Oncological Emergencies

What is Oncologic Emergency?

A clinical condition resulting from a metabolic, neurologic, cardiovascular, hematologic, and/or infectious change caused by cancer or its treatment that requires immediate intervention to prevent loss of life or quality of life.

Classifications

Major Classifications

- **Metabolic**
- **Structural**

Sub-Classifications

» **Metabolic**

» **Neurologic**

» **Cardiovascular**

» **Hematologic**

» **Infectious**

(Oncology Nursing Society-ONS)

Classifications	Oncologic Emergencies
Metabolic	1. Hypercalcemia (most common) 2. Tumor Lysis Syndrome 3. SIADH (Syndrome of Inappropriate antidiuretic syndrome)
Neurologic	1. Spinal Cord Compression 2. Brain metatases/⇧ ICP
Cardiovascular	1. Malignant Pericardial Effusion 2. Superior Vena Cava Syndrome
Hematologic	1. Hyperviscosity due to Dysproteinemia 2. Hyperleukocytosis 3. DIC (disseminated intravascular coagulation)
Infectious	1. Neutropenic fever 2. Septic shock

METABOLIC

Hypercalcemia of Malignancy. Major Mechanisms:

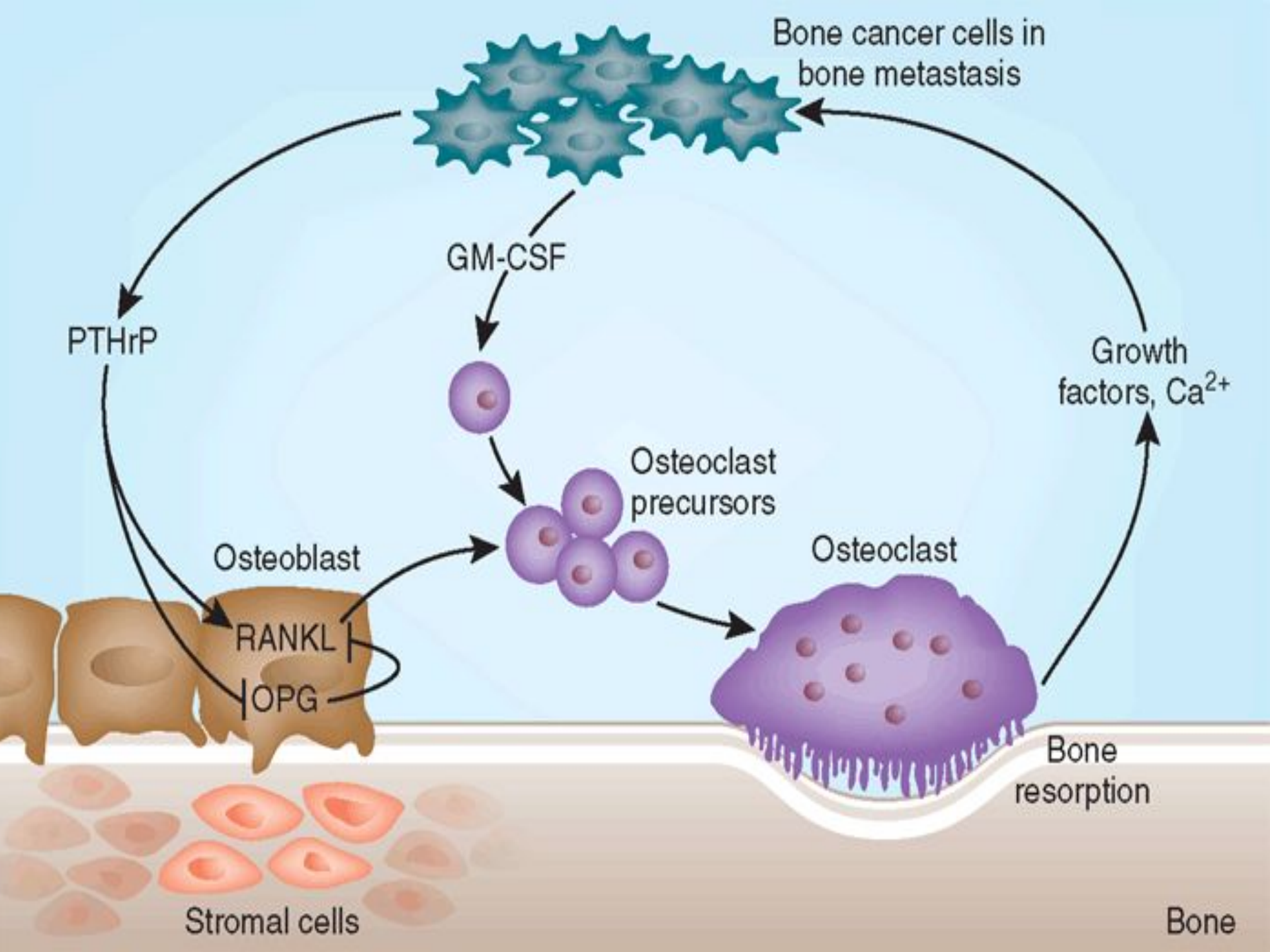
1) *Local osteolytic hypercalcemia*

Osteoclastic bone resorbing cytokines

In Extensive bone metastases - 20%

2) *Humoral hypercalcemia of malignancy*

Parathyroid hormone related peptide (PTHrP) secreted systemically - 80%


Bone cancer cells in bone metastasis
GM-CSF
PTHrP
Growth factors, Ca^{2+}
Osteoclast precursors
Osteoblast
Osteoclast
RANKL
OPG
Bone resorption
Stromal cells
Bone

Symptoms

- *GI :*

Nausea, vomiting, Anorexia,Constipation

- *Renal*

Polyuria due to interference with ADH- Diabetes insipidus-like syndrome, Polydipsia

- *Neurologic*

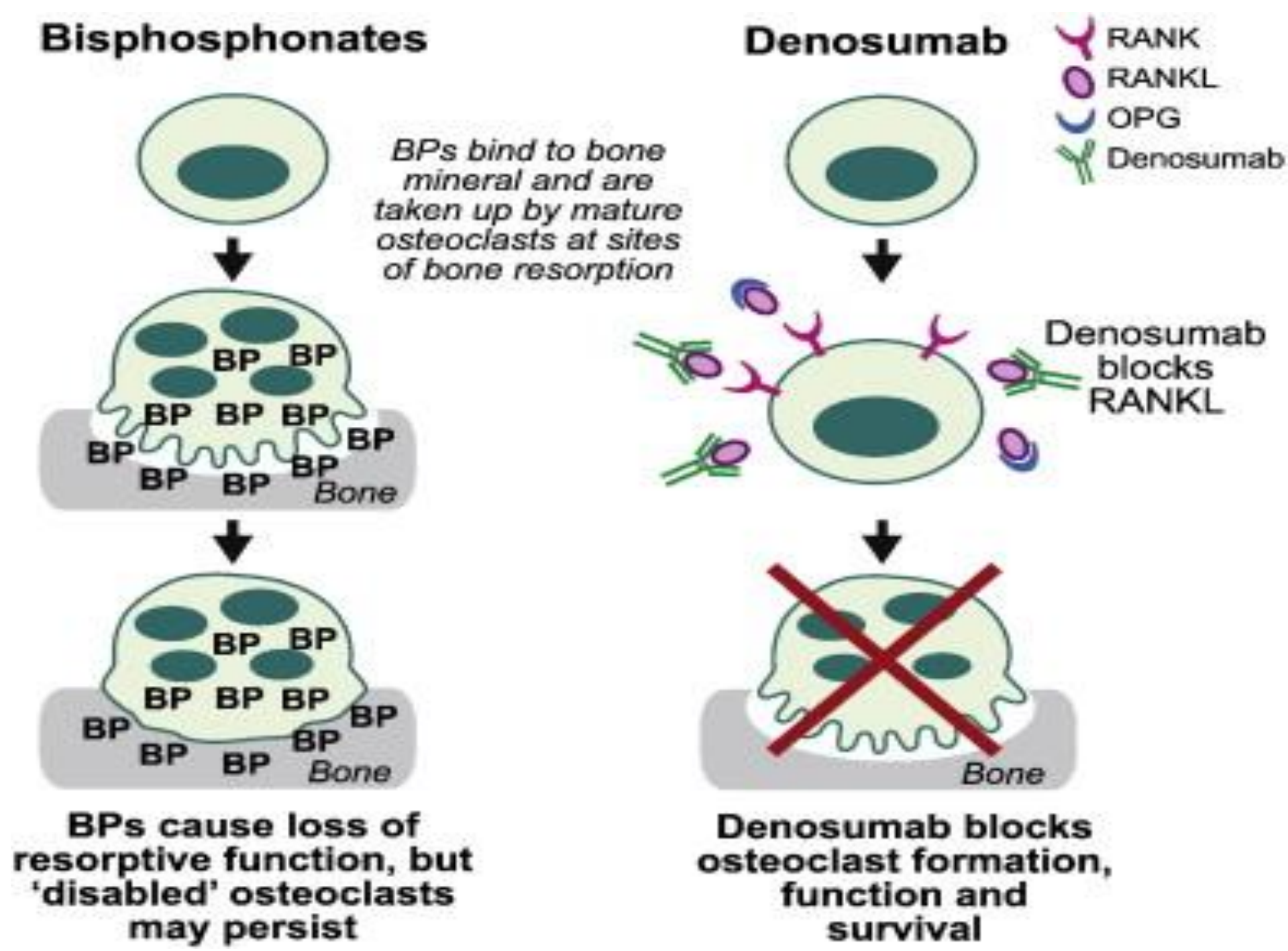
Lethargy and fatigue ,Cognitive and behavioural changes ,Altered mental status to coma

Muscle weakness

Lab

- Total calcium & albumin or ionized calcium
  - Medical emergency above 10.5 mg/dL
- Phosphorus ↓
- Creatinine, urea ↑
  - Electrolytes
    - 50% are hypokalemic
  - PTH level
    - If elevated may be primary hyperparathyroidism (or rarely ectopic PTH production)

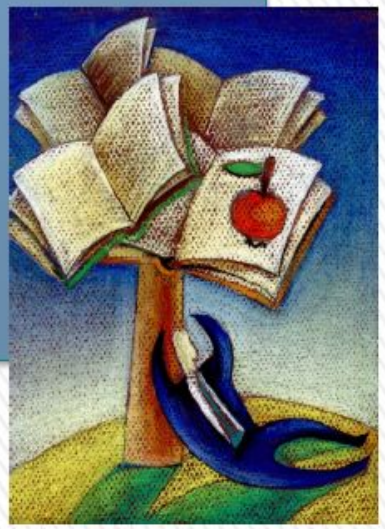
Definition	Signs & Symptoms	Treatment
(Normal= 8.5 -10.5mg/dl) **MOST COMMON Metabolic Emergency!**	**Serum calcium levels > 11.0 mg/dl.**	IV hydration, corticosteriods, antitumor treatment.
Associated with multiple myeloma & lung, breast, kidney, head/neck, & esophageal cancers.	Lethargy, restlessness, confusion, nausea/vomiting, polyuria, constipation, dysrhythmias.	Loop diuretics used to promote excretion of calcium.
Bony metastases	Hypokalemia, hyponatremia, hypophosphatemia	Bisphosphonates to interfere with bone resorption (breakdown). Examples are: Pamidronate or Zometa.
	Increased BUN and creatinine	Increase mobility/exercise to help maintain bone mass; dialysis.
		I&O and daily weights


Bisphosphonates
Denosumab
RANK
RANKL
OPG
Denosumab
BPs bind to bone mineral and are taken up by mature osteoclasts at sites of bone resorption
BP
Bone
Denosumab blocks RANKL
Bone
BPs cause loss of resorptive function, but 'disabled' osteoclasts may persist
Denosumab blocks osteoclast formation, function and survival

Knowledge Checkpoint

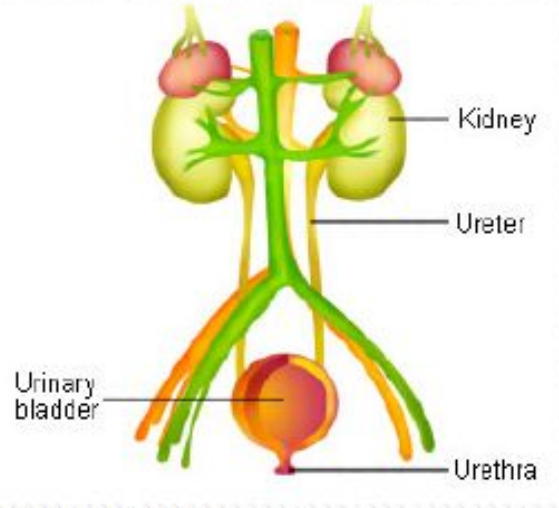
What are the important nursing considerations for management a patient with hypercalcemia?

A. Monitor for patient safety related to mental status changes
B. Monitor daily weights
C. Monitor I & O
D. Patient education regarding symptoms of hypercalcemia
E. All of the above



Синдром неадекватной секреции антидиуретического гормона
(SIADH)

SIADH



Increased levels of ADH

↓

Renal Tubules permeable to water

↓

Water Reabsorption

↓ urine volume

↓

↑urine osmolality

↓

↑urine sodium

↓ aldosterone

↑ blood volume

↓

↑serum hypoosmolality

↓

Dilutional hyponatremia

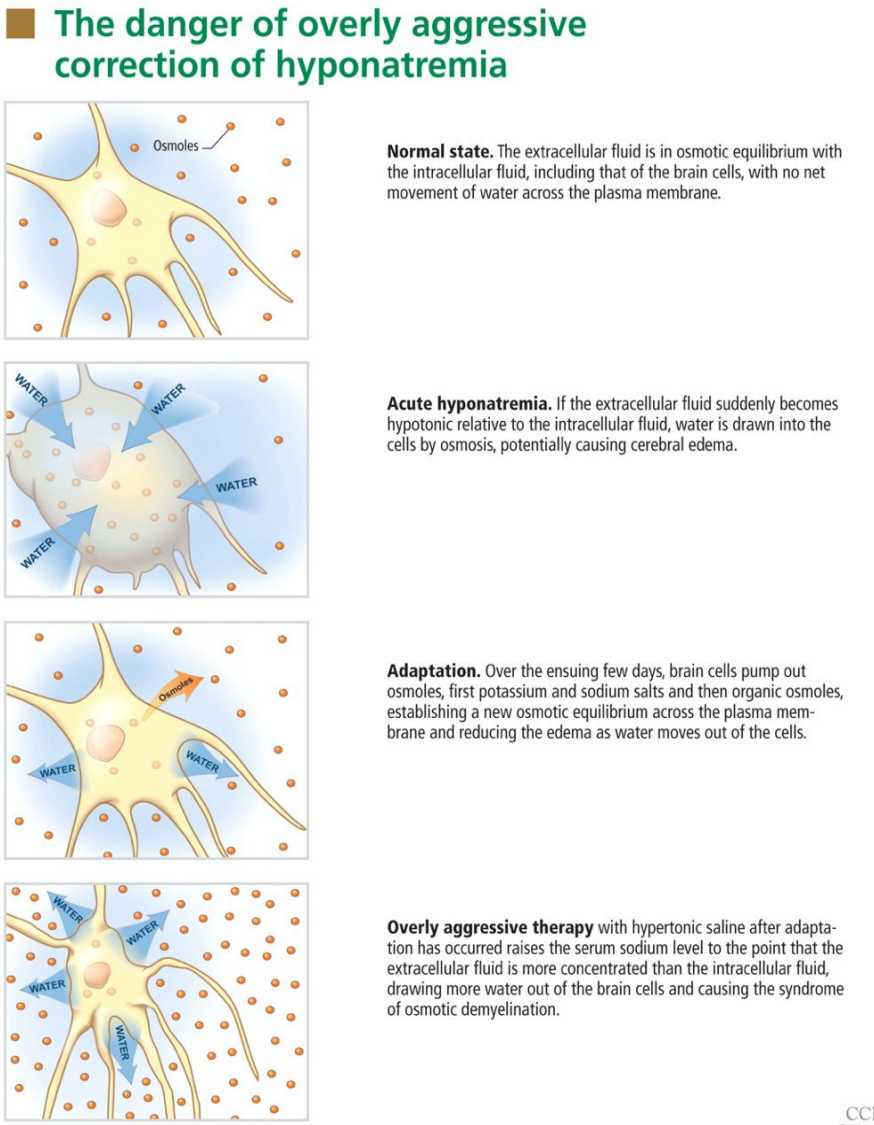
↓

Anorexia, Nausea, Vomiting

Irritability, Confusion, Hallucinations, Seizures

Osmotic Demyelination Syndrome

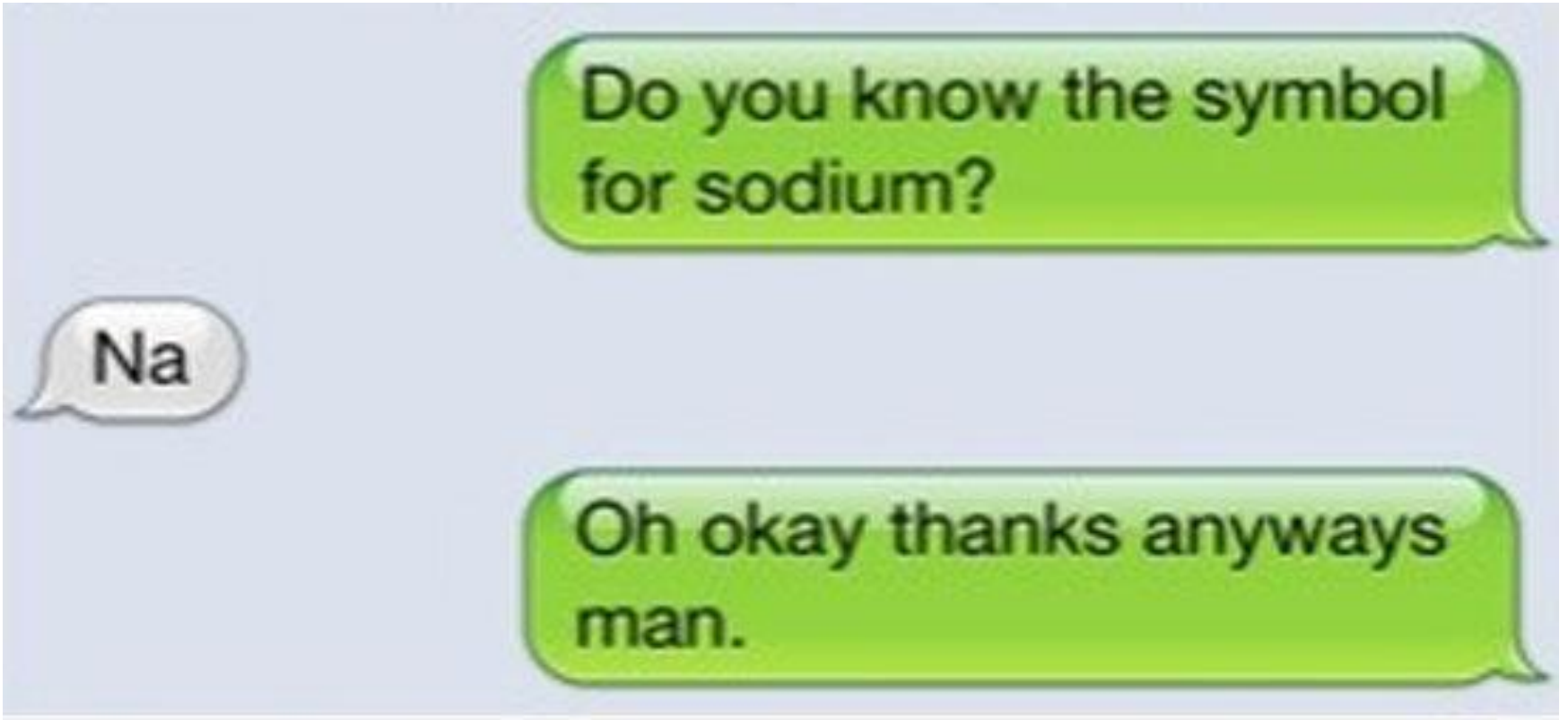
- Recall that during chronic hyponatremia, osmolytes are shifted out of brain cells to avoid shift of water into cells and brain edema
- With rapid correction of [Na], brain cells not able to reaccumulate these osmolytes quickly enough resulting in water shift out of cells hence cell shrinkage and concentrated ion damage[1]



Syndrome of Inappropriate ADH

Metabolic

Definition	Signs & Symptoms	Treatment
Associated with SCLC, pancreatic/prostate/brain cancers/Infusions of Cytoxan, Vincristine, or Cisplatin can cause SIADH.	**Na <130mEq/L**	Control the underlying cause.
Occurs when antidiuretic hormone (ADH) is secreted w/o response to the body's usual feedback mechanisms, resulting in water intoxication The kidneys continue to return water to the body, diluting the Na.	H/A, thirst, n/v, confusion, lethargy, hyporeflexia, oliguria, seizures, hypotension, muscle cramps.	Correcting electrolyte imbalance, Fluid restriction 500-1000 cc/day, Infusion of 3% hypertonic NS so sodium is not depleted further
ADH Anti-diuretic hormone functions to regulate body water		▪ Daily weights and I&O ▪ Daily labs
ADH is a horomone that is stored in the pituitary gland and acts on kidneys to regulate water		Declomycin po= inhibits ADH secretion Other new agents to increase serum sodium


Do you know the symbol for sodium?
Na
Oh okay thanks anyways man.

Acute Tumor Lysis Syndrome

- Usually starts 6-72 h from initiation of chemo or radiotherapy
- Due to rapid release of cell contents into blood stream
- Most common tumor cause:
  - Leukemias
  - Lymphomas
  - Small cell ca

Etiologic Factors

- Large Tumor burden
- High growth fraction
- High pre treatment serum LDH or Uric Acid
- Preexisting renal insufficiency

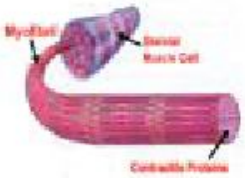
Symptoms	Pathophysiology	Time to onset	Electrolyte
weakness nausea, diarrhea, flaccid paralysis, muscle cramps, paresthesia's, arrhythmias	Release of intracellular K into the bloodstream	6-72h	K-Hyperkalemia
oliguria, anuria, azotemia, renal insufficiency , secondary hypocalcemia	Release of intracellular Ph into the bloodstream	24-48h	Ph-hyperphosphatemia
paresthesia's, muscle twitching, tetany, seizures, mental status changes	Precipitation of Calcium phosphate in tissues	24-48h	Ca-hypocalcemia
hematuria, oliguria, anuria, azotemia	Release of nucleic acids that metabolize into uric acid	48-72h	Uric Acid-Hyperuricemia

Cellular breakdown

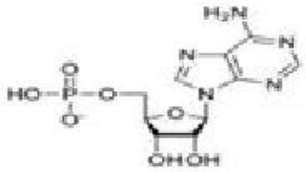
Release of DNA

hyperphosphatemia

nucleotides



Neuromuscular irritability



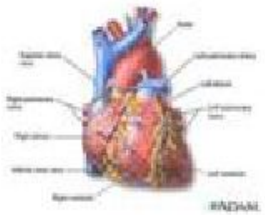
Purine catabolism

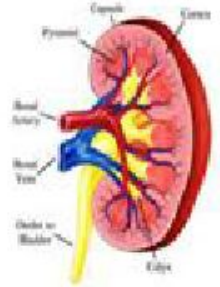
Calcium-phosphate unbalance

Hyperuricemia

Precipitated uric acid crystals in renal tubules

arrhythmias





hyperkalemia

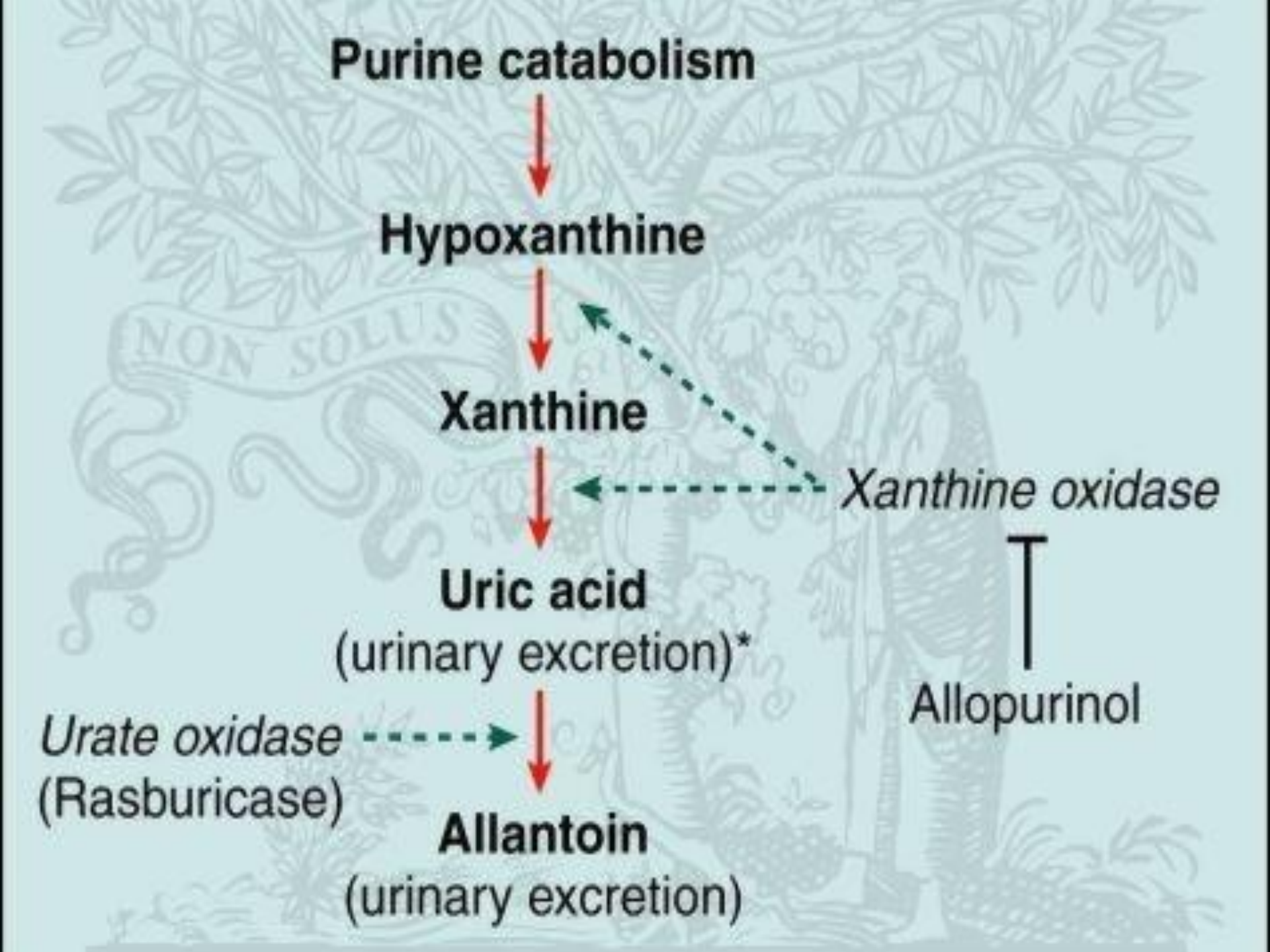
Acute renal failure ARF

Treatment

Best treatment – prevention

- Hydration – 3L\24h, better started 24-48 h before treatment initiation
- Stop nephrotoxic drugs
- Monitoring of electrolyte levels
- *Urine alkalinization Ph >7.5*
- Allopurinol

- Stop the chemotherapy
- Aggressive IV hydration / diuresis
- $CaCl_2$, $NaHCO_3$, glucose / insulin, kayexalate for hyperkalemia
- Rasburicase
- Emergency hemodialysis
  - If K > 6, urate > 10, creat. > 10, or unable to tolerate diuresis


Purine catabolism
Hypoxanthine
Xanthine
Xanthine oxidase
Uric acid
(urinary excretion)*
Allopurinol
Urate oxidase
(Rasburicase)
Allantoin
(urinary excretion)

Knowledge Checkpoint

What abnormal lab values are you watching for when cell content explodes into the blood stream during Tumor Lysis Syndrome?

A. ↓Potassium, ↓Sodium, ↑Calcium

B. ↑Potassium, ↑Uric Acid, ↑Phosporus

C. ↓Uric Acid, ↓↑Calcium, Sodium

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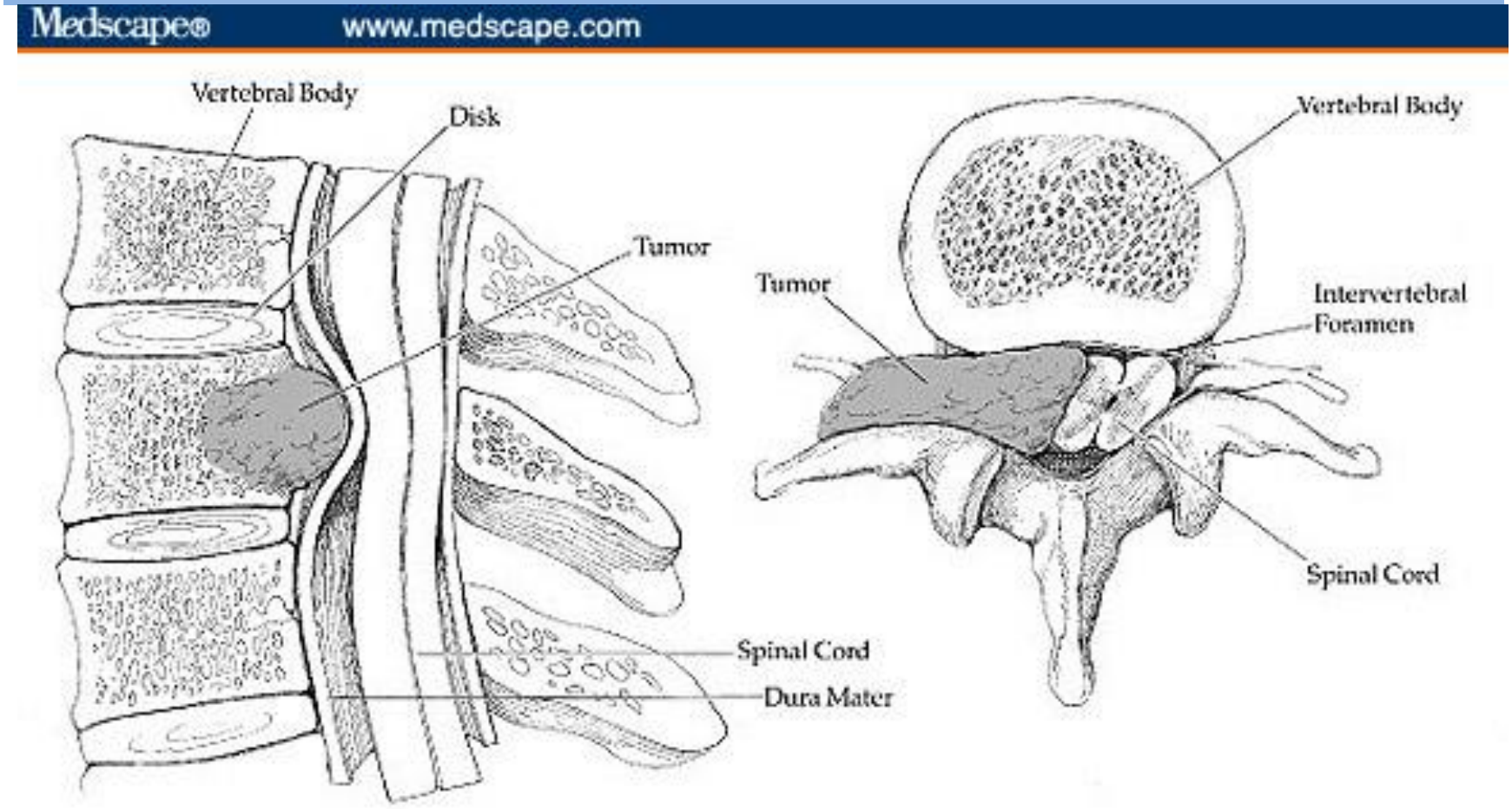
STRUCTURAL:

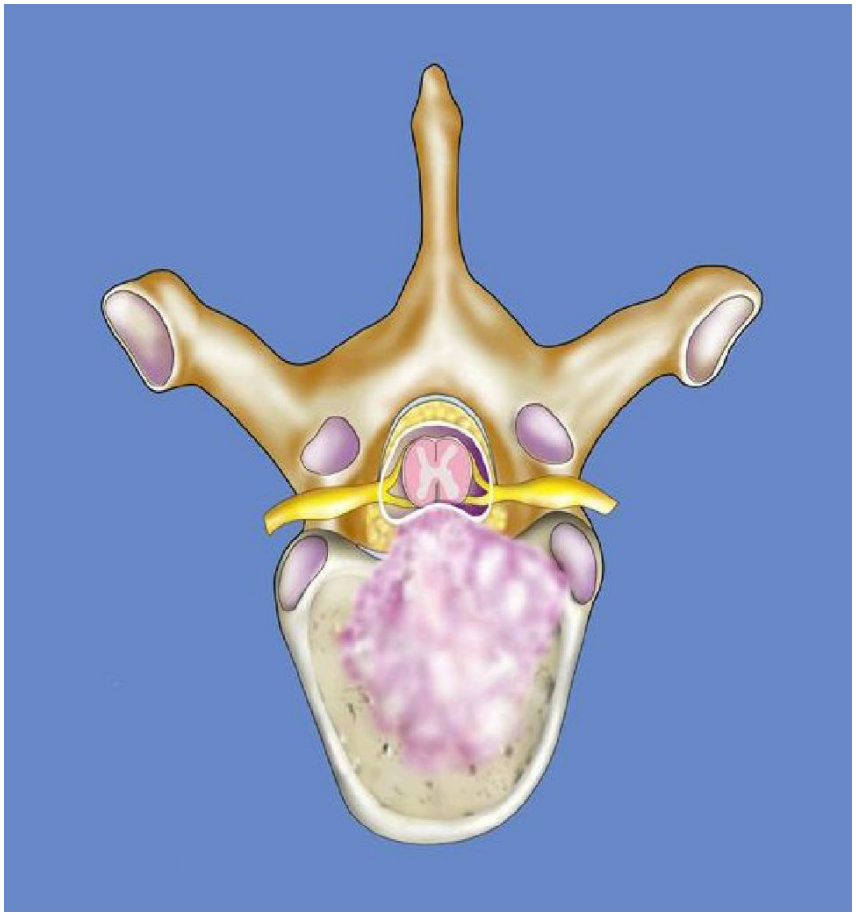
Neurologic emergencies

Spinal Cord Compression



What is malignant spinal cord compression?

- Occurs when cancer cells grow in/near to spine and press on the spinal cord & nerves
- Results in swelling & reduction in the blood supply to the spinal cord & nerve roots
- The symptoms are caused by the increasing pressure (compression) on the spinal cord & nerves



What types of cancer cause it?

Most commonly seen in

- **Breast**
- **Lung**
- **Prostate**
- **Lymphoma**
- **Myeloma**

– **About 10% of patients with cancer overall**

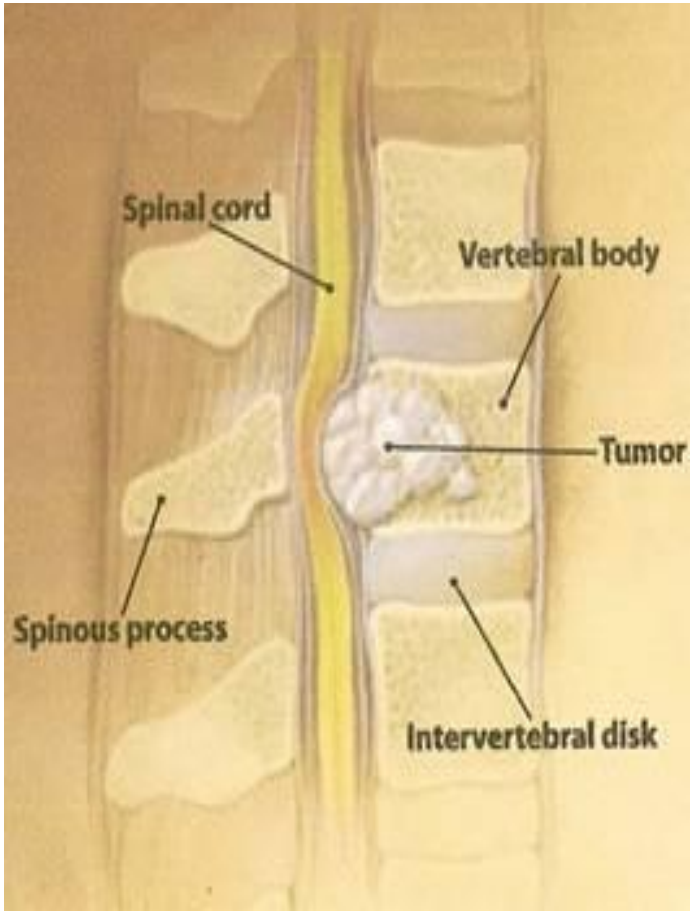
Method of spread

85%From vertebral body or pedicle

10% Through intervertebral foramina (from paravertebral nodes or mass)

4% Intramedullary spread

1%(Low) Direct spread to epidural space (Batson's plexus)



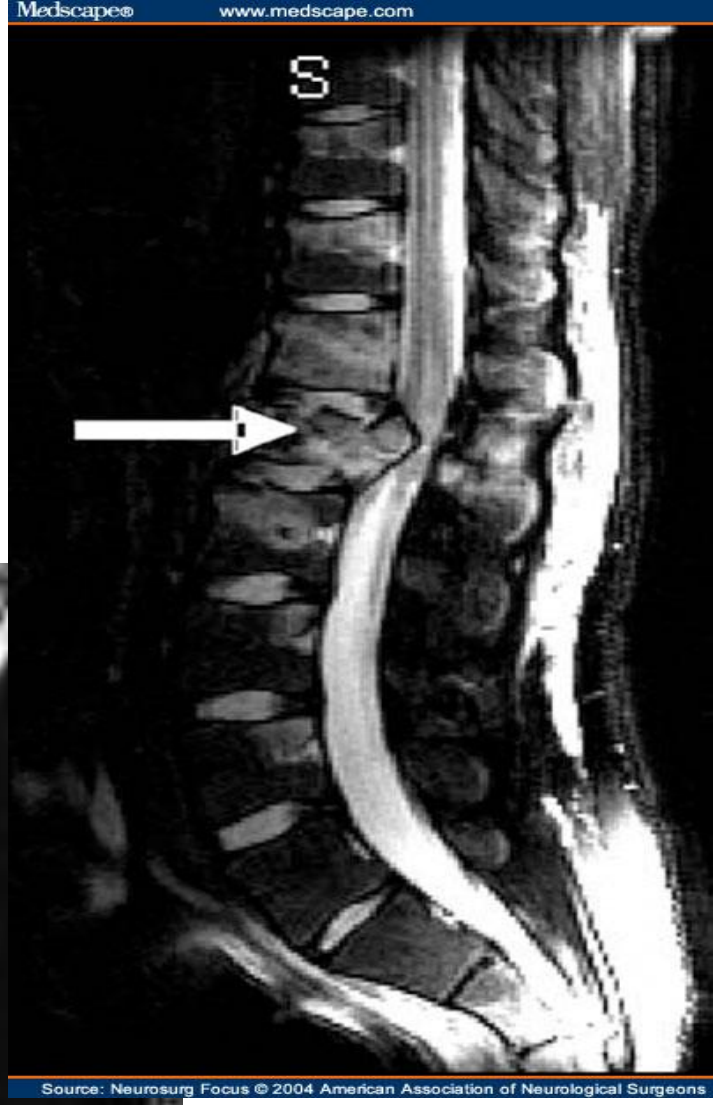
Location

Thoracic spine 60-70%

Lumbosacral spine 20-30%

Cervical and sacral spine

less then 10% each


Medscape®
www.medscape.com
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Source: Neurosurg Focus © 2004 American Association of Neurological Surgeons

First Symptoms

Pain 95%

Weakness 5%

Ataxia 1%

Sensory loss 1%

RED FLAGS…..

First Red Flag: Pain

- **Usually first and most common symptom** (80-90%)
- **Usually precedes other neurologic symptoms by weeks to month**
- **Severe local back pain**
- **Aggravated by lying down**
- **Pain may feel like a 'band' around the chest or abdomen (**radicular)

Second Red Flag: Motor

- **Weakness: 60-85%**
- **At or above conus medularis**
  - Extensors of the upper extremities
- **Above the thoracic spine**
  - Weakness from corticospinal dysfunction
  - Affects flexors in the lower extremities
- **Patients may be hyper reflexic below the lesion and have extensor plantars**

Third Red Flag: Bladder & Bowel Function

- **Loss is late finding**
- **Problems passing urine**
  - **may include difficulty controlling bladder function**
  - **passing very little urine**
  - **or passing none at all**
- **Constipation or problems controlling bowels**
- Autonomic neuropathy presents usually as urinary retention
  - Rarely sole finding

Investigations & information needed prior to therapy

1. **MRI scan of the whole spine**
   - Can get compression at multiple levels
2. **Knowledge of cancer type & stage**
3. **Knowledge of patient fitness**
4. **Current neurological function**
   - Have they lost power in their legs?
   - Can they walk?
   - Do they need a catheter?
5. **Do they have pain?**

Treatment options include:

1. Immobilisation
2. Steroids & gastric protection
3. Analgesia
4. Surgery – decompression & stabilisation of the spine
5. Radiotherapy
6. Chemotherapy e.g. lymphoma
7. Hormonal manipulation e.g. prostate Ca

Indications for Surgery

- Unknown primary tumour
- Relapse post RT
- Progression while on RT
- Intractable pain
- Instability of spine
- Patients with a single level of cord compression who have not been totally paraplegic for longer than 48 hours
- Prognosis >3 months

Surgery

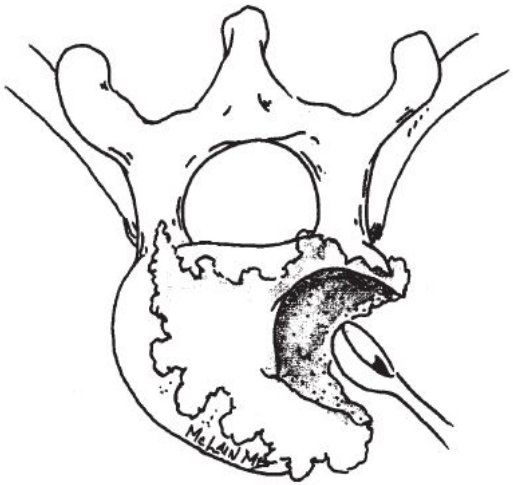
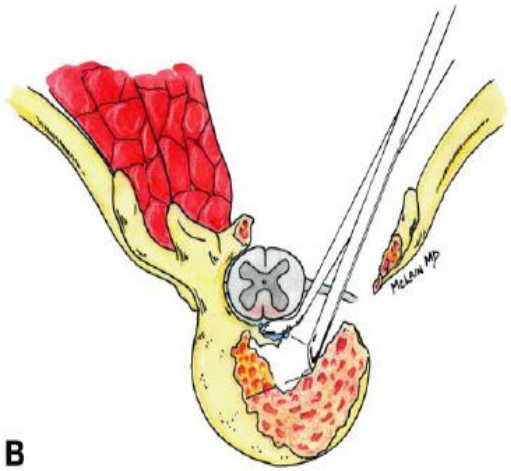
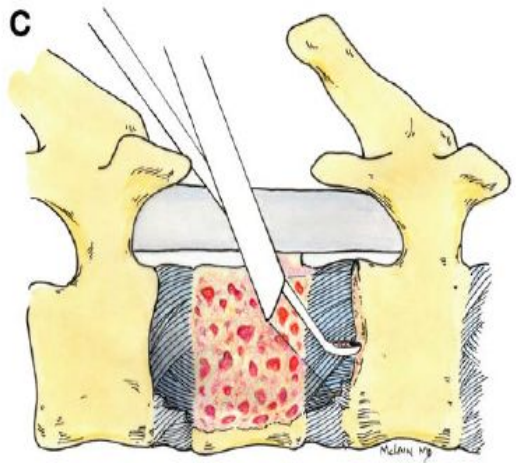
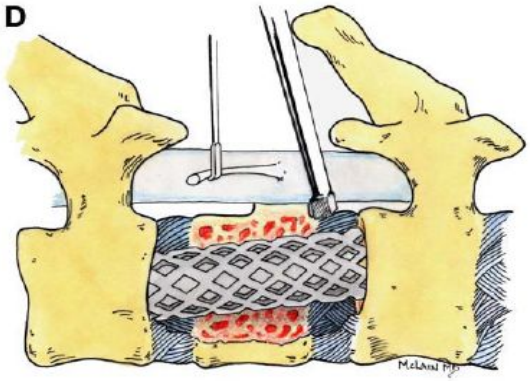
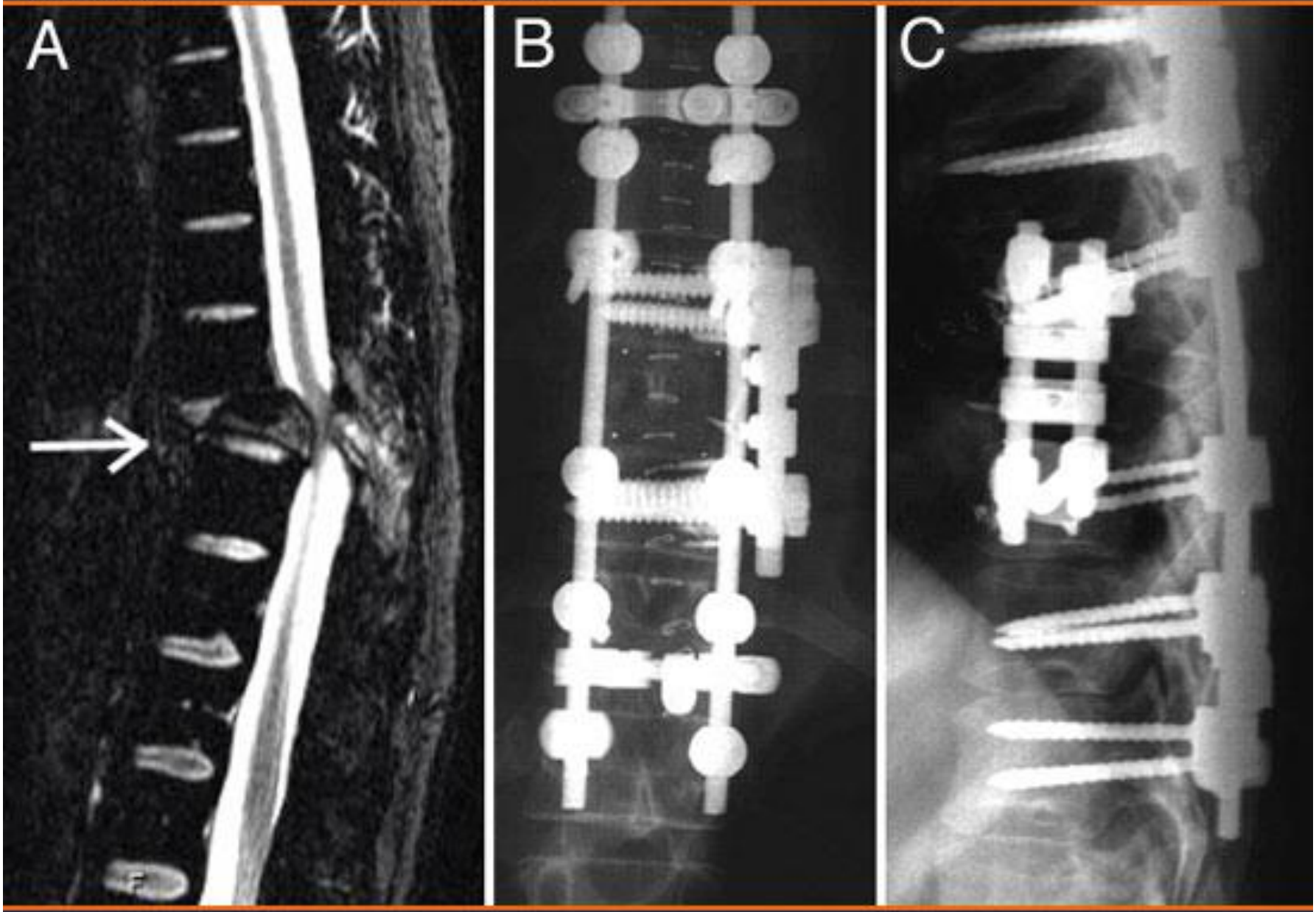


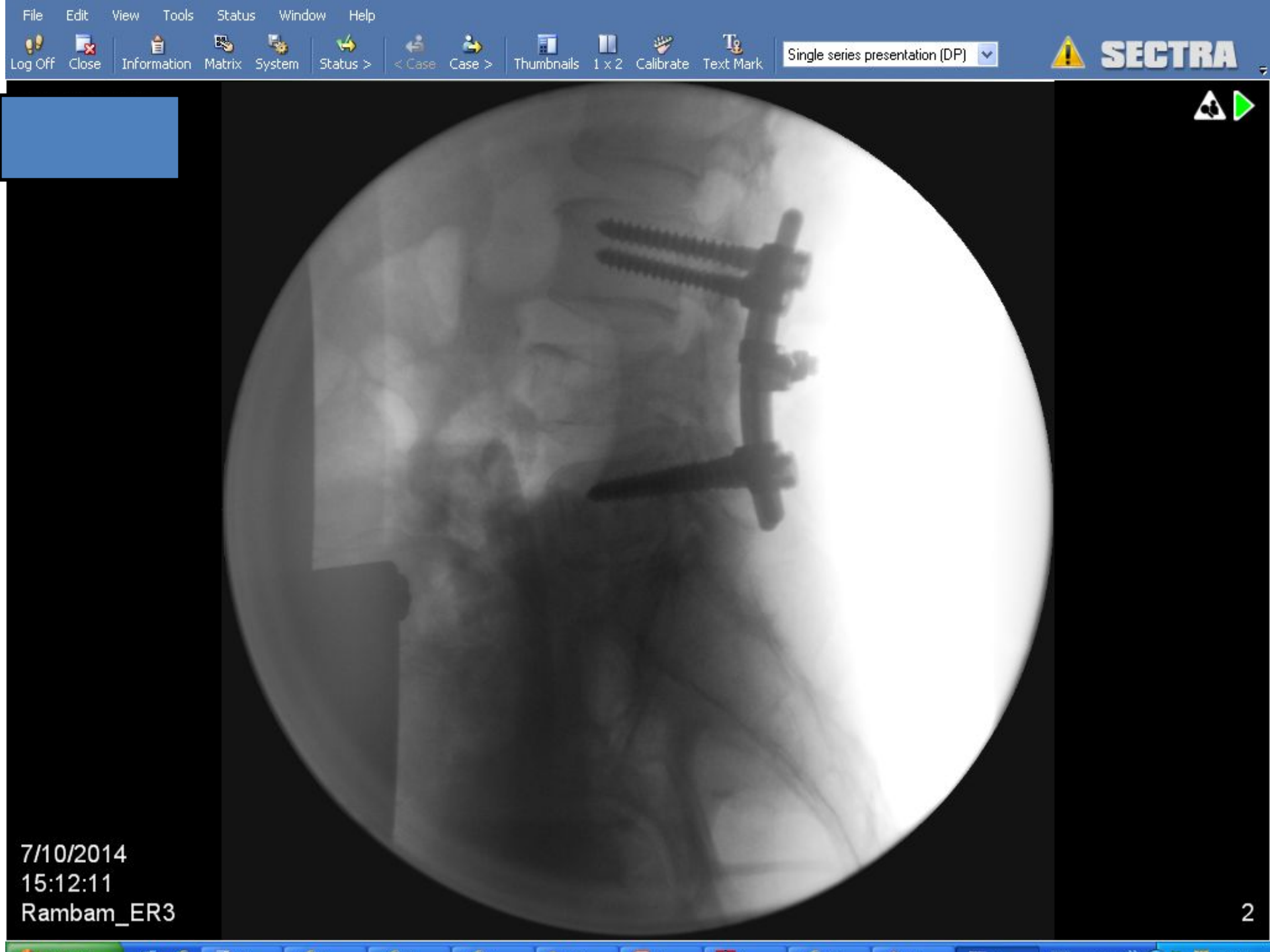
Fig. 4. Anterior curettage of a metastatic lesion.







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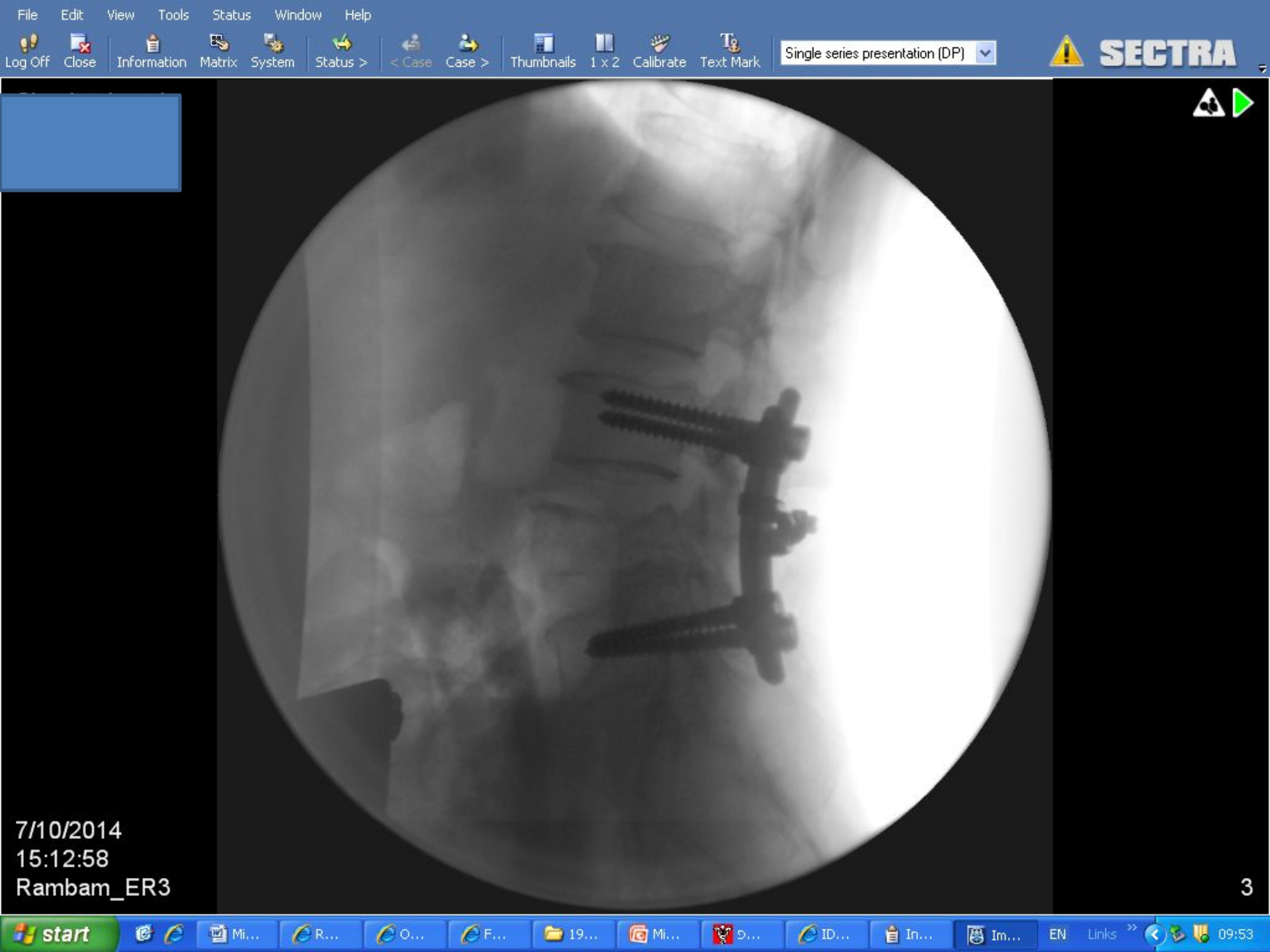
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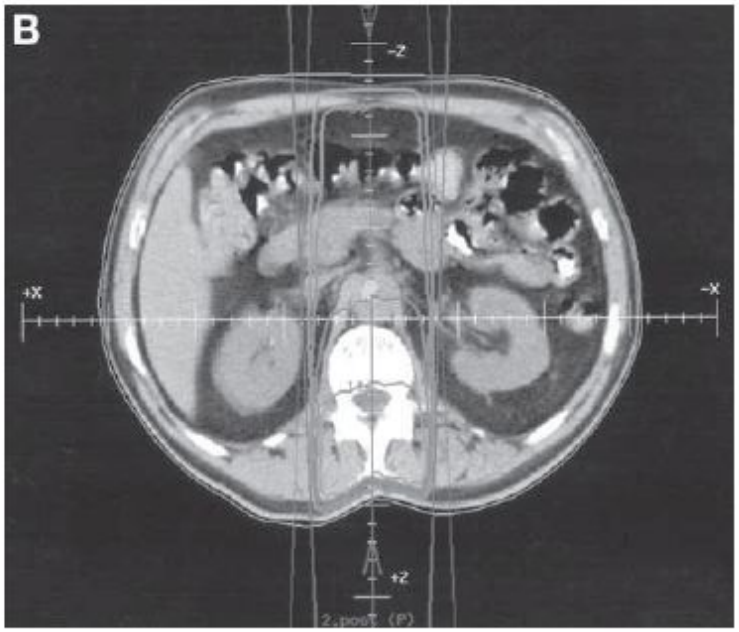
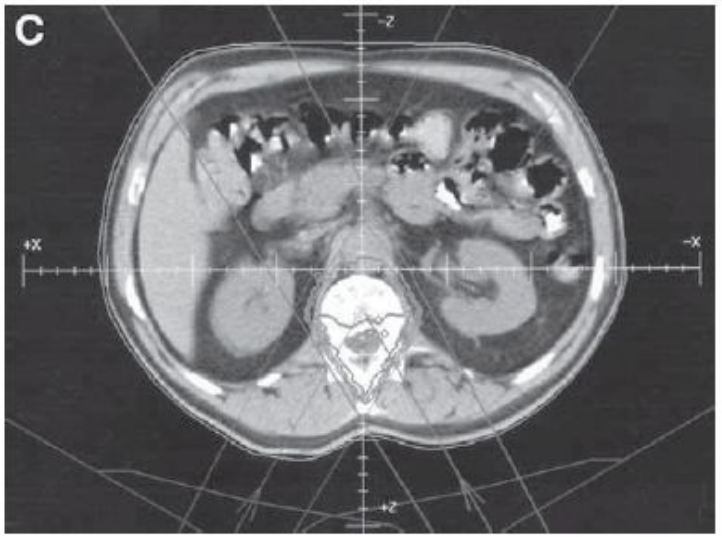
RCT comparing surgery followed by RT vs. RT alone

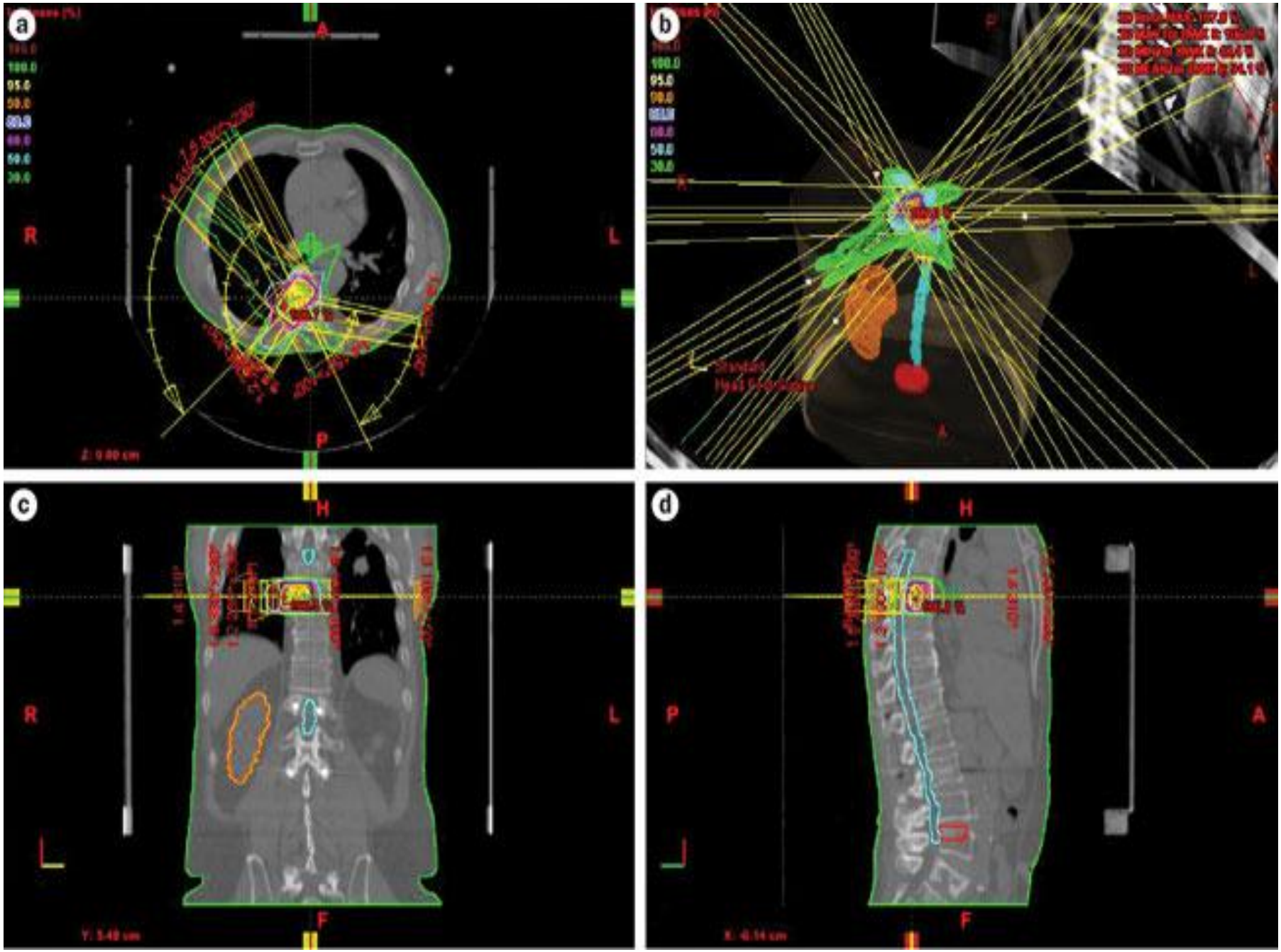
- Improvement in surgery + RT
  - Days remained ambulatory (126 vs. 35)
  - Percent that regained ambulation after therapy (56% vs. 19%)
  - Days remained continent (142 vs. 12)
  - Less steroid dose, less narcotics
  - *Trend* to increase survival

Patchell, R, Tibbs, PA, Regine, WF, et al. A randomized trial of direct decompressive surgical resection in the treatment of spinal cord compression caused by metastasis (abstract). proc Am Soc Clin Oncol 2003; 22:1.

Radiation Therapy



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Prognosis

- Median survival with MSCC is 6 months

- Ambulatory patients with radiosensitive tumours have the best prognosis
  - Likely to remain mobile

MSCC is a poor prognostic indicator in cancer patients
Need better detection rates

Superior Vena Cava Syndrome

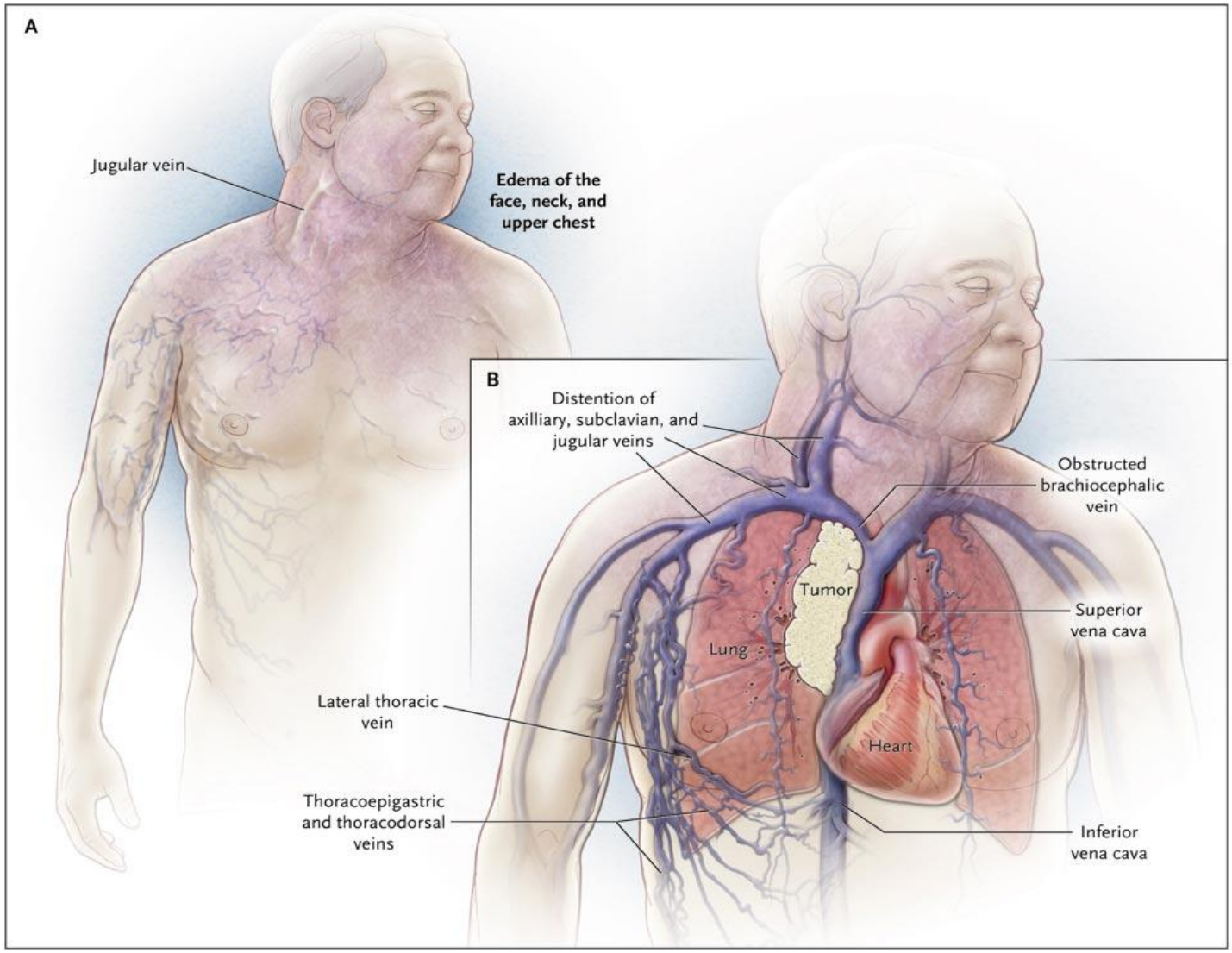


Table 2. Symptoms and Signs Associated with the Superior Vena Cava Syndrome.*

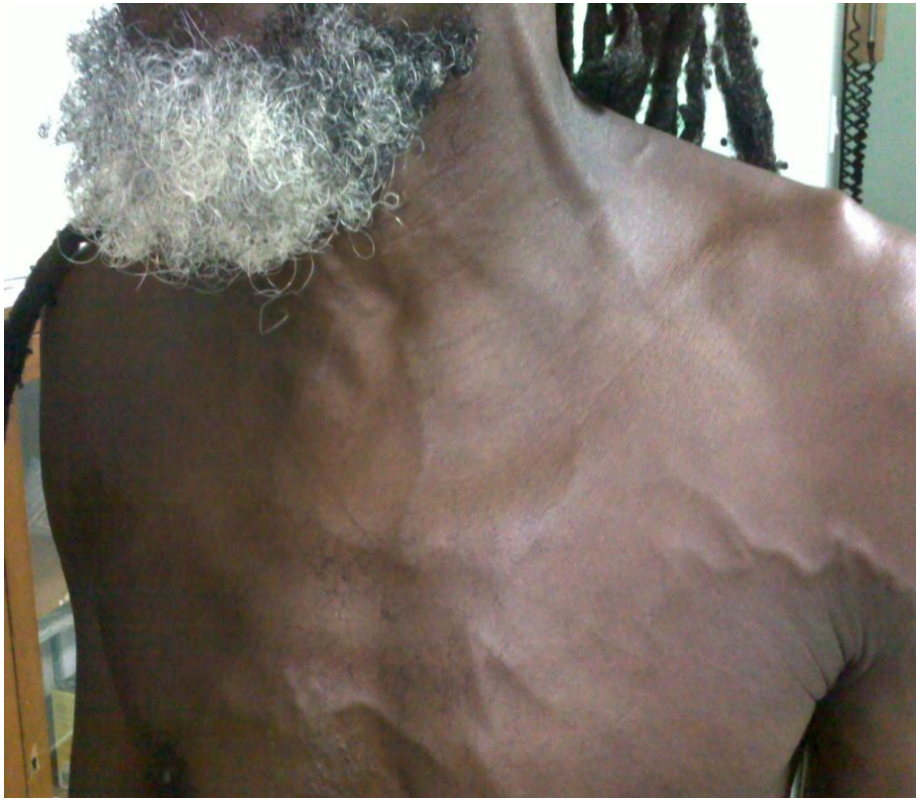
Sign or Symptom	Frequency	Range
	percent	
Facial edema	82	60–100
Arm edema	46	14–75
Distended neck veins	63	27–86
Distended chest veins	53	38–67
Facial plethora	20	13–23
Visual symptoms	2	0–3
Dyspnea	54	23–74
Cough	54	38–70
Hoarseness	17	15–20
Stridor	4	0–5
Syncope	10	8–13
Headaches	9	6–11
Dizziness	6	2–10
Confusion	4	0–5
Obtundation	2	0–3

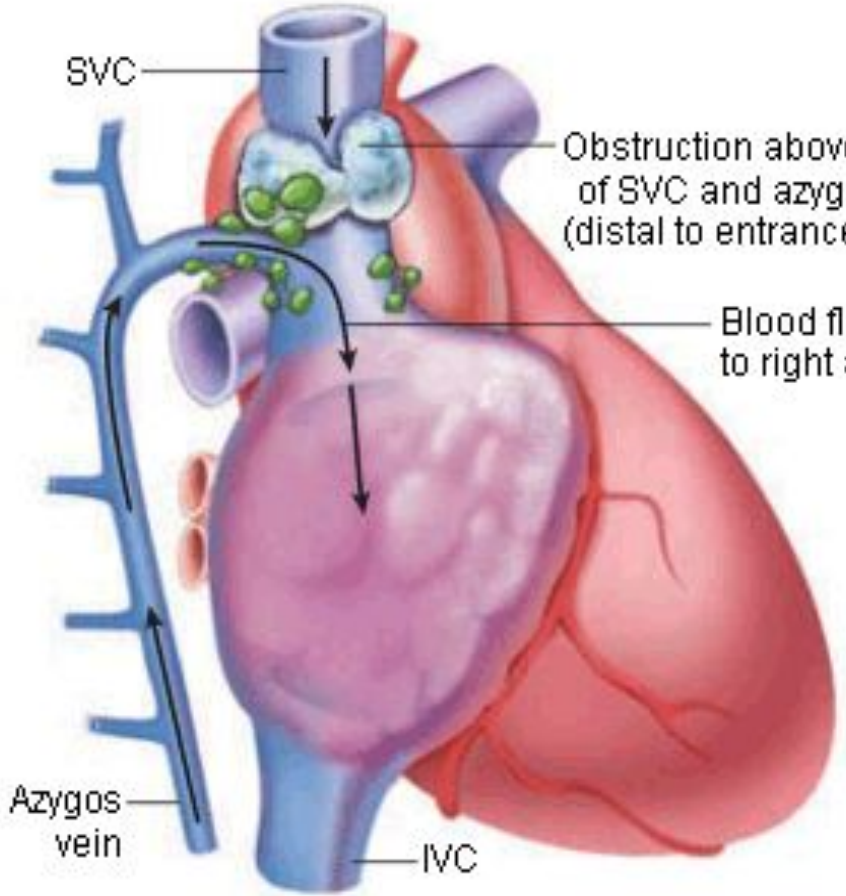
Superior Vena Cava Syndrome

Superior Vena Cava Syndrome


7 AM

Superior Vena Cava Syndrome

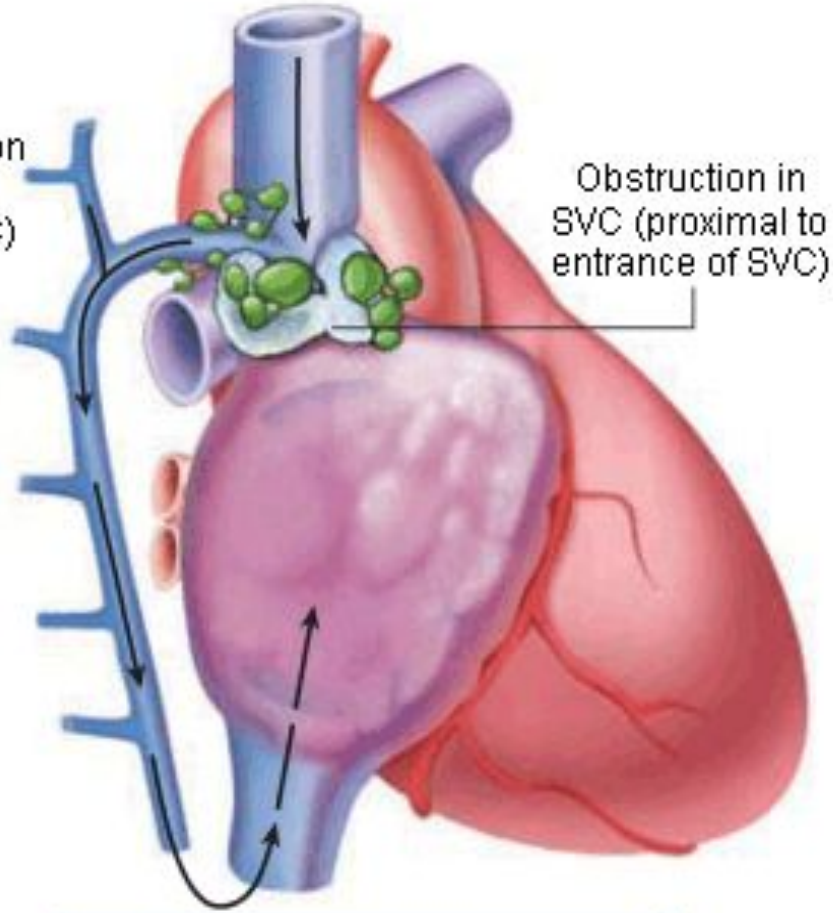




Manifestations of supra-azygos SVC obstruction

- Distended arm and neck veins
- Oedema of neck, face and arms
- Congested mucous membranes (mouth)
- Dilated, tortuous vessels on upper chest and back

A



Manifestations of infra-azygos SVC obstruction

- More severe symptoms but all of the features for obstruction distal to entrance of SVC
- Dilation of collateral vessels on anterior and posterior abdominal wall with downward blood flow into IVC, then back to heart

B

Table 1. Malignant Causes of the Superior Vena Cava Syndrome.*

Tumor Type	Proportion	Suggestive Clinical Features
	% *(range)*	
Non–small-cell lung cancer	50 (43–59)	History of smoking; often age >50 yr
Small-cell lung cancer	22 (7–39)	History of smoking; often age >50 yr
Lymphoma	12 (1–25)	Adenopathy outside the chest; often age <65 yr
Metastatic cancer†	9 (1–15)	History of malignant condition (usually, breast cancer)
Germ-cell cancer	3 (0–6)	Usually, male sex and age <40 yr; elevated levels of β human chorionic gonadotropin or alpha-fetoprotein are common
Thymoma	2 (0–4)	Characteristic radiographic appearance on the basis of the location of the thymus; frequently associated with the parathymic syndromes (e.g., myasthenia gravis and pure red-cell aplasia)
Mesothelioma	1 (0–1)	History of asbestos exposure
Other cancers	1 (0–2)	

Superior Vena Cava Syndrome

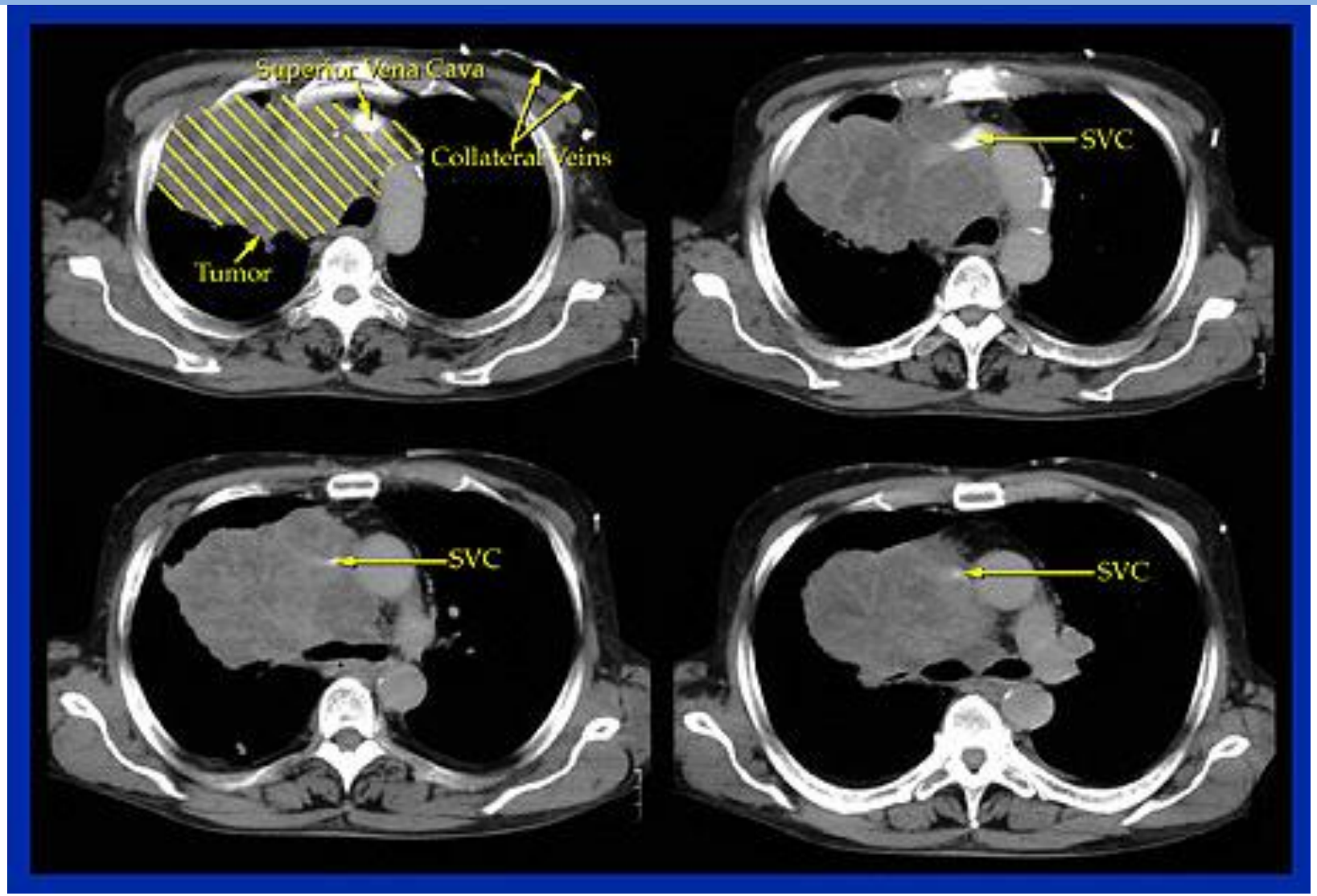
- In rare cases can be disease presentation
  - No time for pathology
  - Urgent treatment without tissue diagnosis
- Median survival – 6 month

2 year survivale – 15%

Exeption: Treatment Sensitive Tumors

- NHLs, germ cells, and limited-stage small cell lung cancers usually respond to chemotherapy and or radiation
- Can achieve long term remission with tumor specific directed therapy
- Symptomatic improvement usually takes 1-2 weeks after start of therapy

Superior Vena Cava Syndrome



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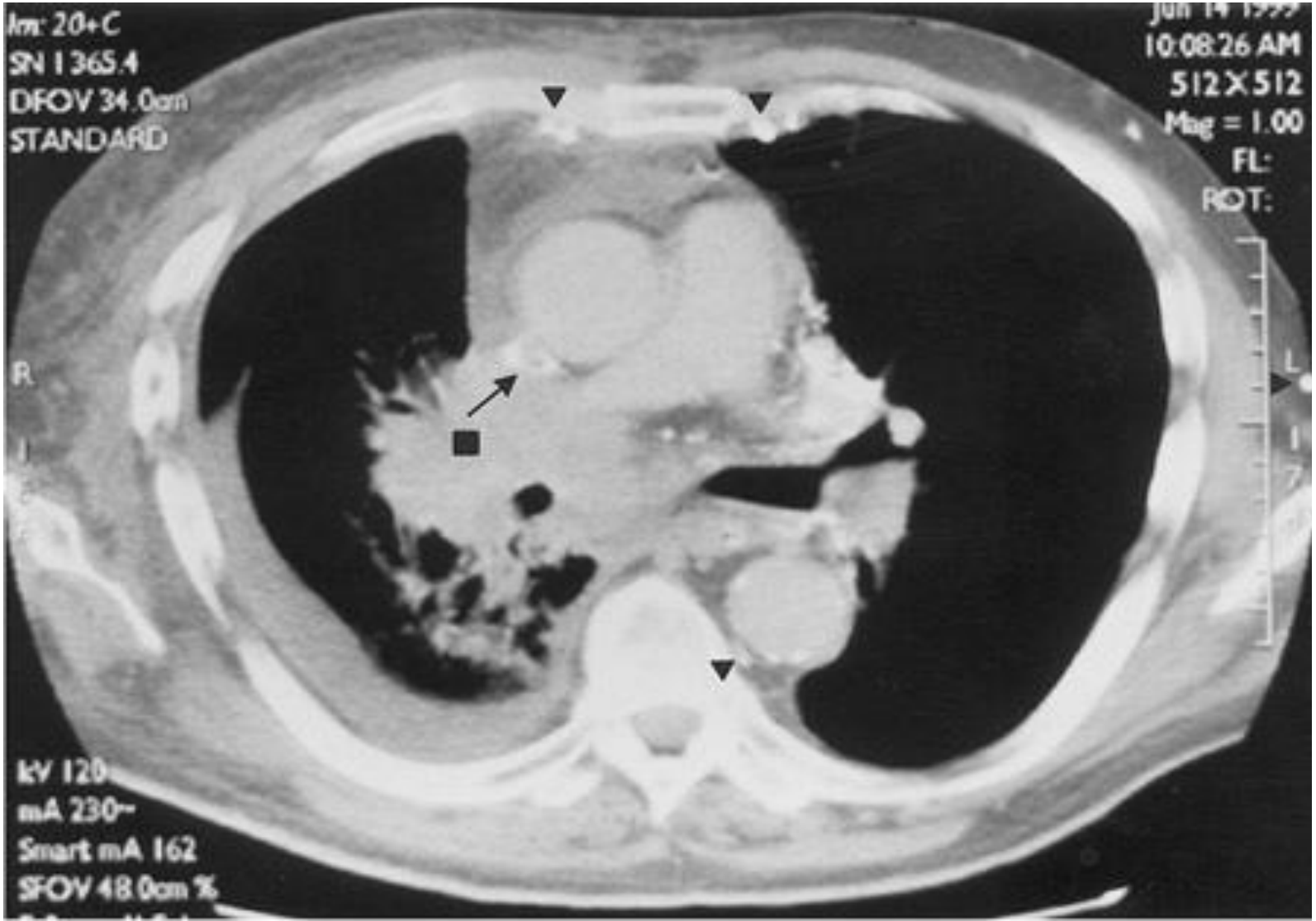

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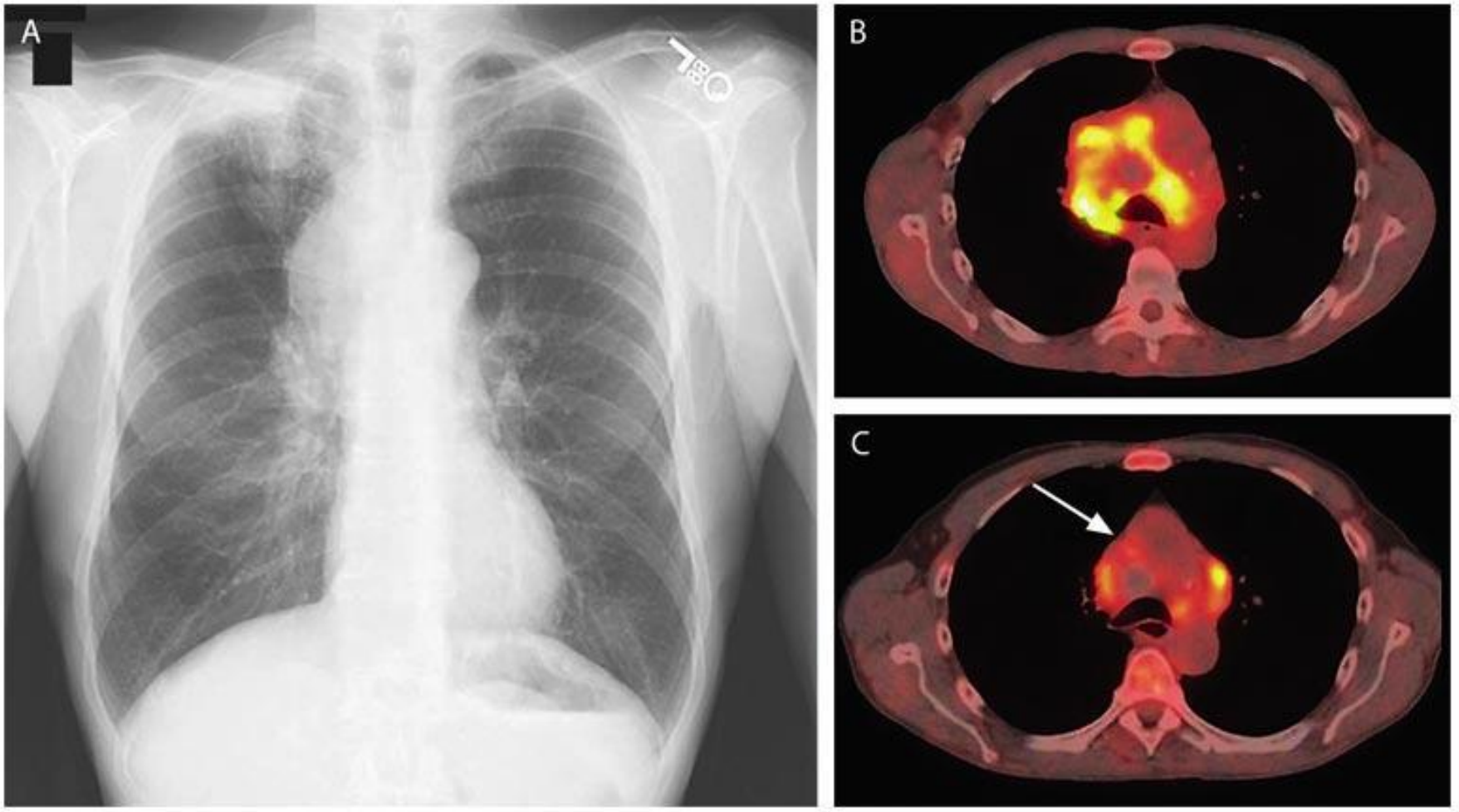


Treatment Options

- Radiation therapy
- Chemotherapy
- Intraluminal Stent

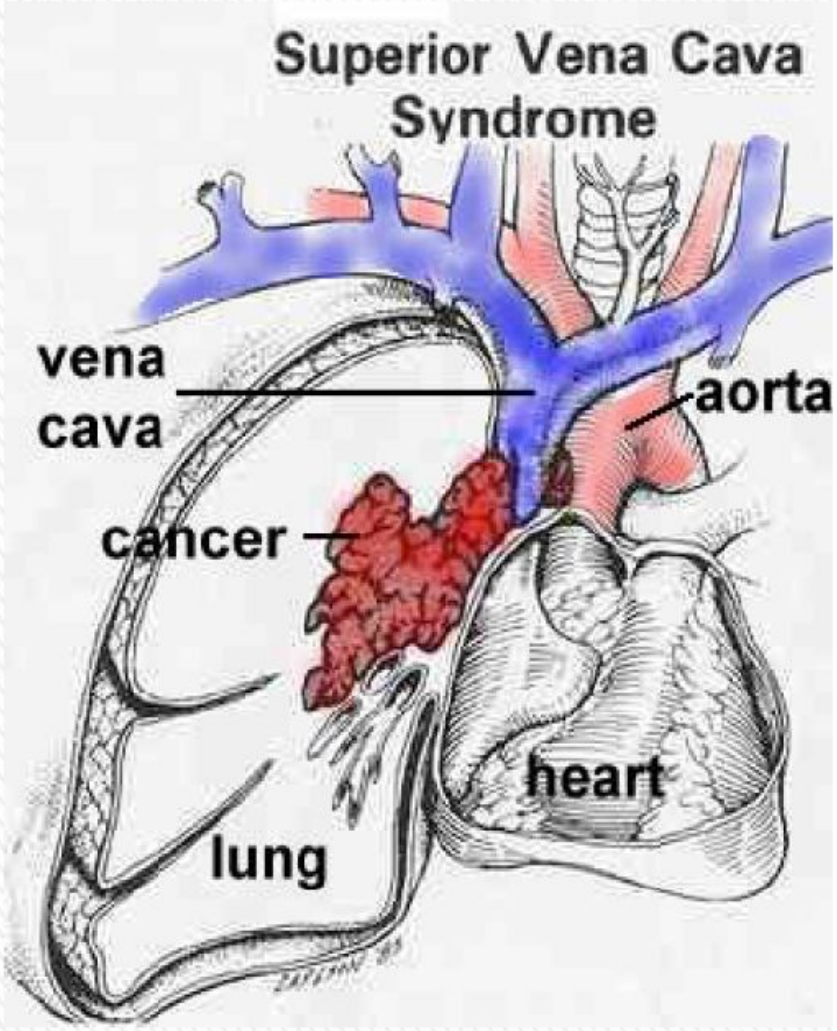
+supportive care

Supportive Care:

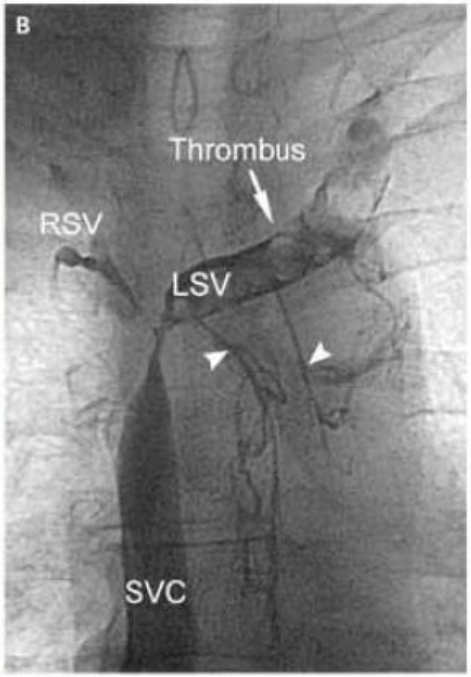
- Rest
- Head elevation
- Oxygen
- Diuretics
- Anticoagulation
- Steroids
- Avoid high volume fluid infusion through upper extremities

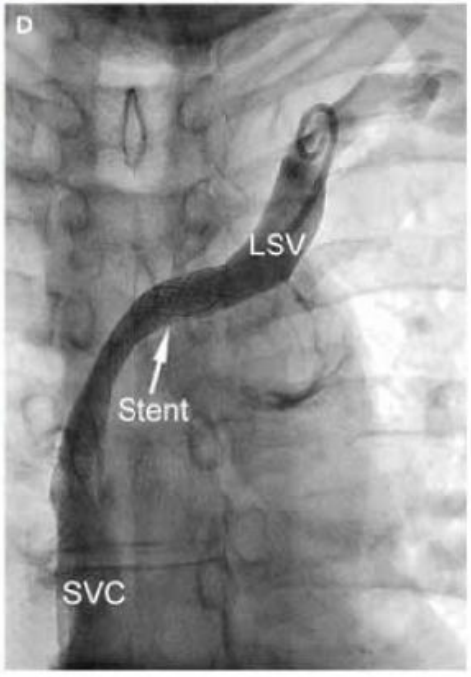
Intraluminal Stents

- Endovascular placement under fluoroscopy
- Patients who have recurrent disease in previously irradiated fields
- Tumors refractory chemotherapy
- Patient too ill to tolerate radiation or chemotherapy



www.aboutcancer.com/svco.htm





Superior vena cava syndrome

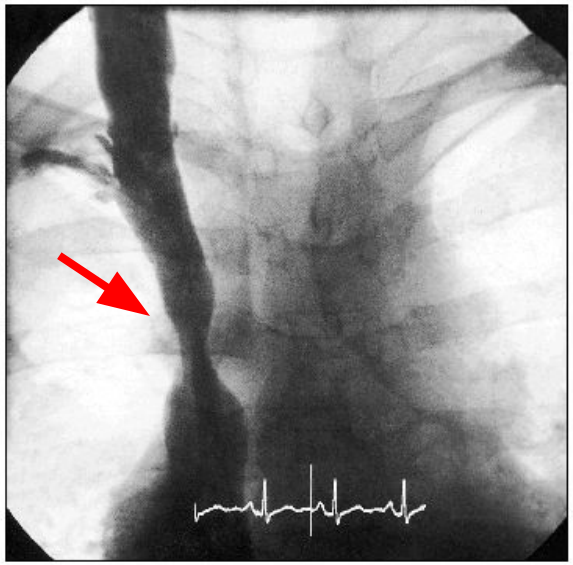


Fig. 2. *Superior venogram before stent deployment shows narrowing of the SVC.*

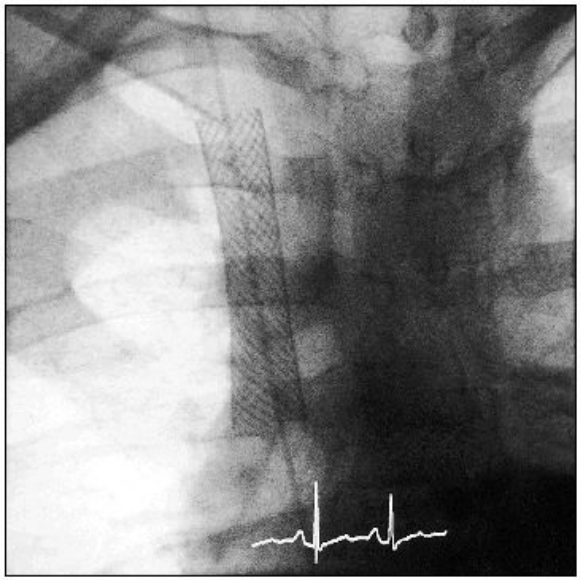


Fig. 3. *Post-stent venogram demonstrates a widely patent SVC.*

Fig. 4. *Check angiogram showing no residual stenosis and good antegrade flow in the SVC.*

Endovascular stenting and angioplasty

Knowledge Checkpoint

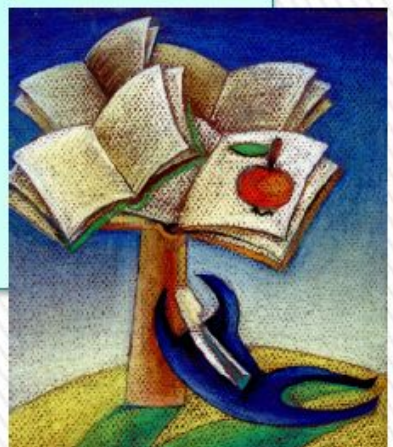
Which of the following is NOT a symptom of superior vena cava syndrome?

A. Upper extremity, head and neck swelling

B. Discoloration of neck and face

C. Swelling and discoloration of both lower extremities

D. Development of collateral circulation around the superior vena cava to bypass obstruction



Knowledge Checkpoint

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Increased Intracranial Pressure **Structural**

Definition	Signs & Symptoms	Treatment
Lung cancer, breast cancer, & melanoma are the most common causes.	Symptoms can be focal or generalized , depending on the location of the lesion(s) within the brain.	MRI Treatment varies from alleviating symptoms to aggressive tx directed at the tumor:
Distribution of brain mets within the brain is in accordance with the regional blood flow.	Nausea/vomiting, headache, seizures.	IV steriods, IV anticonvulsants, Radiation therapy, Surgery.
Brain edema & tumor expansion commonly result in ↑ ICP.		

Brain Metastasis

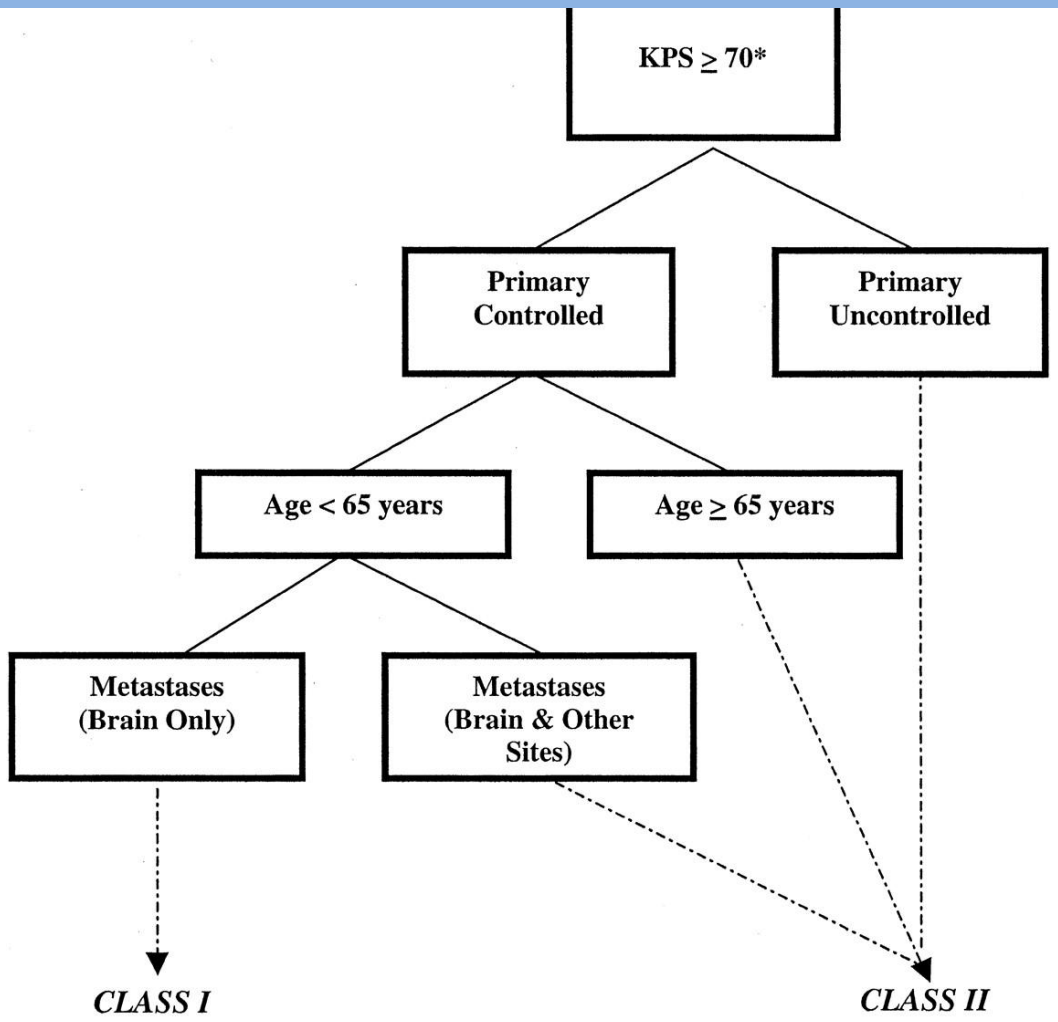
- Most Common type of CNS malignancy
- 20-40% of cancer patients will develop brain mets
- Most common types: Breast, Lung, Melanoma, Colorectal Ca
- Highest risk for bleeding
  - RCC
  - Melanoma
  - Choriocarcinoma
  - Papillary thyroid
  - Lung Cancer

Brain Metastasis

Recursive Partitioning Analysis - RPA

Class	Characteristics	Survival (months)
I	KPS 70–100, Primary controlled Age < 65 Mets to brain only	7.1
II	All Others	4.2
III	KPS < 70	2.3

Brain Metastasis

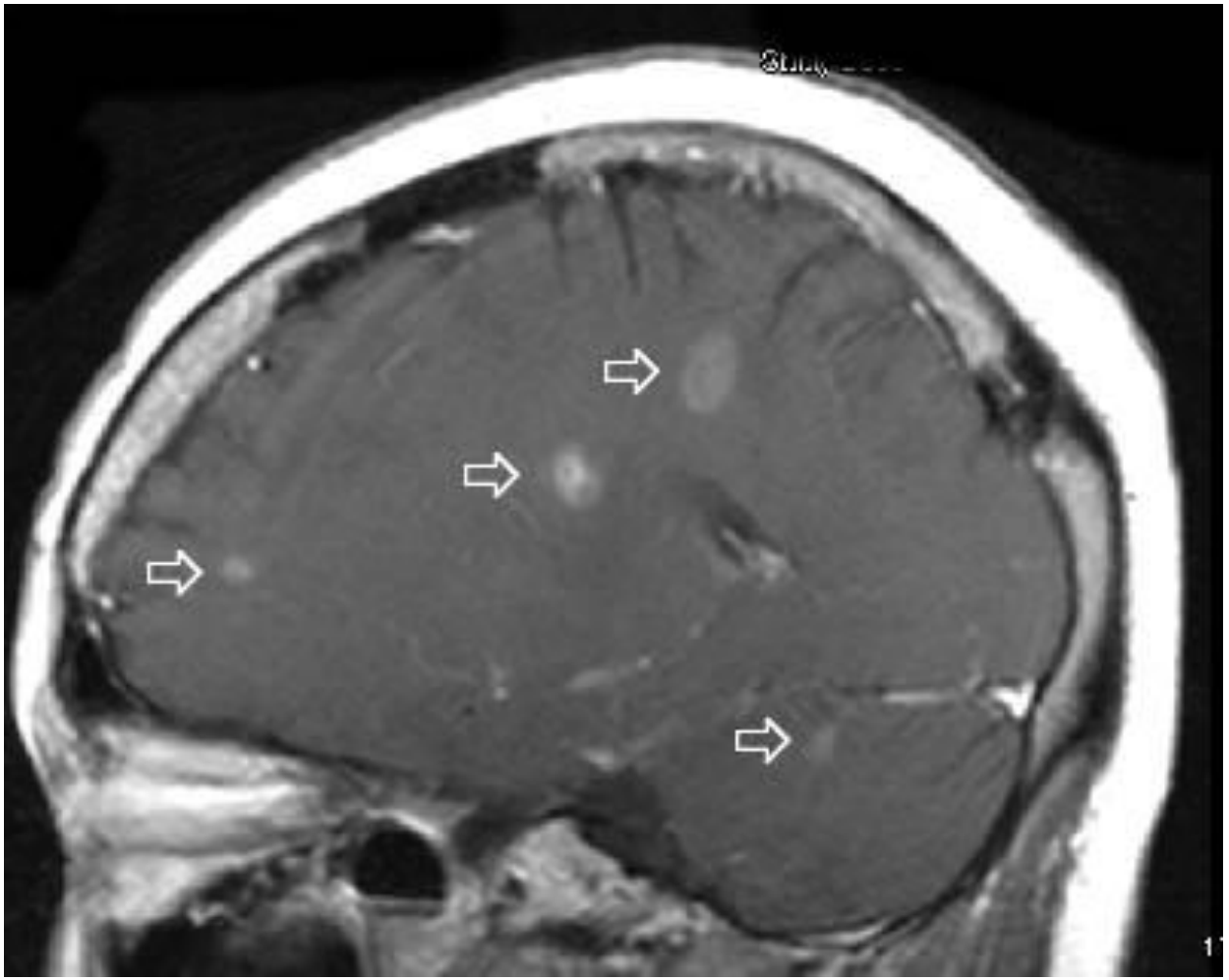


*KPS < 70 = *Class III*

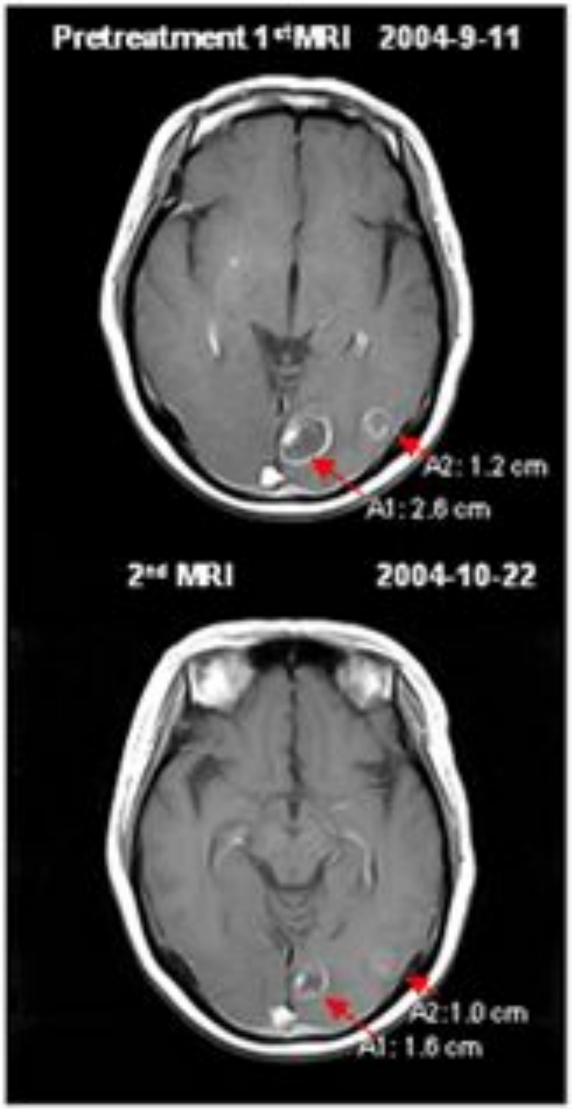
Brain Metastasis

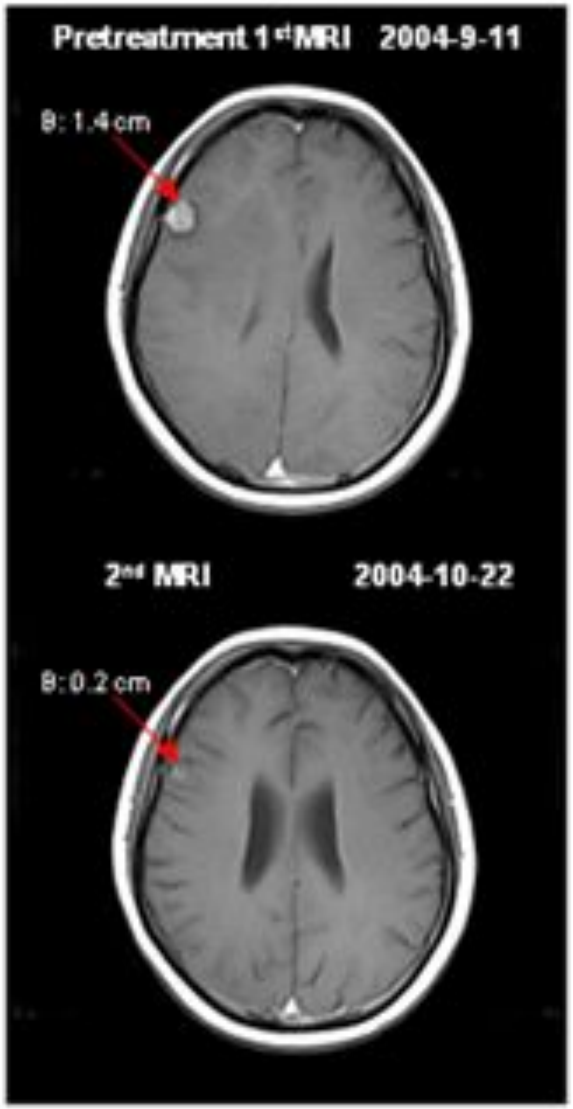
- Diagnosis:
  - CT with and without contrast
  - MRI – modality of choice for small lesions including leptomeningial spread
  - If no previous history of malignancy - consider total body imaging

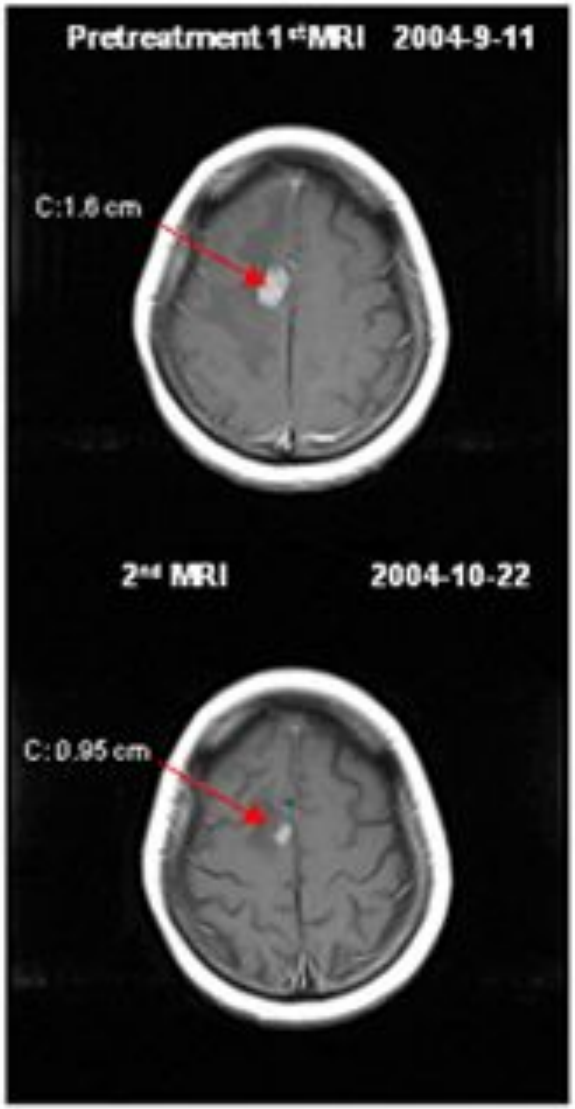
Brain Metastasis



Brain Metastasis







Brain Metastasis

Brain Metastasis

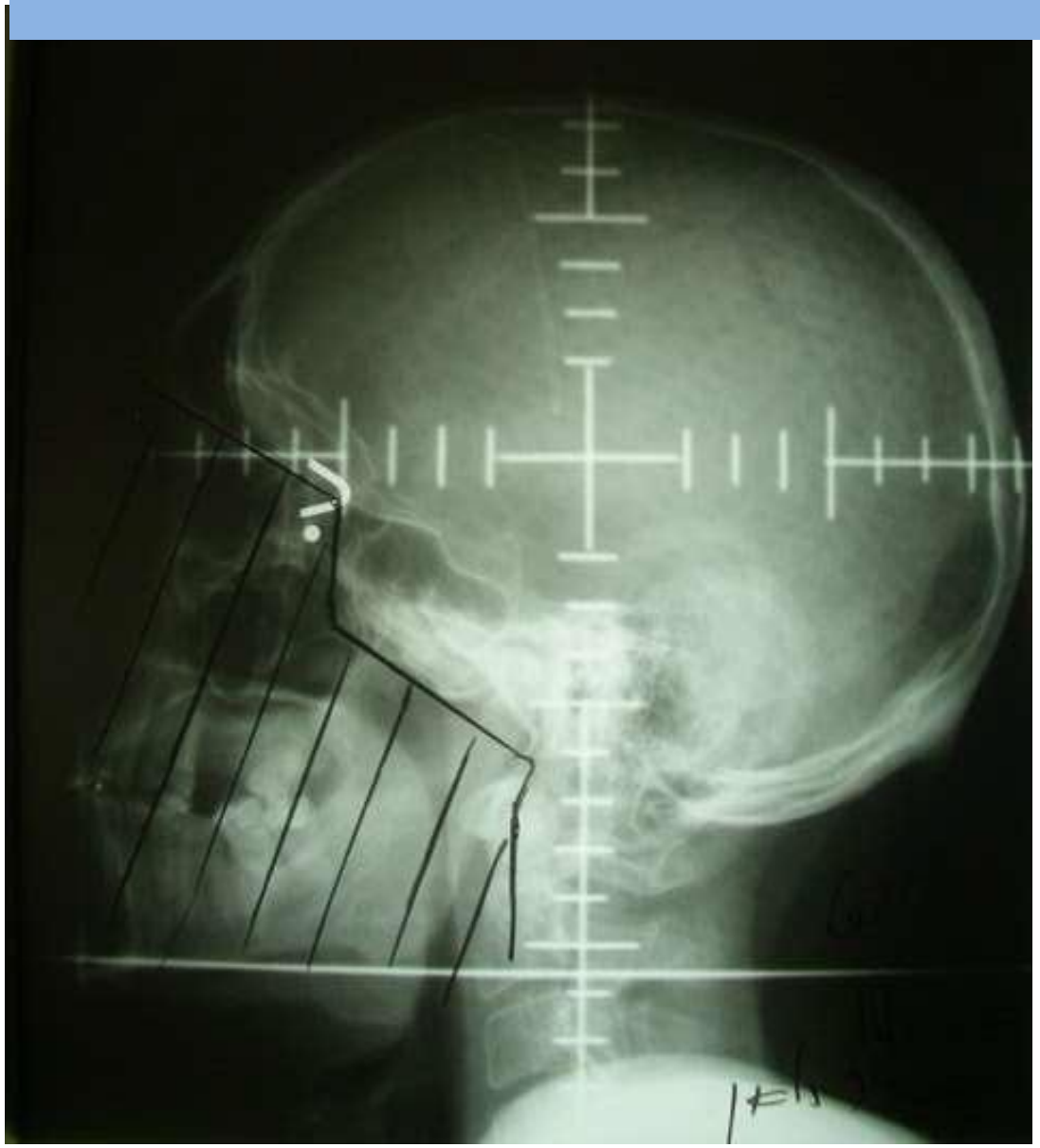
Treatment:

- Steroids – Dexamethasone 16mg*2
- Anticonvulsant
- Surgery?
- Radiation therapy

Brain Metastasis

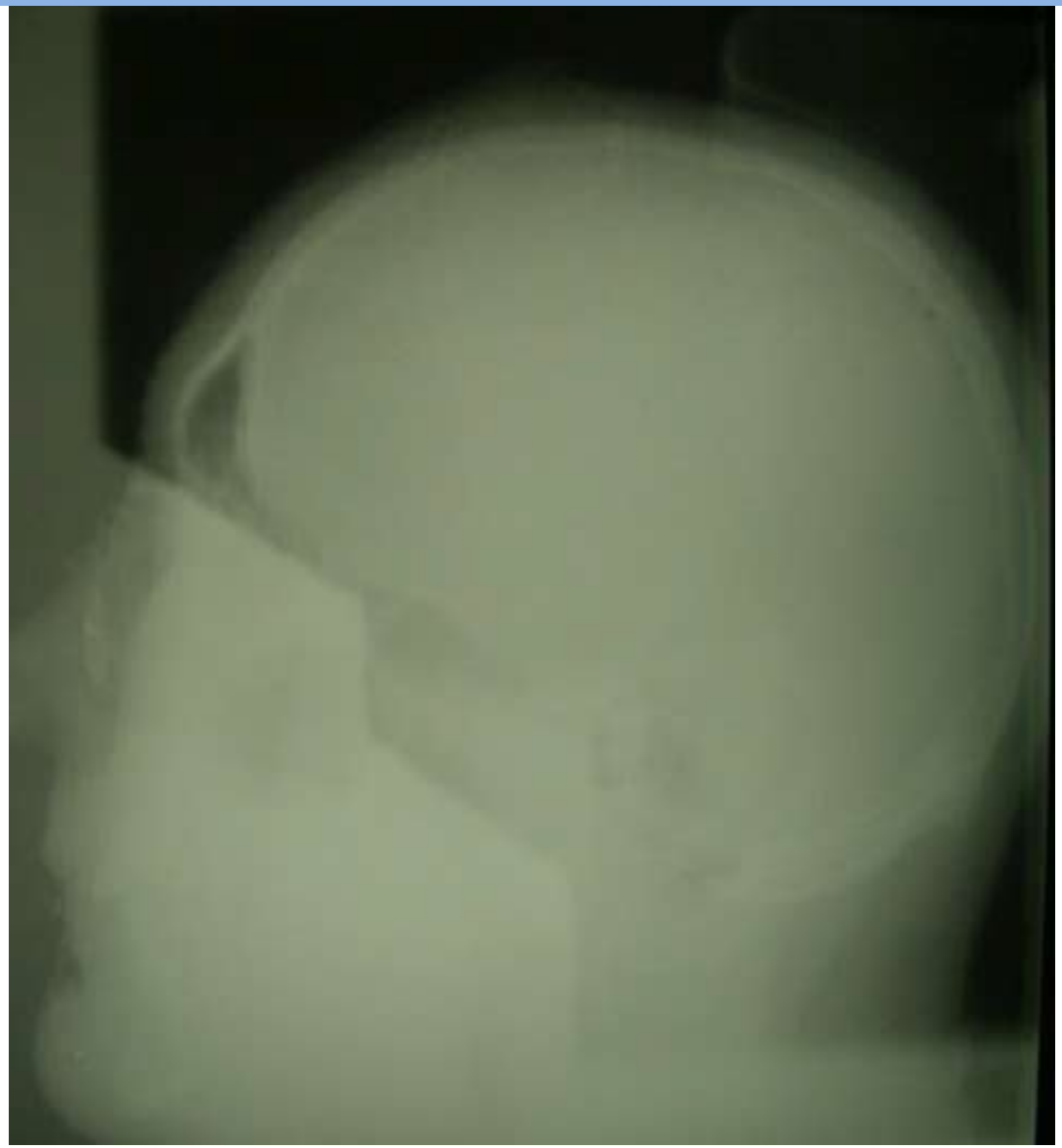
- Radiation therapy
  - WBRT=Whole Brain RT
  - SRS=Stereotactic Radio Surgery

Brain Metastasis

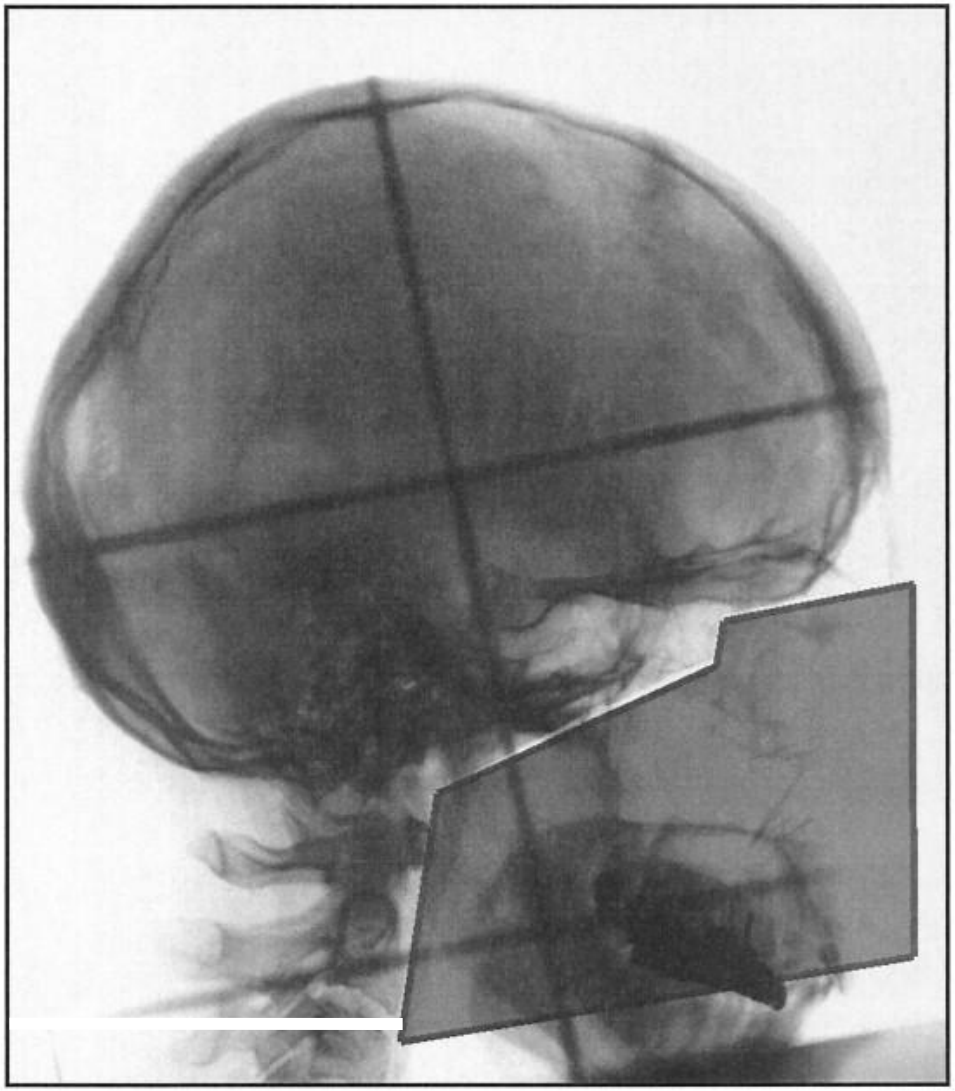


German Helmet

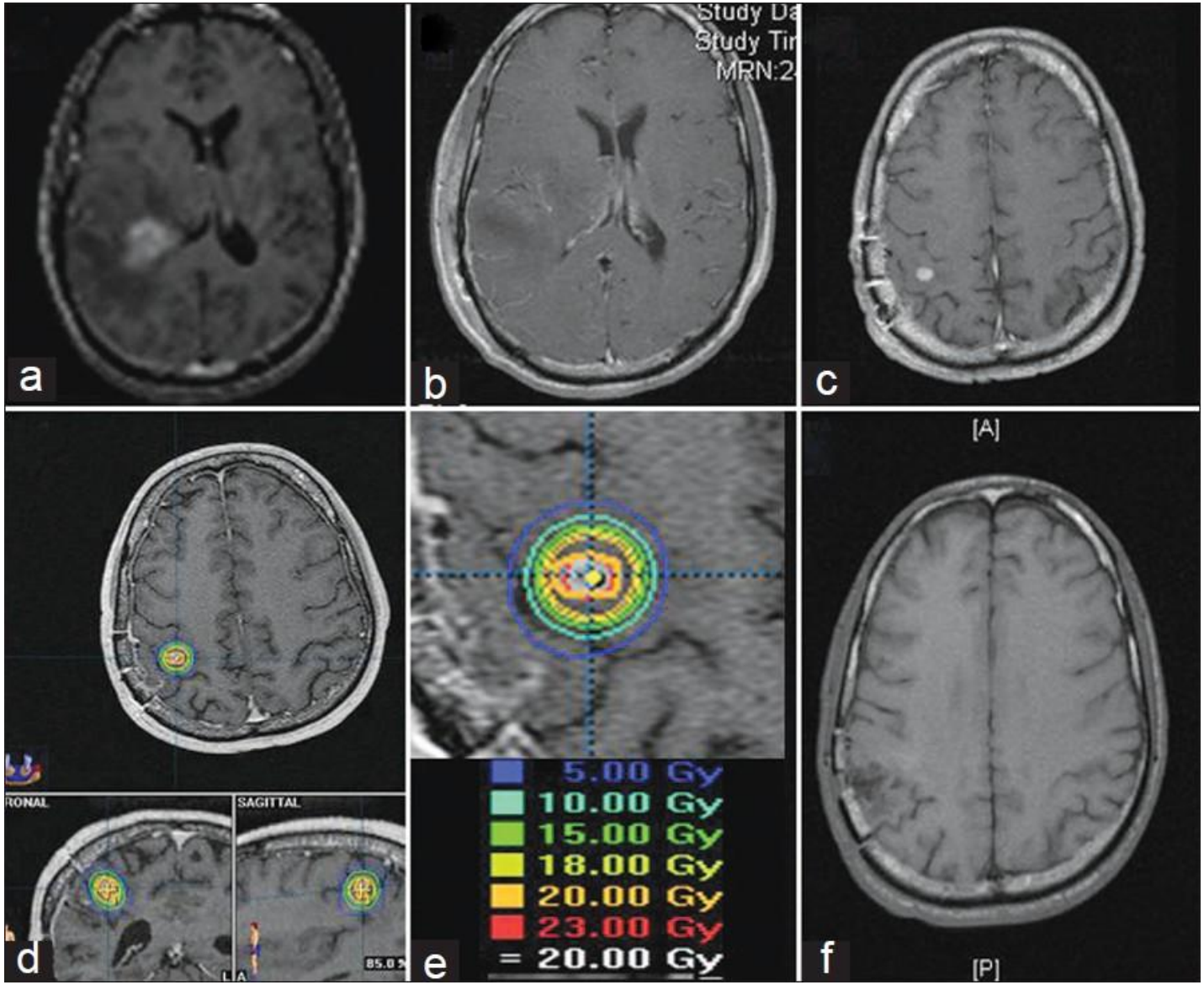
Brain Metastasis



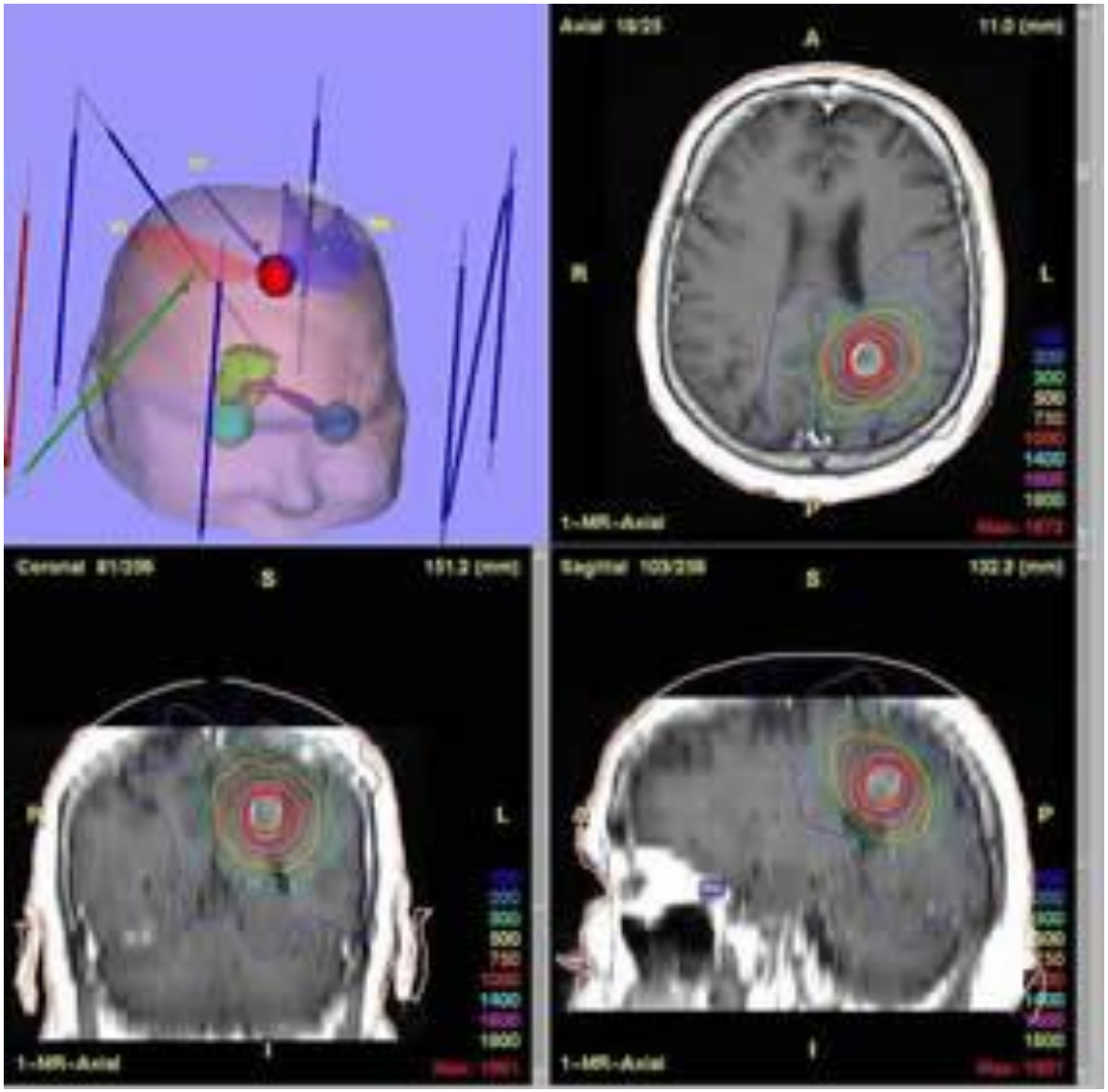
Brain Metastasis



SRS


a
b
c
d
e
f
RONAL
SAGITTAL
5.00 Gy
10.00 Gy
15.00 Gy
18.00 Gy
20.00 Gy
23.00 Gy
= 20.00 Gy
[A]
[P]

Brain Metastasis



Спасибо за внимание!