sloan, MD⁹, James G. Kang, MD¹⁰, Michel H. Hartin, MD¹¹

*Department of Biostatistics, Brigham Young University, Provo, UT; ¹Department of Neurosurgery, Brigham Young University, Provo, UT; ²Department of Orthopedics, Brigham Young University, Provo, UT; ³Department of Neurosurgery, Brigham Young University, Provo, UT; ⁴Department of Neurosurgery, Brigham Young University, Provo, UT; ⁵Department of Neurosurgery, Brigham Young University, Provo, UT; ⁶Department of Neurosurgery, Brigham Young University, Provo, UT; ⁷Department of Neurosurgery, Brigham Young University, Provo, UT; ⁸Department of Neurosurgery, Brigham Young University, Provo, UT; ⁹Department of Neurosurgery, Brigham Young University, Provo, UT; ¹⁰Department of Neurosurgery, Brigham Young University, Provo, UT; ¹¹Department of Neurosurgery, Brigham Young University, Provo, UT.

NESMS characteristic	Points assigned
1. Modified Basso Score	
No cerebral metastases (1 point)	1
Primary tumor is not lung, renal, or lymphoma or melanoma (1 Point)	1
Single skeletal metastases (1 point)	1
Modified Basso Score ≤2	0
Modified Basso Score ≥3	2
2. Ambulatory function	
Dependent ambulation/hemiparesis	0
Independent ambulator	1
3. Serum albumin	
<3.5 g/dL	0
≥3.5 g/dL	1

NESMS	6-month mortality (%)	1-year mortality (%)	Overall mortality (%)
0	23 (85)	27 (100)	27 (100)
1	26 (63)	32 (76)	36 (83)
2	20 (27)	35 (48)	44 (60)
3	4 (10)	6 (15)	12 (30)

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Journal of Neuro-Oncology (2022) 157:271–280
 https://doi.org/10.1007/s11060-022-03962-6

TOPIC REVIEW

Evolution of surgical treatment of metastatic spine tumors

Patricia Zedler Sallmann^{1,2}, Florjan Wu³, Jose Fernandez-Almador⁴, Sahel Tami⁵, Prakash Sampath⁶, Albert Velasco⁷, Jared Frisley⁸, Peter Klinge⁹, Joseph Carney¹⁰, Adriaan Van Cuylen¹¹, Ziya L. Gokbulut¹²

Received: 13 December 2021 / Accepted: 4 March 2022 / Published online: 29 March 2022
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Abstract The treatment of cancer has transformed over the past 40 years, with medical oncology, radiation oncology and regenerative medicine working together to prolong survival times and minimize treatment-related morbidity. With such advancements, the risk-benefit ratio has been calibrated to provide an accurate assessment of surgical hazard. The goal of this review is to look back at how the role of surgery has evolved with such new medical advances, and to explore the role of surgery in the future of cancer care.

Methods A literature review was conducted, highlighting the key papers guiding surgical management of spinal metastatic lesions.

Conclusion The roles of surgery, medical therapy, and radiation have evolved over the past 40 years, with new advances requiring complex interdisciplinary care.

REVIEWS

Paradigm changes in spine surgery —evolution of minimally invasive techniques

Authors: K. Smith and P. S. Hsu

Abstract: The evolution of spine surgery over the past 40 years has been remarkable, with significant advances in medical, radiation, and regenerative medicine working together to prolong survival times and minimize treatment-related morbidity. With such advancements, the risk-benefit ratio has been calibrated to provide an accurate assessment of surgical hazard. The goal of this review is to look back at how the role of surgery has evolved with such new medical advances, and to explore the role of surgery in the future of cancer care. Methods: A literature review was conducted, highlighting the key papers guiding surgical management of spinal metastatic lesions. Conclusion: The roles of surgery, medical therapy, and radiation have evolved over the past 40 years, with new advances requiring complex interdisciplinary care.

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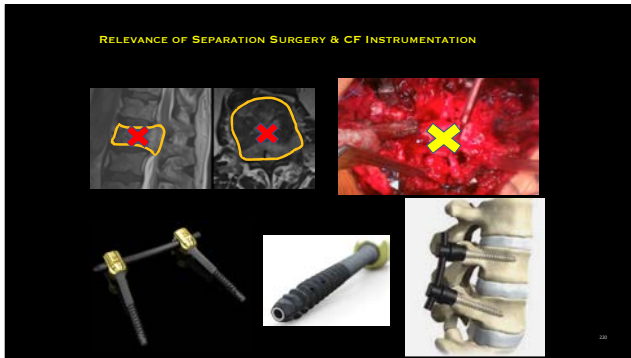
RELEVANCE OF SEPARATION SURGERY & CF INSTRUMENTATION

RADIOLUCENT HARDWARE

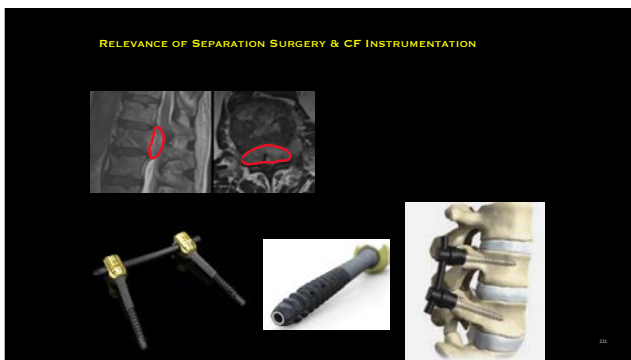
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RELEVANCE OF SEPARATION SURGERY & CF INSTRUMENTATION

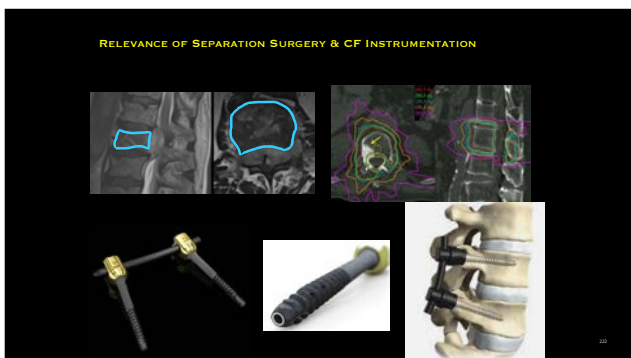
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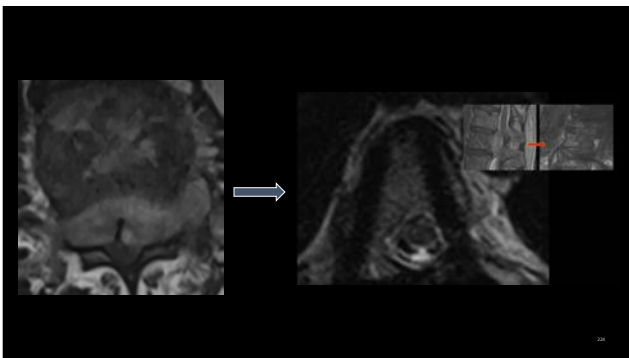
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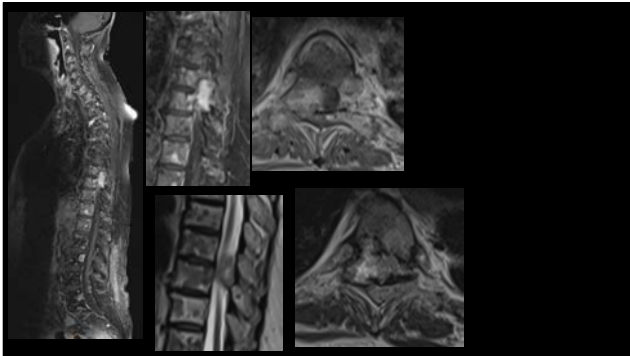
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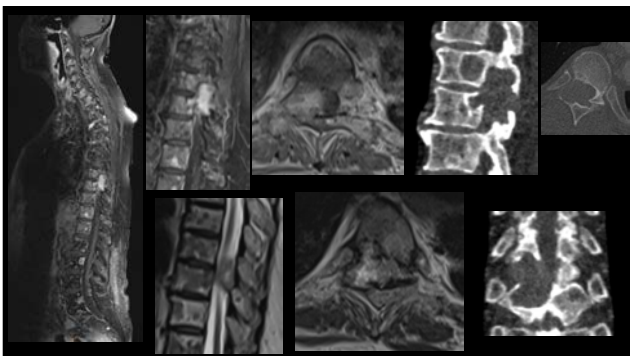
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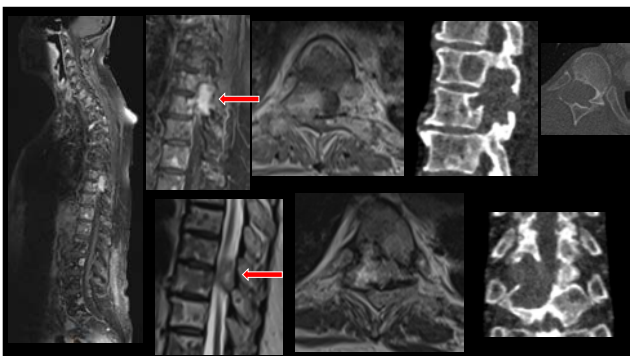
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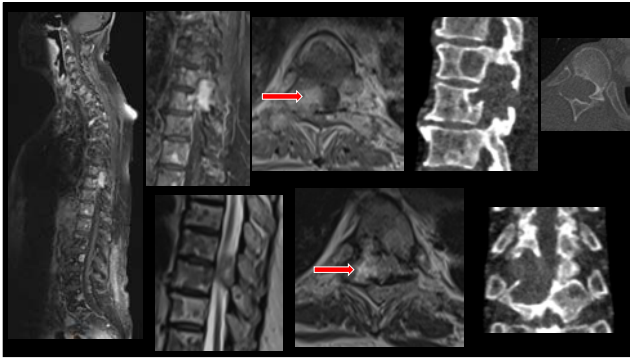
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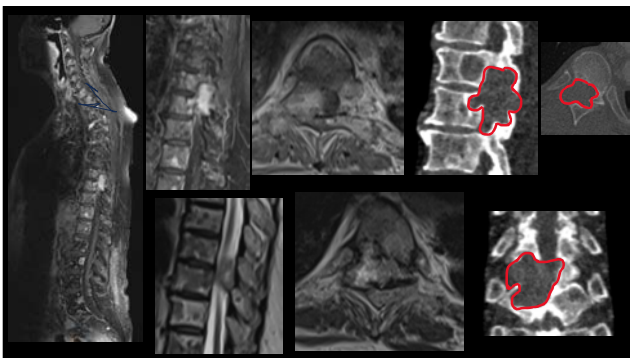
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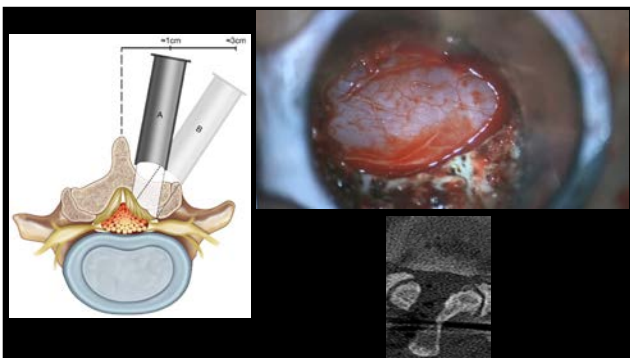
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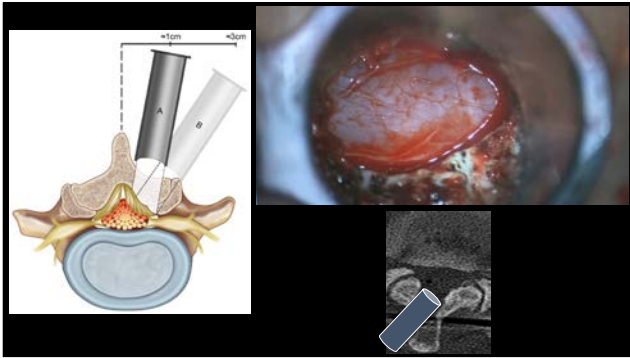
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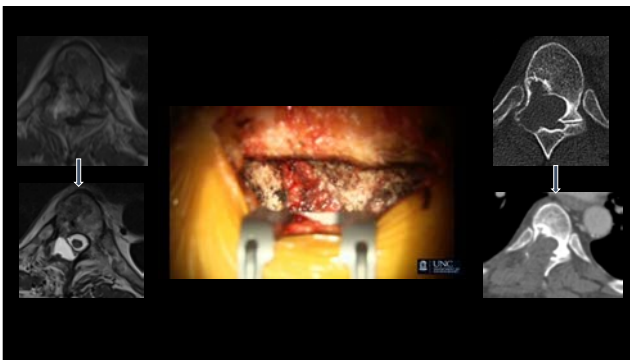
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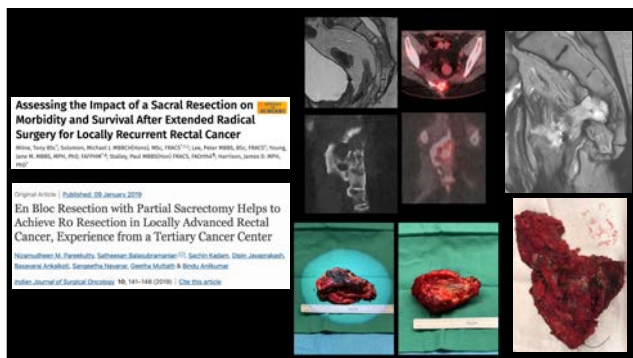
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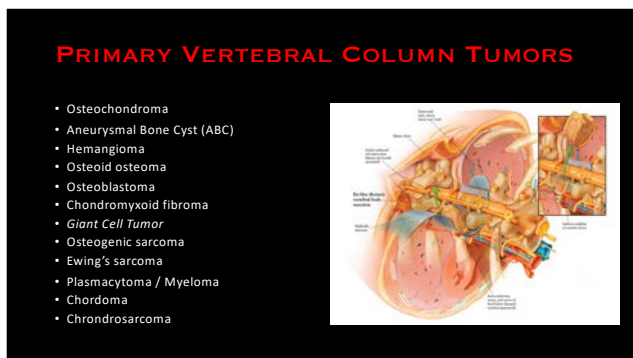
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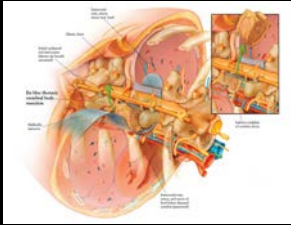
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PRIMARY VERTEBRAL COLUMN TUMORS

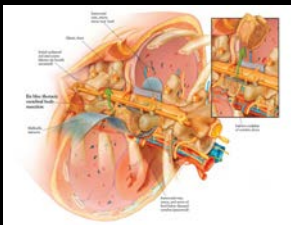
- Osteochondroma
- Aneurysmal Bone Cyst (ABC)
- Hemangioma
- Osteoid osteoma
- Osteoblastoma
- Chondromyxoid fibroma
- Giant Cell Tumor
- Osteogenic sarcoma
- Ewing's sarcoma
- Plasmacytoma / Myeloma
- Chordoma
- Chondrosarcoma



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PRIMARY VERTEBRAL COLUMN TUMORS

- Osteochondroma
- Aneurysmal Bone Cyst (ABC)
- Hemangioma
- Osteoid osteoma Locally-Aggressive
- Osteoblastoma
- Chondromyxoid fibroma
- Giant Cell Tumor
- Osteogenic sarcoma
- Ewing's sarcoma
- Plasmacytoma / Myeloma
- Chordoma
- Chondrosarcoma



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CHONDROMYXOID FIBROMA

Arch Orthop Trauma Surg (2005) 120:42-47

ORIGINAL ARTICLE

H. H. Diller · A. E. Litzman · A. Norlich
B. Vignery · R. S. Hoffer


Chondromyxoid fibroma of bone

Chondromyxoid Fibroma: First Report of Occurrence of This Tumor in Vertebral Column
Walter R. Barlow, M.D., Spencer Davis, M.D.

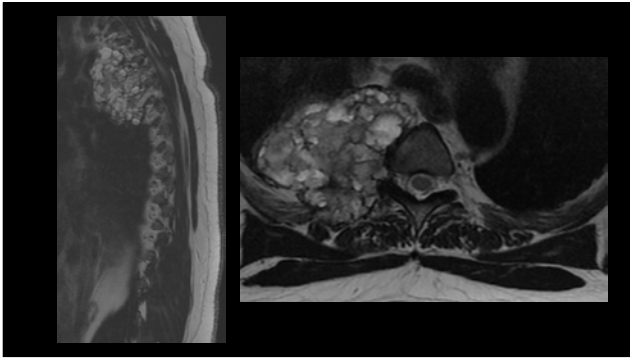
Annals of the Royal College of Surgeons in Great Britain, Volume 95, Number 11, November 2003, Pages 1236-1239, <http://doi.org/10.1054/ars.2003.31236>

Chondromyxoid fibroma of the lumbar spine: case report and literature review

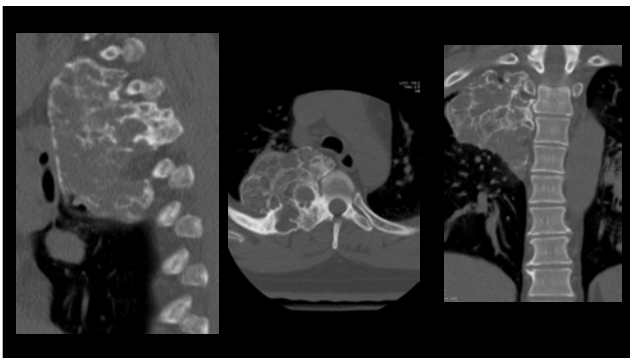
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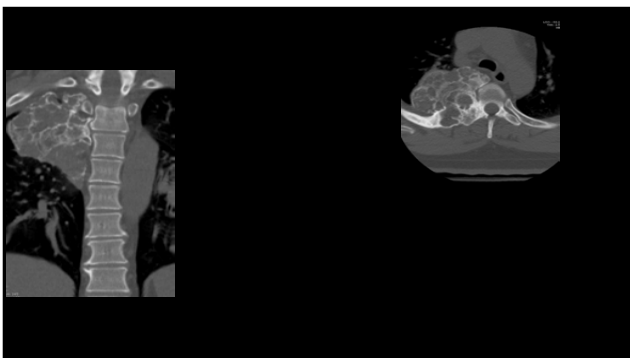
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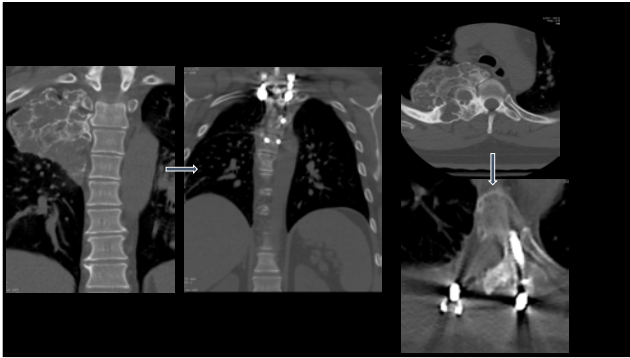
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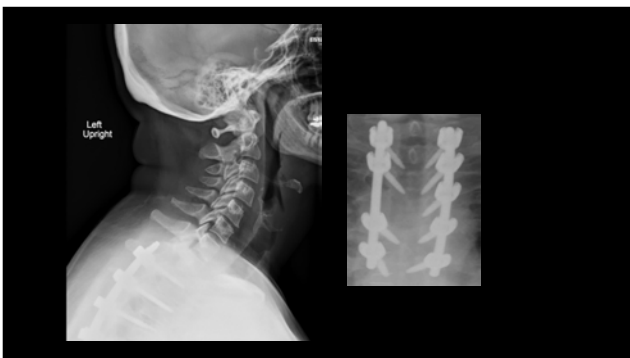
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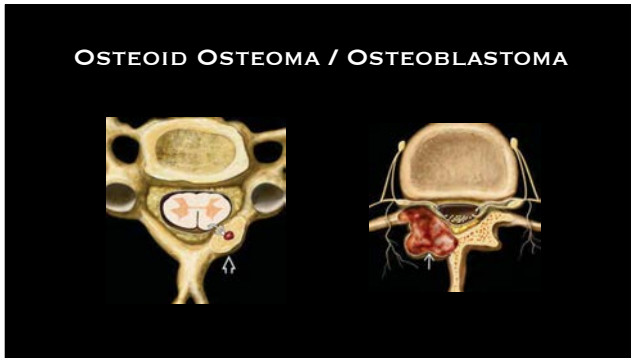
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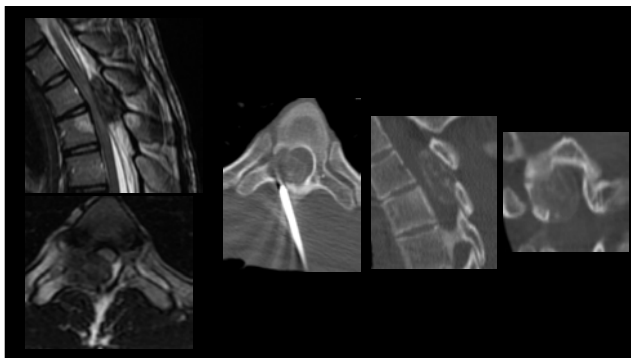
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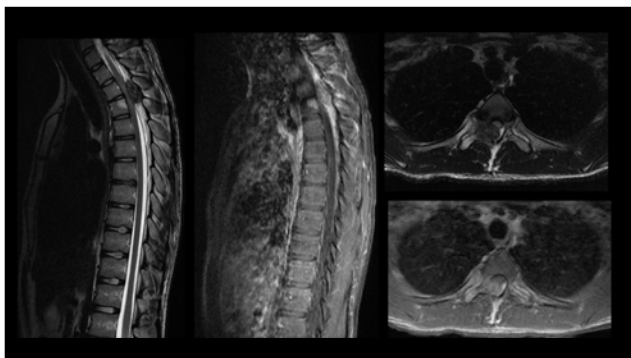
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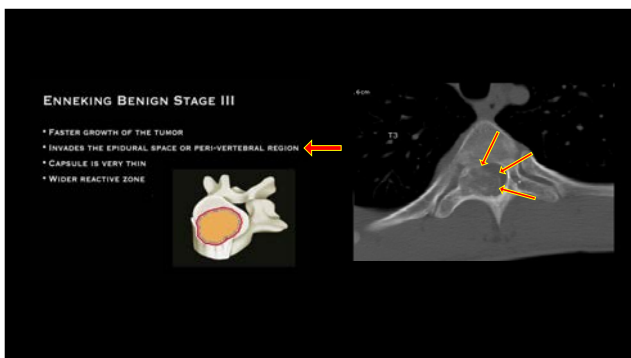
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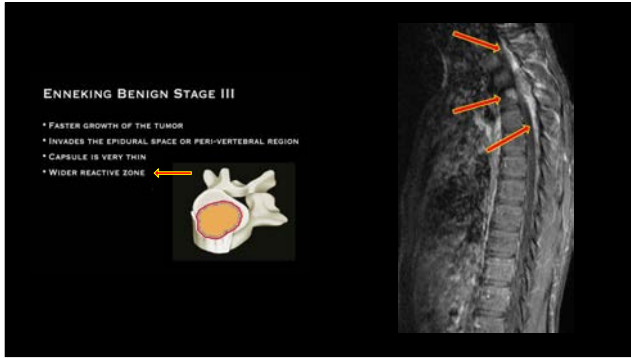
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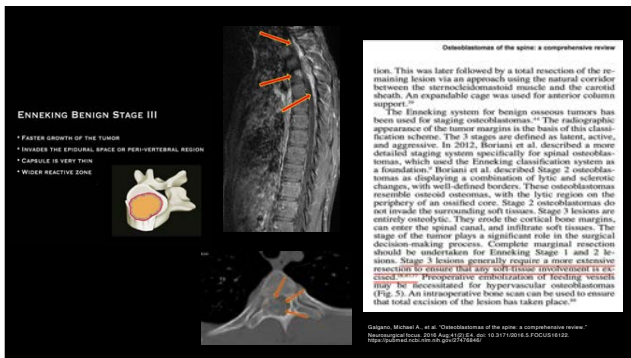
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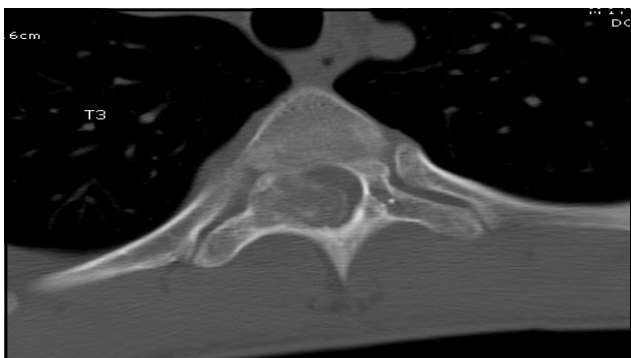
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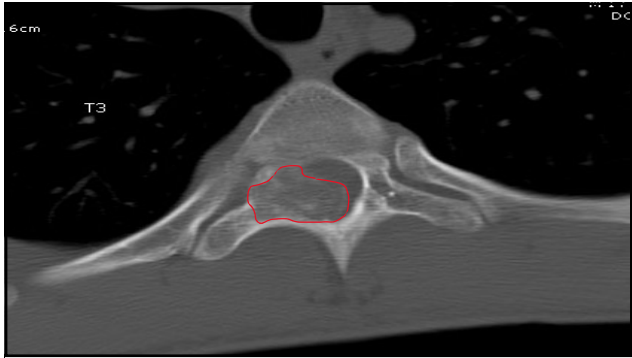
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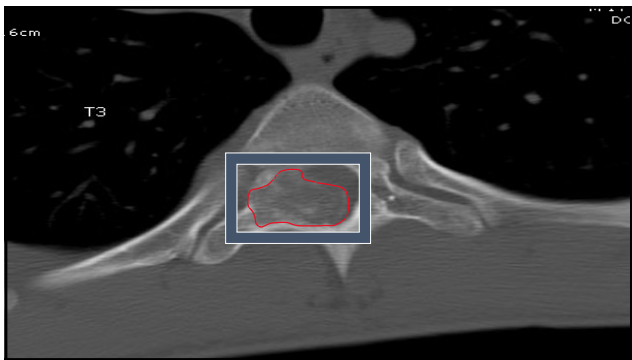
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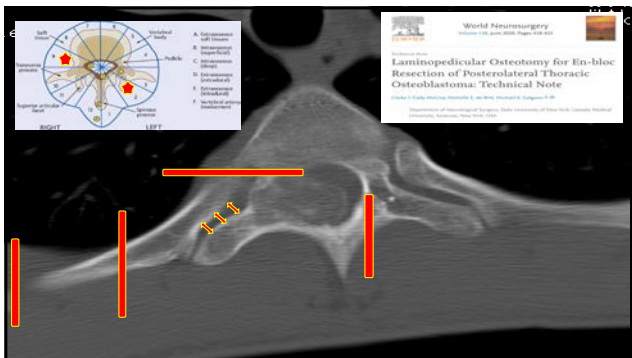
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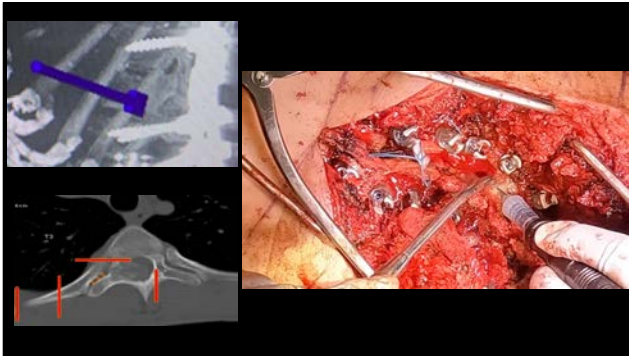
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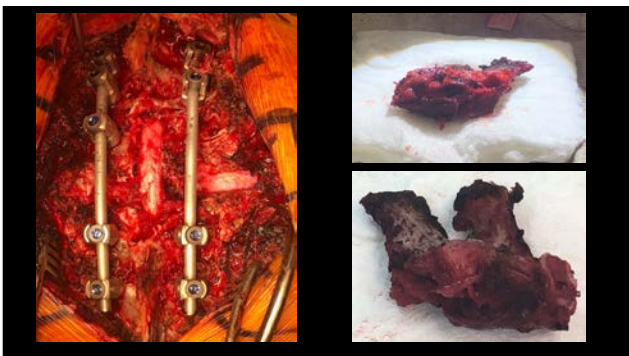
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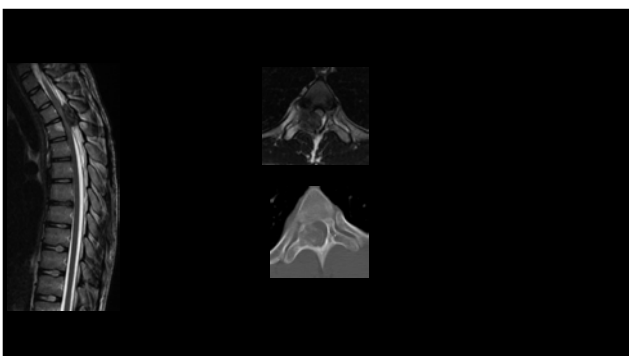
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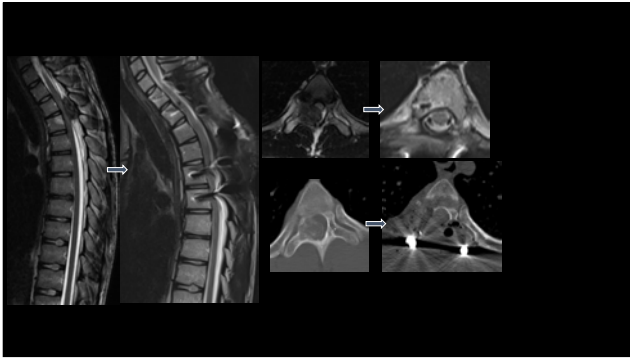
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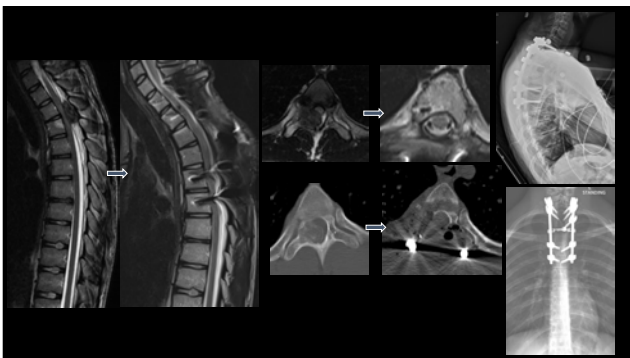
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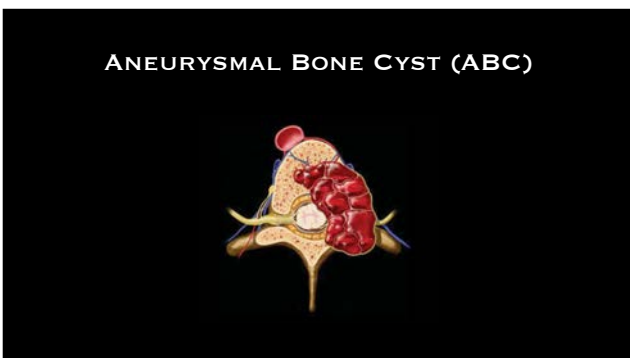
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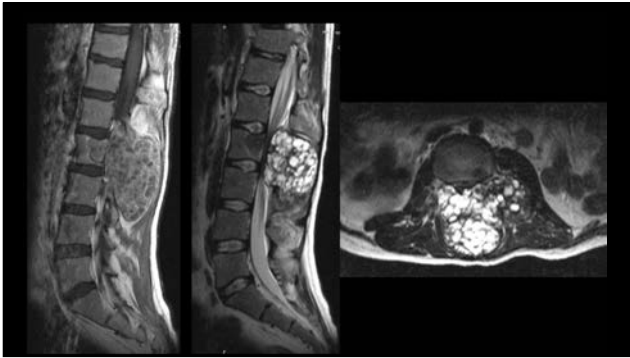
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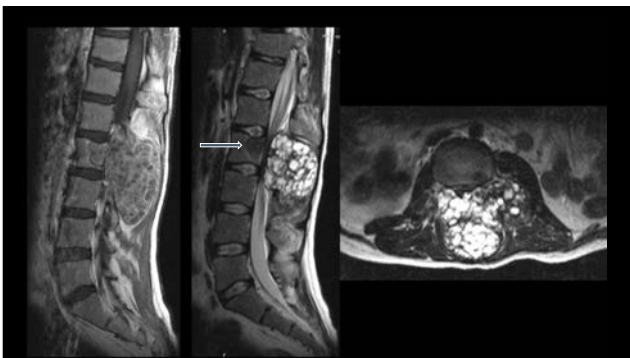
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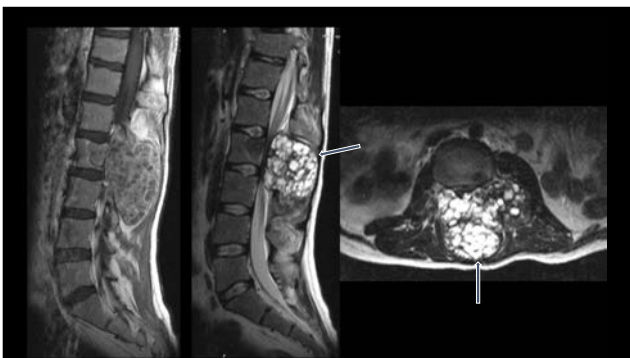
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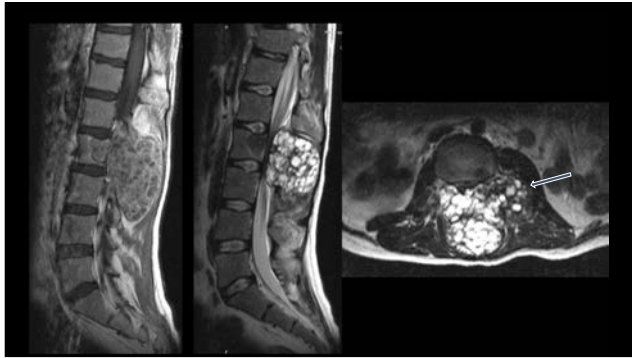
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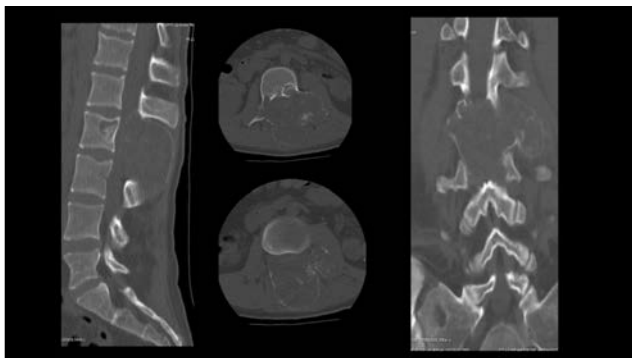
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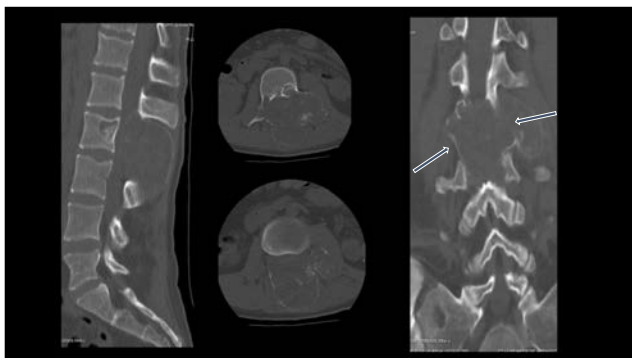
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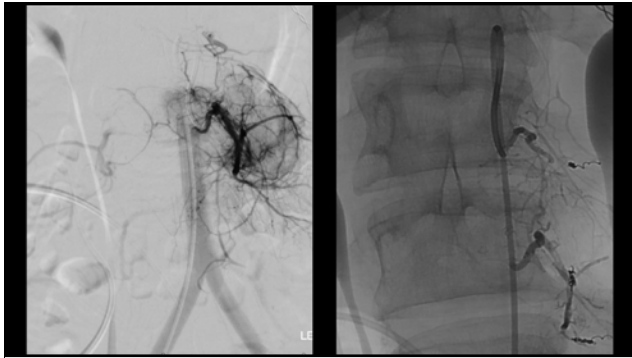
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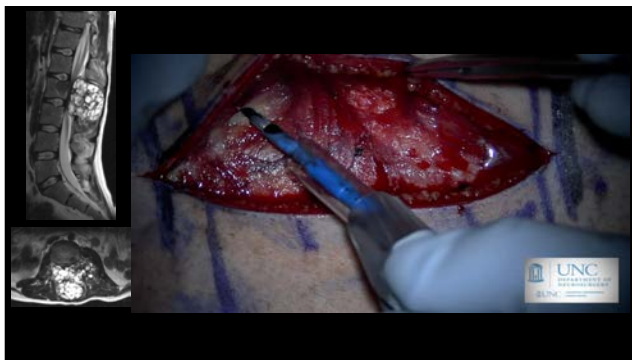
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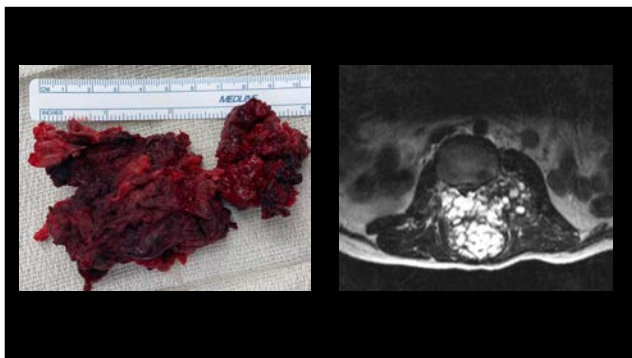
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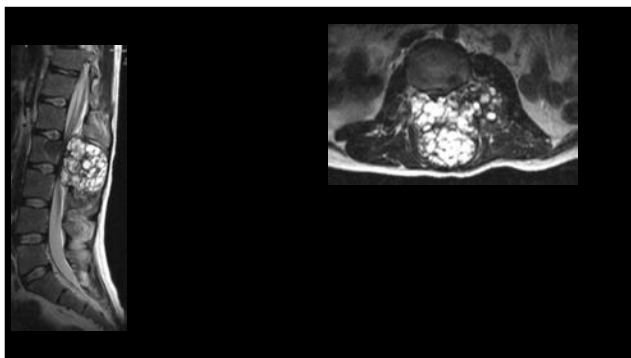
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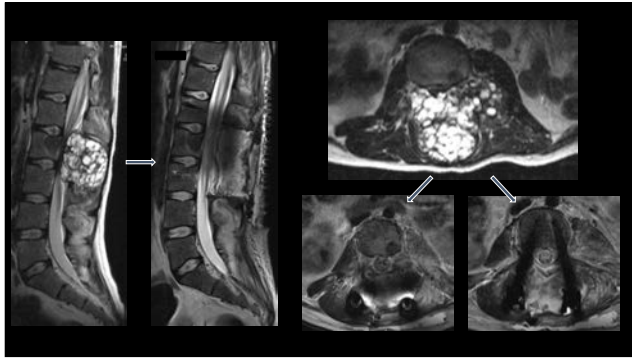
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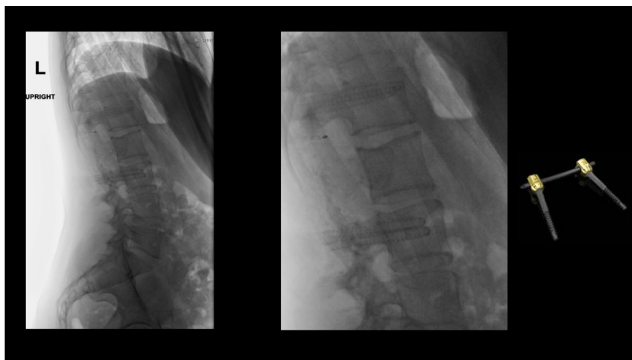
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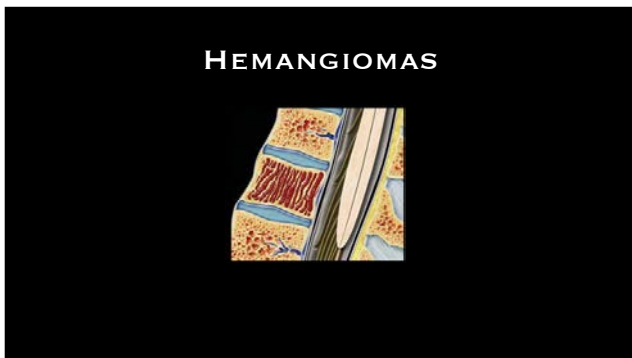
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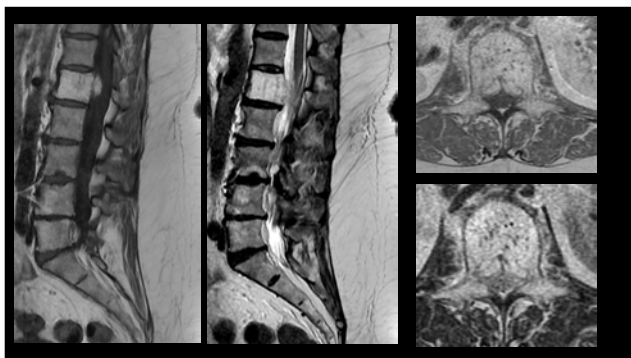
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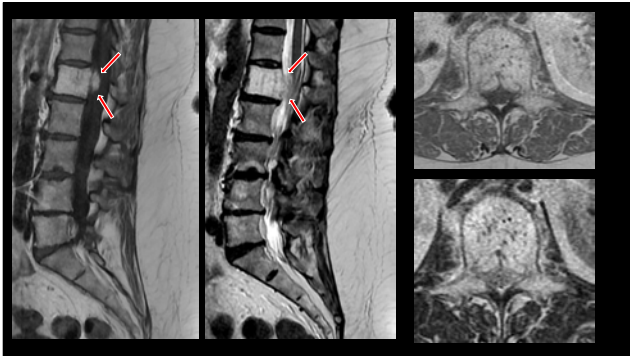
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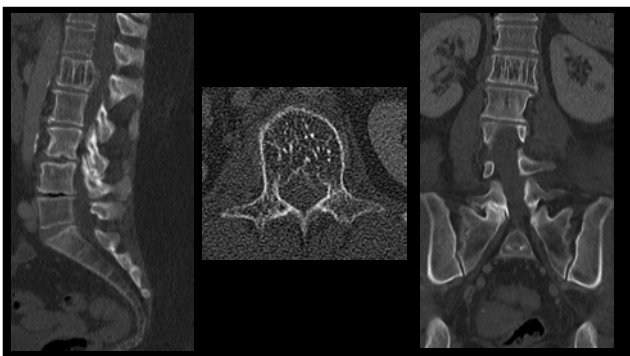
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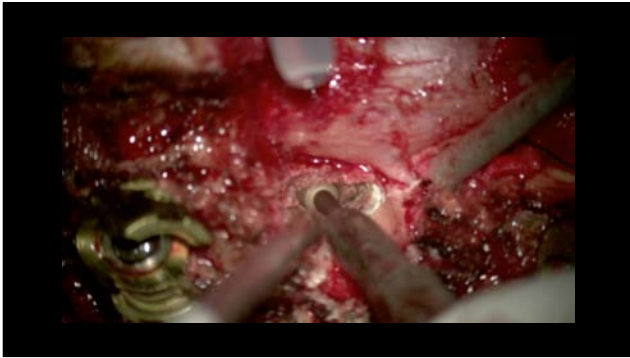
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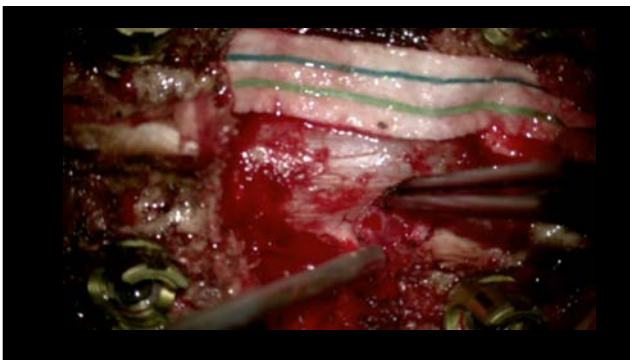
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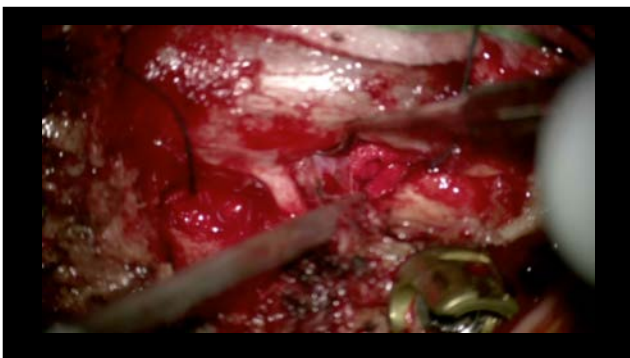
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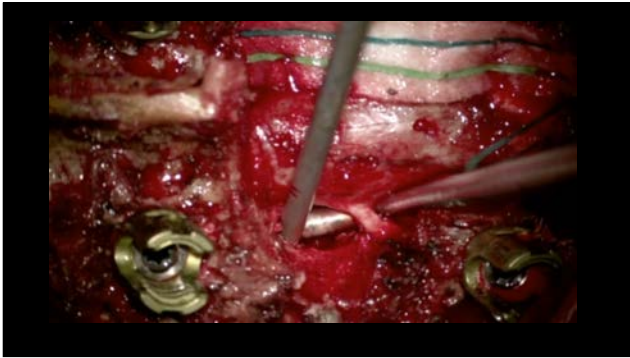
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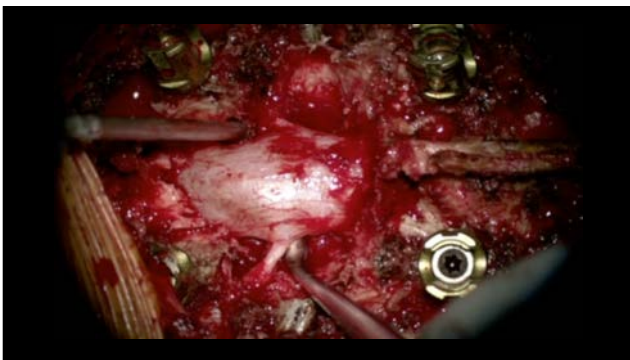
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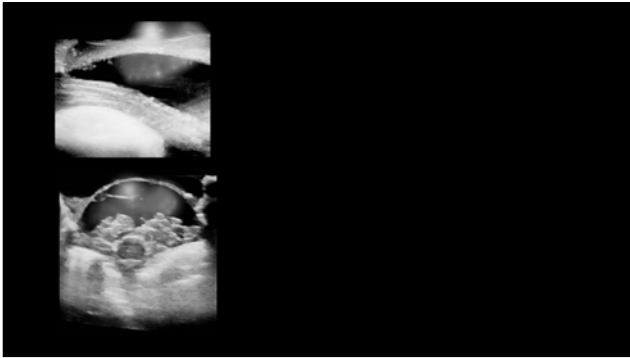
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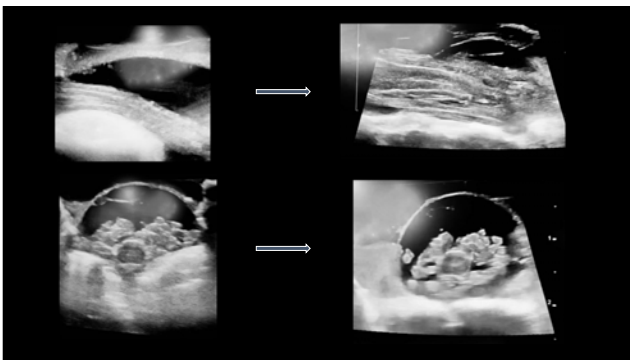
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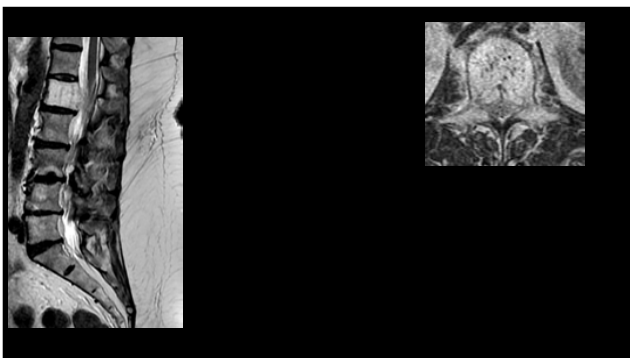
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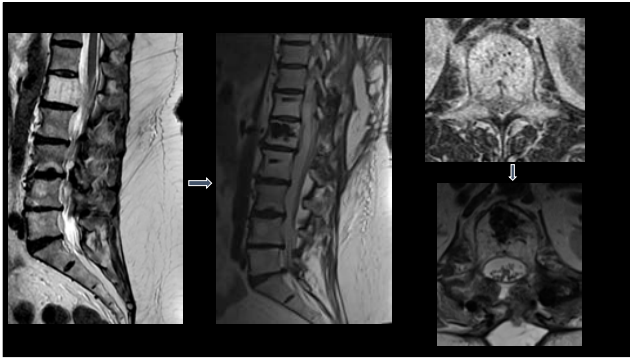
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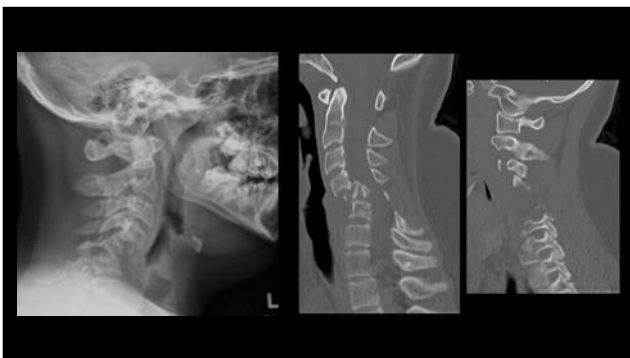
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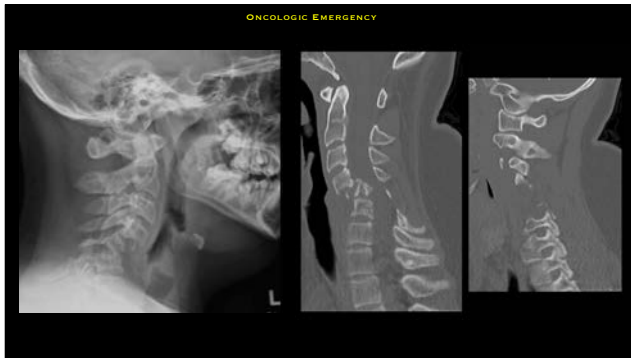
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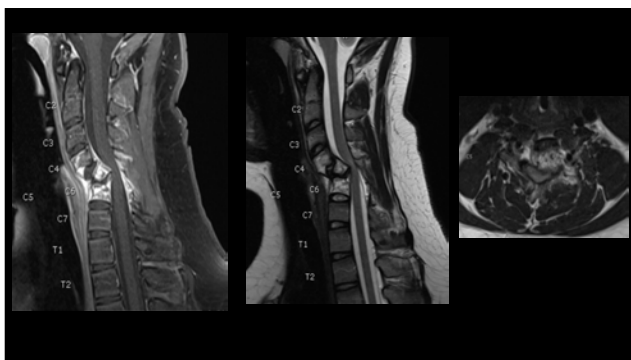
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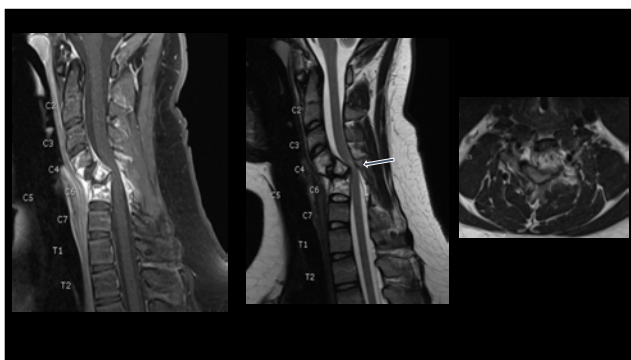
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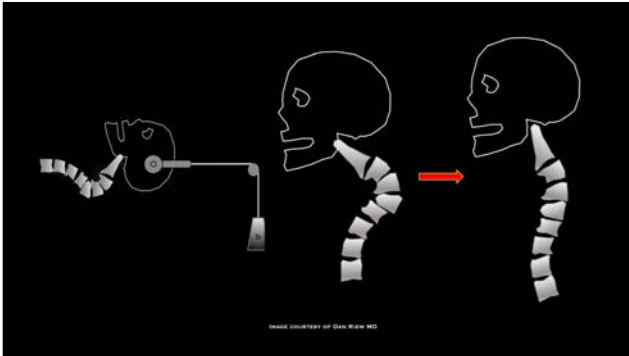
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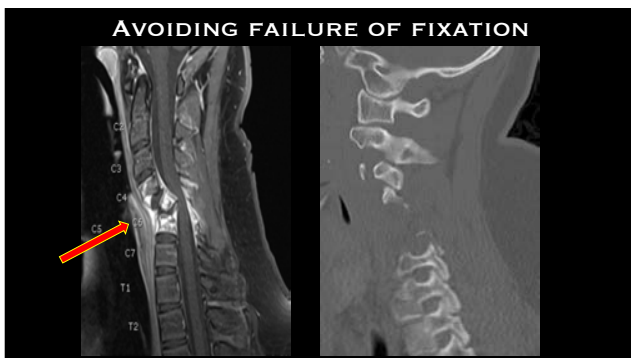
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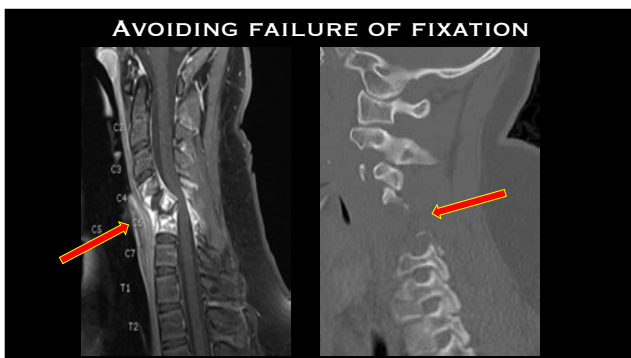
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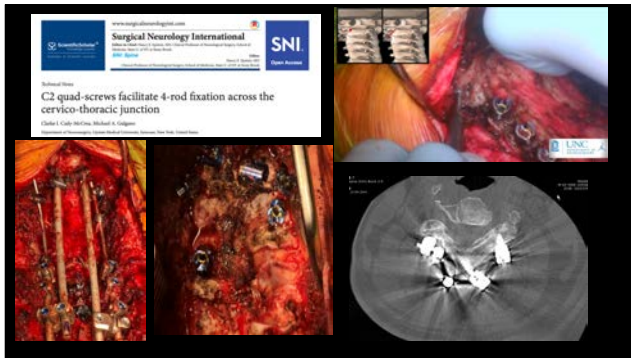
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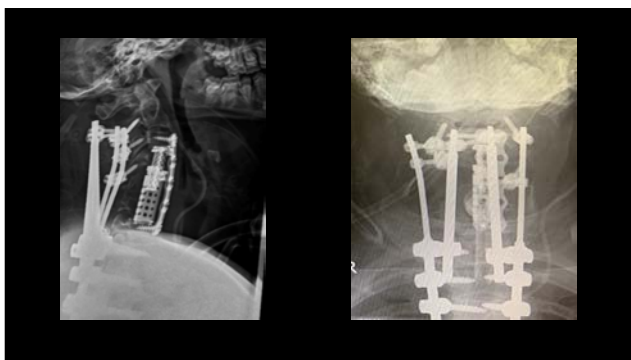
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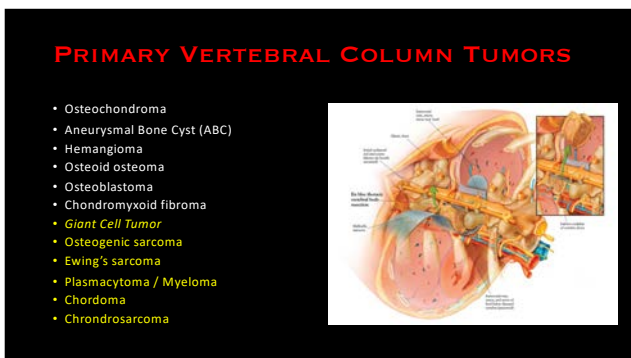
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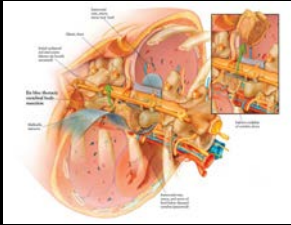
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PRIMARY VERTEBRAL COLUMN TUMORS

- Osteochondroma
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- Hemangioma
- Osteoid osteoma
- Osteoblastoma
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- **Giant Cell Tumor**
- Osteogenic sarcoma **Metastatic Potential**
- Ewing's sarcoma
- Plasmacytoma / Myeloma
- Chordoma
- Chondrosarcoma




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What is the ideal treatment to induce an oncological cure or prolonged disease-free intervals in patients with malignant primary bone tumors (ie. sacral chordoma)?

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Method of Resection Correlates Strongly with Disease-Free Survival


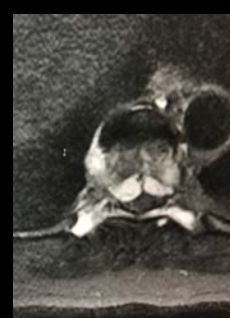
Bonazzi et al. *SPSND*, 21:1566-1577, 1996

Table 3. Location and Extent of 23 Cases of Metastases of the Spine

Location	No. of Cases	Proportion
Thoracic	11	47.8%
Lumbar	10	43.5%
Cervical	2	8.7%
Conus Medullaris	0	0%
Total	23	100%

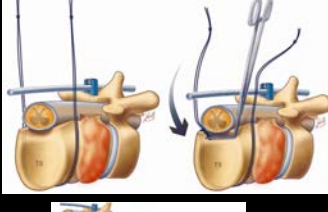
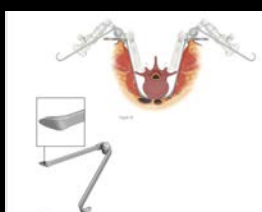



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Images of Dr. Ziya Gokasian

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Images of Dr. John Shin

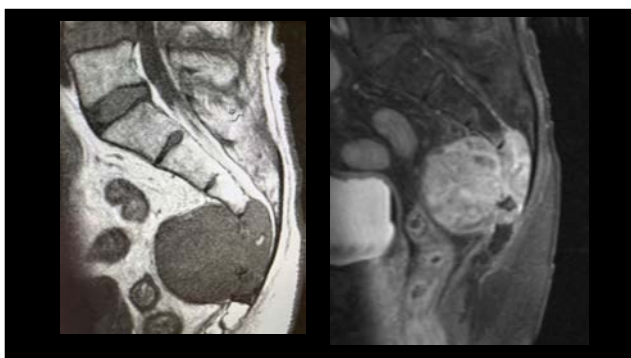
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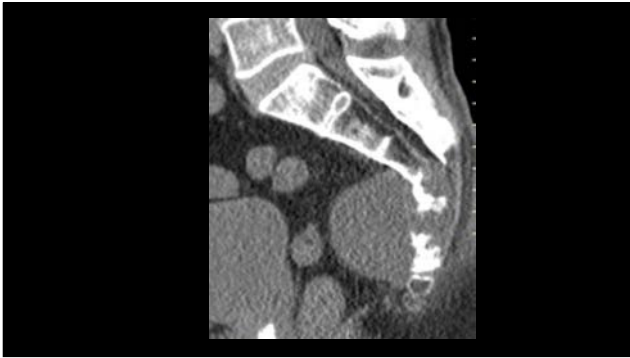
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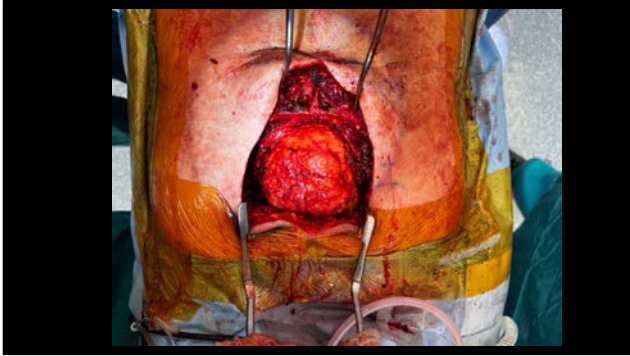
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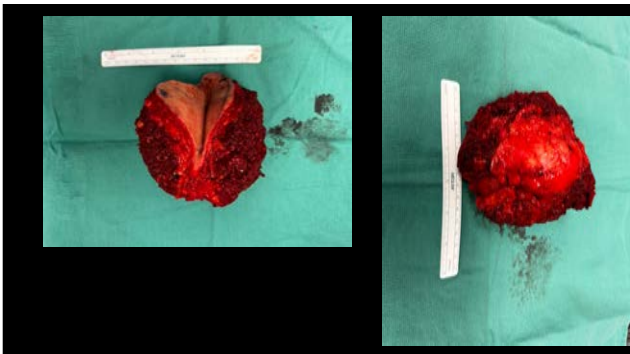
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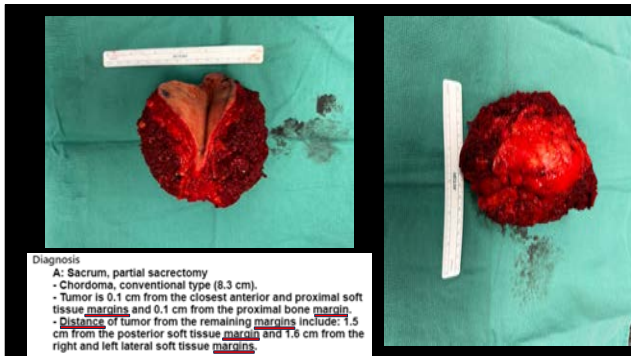
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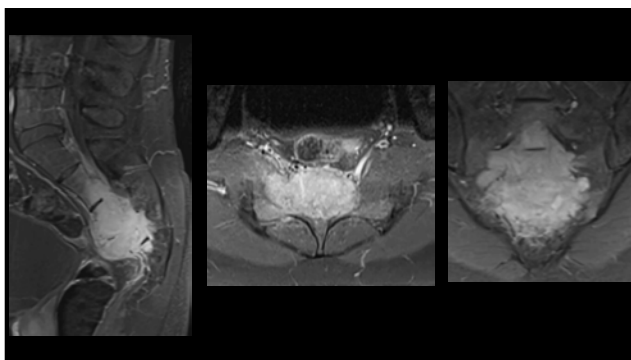
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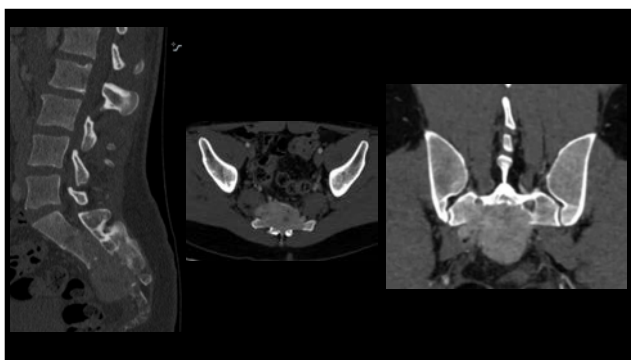
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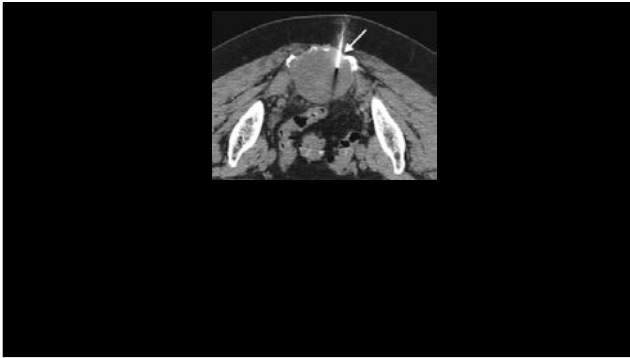
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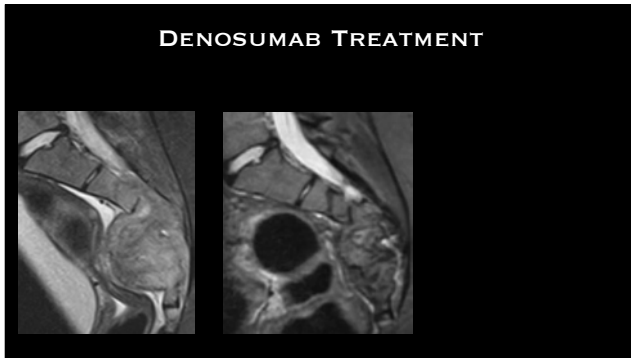
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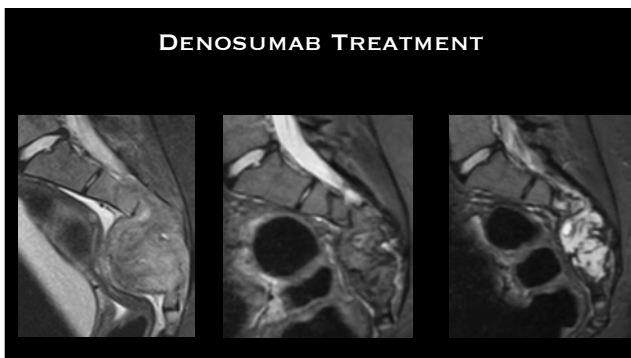
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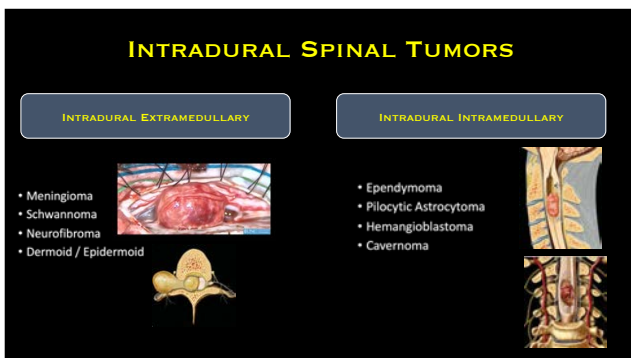
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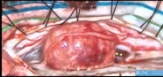
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336

INTRADURAL EXTRAMEDULLARY



- Meningioma
- Schwannoma
- Neurofibroma
- Dermoid / Epidermoid



337

INTRADURAL EXTRAMEDULLARY


- Meningioma
- Schwannoma
- Neurofibroma
- Dermoid / Epidermoid



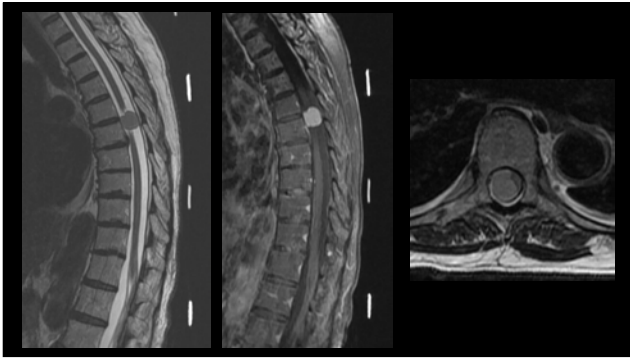
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INTRADURAL EXTRAMEDULLARY

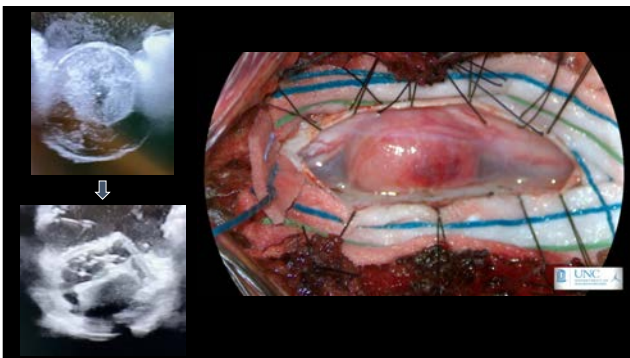
- Meningioma
- Schwannoma
- Neurofibroma
- Dermoid / Epidermoid



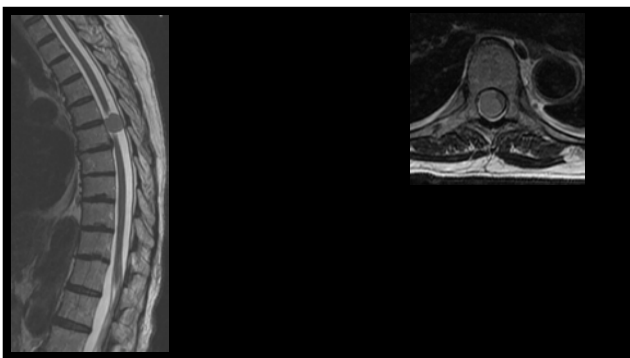
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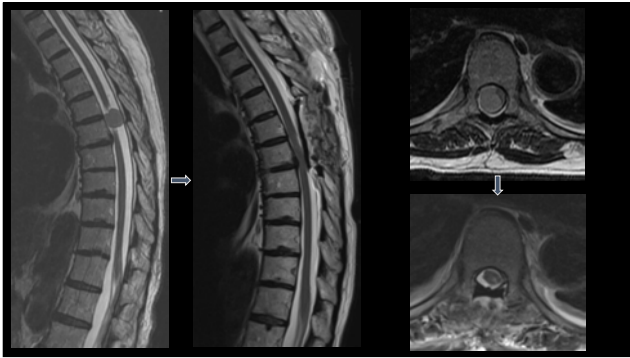
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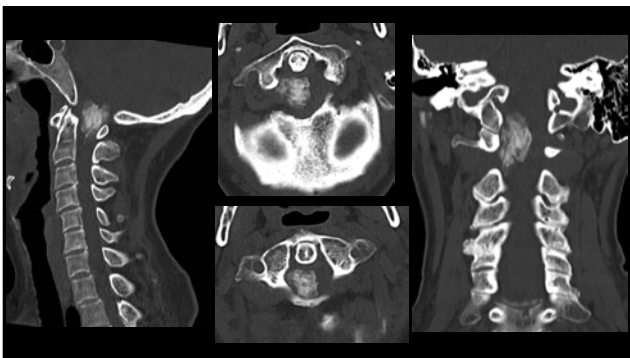
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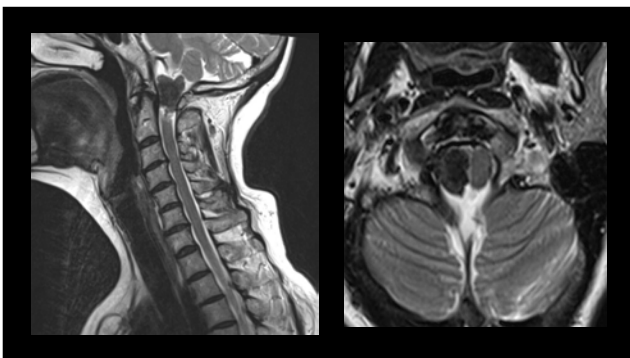
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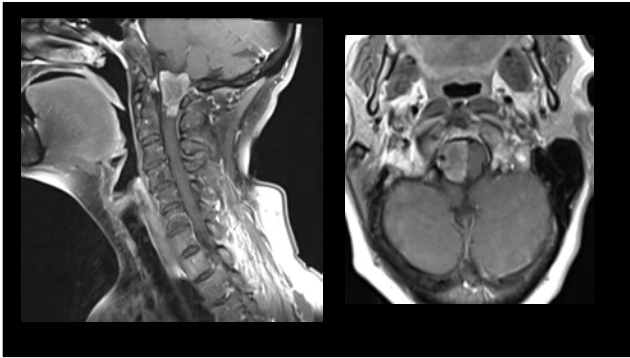
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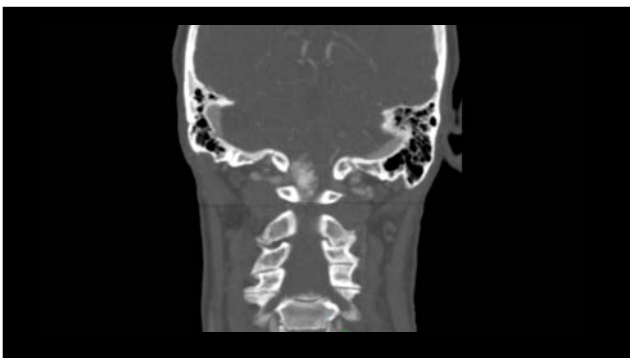
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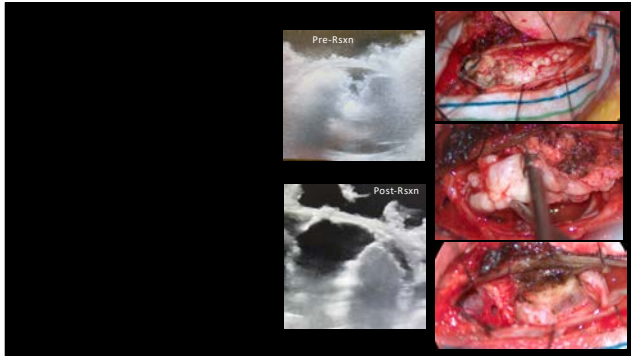
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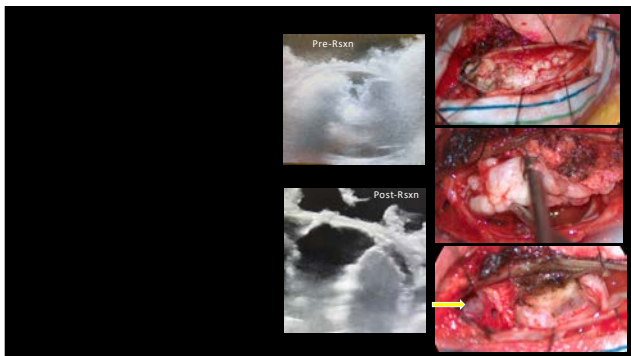
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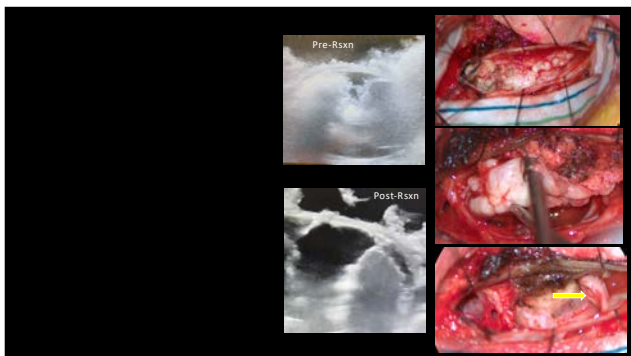
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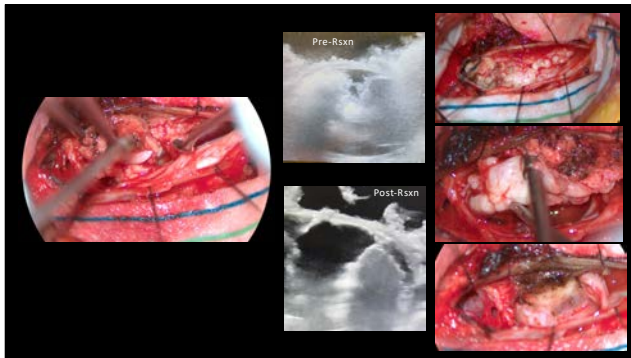
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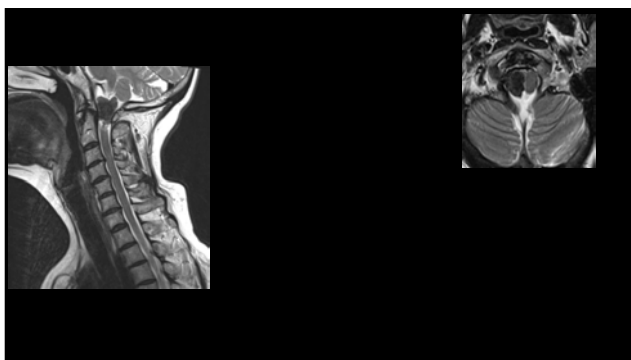
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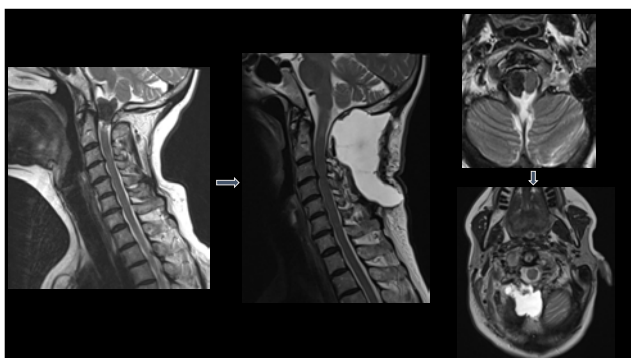
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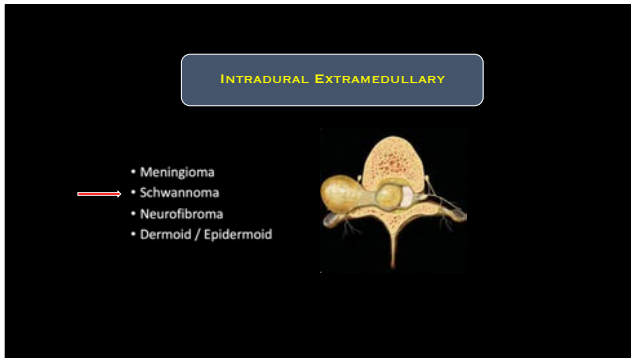
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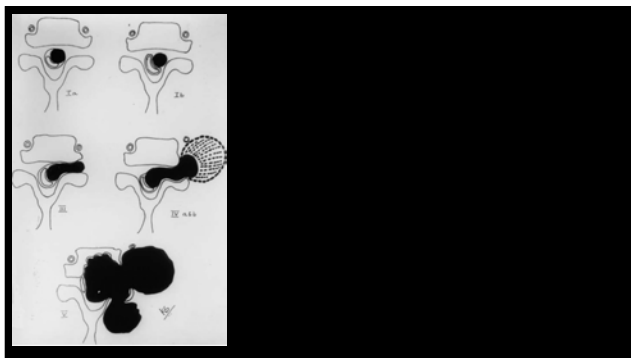
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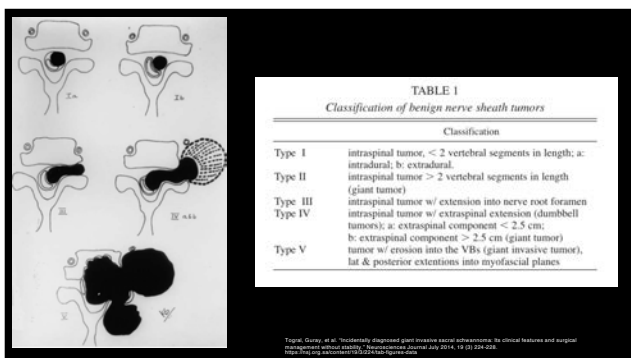
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357

SCHWANNOMAS

- PURE EXTRADURAL
- PURE INTRADURAL
- HYBRID (IE. DUMBELL)

358

SCHWANNOMAS

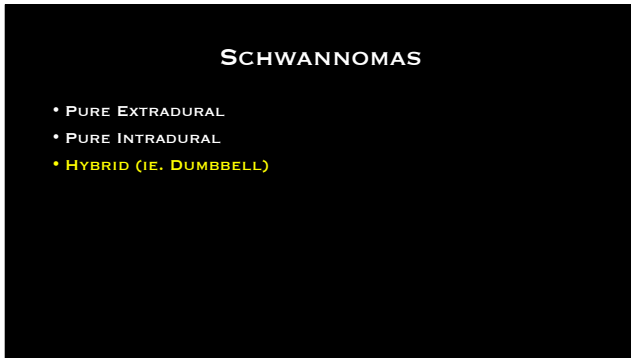
- PURE EXTRADURAL
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- HYBRID (IE. DUMBELL)

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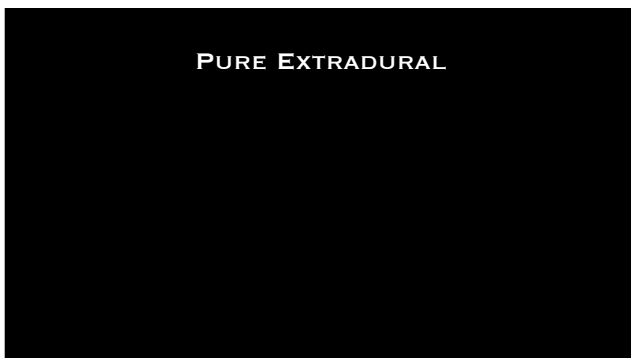
SCHWANNOMAS

- PURE EXTRADURAL
- PURE INTRADURAL
- HYBRID (IE. DUMBELL)

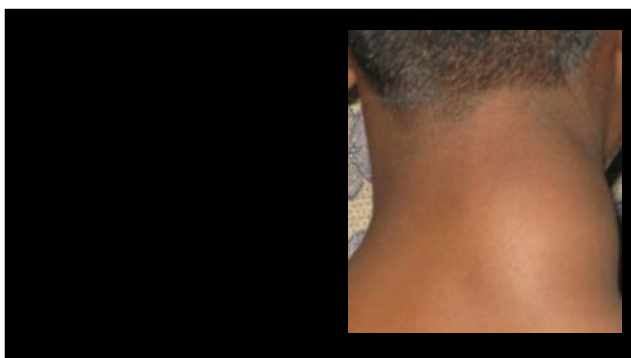
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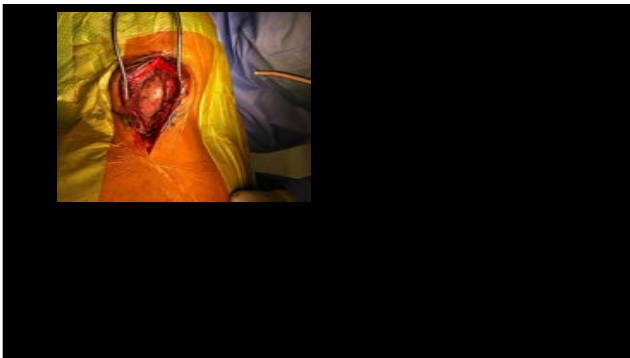


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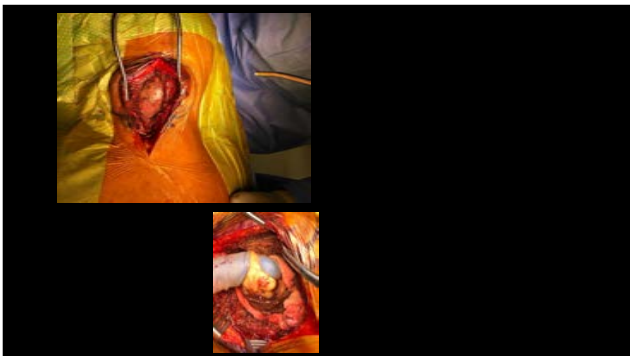




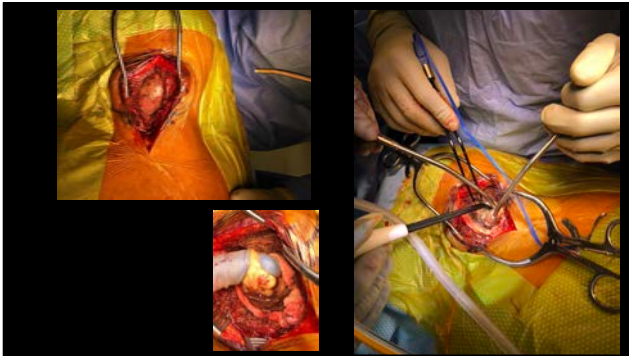
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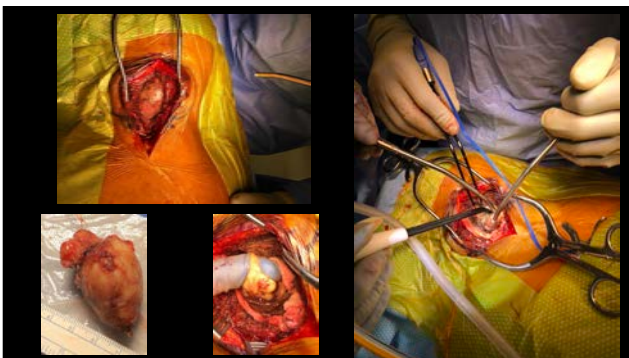
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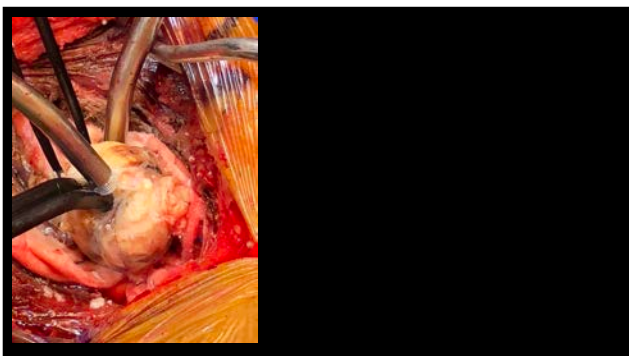
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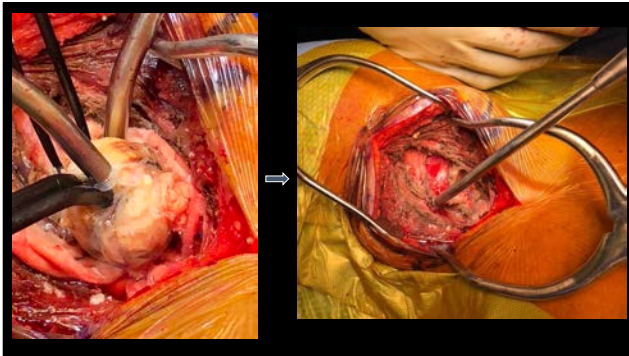
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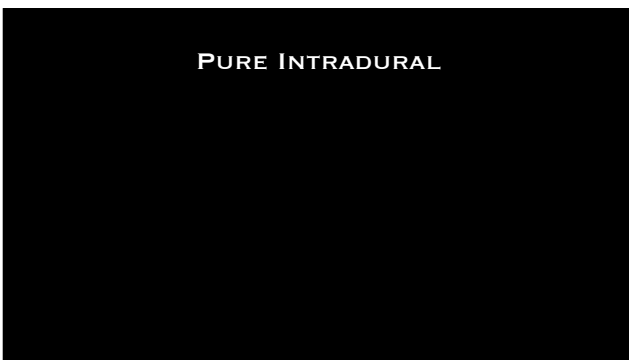
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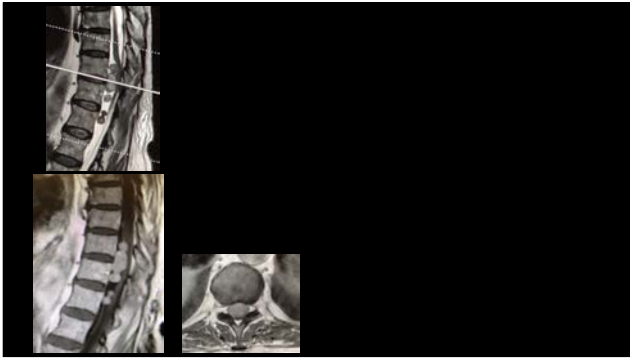
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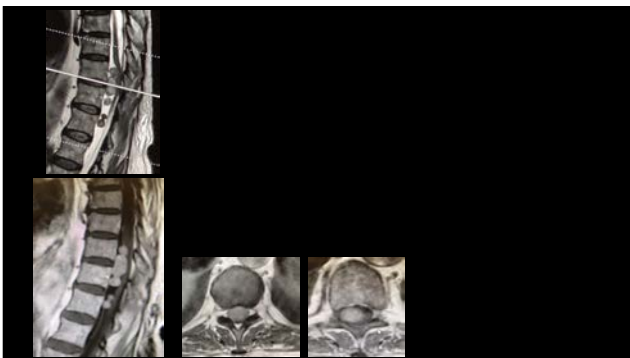
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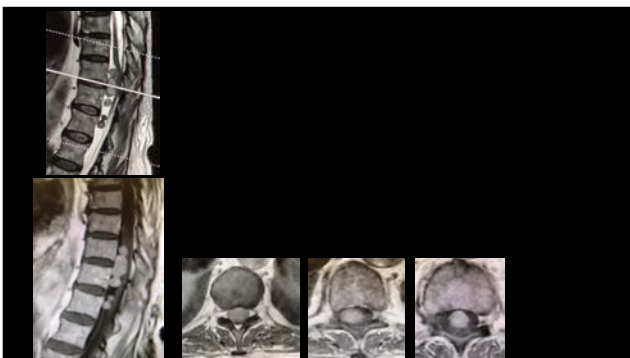
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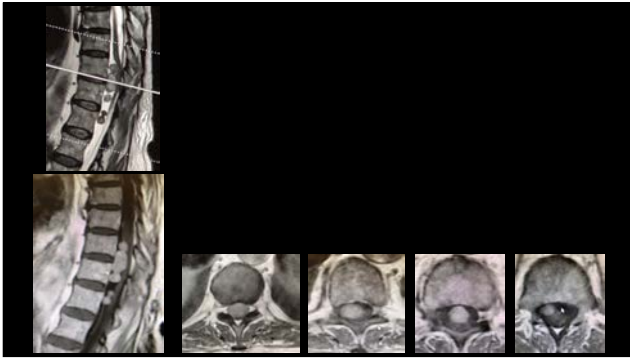
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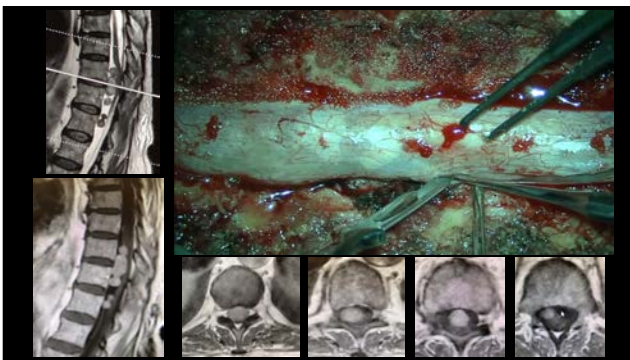
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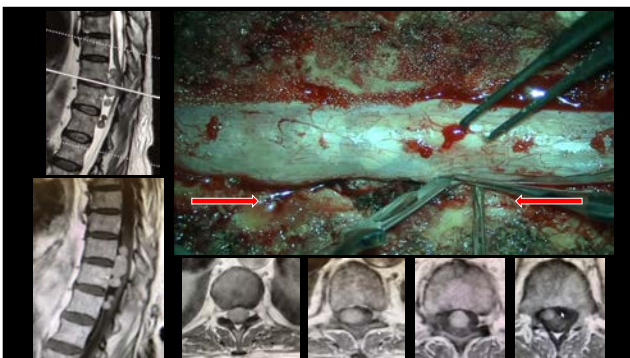
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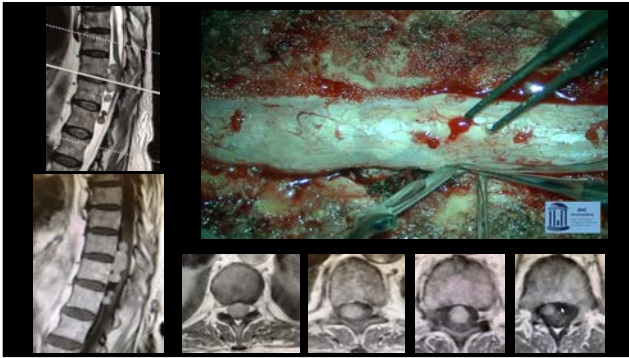
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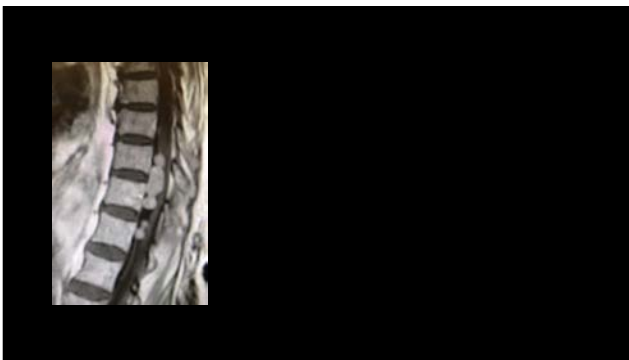
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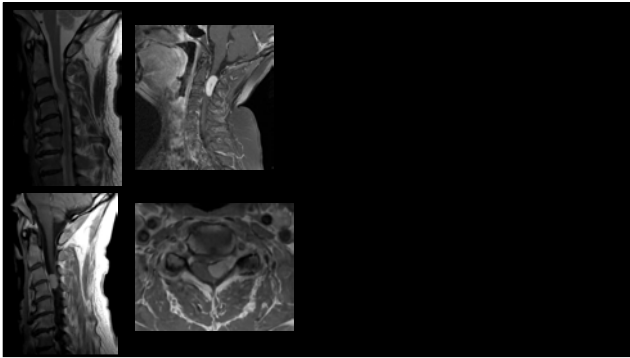
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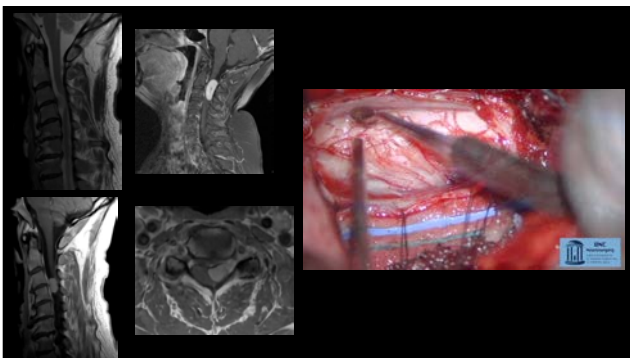
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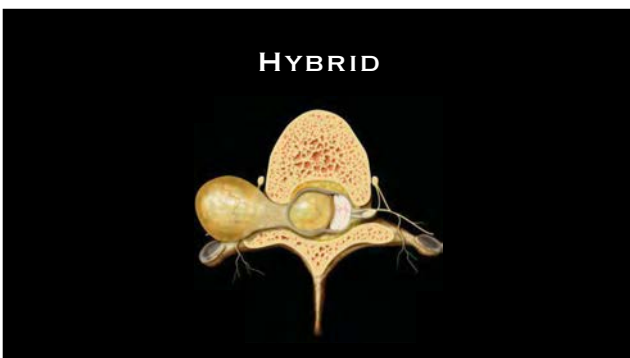
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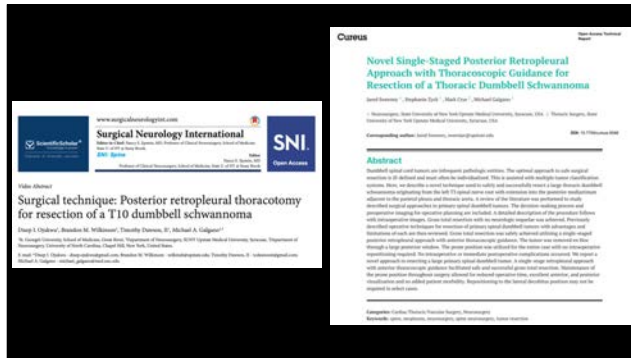
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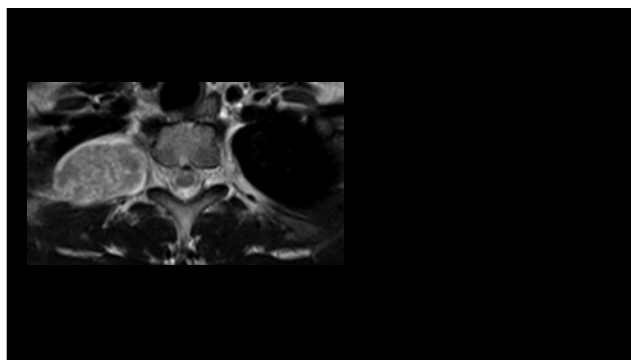
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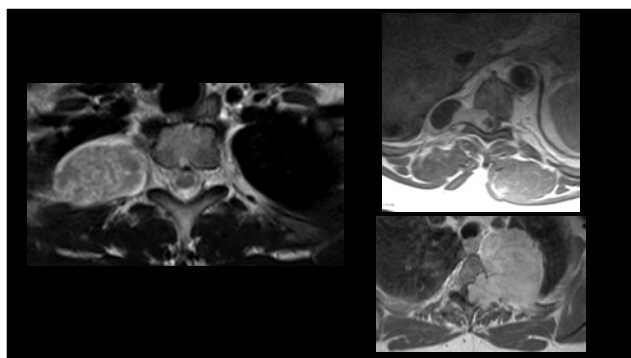
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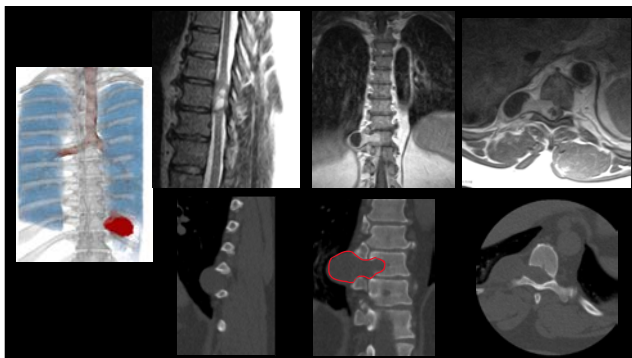
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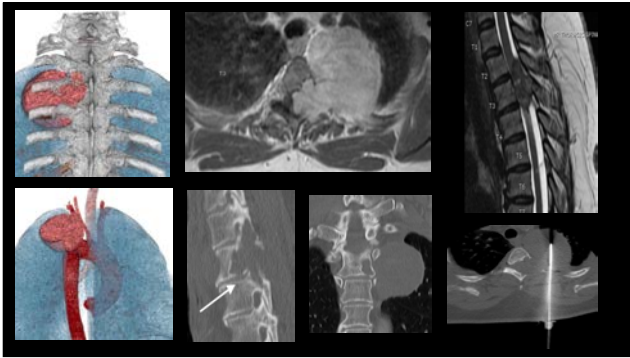
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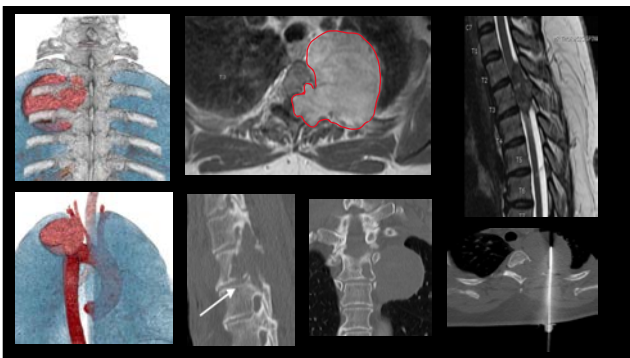
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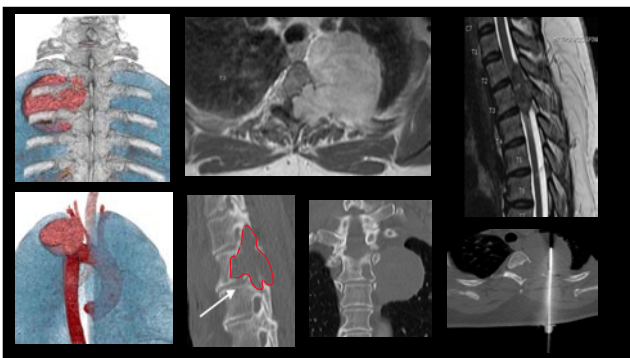
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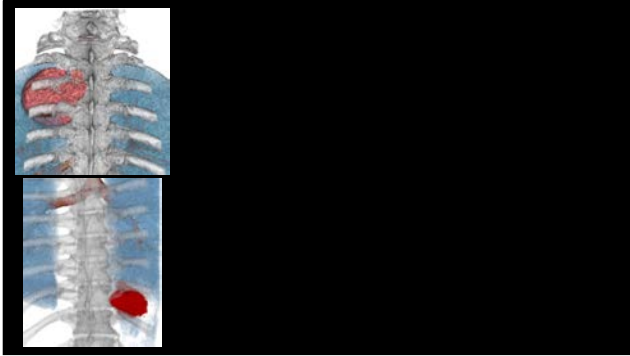
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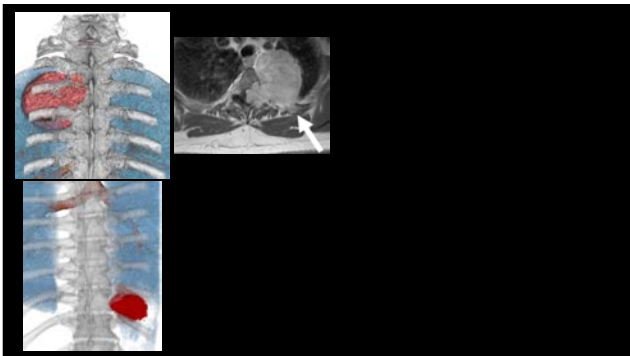
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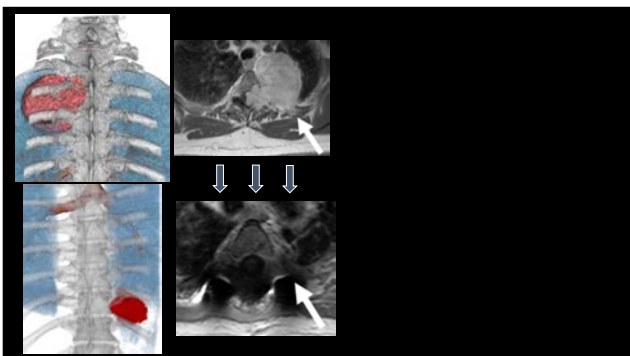
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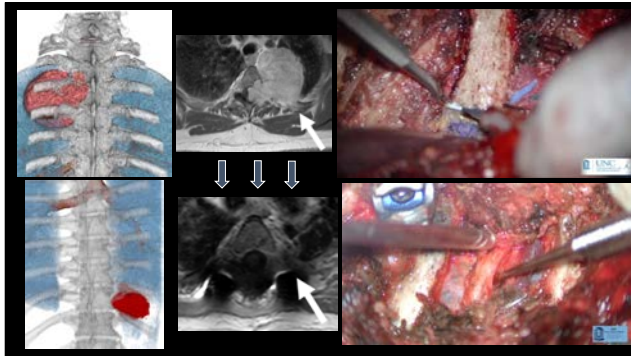
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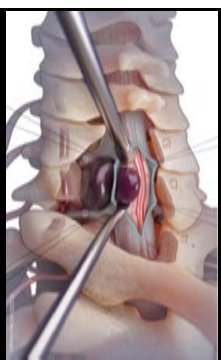
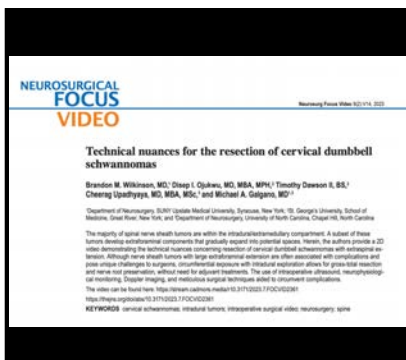
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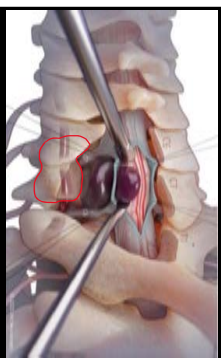
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400



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NEUROSURGICAL FOCUS VIDEO

Technical nuances for the resection of cervical dumbbell schwannomas

Brandon M. Wilkinson, MD, Dorel J. Cjokic, MD, MBA, MPH, Timothy Dawson II, BS, Cheerag Upadhyay, MD, MBA, MSc, and Michael A. Gaigano, MD

Department of Neurosurgery, SUNY Upstate Medical University, Syracuse, New York, US, Georgia University, School of Medicine, Small Bone, New York, and Department of Neurosurgery, University of North Carolina, Chapel Hill, North Carolina

The majority of spinal nerve sheath tumors are within the intradural/intracanalicular compartment. A subset of these tumors develop extradural components that gradually expand into potential spaces. Herein, the authors provide a 3D video demonstrating the technical nuances concerning resection of cervical dumbbell schwannomas with extradural extension. Although nerve sheath tumors with large extradural extension are often associated with complications and pose unique challenges to surgeons, careful attention with technical considerations allows for gross total resection and nerve not preservation, without need for adjuvant treatments. The use of intraoperative ultrasound, neurophysiologic monitoring, Doppler imaging, and minimally surgical techniques aided to overcome complications.

The video can be found here: <https://www.youtube.com/watch?v=317120237F0C402081>

KEYWORDS cervical schwannomas, intradural tumors, intraoperative surgical video, neurosurgery, spine

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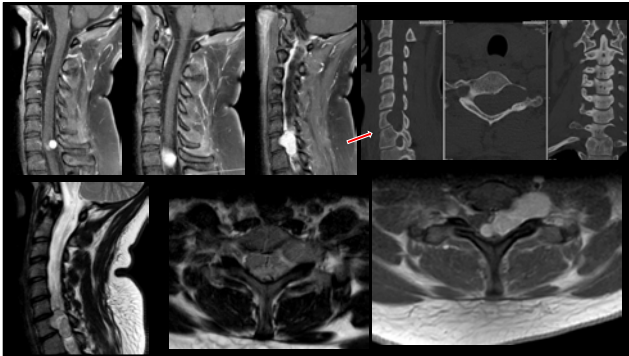
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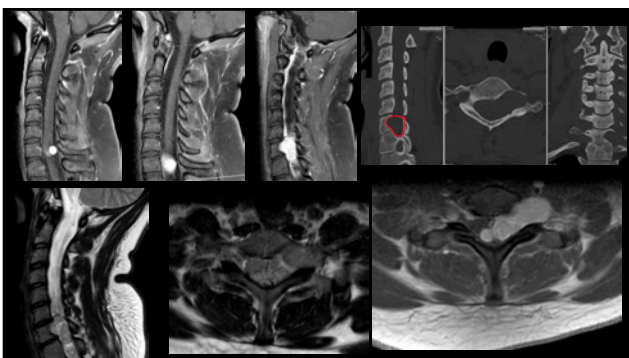
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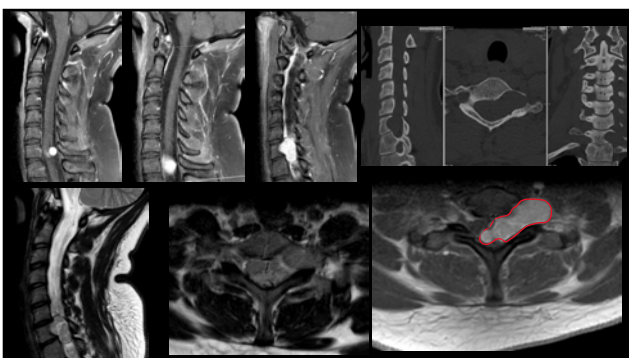
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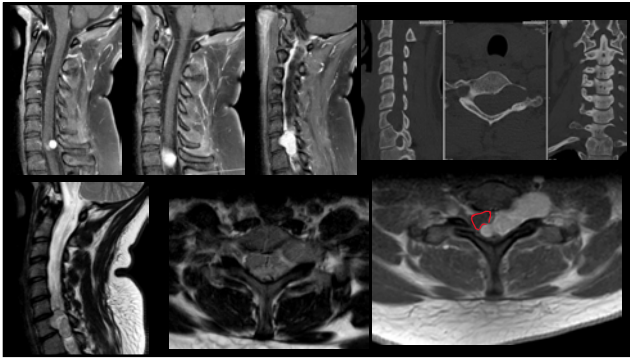
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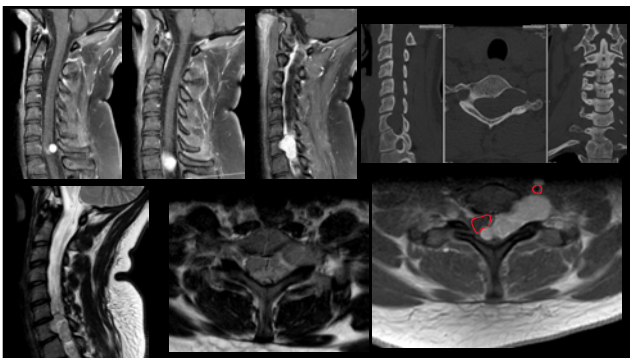
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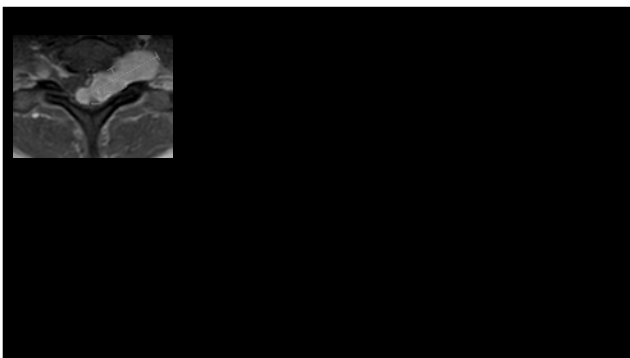
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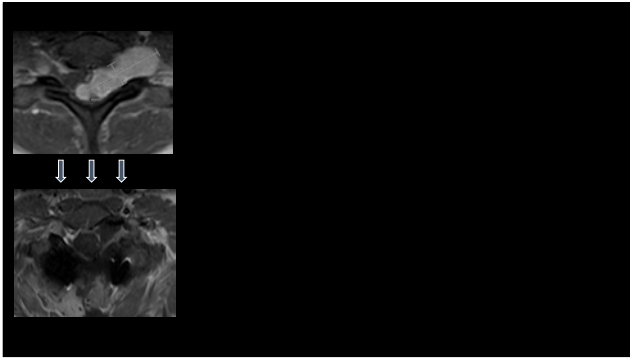
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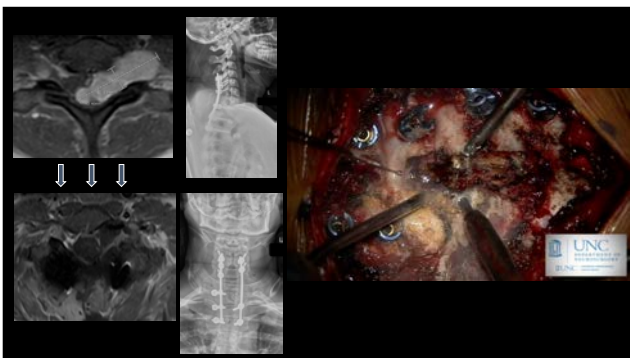
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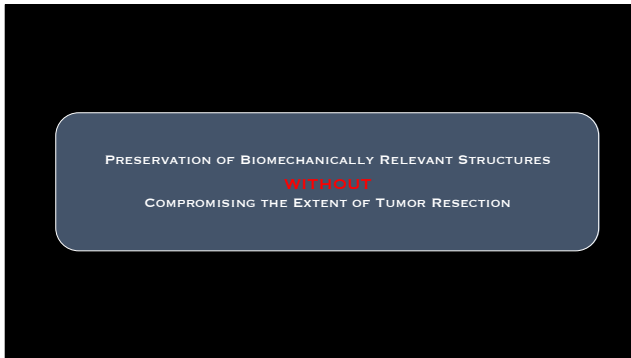
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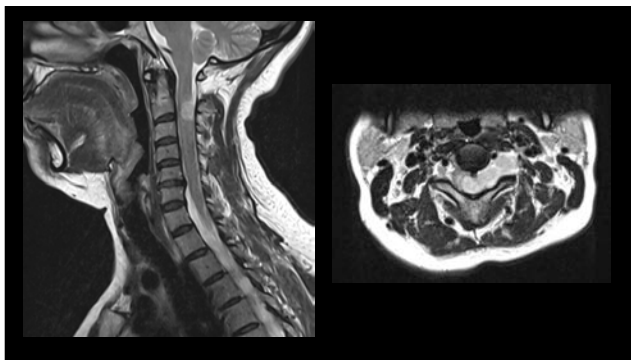
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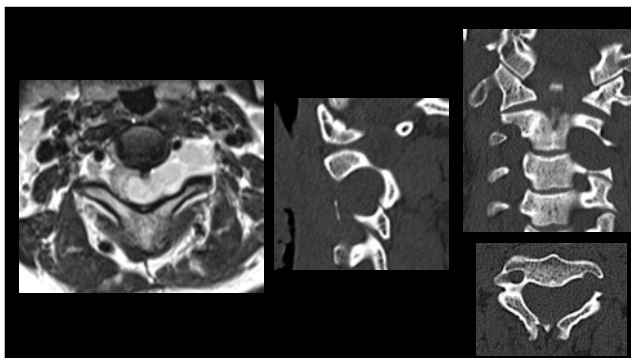
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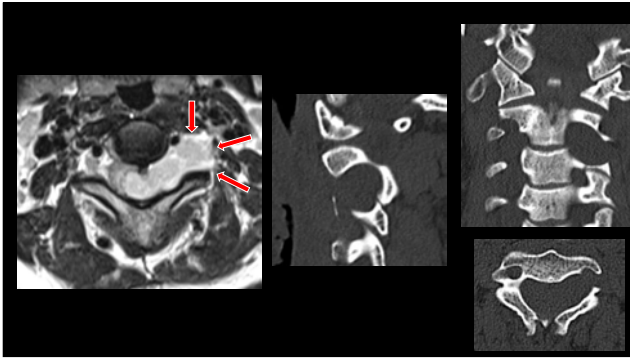
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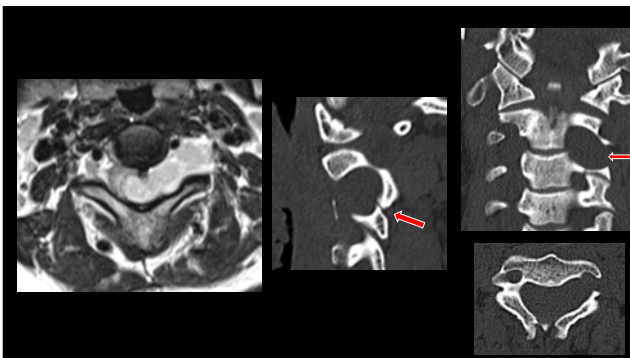
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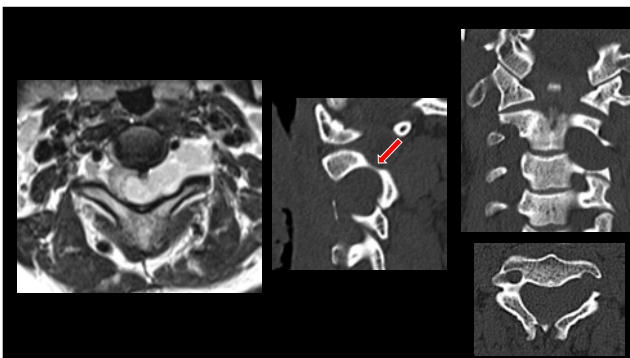
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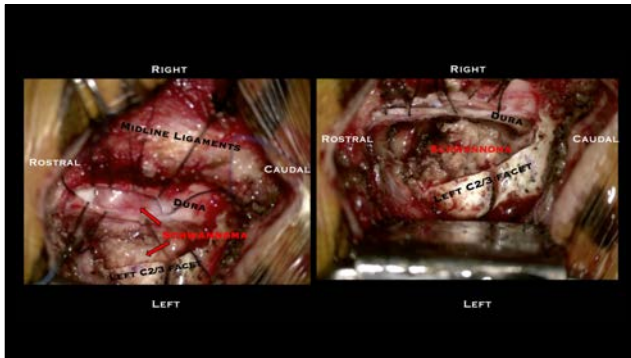
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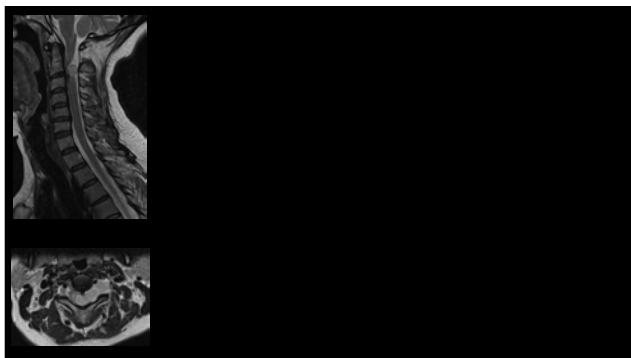
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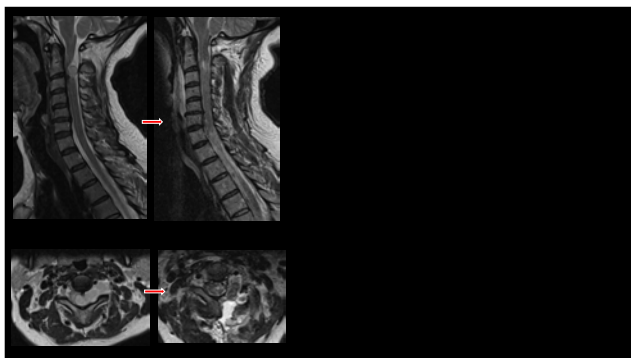
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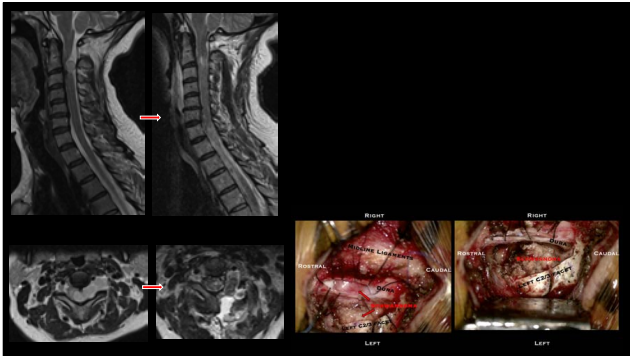
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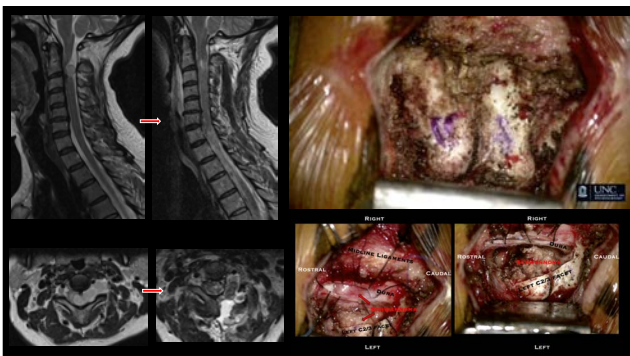
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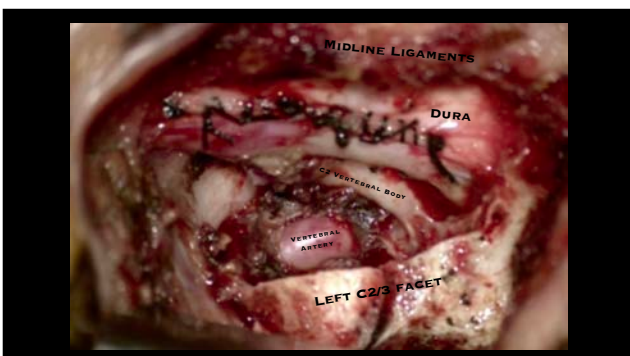
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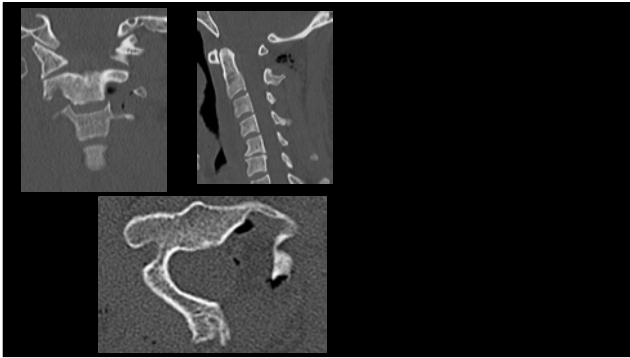
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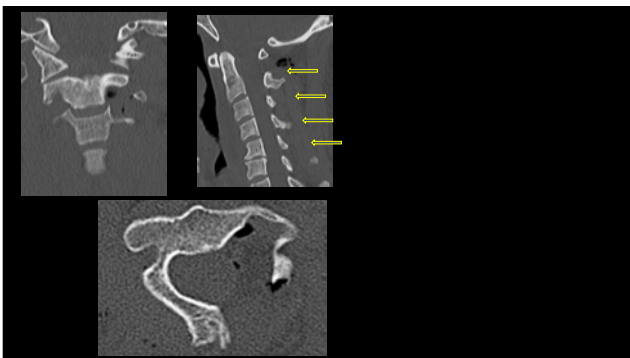
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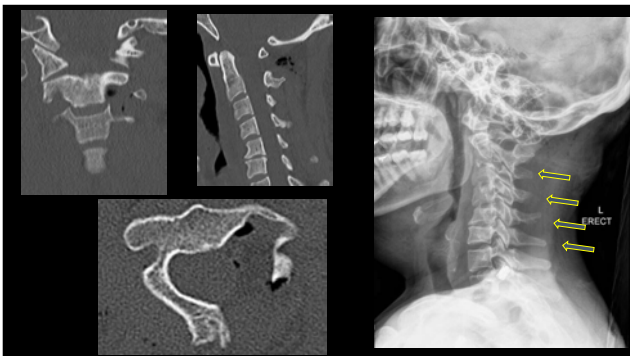
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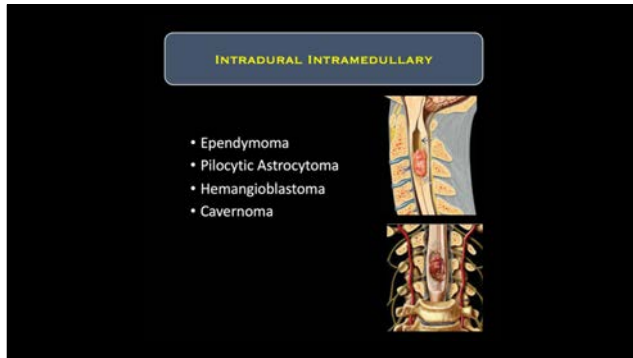
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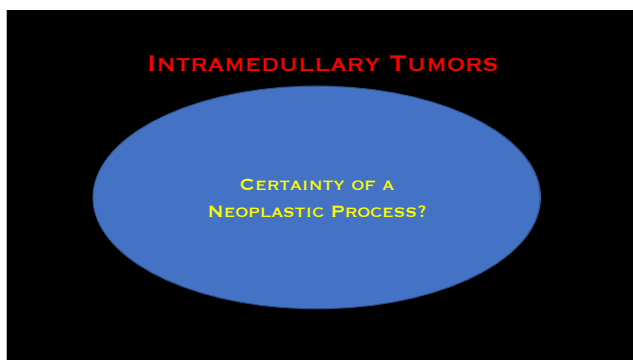
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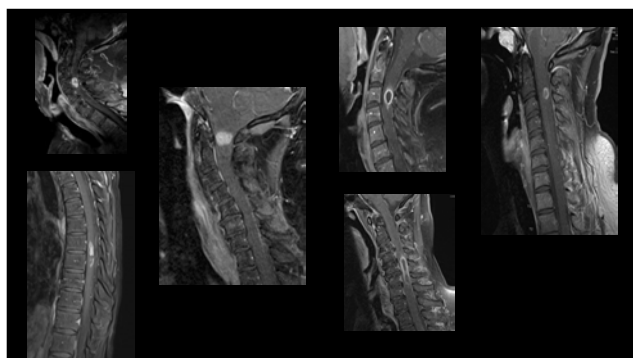
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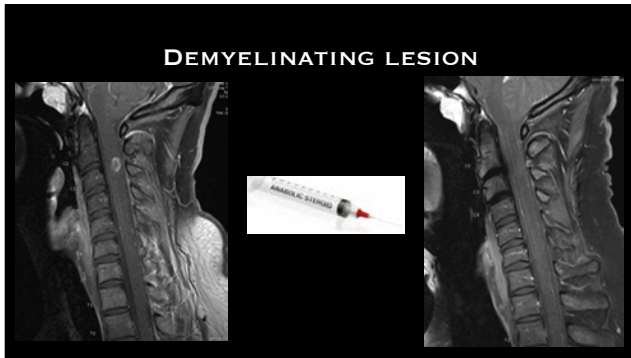
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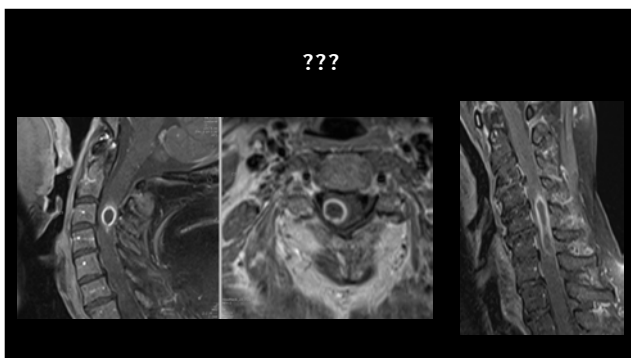
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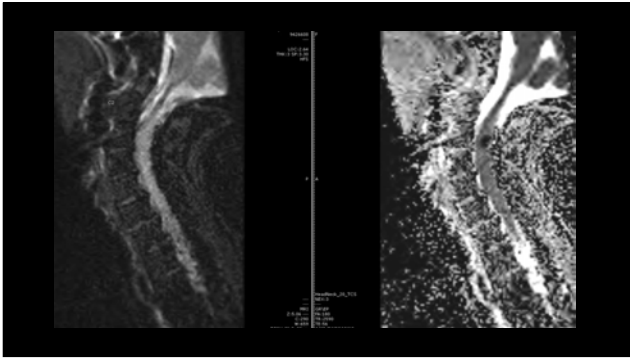
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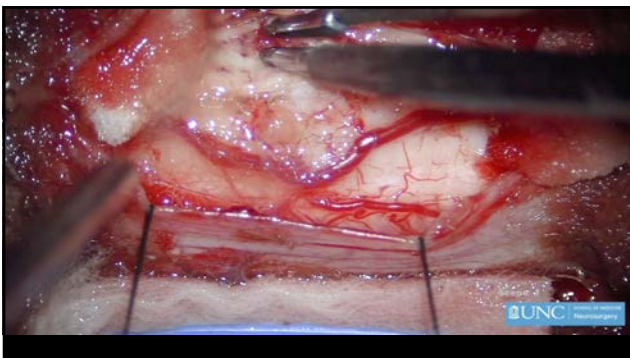
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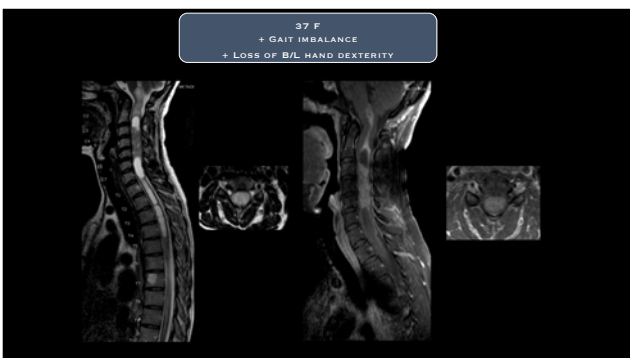
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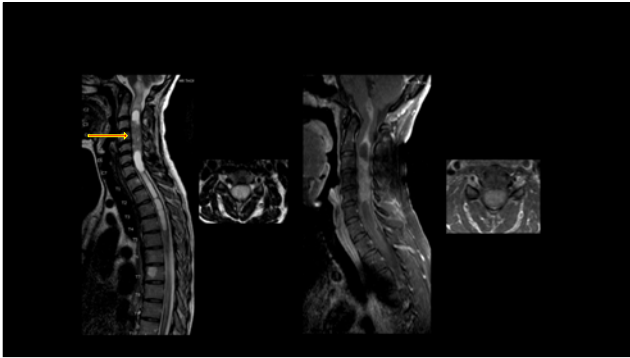
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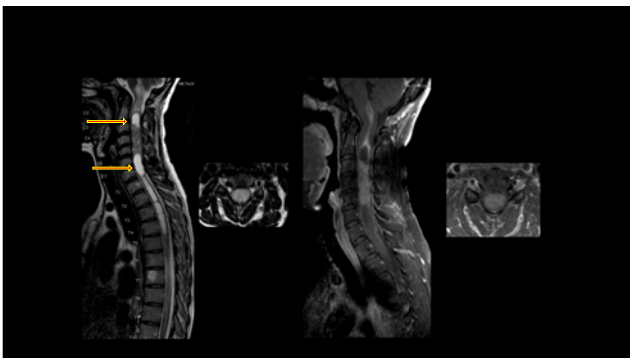
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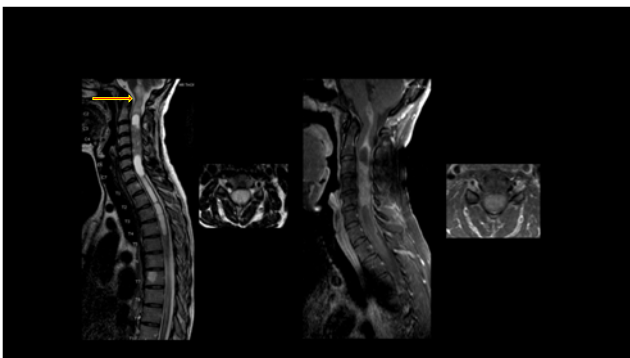
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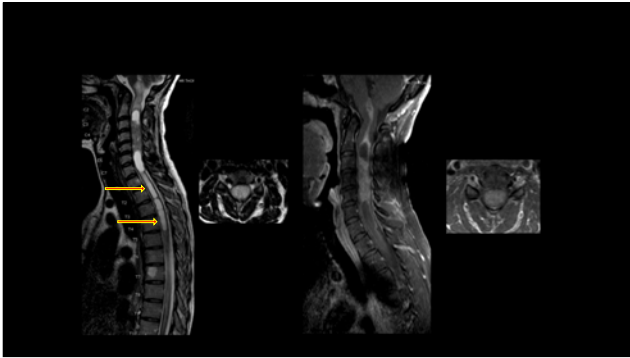
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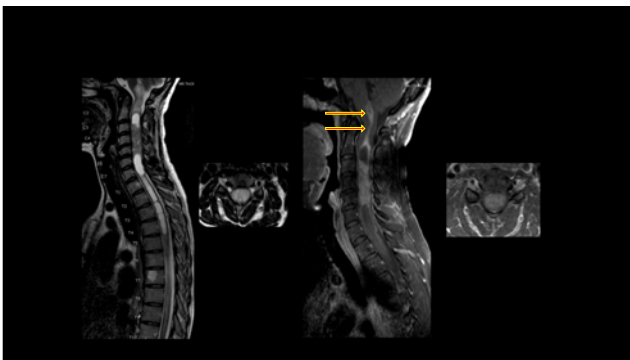
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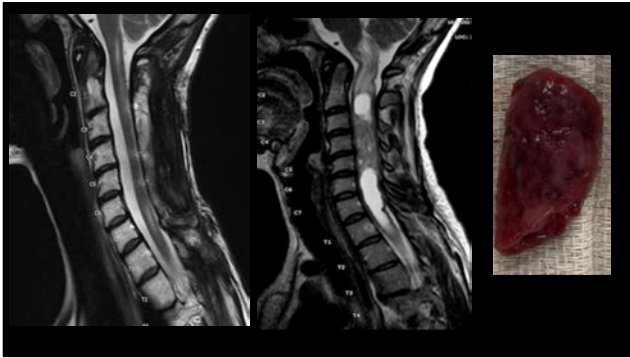
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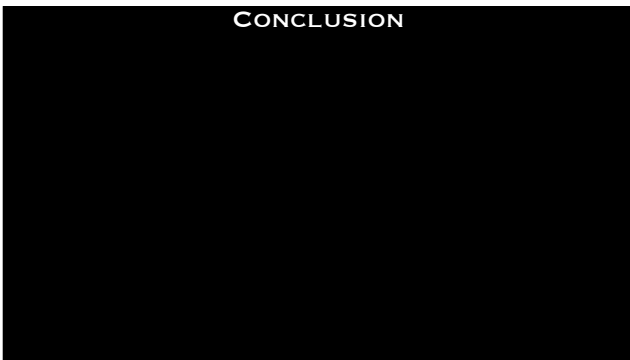
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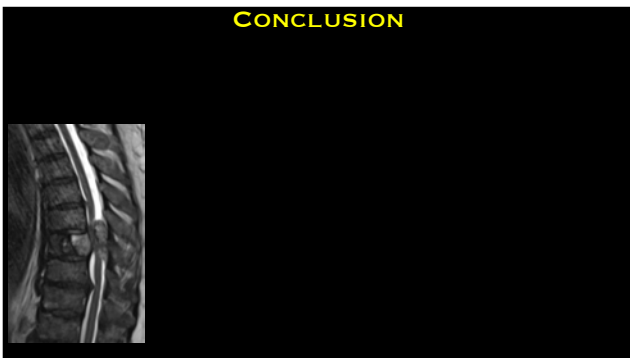
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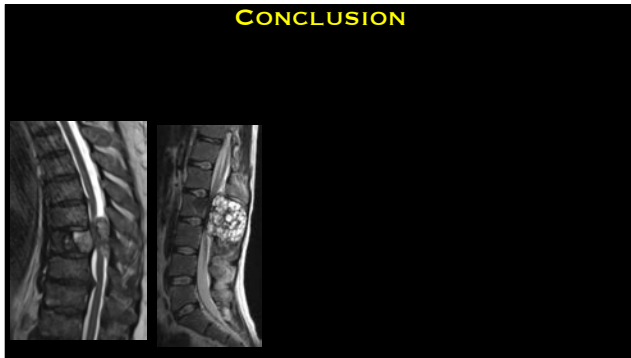
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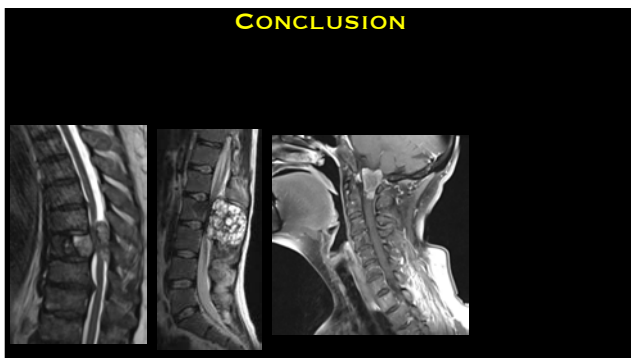
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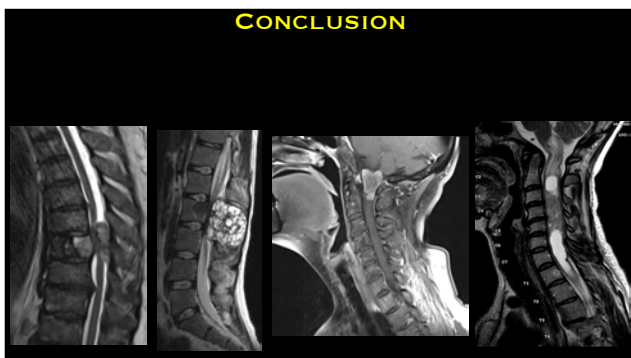
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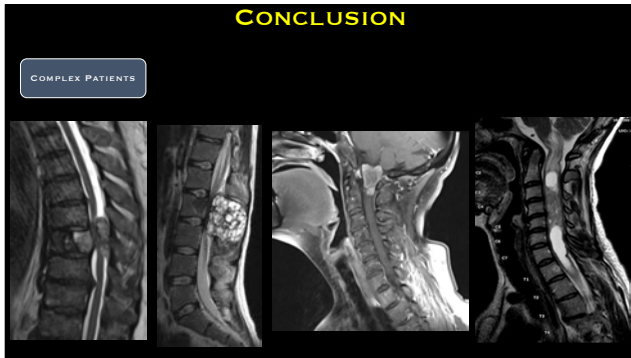
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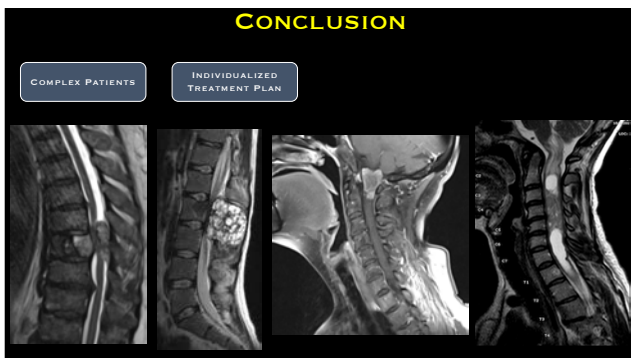
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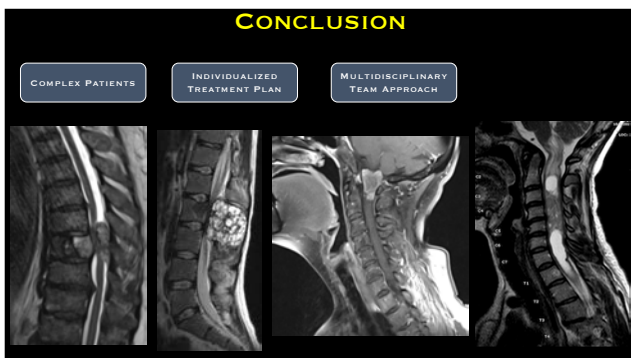
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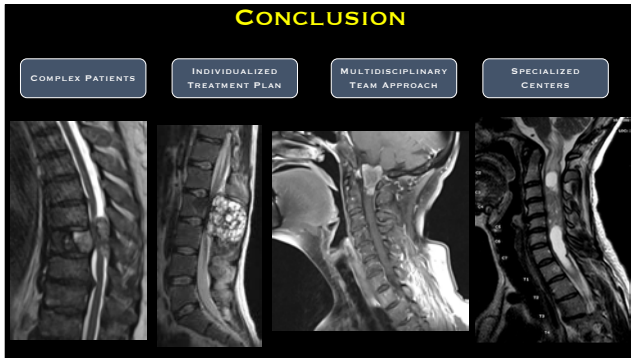
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Katie McDaniel, MSN, RN
Nurse Coordinator, Spine/Neuro Surgery

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Chief, Spinal Oncology; Chief, Spinal Neurosurgery; Assistant Professor, Radiation Oncology

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