

Lead poisoning

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Source of Lead

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Sources

- آب و غذاي آلوده
- ترکش هاي جنگي، Bullet
- Amalgam
- خاک منطقه، پوسته زمين (نيمه عمر 30 ساله)
- ترياک خوراكي
- شغل: کارگران اسلحه و مهمات سازي، فشفشه و آتش
بازی، پلاستيک، باطري ساز، راديوتور، سراميك، کاغذ
ديواري، رنگ، تراش آينه،

TABLE 96–1. Environmental Lead Sources

<i>Source</i>	<i>Comment</i>
Paint	Especially pre-1978 homes
Dust	House dust from deteriorated lead paint
Soil	From yards contaminated by deteriorated lead paint, lead industry emissions, roadways with high leaded gasoline usage
Water	Leached from leaded plumbing (pipes, solder), cooking utensils, water coolers
Air	Leaded gasoline (pre-1976 United States; still prevalent worldwide), industrial emissions
Food	Lead solder in cans (pre-1991 United States; still prevalent in imported canned foods); “natural” dietary supplements; “moonshine” whiskey and lead foil–covered wines; contaminated flour, paprika, other imported foods and candy; lead leached from leaded crystal, ceramics, vinyl lunch boxes
Other	Complementary and alternative medicines, children’s toys and jewelry (especially imported products), cosmetics, leaded ink, vinyl mini-blinds

High Risk Occupation

TABLE 96–2. Occupational and Recreational Lead Sources

High Risk Occupations

Automobile radiator repairers

Crystal glass makers

Firing range instructors, bullet salvagers

Lead smelters, refiners

Metal welders, cutters (includes bridge and highway reconstruction workers)

Painters, construction workers (sanding, scraping, or spraying of lead paint; demolition of lead-painted sites)

Polyvinyl chloride plastic manufacturers

Shipbreakers

Storage battery manufacturers, repairers, recyclers

Possible Increased Risk Occupations

Electronics manufacturers

Jewelers

Pipefitters

Printers

Rubber product manufacturers

Traffic police officers, taxi drivers, garage workers, turnpike tollbooth operators, gas station attendants
fumes; unlikely now in the United States but still a hazard in developing countries)

Recreational and Hobby Sources

Ceramic crafts

Furniture refinishing, restoring

Home remodeling, refinishing

Painting (fine artist's pigments)

Repair of automobiles, boats

Stained glass making

Target shooting, recasting lead for bullets

Additional sources

Ingested lead foreign bodies and retained lead bullets

Illicit substance abuse (heroin, methamphetamine, leaded gasoline “huffing”)

Burning batteries, leaded paper, or wood for fuel

Hand–mouth contact with pool cue chalk, glazes, leaded ink

Moderate Risk Occupation

Moderate Risk Occupations

Automobile factory workers and mechanics

Enamellers

Glass blowers

Lead miners

Plumbers

Pottery glazers

Ship repairers

Shot makers

Solderers

Type founders

Varnish makers

Wire and cable workers

- مینا کاری و لعاب دادن

- شیشه سازی

- معادن سرب

- لوله کش ها

- سفال گری و کوزه گری

- بازسازی کشتی

- گلوله سازی

- حروف چینی (صنعت چاپ)

- واکس

- سیم فلزی

Lead Absorption

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Lead Absorption

- Lungs

- Dust (Home dust/environment)

- Fume

- G.I.T

Lead Absorption

- **Active absorption** از روده (50% در بچه ها و 10% بالغین)
- **Empty stomach**
- **High Fat**
- **Iron def.**
- **Low Ca intake**

Other sources of lead exposure

- **Soil**
- **Water:** Copper plumbing soldered with lead is a source of contamination of household drinking water.
- **Household dust:** Household dust can contain lead from lead paint chips or from contaminated soil brought in from outside.
- **Pottery:** Glazes found on some ceramics, china and porcelain can contain lead that may leach into food.
- **Toys**
- **Traditional cosmetics.**

Distribution

- مرحله 1: اتصال به RBC 95%
- مرحله 2: انتشار به Soft tissues (کبد، کلیه، مغز)
- مرحله 3: انتشار به Bones

95% of the body lead burden is stored in bone

Target Organs

- **Nephrotoxicity**
- **Neurotoxicity**
- **Hematologic T.**
- **Heart**
- **Skeletal**
- **G.I. T**
- **Endocrine**
- **Reproductive system**

Lead poisoning

- Acute (**Plumbism**)
 - Rare in adult; يا استنشاق بخارات سرب آلي heating gun
 - Common in children
- Chronic
- Acute on chronic

مسمومیت حاد سربی در کودکان

- بلع مواد حاوی سرب، Home dust

- انسفالوپاتی: شایع، $BLL > 50$

- نوروپاتی حاد (F&W D)

- علایم گوارشی

- اختلال رشد استخوانی

- تخریب دندان ها

- کاهش هوش: $5/10 \text{ mic/dl}$

- سابقه pica مهم است

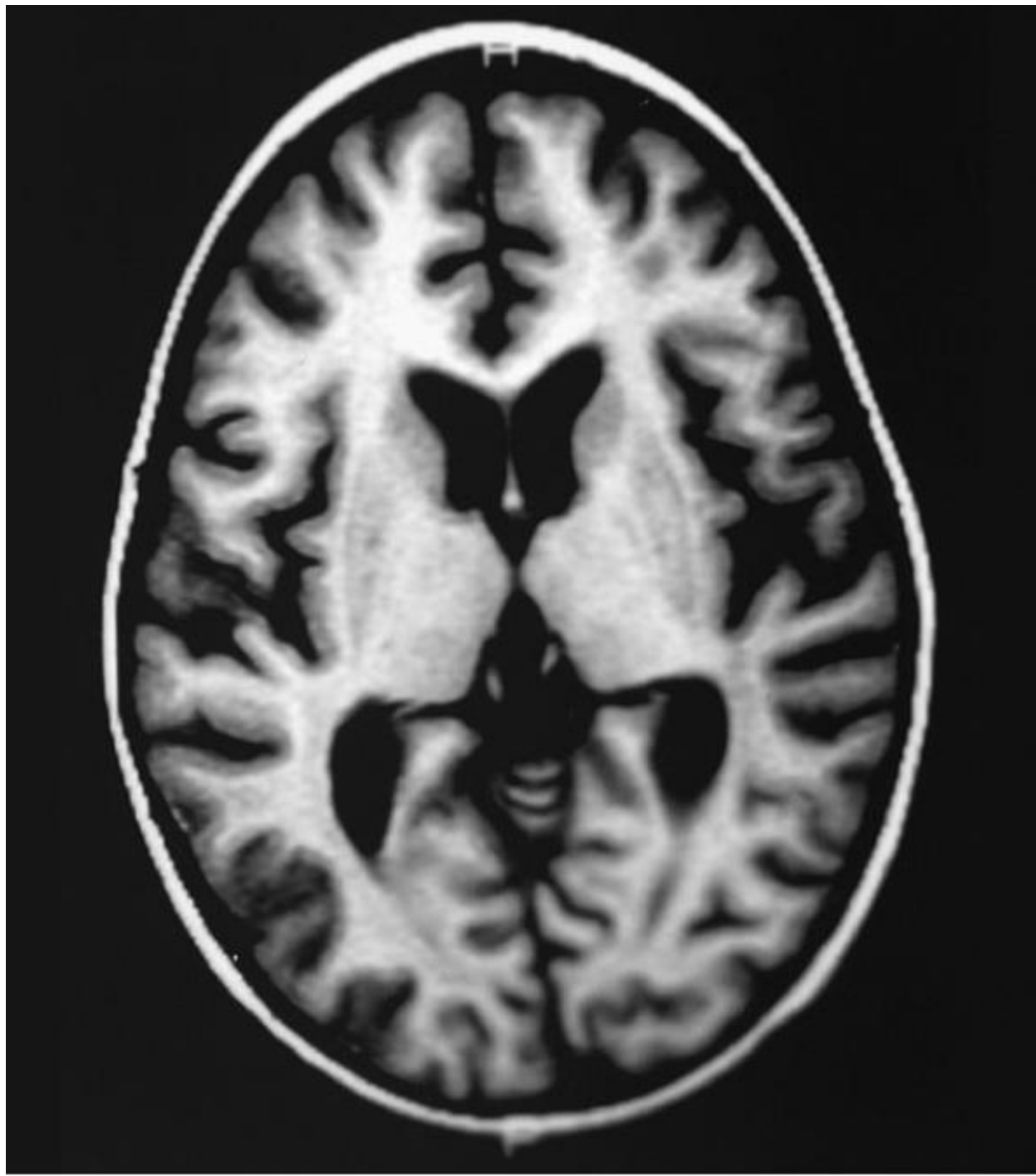
علائم در بچه ها

- بی اشتهايي، استفراغ، يبوست
- دردهای کولیکی شکم
- عدم تمایل به بازی کردن
- رفتارهای تهاجمی، بیقراری
- افت تحصیلی، بیش فعالی، اختلال تمرکز و توجه
- آپاتی، آتاکسی، خواب آلودگی
- تشنج



TABLE 96–3. Clinical Manifestations of Lead Poisoning in Children

<i>Clinical Severity</i>	<i>Typical Blood Lead Concentrations (µg/dL)</i>
Severe CNS: Encephalopathy (coma, altered sensorium, seizures, bizarre behavior, ataxia, apathy, incoordination, loss of developmental skills, papilledema, cranial nerve palsies, signs of increased ICP) GI: Persistent vomiting Hematologic: Pallor (anemia)	>70–100
Mild to moderate CNS: Hyperirritable behavior, intermittent lethargy, decreased interest in play, “difficult” child GI: Intermittent vomiting, abdominal pain, anorexia	50–70
Asymptomatic CNS: Impaired cognition, behavior, balance, fine-motor coordination Miscellaneous: Impaired hearing, impaired growth	>49





Persistent growth arrest lines in a child with prior lead poisoning



Severity of Lead poisoning in Adult

Severe

>100

CNS: Encephalopathy (coma, seizures, obtundation, delirium, focal motor disturbances, headaches, papilledema, optic neuritis, signs of increased ICP)

PNS: Foot drop, wrist drop

GI: Abdominal colic

Hematologic: Pallor (anemia)

Renal: Nephropathy

Moderate toxicity in adult

Moderate

70–100

CNS: Headache, memory loss, decreased libido, insomnia

PNS: peripheral neuropathy

GI: Metallic taste, abdominal pain, anorexia, constipation

Kidney: Arthritis due to saturnine gout (impaired urate excretion)

Miscellaneous: Mild anemia, myalgias, muscle weakness, arthralgias

Mild toxicity in adult

Mild

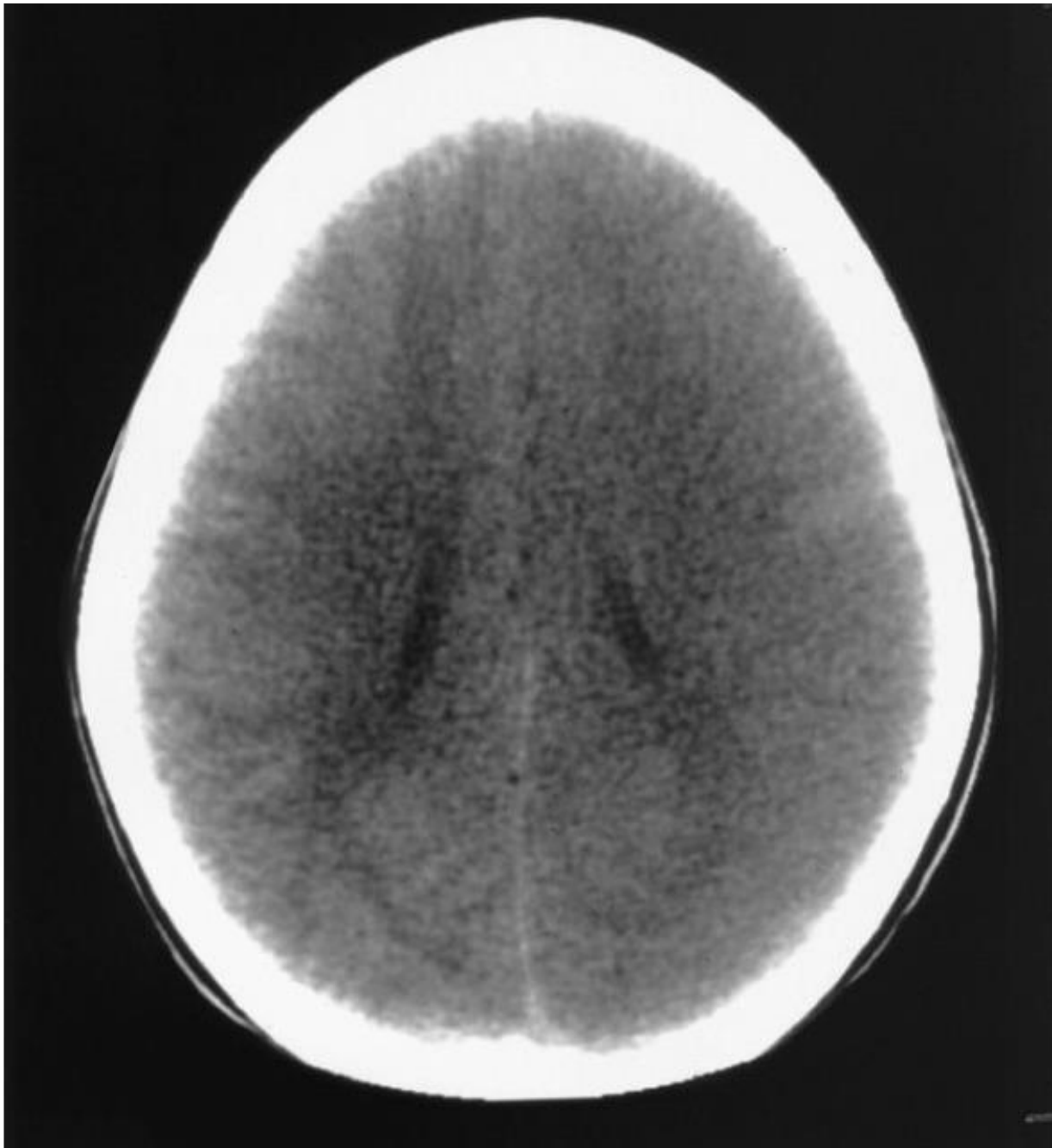
20–69^a

CNS: Fatigue, somnolence, moodiness,
lessened interest in leisure activities

Miscellaneous: Adverse effects on cognition,
reproduction, kidney function, or bone density;
hypertension and cardiovascular disease;
possible increased risk of cancer

تظاهرات مسمومیت حاد

- علایم گوارشی
 - تهوع، استفراغ، یبوست، علایم انسدادی، درد شکمی، اختلال کبدی
 - نارسایی حاد کلیوی: توبولوپاتی، نفریت انترسیسیل
 - درگیری CNS :
- **BLL>100 : Coma, Seizure**
- **BLL>150 : Life threatening**
 - انسفالوپاتی حاد سربی: در اطفال شایع و بالغین نادر است.
 - پریفرال نوروپاتی: Foot & wrist drop
 - درگیری خون: همولیز، آنمی
 - سایر علایم: Bone lead line ، Gingival lead line



Diagnosis

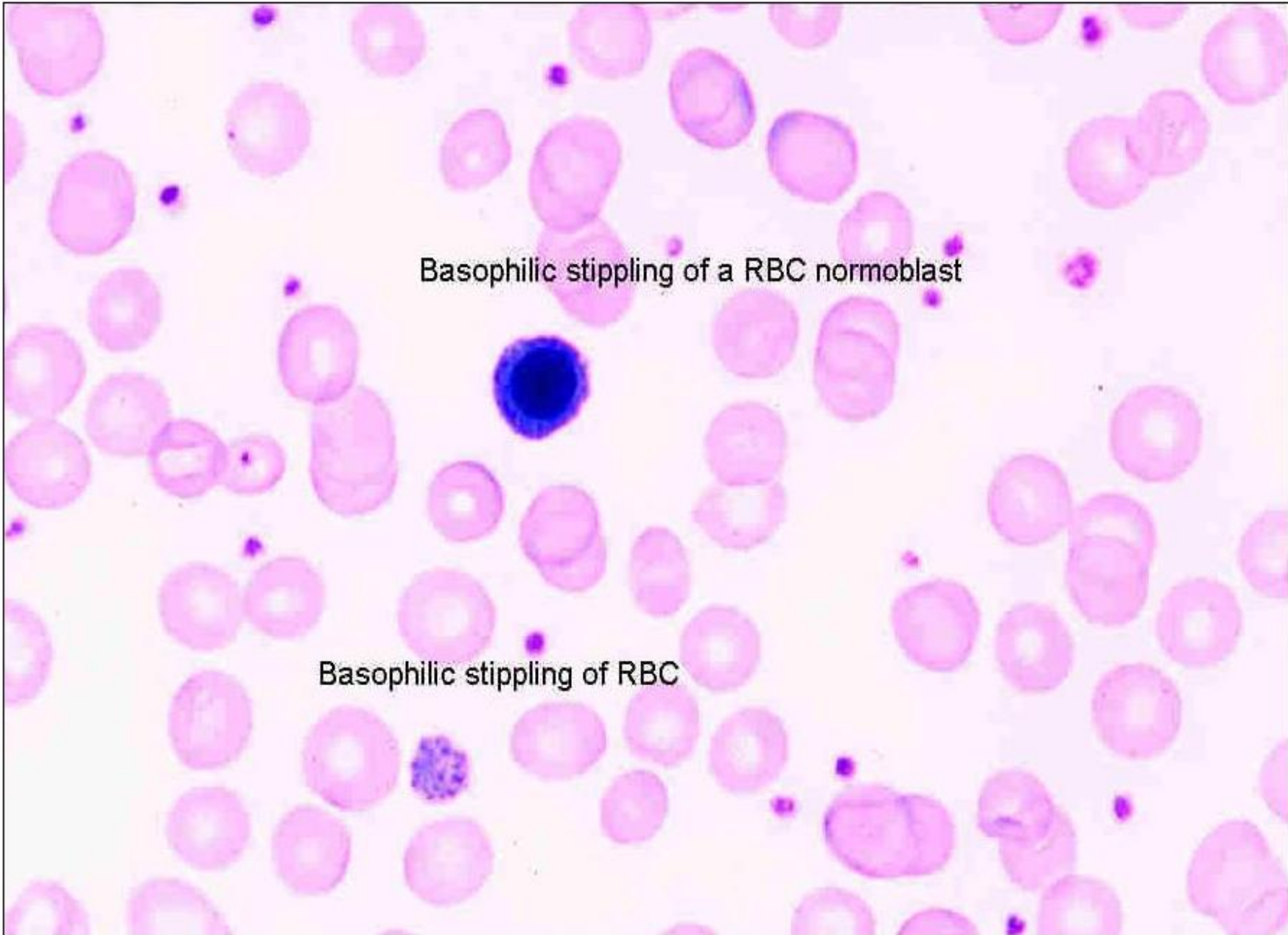
- Symptoms & Signs
- Hx. Of Exposure to Lead
- BLL > 40
- Abd. X-ray: in acute toxicity
- Long bone X-ray: in children, BLL > 45, 3-6w, Radius & fibula
- Basophilic Stippling: Short/ Acute/hallmark
- EMG & NCV: Ulna
- Auditory brain stem evoke potential

**Definitive test
for Lead poisoning?**

BLOOD LEAD LEVEL

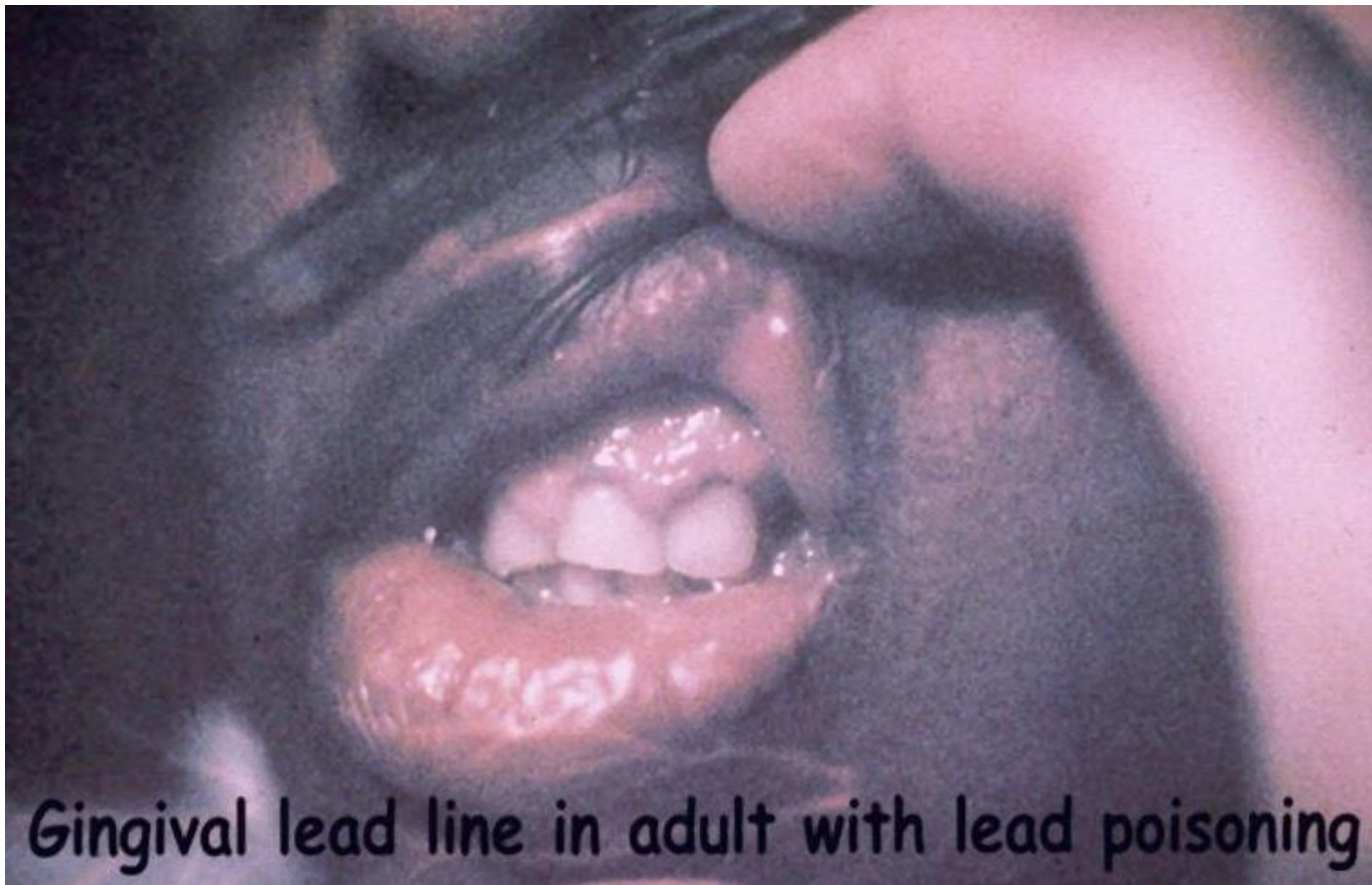
Differential Diagnosis

- **Neurologic disease**
 - Guillen barre/ Miller fisher
- **Causes of acute abdomen**
 - Hepatitis/Pancreatitis/Appendicitis/Renal colic
- **Heavy metals toxicity**
- **Coma/encephalopathy & seizure**
- **Hypochrom-microcytic anemia**



Basophilic stippling of a RBC normoblast

Basophilic stippling of RBC



Gingival lead line in adult with lead poisoning

Chronic Toxicity

- Peripheral neuropathy
- C.N.C; Headach, Amnesia, Concentration, ADHD, Hyperactivity, Educational problem,
- Anemia ?
- Chronic or acute Abd. Pain
- Skletal: Muscles & Joint pain
- Infertility
- Glandular disease? GA, Thyroid
- Liver disease

Paraclinic & Lab. tests

- CBC, RBC Indexes
- Erythrocyte Protoporphyrin
>250mic/dl, response to therapy/differ
acute from chronic
- PBS for BS
- Blood Lead Level
- Serum Iron, Ferritine
- Mg, Ca, Zn
- LFT
- BUN, Creatinine
- U/A
- Bone X-Ray
- Abd. X-ray
- Abd. CT scan
- EMG & NCV
- Fondoscopy
- Brain Ct Scan
- X-Ray fluorescence
technology

Treatment

- In Adult
- In workers
- In Children

Treatment

- Discontinuing exposure/ Finding source
- Conservative: Constipation/
- Chelator therapy
- Post Chelator therapy: Trace elements/Anemia

Chelator therapy

- I.V drugs
 - Dimercaprol (BAL)
 - CaNa_2EDTA
 - DMSA
- Oral drugs

Chelation therapy indexes

- Age of pt.
- BLL
- Clinical symptoms

Chelators

- BAL
- CaNa₂ EDTA
- Succimer
- D-Penicillamine
 - For mild to moderate toxicity
 - Long course
 - Toxicity to: Hematologic/ Renal/ derm/Liver

Presumptive empiric chelation therapy

- سابقه exposure به سرب وجود دارد.
- علائم مسمومیت شدید سربی دارد.
- بیمار در وضعیت انسفالوپاتی باشد.
- امکان تعیین سطح خونی سرب نباشد.
- پاراکلینیک مثبت: **BS, PP>250, Anemia, graphy+**
- سایر علل از جمله مننژیت هرپسی R/O شده باشد

Chelation

- In Adult BLL>70 mic/dl
- In Children BLL> 45 mic/dl

Chelator Guidelines in Adult

- | | |
|---------------------------------------|------------------|
| • Encephalopathy
or BLL>100 | iv. dual therapy |
| • Moderate symptoms
and BLL 70-100 | iv. Monotherapy |
| • Mild symptoms
and BLL 70-100 | Succimer |
| • Asymptomatic &<70 | Not indicated |

Chelator Guidelines for Adult in firouzgar

- | | |
|---------------------------------------|------------------|
| • Encephalopathy
or BLL>100 | iv. dual therapy |
| • Moderate symptoms
and BLL 70-100 | iv. Monotherapy |
| • Mild symptoms
and BLL 45-70 | Succimer |
| • Asymptomatic &<45 | Not indicated |

Chelator Guidelines in Children

- | | |
|--------------------------------------|------------------|
| • Encephalopathy
or BLL>70 | iv. dual therapy |
| • Moderate symptoms
and BLL 45-70 | iv. Monotherapy |
| • Mild symptoms
and BLL 20-45 | Succimer |
| • Asymptomatic & <20 | Not indicated |

Oral Chelation Therapy

- 2,3 Dimercaptosuccinic Acid (DMSA, Succimer) is an orally chelating agent that is commonly used for the treatment of BLL > 45 mcg/dL in the USA.
- DMSA in US for children; 30 mg/kg/day for 5 days followed by a 14-day course of 20 mg/kg/day to prevent or blunt the rebound.

Racemic-2,3-dimercapto-1-propanesulfonic acid (DMPS, Unithiol, Dimaval)

- It is water soluble and is less toxic than dimercaprol.
- It is available for oral, intravenous & intramuscular
- Currently, it is not FDA approved in the United States, but is used more commonly in the Soviet Union and Europe.

Dimaval[®]

Injektionslösung

Wirkstoff:

(RS)-2,3-Bis(sulfanyl)propan-1-sulfon-
säure, Natriumsalz 1 H₂O



5 Ampullen mit je 5 ml Injektionslösung
zur intravenösen oder intramuskulären Anwendung
Nicht über 25 °C Lagern!

N1

Heyl
Chem.-pharm. Fabrik
14133 Berlin

Pregnancy and lead

- سرب از پلاسنتا عبور می کند
- سطح خونی سرب جنین 30% بالاتر از BLL مادر خواهد بود.
- تجویز آنتی دوت و شلاتور در مادر در صورت ضرورت مجاز می باشد.
- بارداری مجدد با مسمومیت مزمن، سرب خون بالا می رود و خطر Abortion و Still birth

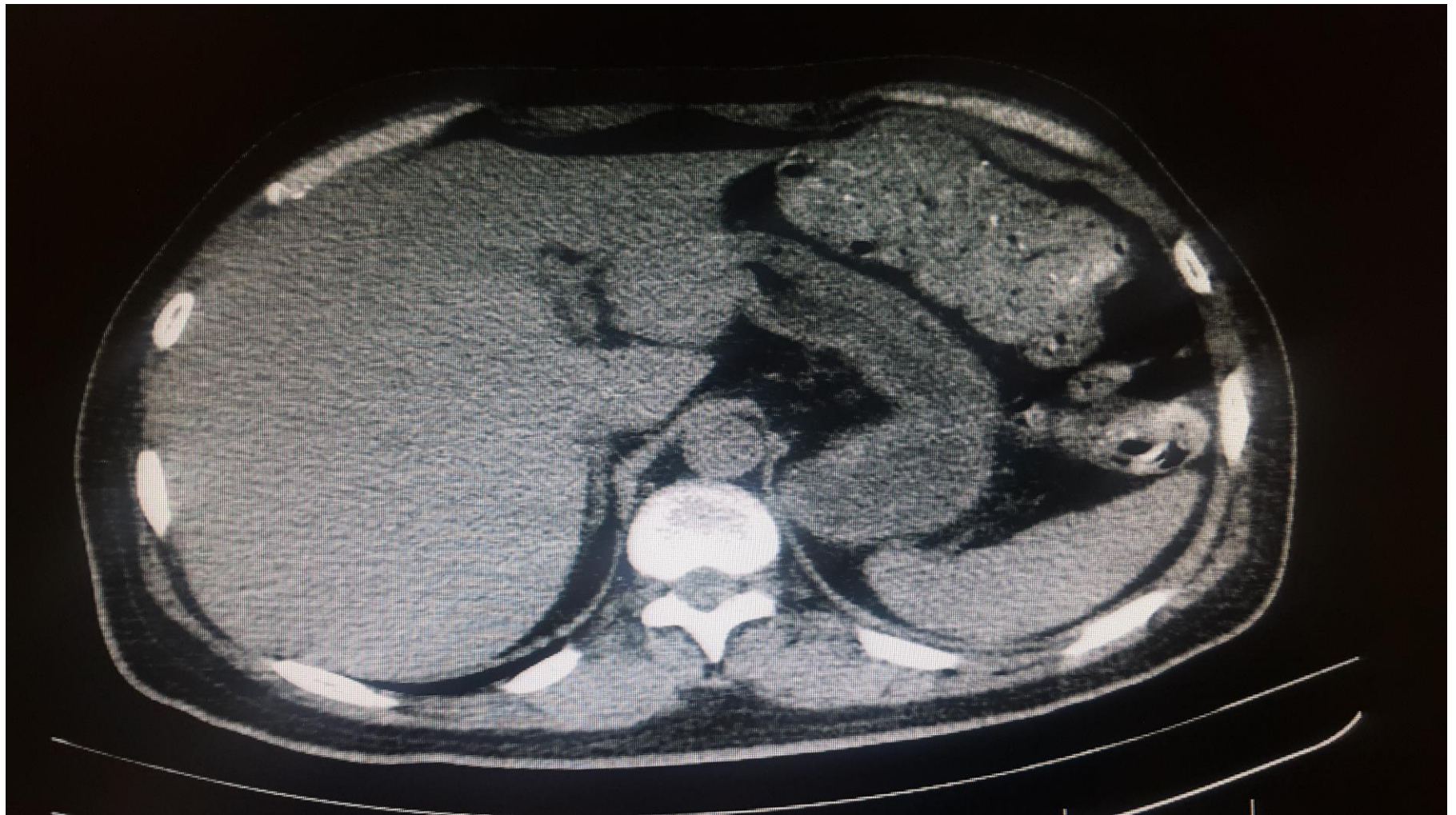
مسمومیت سرب در معتادان

- مشکلات جسمی مربوط به اعتیاد

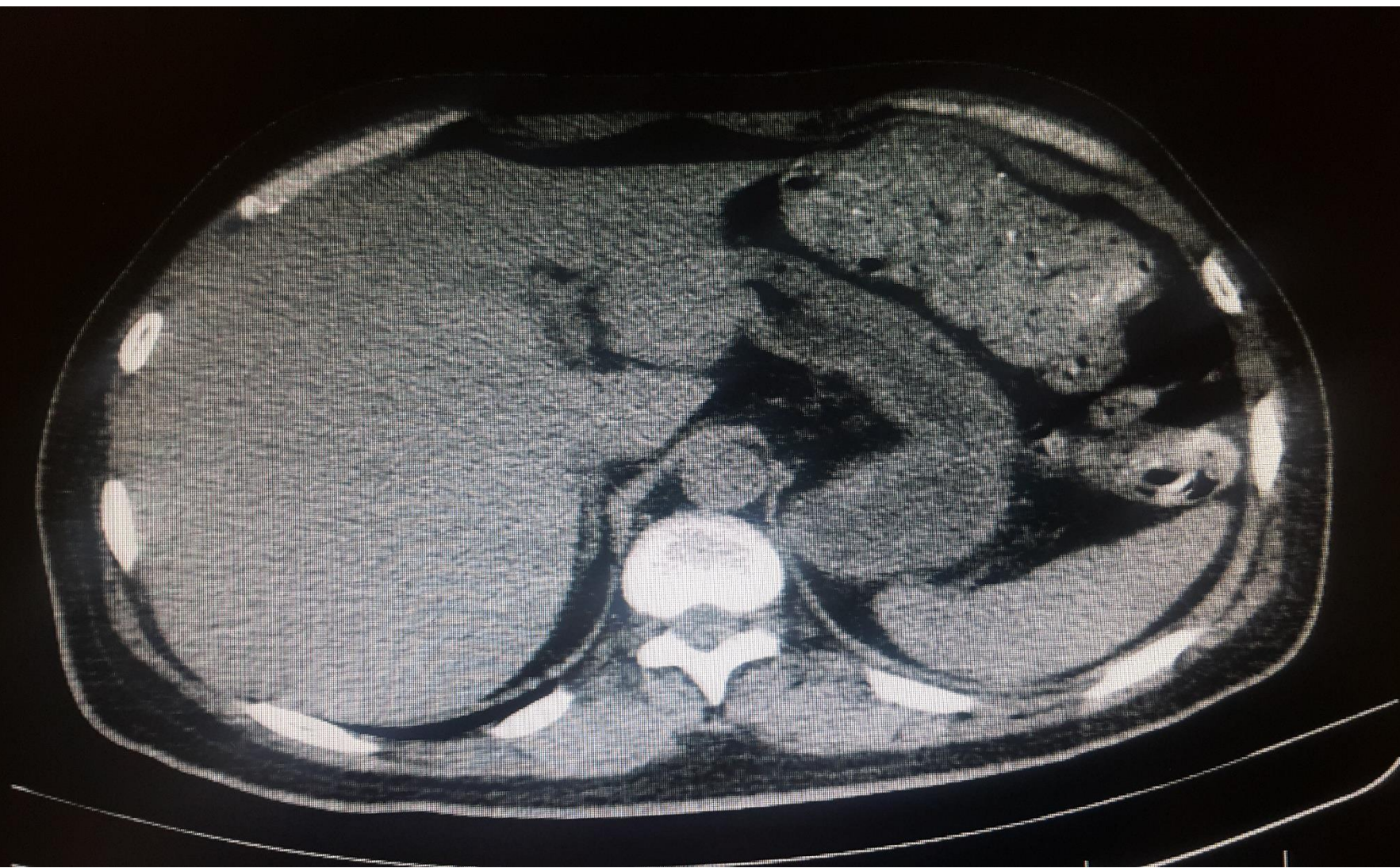
 - سم زدایی

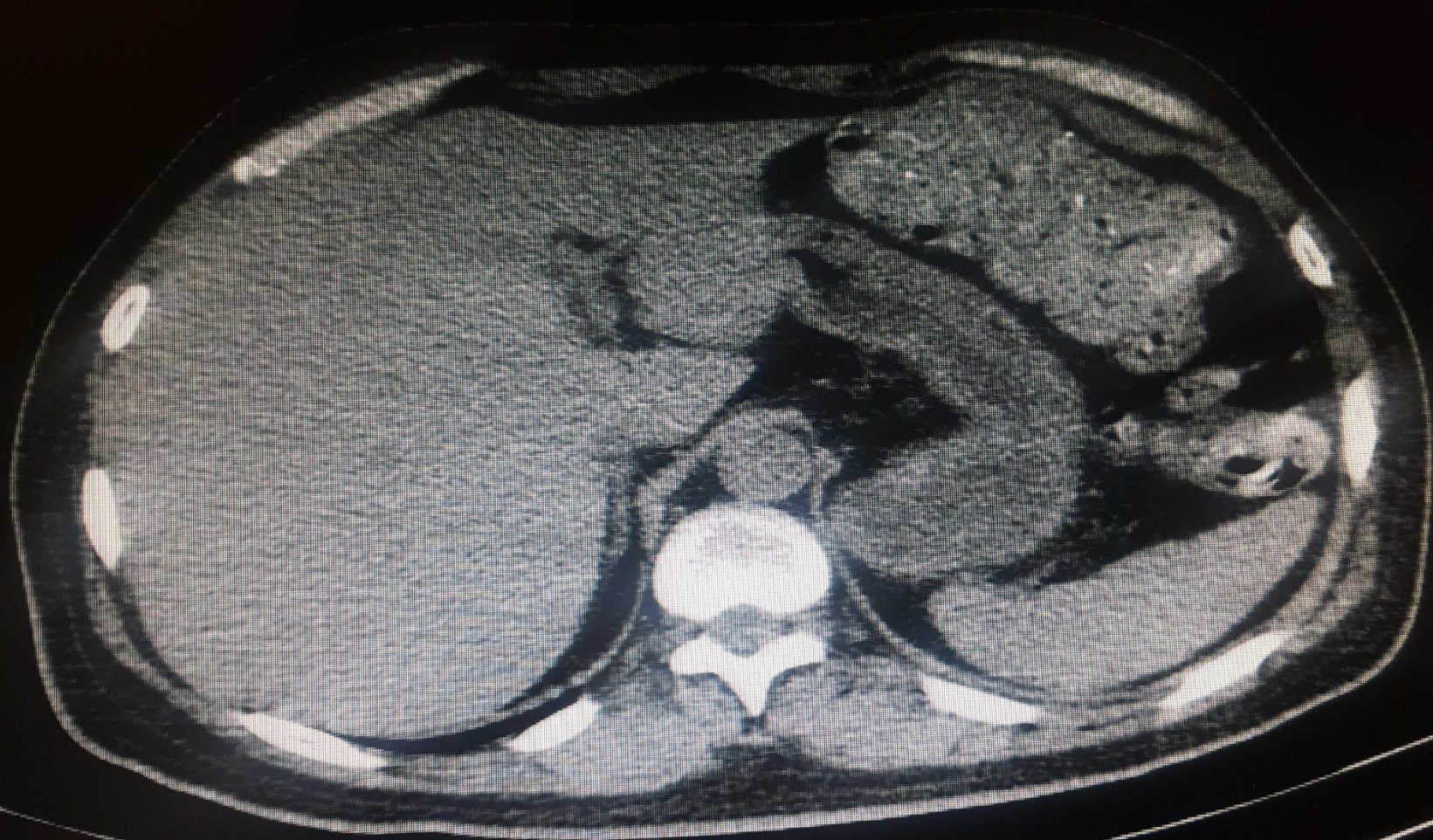
 - درمان یبوست

- درمان مسمومیت با سرب

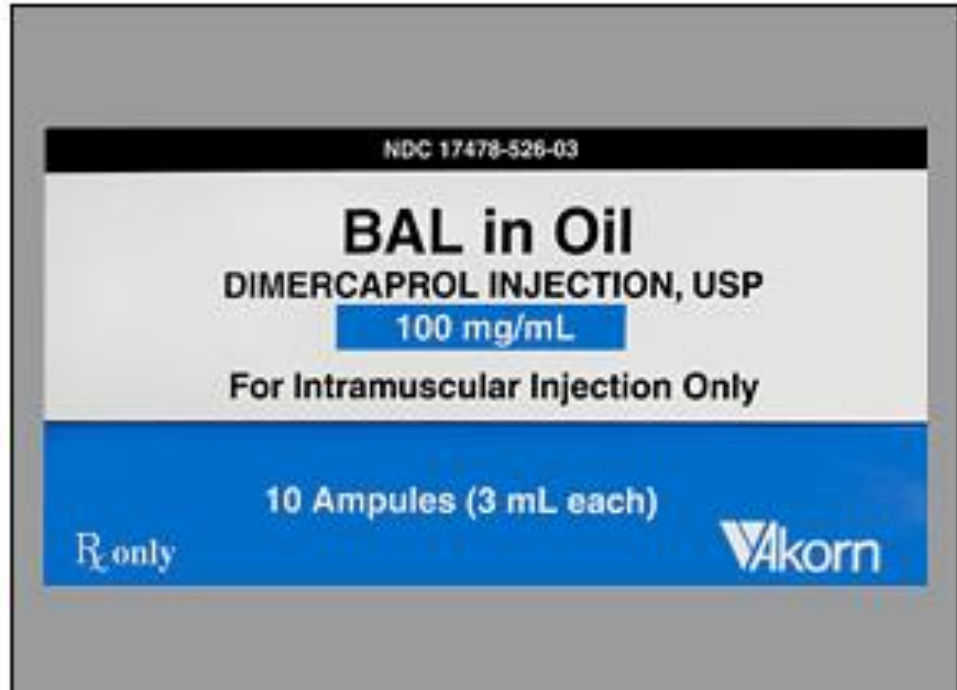


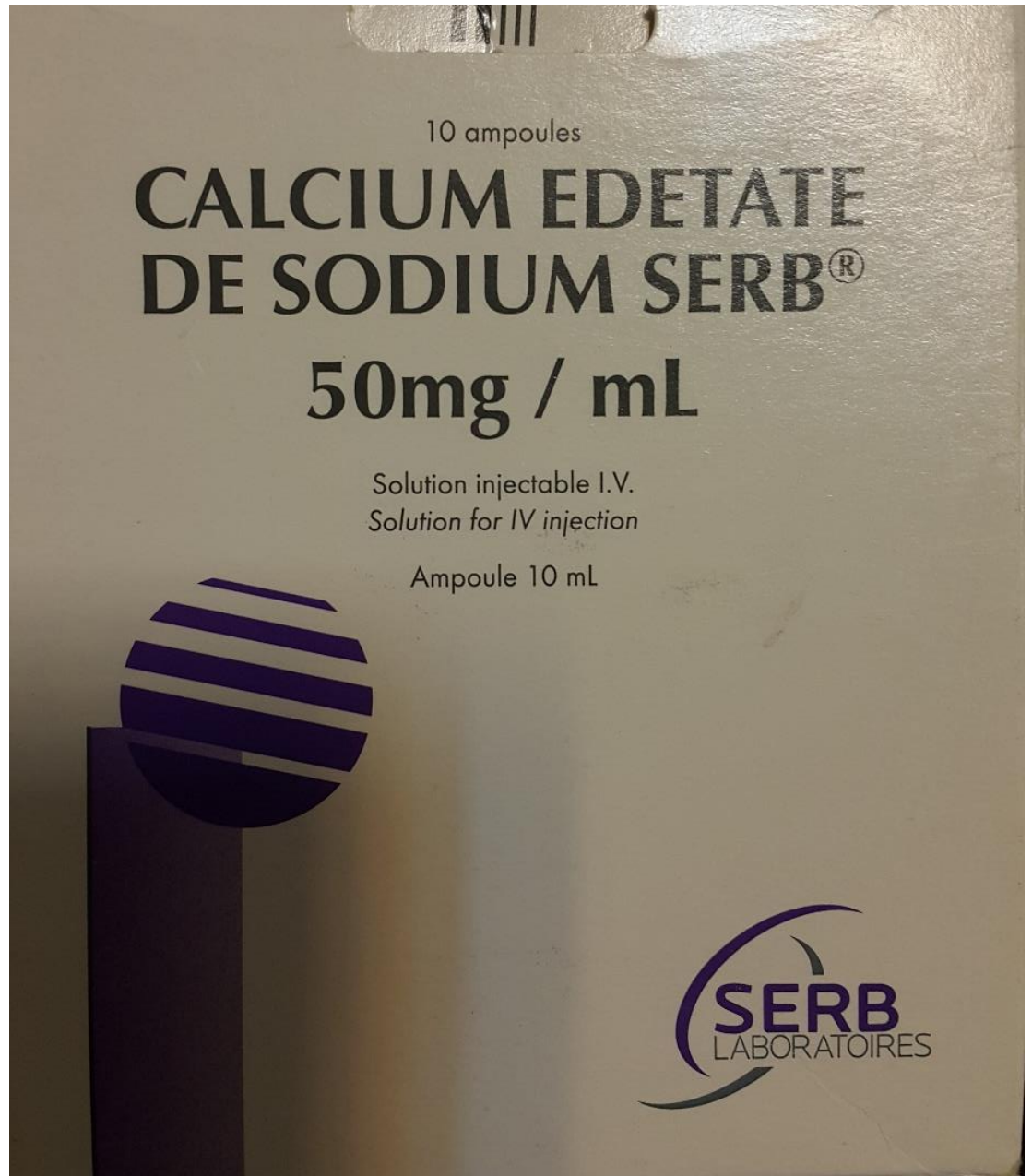






Treatment





10 ampoules

CALCIUM EDETATE DE SODIUM SERB[®]

50mg / mL

Solution injectable I.V.

Solution for IV injection

Ampoule 10 mL

SERB
LABORATOIRES

Thank you