

# A 64 Year-Old Male with Weakness and Back Pain



Meltem Zeytinoglu, MD

# History of the Present Illness



64 year-old, generally healthy, Black male presents with progressive weakness, new near complete inability to ambulate, and worsening back pain (unresponsive to NSAIDS) over the last 1-2 weeks.

Endocrine service is consulted for abnormal thyroid function tests.

# Pertinent History

## Past Medical History

Gout

Hypertension (x 2 years, 140s-150/90s, not on diet-control or medications)

## Past Surgical History

Right knee surgery for torn ligaments

## Social History

Bus-driver for school system

Lives with uncle and brother; has 1 healthy daughter and son

Denies tobacco, alcohol, or illicit drug use.

## Family History

None pertinent to presentation. Mother with dementia.

Negative for malignancy, coronary or cerebrovascular disease, diabetes, or thyroid disease

## Prior to Admission Medications

None

# Review of Systems

**Constitutional:** Denies fevers, chills, night sweats, weight change, hot or cold intolerance, or insomnia. **+weakness, fatigue over the last year.**

**HEENT:** Denies headaches, blurry vision, diplopia, tinnitus, rhinorrhea, neck swelling or mass, goiter. **Occasional hoarseness.**

**Cardiovascular:** Denies chest pain, palpitations, syncope, lower extremity edema.

**Respiratory:** Denies difficulty breathing or shortness of breath, cough, or wheezing.

**Gastrointestinal:** Denies changes in appetite, nausea, vomiting, abdominal pain, diarrhea, fecal incontinence, heartburn. **+Constipation- 1-2 bowel movements/wk in last few months.**

**Genitourinary:** Denies urinary incontinence, frequency, dysuria, burning with urination.

**Skin:** **+Increasing extreme dryness of skin over the last few months.** Denies diaphoresis, new rash, changes in hair or nails.

**Musculoskeletal:** **+Generalized weakness. Occasional myalgias.** Denies joint swelling.

**Neurological:** Denies numbness. No saddle anesthesia. **Mild paresthesias in bilateral feet (baseline).**

**Psychiatric/Behavioral:** Denies changes in mood including depression, sluggishness, anxiety, or restlessness.

All other systems reviewed and unremarkable except as noted.

# Physical Examination

BP 129/84 P 69 T 36.9 (97.9) R 18 O2 96% RA Wt 104.3 kg Ht 190.5 cm

**GENERAL:** Patient is in no acute distress, alert and oriented, **tired and weak-appearing.**

**HEENT:** EOMI. Oropharynx clear. **Mild macroglossia. Mucous membranes very dry. Facial puffiness.**

**NECK: Supple. Patient unable to flex neck.** Difficult to examine thyroid in patient position. Thyroid soft. There is no apparent goiter or thyromegaly.

**CV:** Regular rate and rhythm, without murmurs or gallops.

**RESP:** Good respiratory effort, clear to auscultation bilaterally with no wheezes or rales.

**ABD:** Soft, non-tender. **Distended abdomen. Bowel sounds present but hypoactive.**

**MSK:** Bilateral **1+ non-pitting edema.**

**NEURO:** **Delayed relaxation phase of biceps and patellar tendons.** Sensation intact to light touch. **Strength right LE 5/5, left LE 4/5.**

**SKIN:** No abnormality in pigmentation. **Slightly cool, marked dehydration, scaliness, and xerosis of skin.**

**PSYCH:** Patient cooperative and pleasant. **Affect is mildly depressed.**

# Diagnostic Evaluation

Glucose	74
Sodium	137
Potassium	3.9
Chloride	102
CO2	24
Anion Gap	11
BUN	24
Creatinine	1.9
GFR	36
Calcium	9.2
Albumin	3.3
Total Protein	8.3
T bili	0.3
Alk Phos	70
AST	31
ALT	10

WBC	6.4
HGB	8.7
HCT	26.4
PLT	312

TSH	308.6

# Diagnostic Evaluation



<b>TSH</b>	308.6
<b>FT4</b>	0.11
<b>T3</b>	28
<b>Reverse T3</b>	< 25
<b>TPO Ab</b>	30
<b>Thyroglobulin Ab</b>	3.4

# Diagnostic Evaluation

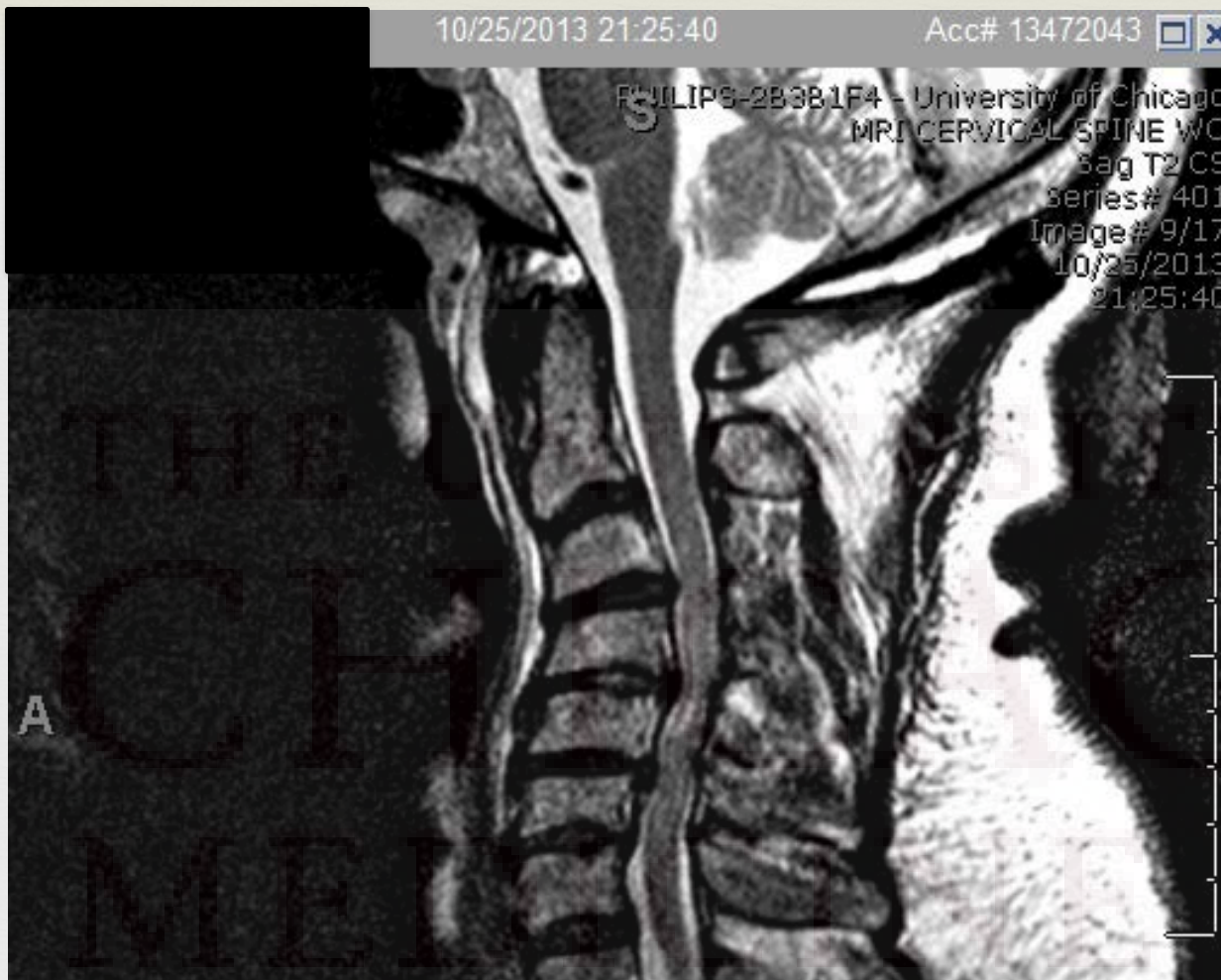


	MRI SPINE
<b>Cervical</b>	Loss of normal cervical lordosis with focal kyphosis about the C4 vertebral body secondary to degenerative spondylosis. Multilevel mild vertebral endplate deformities. Vertebral body heights otherwise intact. <b>Prominent posterior disc-osteophyte complexes at the C3/4, C4/5, C5/6 result in moderate to severe central spinal canal stenosis with impingement upon the spinal cord which displays findings consistent with myelomalacia.</b>
<b>Lumbar</b>	<p>L2/L3 demonstrates mild degenerative disk disease and degenerative changes of posterior elements. There is mild central cala spinal stenosis and bilateral neural foraminal compromise.</p> <p>L3/L4 demonstrate advanced degenerative disk disease with resultant loss of intervertebral disk height and mild bilateral facet and ligamentum flavum hypertrophic changes. Mild central spinal stenosis and moderate bilateral neural formainal compromise.</p> <p>L4/L5 demonstrates mild degenerative disk diseased degenerative changes of posterior elements. No central spinal stenosis. Mild bilateral neural foraminal compromise.</p> <p>L5/S1 demonstrates moderate disk disease with slight loss of disk height and minimal degenerative changes of facets and ligamentum flavum. No central spinal stenosis or any significiant neural foraminal compromise.</p>

10/25/2013 21:25:40

Acc# 13472043

PHILIPS-2B3B1F4 - University of Chicago  
MRI CERVICAL SPINE WO  
Sag T2 CS  
Series# 401  
Image# 9/17  
10/25/2013  
21:25:40



Neurosurgery Service Recommends:  
Urgent three-level (C3-6) posterior anterior cervical disectomy

ETL 25  
FA 90.0  
Matrix 276 x 275  
FOV 220.0 mm

Gap 3.80  
3.50 mm  
Zoom 114.3%  
www/wl 491/337

# Clinical Questions



1. Is there a proper way to classify severity of hypothyroidism?
2. Can this patient's hypertension, anemia, and renal failure be explained by hypothyroidism?
3. Should hypothyroid patients undergo non-emergent surgical procedures

# Physical Examination



BP 129/84 P 69 T 36.9 (97.9) R 18 O2 96% RA

**GENERAL:** Patient is in no acute distress, **tired and weak-appearing.**

**HEENT:** EOMI. Oropharynx clear. **Mild macroglossia. Mucous membranes very dry. Facial puffiness.**

Characteristic features of severe hypothyroidism or myxedema: severely depressed mental status or seizure, hypothermia, bradycardia, hyponatremia, worsening of heart failure, hypopnea.

**NECK:** Alert and oriented x3. **Delayed relaxation phase of deeps and patellar tendons.** Sensation intact to light touch. **Strength** right LE 5/5, left LE 4/5.

**SKIN:** No abnormality in pigmentation. Warm, **marked dehydration, scaliness, and xerosis of skin.**

**PSYCH:** Patient cooperative and pleasant. **Affect is mildly depressed.**

## Clinical Practice Guidelines for Hypothyroidism in Adults: Cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association

Jeffrey R. Garber,<sup>1,2,\*</sup> Rhoda H. Cobin,<sup>3</sup> Hossein Gharib,<sup>4</sup> James V. Hennessey,<sup>2</sup> Irwin Klein,<sup>5</sup>  
Jeffrey I. Mechanick,<sup>6</sup> Rachel Pessah-Pollack,<sup>6,7</sup> Peter A. Singer,<sup>8</sup> and Kenneth A. Woeber<sup>9</sup>

for the American Association of Clinical Endocrinologists and American Thyroid Association  
Taskforce on Hypothyroidism in Adults

### ***What is the role of clinical scoring systems in the diagnosis of patients with hypothyroidism?***

#### **■ RECOMMENDATION 5**

Clinical scoring systems should not be used to diagnose  
hypothyroidism. **Grade A, BEL 1**

*SEE: Signs and symptoms of hypothyroidism; Other diagnostic  
tests for hypothyroidism*

# Diagnostic Evaluation & Management - By Systems



## CARDIOVASCULAR

1. Decreased heart rate and contractility → decreased cardiac output
2. Decreased systolic and diastolic heart function
3. Increased peripheral vascular resistance  
→ hypertension
4. Glycosaminoglycan deposition + increased capillary permeability → accumulation of fluid in extracellular space → Non-pitting edema
5. EKG changes  
→ bradycardia, nonspecific ST changes

### EKG

Sinus rhythm with occasional PVCs.  
Moderate left ventricular hypertrophy by voltage criteria.  
Non-specific T-wave abnormality – anterolateral ischemia?

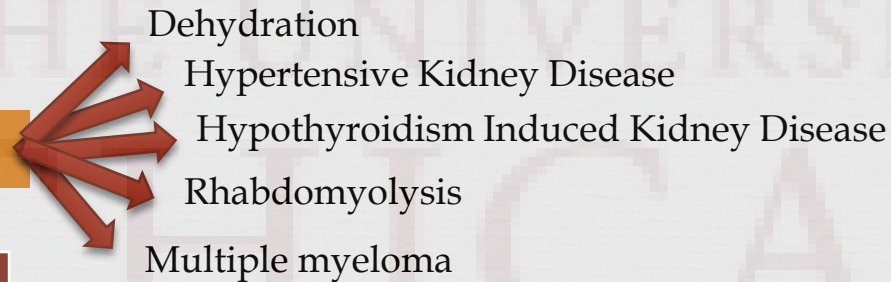
### ECHOCARDIOGRAM

1. Left ventricle is mildly dilated.
2. Mild to moderate left ventricular hypertrophy.
3. Left ventricular performance is moderately reduced (44%).
4. Global LV systolic dysfunction Right ventricle is upper normal in size and performance is normal.
5. **There is no pericardial effusion.**
6. Mild mitral regurgitation
7. Trace aortic regurgitation

# Diagnostic Evaluation & Management – By Systems



## RENAL



### Fractional Excretion of Sodium

1.41

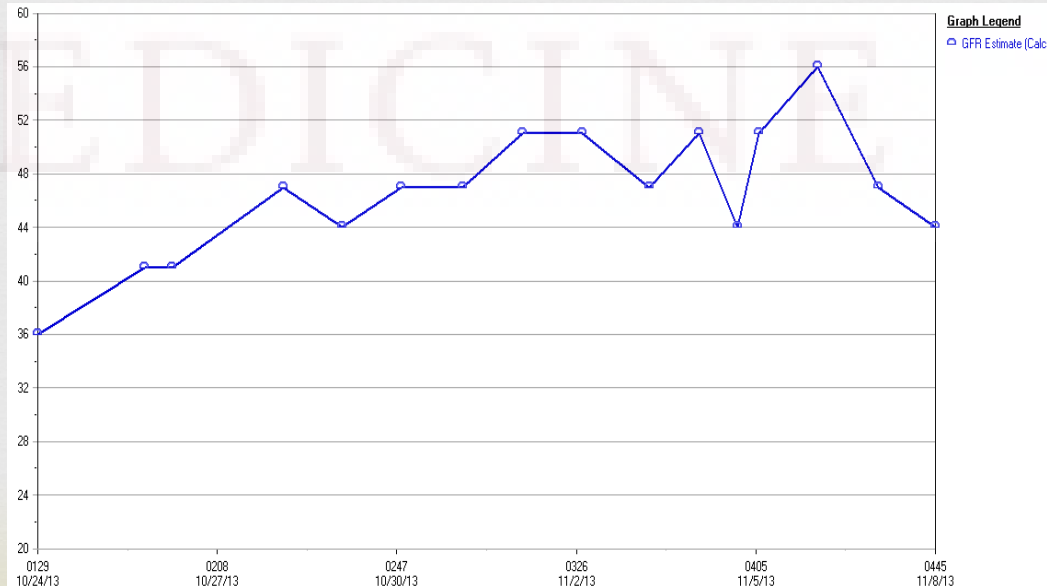
### Renal Ultrasound

Echotexture bilaterally is consistent with medical renal disease.

### Nephrology Service Assessment

Patient likely has CKD stage 3 secondary to hypertension

1. Reduction in renal blood flow and diminished GFR.
2. Reduced free water clearance, decreased sodium absorption  
→ hyponatremia
- 3



# Changes in Renal Function in Primary Hypothyroidism

**Table 1. Clinical Data in Patients With Primary Hypothyroidism at Baseline and After 2 Months of Thyroid Hormone Replacement**

Parameter	Pretreatment	Posttreatment	Probability Value
TSH ( $\mu$ U/mL)	114 $\pm$ 11	3.8 $\pm$ 0.8	<0.05
T <sub>4</sub> (ng/mL)	1 $\pm$ 0.12	4.3 $\pm$ 1.1	<0.05
Hemoglobin (g/L)	12 $\pm$ 0.2	13.6 $\pm$ 0.22	<0.05
MCV (fL)	95 $\pm$ 1	89 $\pm$ 10	<0.05
Serum cholesterol (mg/dL)	280 $\pm$ 17	217 $\pm$ 10	<0.05
Serum triglycerides (mg/dL)	147 $\pm$ 19	99 $\pm$ 6	<0.05
Serum creatinine (mg/dL)	1.16 $\pm$ 0.04	0.87 $\pm$ 0.02	<0.05
Blood urea (mg/dL)	47 $\pm$ 4	38 $\pm$ 2	<0.05
Na (mEq/L)	136 $\pm$ 0.8	140 $\pm$ 0.5	<0.05
Cl (mEq/L)	99 $\pm$ 0.8	101 $\pm$ 0.3	NS
Creatinine clearance (mL/min)	62 $\pm$ 4	90 $\pm$ 3	<0.05
SBP (mm Hg)	119 $\pm$ 5	128 $\pm$ 4	NS
DBP (mm Hg)	71 $\pm$ 3	77 $\pm$ 2	NS
Heart rate (beats/min)	61 $\pm$ 3	74 $\pm$ 1	<0.05
Inverted T wave	28%	0%	<0.05
Flat T wave	50%	1%	<0.05
Weight (kg)	74 $\pm$ 2	65 $\pm$ 2	<0.05
Edema	89%	3%	<0.05

Abbreviations: MCV, mean corpuscular volume; SBP, systolic blood pressure; DBP, diastolic blood pressure.

# Diagnostic Evaluation & Management – By Systems



## MUSCULOSKELETAL

Spectrum:  
Asymptomatic serum CK elevation  
Cramps and Myalgias  
Disabling proximal muscle weakness  
Increased prevalence of hyperuricemia  
and gout

<b>Creatine Kinase</b>	1210

<b>Uric Acid</b>	7.2 Range 2.0-8.0

# Diagnostic Evaluation & Management – By Systems

## HEMATOLOGIC

Squizzato *et al.* • Thyroid Hormones and Coagulation

J Clin Endocrinol Metab, July 2007, 92(7):2415–2420 2419

**TABLE 4.** Overall coagulation and fibrinolytic changes in medium quality studies (23, 28, 29, 36, 41, 42, 49–51)

	No. of studies	Hypo	Hyper	Sub. hypo	Sub. hyper
General hemostatic tests					
Bleeding time	4	↑	↓	=	
aPTT	2	↑		=	
PT	2	↑		=	
Clotting time	2	↑		=	
Prothrombin fragment 1–2	1		=		
Coagulation tests					
fVIII:C	4	↓ or =		↓	
vWf:Ag	6	↓	↑ or =		
vWf:C	2	↓			↑
vWf:Ag	1		↑		
vWf ristocetin	2	↓		↓	
Fibrinogen	6	↓ or =	↑ or =		↑
Ristocetin agglutination	2	↓	=		
Fibrinolytic tests					
t-PA:Ag	2		↑ or =		
t-PA:C	1		=		
PAI-1	2		↑ or =		
Plasminogen	1		↓		
α 2 antiplasmin	1		↑		
Plasmin-antiplasmin complex	1		=		

hypo, Hypothyroidism; hyper, hyperthyroidism; sub, subclinical; aPTT, activated partial thromboplastin time; PT, prothrombin time; f, factor; C, activity, Ag, antigen; vWf, von Willebrand factor; t-PA, tissue plasminogen activator; PAI-1, plasminogen activator inhibitor 1; ↑, increased; ↓, decreased; =, nonstatistically significant difference.

PT	15.0 (11.8-14.5 sec)
INR	1.2
PTT	38.4 (24-34 sec)

# Diagnostic Evaluation & Management – By Systems



## ENDOCRINE

<b>TSH</b>	308.6
<b>FT4</b>	0.11
<b>T3</b>	28
<b>Reverse T3</b>	< 25
<b>TPO Ab</b>	30
<b>Thyroglobulin Ab</b>	3.4

<b>Total Cholesterol</b>	183
<b>LDL</b>	114
<b>HDL</b>	43
<b>Triglycerides</b>	132

<b>Cortisol (09:50)</b>	29.2

# Peri-Operative Management of Patients with Hypothyroidism



Hypometabolic state caused by hypothyroidism can result in many changes which can effect peri-op outcome.

1. Hypoventilation and reduced pulmonary response to hypoxia and hypercapnia.
2. Decreased cardiac output. Demand on heart can also be increased by anemia in hypothyroidism.
3. Coagulopathies
4. Impaired glomerular filtration and decreased clearance of some medications.
5. In severe cases, precipitation of myxedema coma.

# Outcomes in Surgical Hypothyroid Patients

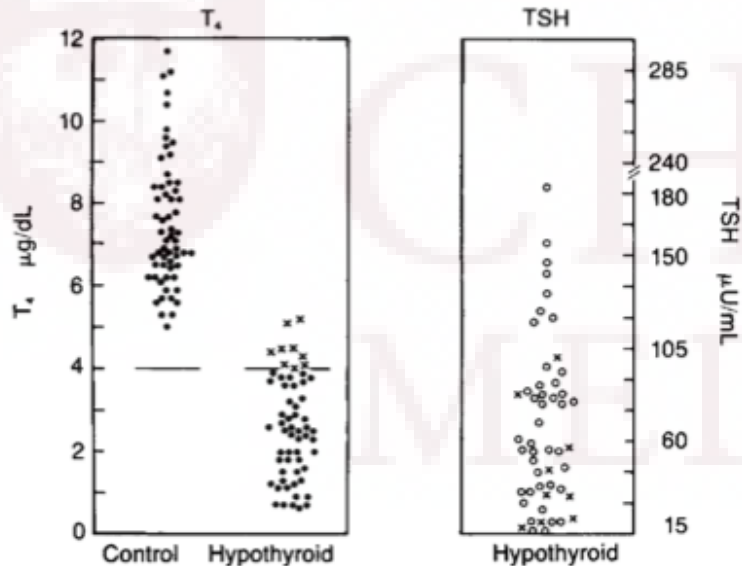


Fig 1.—Distribution of thyroxine ( $T_4$ ) and thyrotropin (TSH) values among hypothyroid and euthyroid patients ( $n = 118$ ). Values marked by x on hypothyroid  $T_4$  panel have their corresponding TSH values marked by x on TSH panel. No TSH levels were measured in euthyroid patients.

59 hypothyroid patients matched with 59 controls.

No significant difference in pre-op risk factors except in the number of hypertensive patients.

No differences in:

- Duration of surgery or anesthesia
- Lowest temperature and BP
- Time to extubation
- Fluid and electrolyte imbalances
- Incidence of arrhythmias
- Incidence of MI or CVA
- Bleeding complications\*
- Need for post-op respiratory assistance
- Time to hospital discharge

# Complications of Surgery in Hypothyroid Patients

Retrospective analysis of 40 hypothyroid patients undergoing elective or semi-elective cardiac/non-cardiac procedures .

80 controls were matched (2:1) to age, sex, operative procedure, pre-operative anesthetic risk class, and anesthetic agent use.

Mean TSH of 99  $\mu$ U/ml. Only two patients classified as having "severe hypothyroidism."

**TABLE III Outcomes in Hypothyroid and Control Patients**

Parameters	Cardiac		Noncardiac		Combined	
	Hypothyroid	Control	Hypothyroid	Control	Hypothyroid	Control
<b>Perioperative complications (percent)</b>						
Intubation problem	6	6	13	2	10	4
Hypotension	41	59	61	30*	53	43
Arrhythmia	53	26	17	11	33	18
Heart failure	29	6*	9	2	18	4†
Hypothermia	6	6	9	2	8	4
Tissue integrity	12	0	0	0	5	0
Anesthetic recovery	14	0*	9	4	11	3
Blood loss >400 ml	—	—	22	24	—	—
<b>Postoperative complications (percent)</b>						
Hyponatremia	65	65	39	28	50	44
Abnormal healing	14	15	0	0	5	6
Infection	53	38	26	28	38	33
Fever	59	100†	17	63‡	35	79‡
Pulmonary	93	79	13	13	43	41
Cardiovascular	29	38	17	7	22	20
Neuropsychiatric	50	24	30	13*	38	18†
Gastrointestinal	31	0†	13	2	19	1†
Deaths (percent)	18	3	4	4	10	6
<b>Postoperative hospitalization (days)</b>						
Intensive care	2 (1-9)	2 (0-10)	0 (0-1)	0 (0-1)	0 (0-9)	0 (0-10)
Total	16 (10-69)	15 (10-48)	13 (5-68)	10 (4-59)	14 (5-69)	13 (4-59)

\* p < 0.05, † p < 0.02, ‡ p < 0.001, Mantel-Haenszel chi-square statistic.  
Values are median with range in parentheses

Ladenson PW, et al. Complications of surgery in hypothyroid patients. Am Jour Med. 1984;77:261-266.

## **Clinical Practice Guidelines for Hypothyroidism in Adults: Cosponsored by the American Association of Clinical Endocrinologists and the American Thyroid Association**

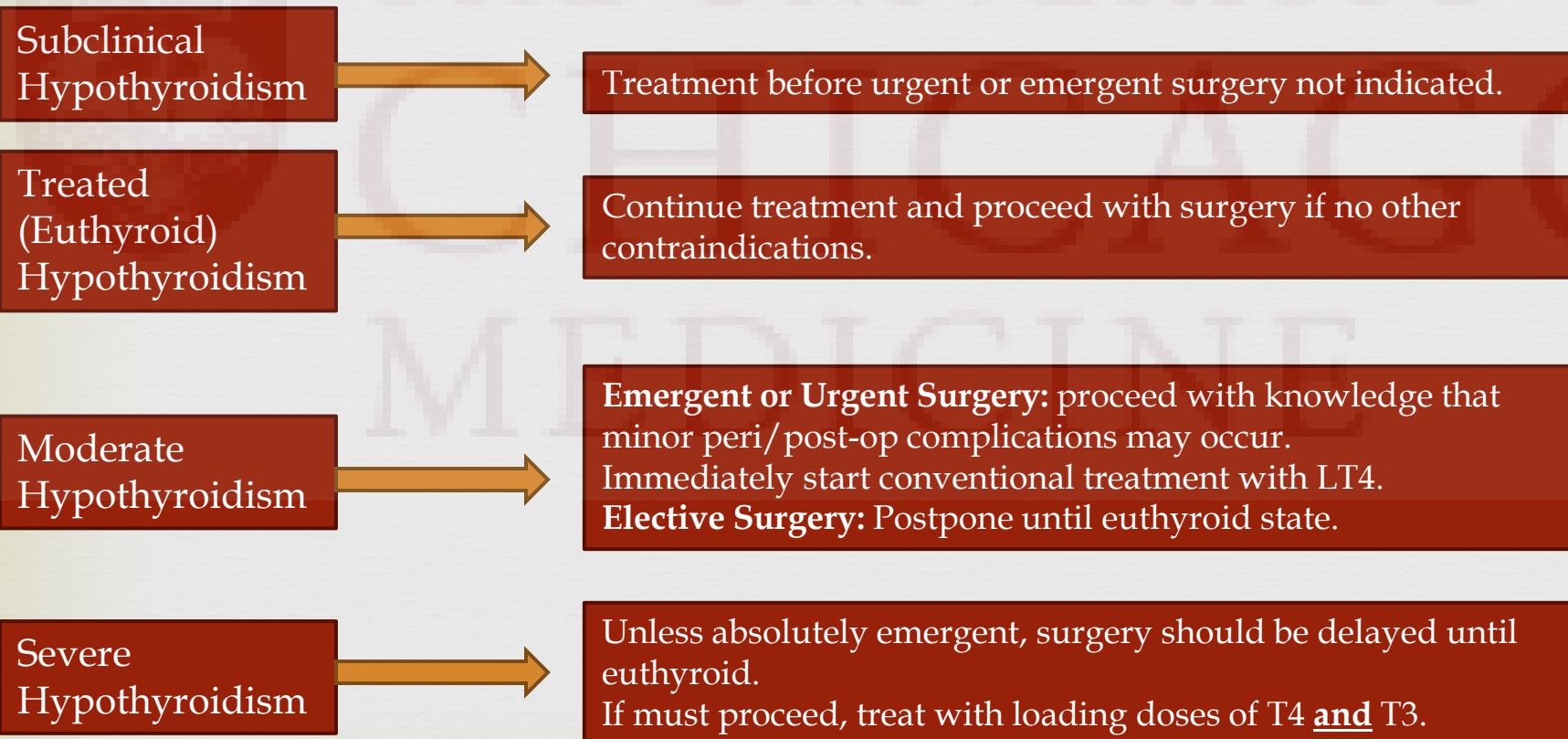
Jeffrey R. Garber,<sup>1,2,\*</sup> Rhoda H. Cobin,<sup>3</sup> Hossein Gharib,<sup>4</sup> James V. Hennessey,<sup>2</sup> Irwin Klein,<sup>5</sup>  
Jeffrey I. Mechanick,<sup>6</sup> Rachel Pessah-Pollack,<sup>6,7</sup> Peter A. Singer,<sup>8</sup> and Kenneth A. Woeber<sup>9</sup>

for the American Association of Clinical Endocrinologists and American Thyroid Association  
Taskforce on Hypothyroidism in Adults

and maintain the patient angina-free. Emergency coronary artery bypass grafting in patients with unstable angina or left main coronary artery occlusion may be safely performed while the patient is still moderately to severely hypothyroid (179,180) but elective cases should be performed after the patient has become euthyroid.

# Surgical Pearls

Unless history and physical exam suggest thyroid disease, routine screening for thyroid disease is not recommended during the pre-operative evaluation.



# Surgical Pearls



In patients with evidence of central hypothyroidism and secondary adrenal insufficiency; or, patients with autoimmune hypothyroidism, who could have primary adrenal insufficiency, must consider the risk of stress-triggered adrenal crisis.

**Test HPA axis or give stress steroids until axis integrity can be confirmed.**

Administration of sedatives and narcotics can precipitate myxedema coma in a patient with severe hypothyroidism.

**Appropriate supportive measures in all cases:**

Mechanical ventilation, fluid replacement, correction of metabolic derangements, judicious warming protocol\*, etc.

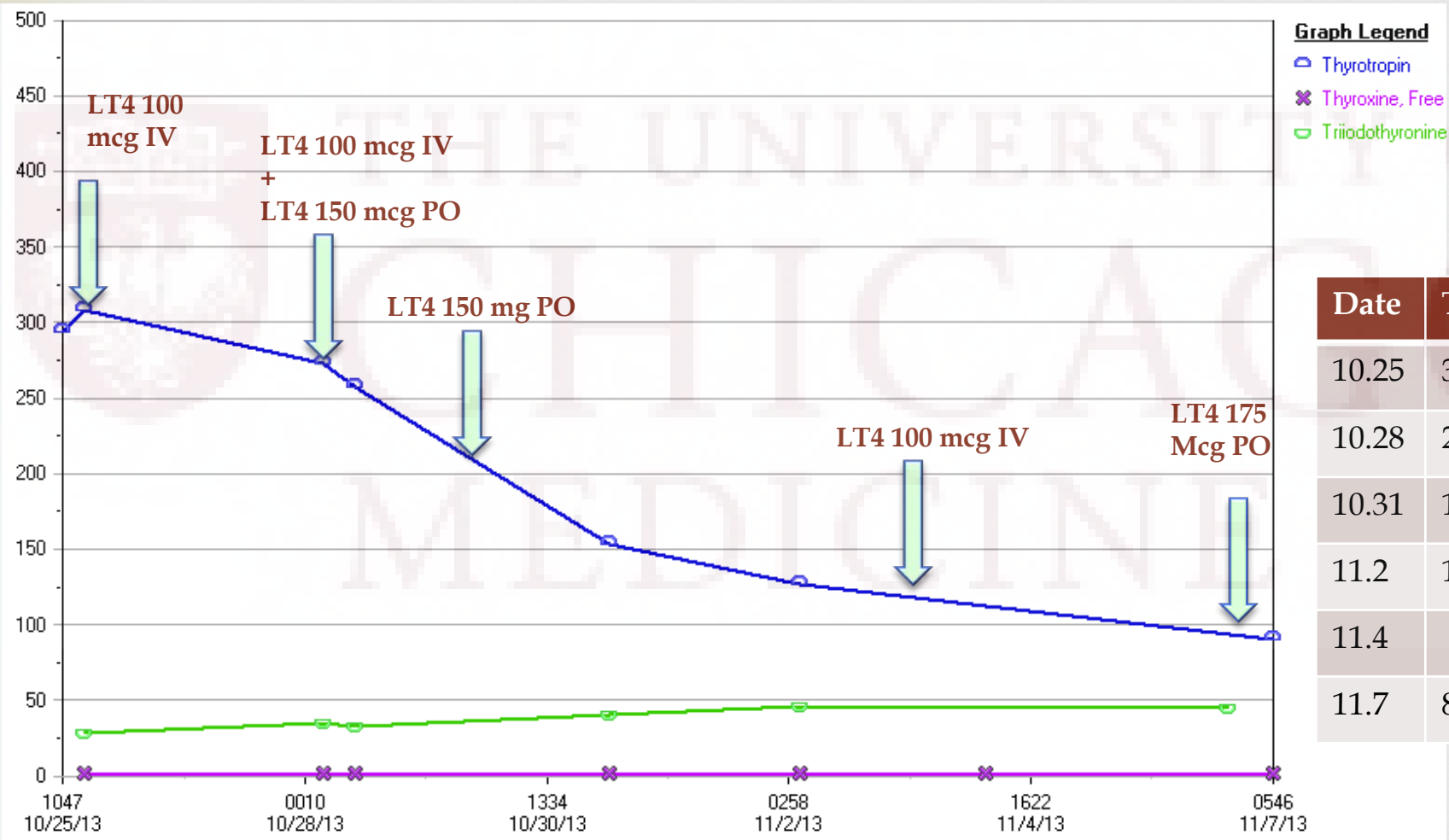
# Surgical Pearls



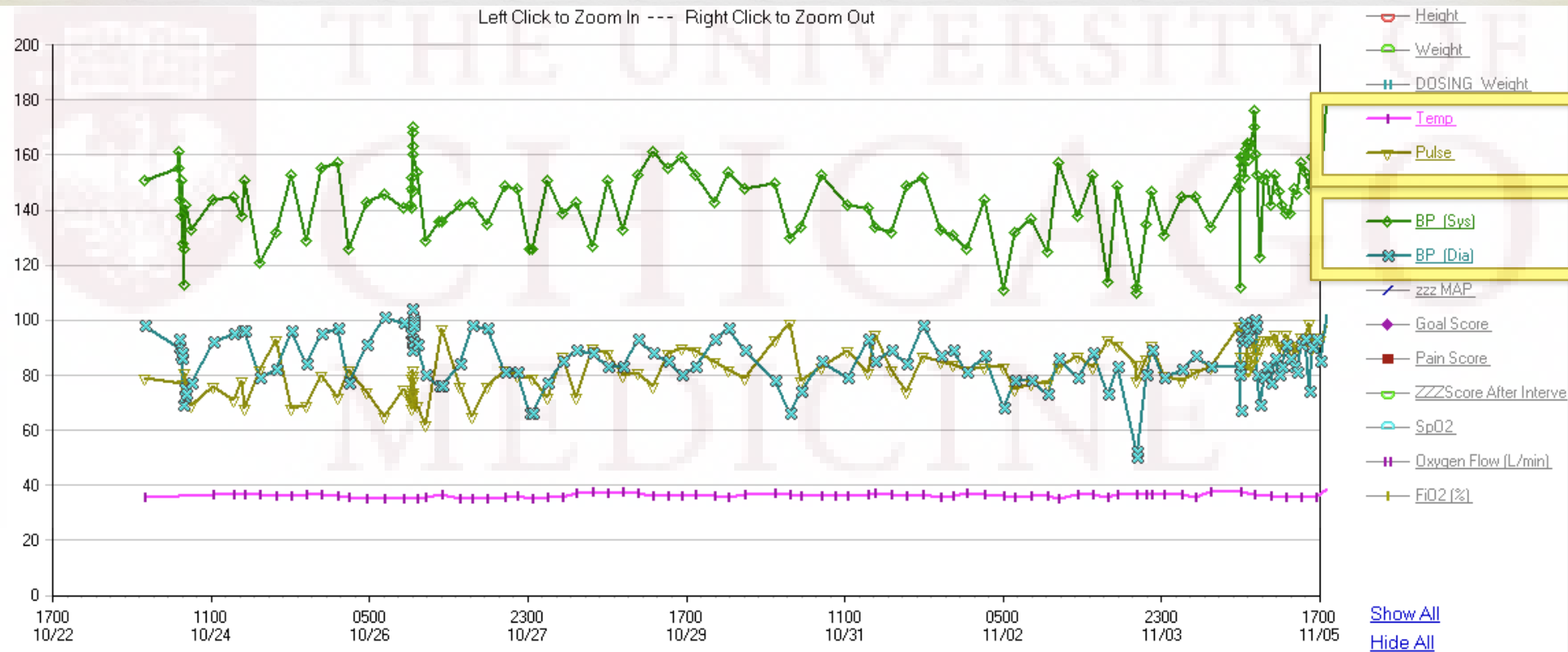
Proper cardiac evaluation (EKG, ECHO) in a hypothyroid patient is critical. Presence of impaired cardiac function (systolic or diastolic) can impact the choice of anesthetic.

Respiratory depression from decreased ventilatory drive and respiratory muscle weakness, hypothermia, and delayed clearance of anesthetics and opioids can all delay emergence from sedation

# Patient's Clinical Course



# Course Vitals



# Clinical Risk Assessment

## ASSESSMENT/PLAN

Relevant labs, studies, and consultations review  
**ASA Physical Status: 3**

**Planned anesthetic:** general - Will f/u repeat t  
 severe cervical stenosis. Pt is at risk for delaye  
 depression of ventilatory response to hypoxia a  
 extension and poor dentition, would consider s

**Induction plan:** intravenous

**Maintenance plan:** inhalational

**Airway plan:** ETT - Beard, large tongue, neck n  
 Planned lines & monitors: arterial line

**Post-op analgesia:** IV

Other techniques considered: post-op ICU and

**Informed Consent:** Risks and benefits of anes

Use of blood products discussed with: patient

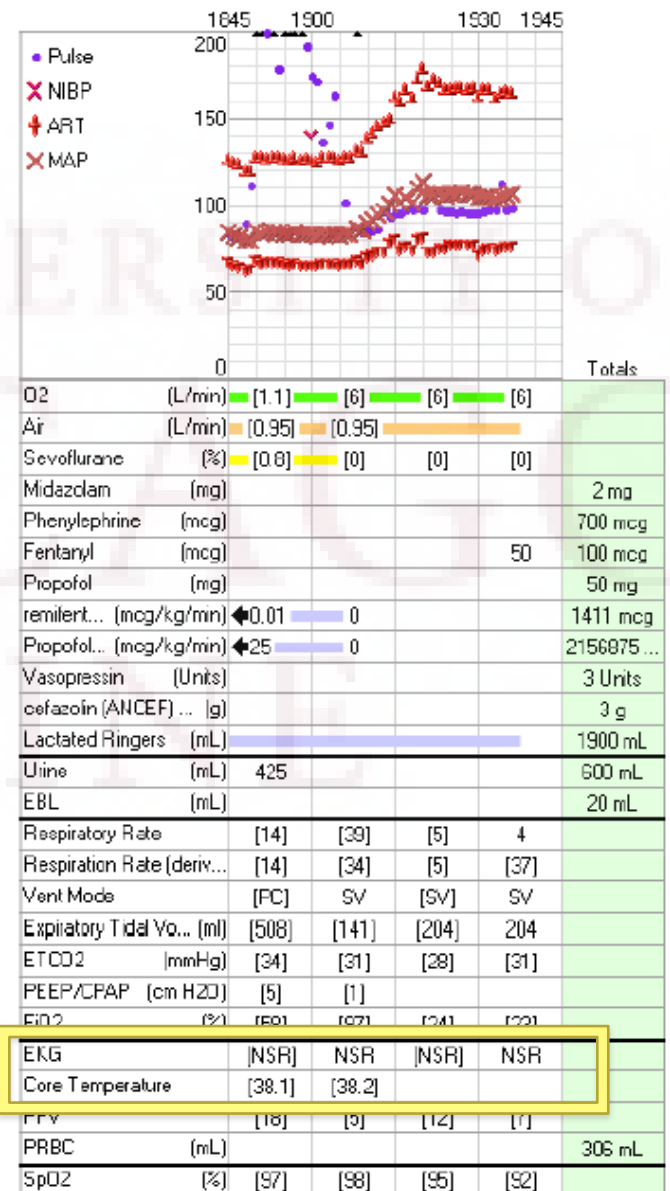
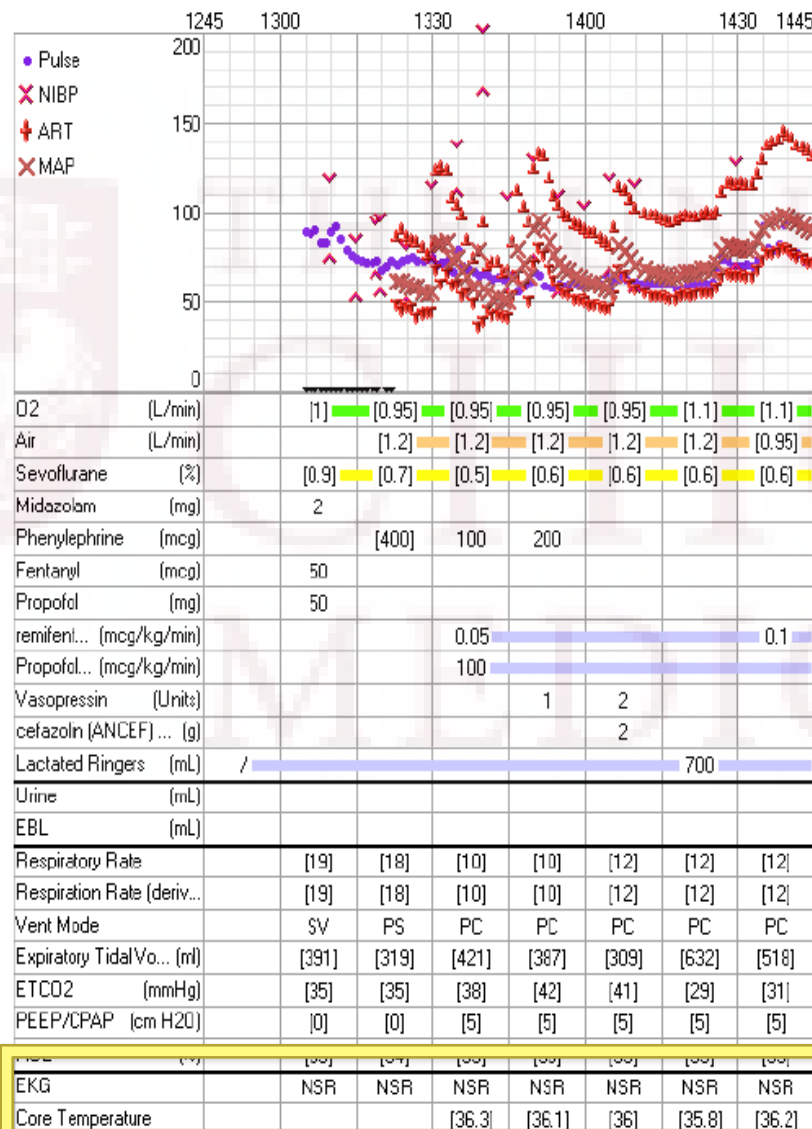
## ASA Physical Status (PS) Classification System\*:

ASA PS Category	Preoperative Health Status	Comments, Examples
ASA PS 1	Normal healthy patient	No organic, physiologic, or psychiatric disturbance; excludes the very young and very old; healthy with good exercise tolerance
ASA PS 2	Patients with mild systemic disease	No functional limitations; has a well-controlled disease of one body system; controlled hypertension or diabetes without systemic effects, cigarette smoking without chronic obstructive pulmonary disease (COPD); mild obesity, pregnancy
ASA PS 3	Patients with severe systemic disease	Some functional limitation; has a controlled disease of more than one body system or one major system; no immediate danger of death; controlled congestive heart failure (CHF), stable angina, old heart attack, poorly controlled hypertension, morbid obesity, chronic renal failure; bronchospastic disease with intermittent symptoms
ASA PS 4	Patients with severe systemic disease that is a constant threat to life	Has at least one severe disease that is poorly controlled or at end stage; possible risk of death; unstable angina, symptomatic COPD, symptomatic CHF, hepatorenal failure
ASA PS 5	Moribund patients who are not expected to survive without the operation	Not expected to survive > 24 hours without surgery; imminent risk of death; multiorgan failure, sepsis syndrome with hemodynamic instability, hypothermia, poorly controlled coagulopathy
ASA PS 6	A declared brain-dead patient who organs are being removed for donor purposes	

\*ASA PS classifications from the American Society of Anesthesiologists

# Surgical Outcome

Intraprocedure Grid/Graph



# Conclusions



1. Thorough systemic historical, physical, and biochemical evaluation is needed to gauge the severity of a patient's hypothyroidism. Clinical scoring systems should not be used.
2. Extensive systemic effects of untreated hypothyroidism involving cardiovascular, respiratory, hematologic, renal organ systems can effect the peri-operative management of surgical patients.
3. In untreated, hypothyroid patients, non-emergent procedures should be delayed until euthyroid status can be achieved. However, with adequate supportive measures and appropriate planning, even severely hypothyroid patients can undergo emergent procedures with safe outcomes.

# EXTRA SLIDES



THE UNIVERSITY OF  
CHICAGO  
MEDICINE



**ABSTRACT:** Although serum creatine kinase (CK) levels are frequently modestly elevated in patients with hypothyroid myopathy, elevations in serum CK to the levels usually seen in inflammatory myopathies or dystrophies are rare. We report a patient with progressive proximal weakness and a serum CK level of over 29,000 IU/L, in whom subsequent laboratory evaluation identified profound hypothyroidism. Thyroid hormone replacement therapy resulted in resolution of clinical symptoms and a marked reduction in the serum CK level. Such a high serum CK level in a patient with hypothyroidism underscores the importance of assessing thyroid function in patients with weakness, regardless of serum CK levels, even when systemic symptoms and signs of hypothyroidism are minimal or absent.

© 2002 Wiley Periodicals, Inc. *Muscle Nerve* 26: 141–144, 2002

## HYPOTHYROID MYOPATHY WITH A STRIKINGLY ELEVATED SERUM CREATINE KINASE LEVEL

KEVIN R. SCOTT, MD,<sup>1</sup> ZACHARY SIMMONS, MD,<sup>1</sup> and PHILIP J. BOYER, MD, PhD<sup>2</sup>

<sup>1</sup> Division of Neurology, Penn State College of Medicine, Hershey Medical Center, 500 University Drive, Hershey, Pennsylvania 17033, USA

<sup>2</sup> Departments of Pathology and of Neuroscience and Anatomy, Penn State College of Medicine, Hershey Medical Center, Hershey, Pennsylvania, USA

**Table 1.** Serial creatine kinase values and thyroid function tests.

Time in relation to treatment for hypothyroidism	Serum levels		
	Creatine kinase (IU/L) (normal 0–180)	Thyroid stimulating hormone (μIU/ml) (normal 0.35–5.5)	Free thyroxine (ng/dl) (normal 0.7–1.8)
4 months before	29,160		
1 month before	21,873	>100.0	<0.40
3 months after	861	47.17	
5 months after	837	90.48	
7 months after	492	5.79	1.34

**TABLE 2** Comparison of FT<sub>3</sub>, FT<sub>4</sub>, TSH, and CK levels and age between overt and subclinical hypothyroidism patients

	Overt hypothyroidism (n = 28)	Subclinical hypothyroidism (n = 38)	<i>p</i> value
FT <sub>3</sub> (2.3–4.2 pg/ml)	1.30 ± 0.74	2.68 ± 0.70	0.001
FT <sub>4</sub> (0.89–1.76 ng/dl)	0.43 ± 0.11	0.98 ± 0.01	0.001
TSH (0.35–5.50 µU/ml)	102.14 ± 53.61	15.80 ± 10.11	0.0001
CK (38–174 U/L)	716.51 ± 182.82	115.13 ± 70.92	0.0001

**TABLE 3** Comparison of FT<sub>3</sub>, FT<sub>4</sub>, TSH, and CK levels and age between overt hypothyroidism patients and controls

	Overt hypothyroidism (n = 28)	Control group (n = 30)	<i>p</i> value
FT <sub>3</sub> (2.3–4.2 pg/ml)	1.30 ± 0.74	3.01 ± 0.52	0.001
FT <sub>4</sub> (0.89–1.76 ng/dl)	0.43 ± 0.11	1.18 ± 0.17	0.001
TSH (0.35–5.50 µU/ml)	102.14 ± 53.61		
CK (38–174 U/L)	716.51 ± 182.82		

*Endocrine Research*, 31(3):171–175, (2005)  
 Copyright © 2005 Taylor & Francis, Inc.  
 ISSN 0743-5800 print/1532-4206 online  
 DOI: 10.1080/07435800500371706



## SERUM CREATINE KINASE LEVELS IN OVERT AND SUBCLINICAL HYPOTHYROIDISM

**Zeliha Hekimsoy** □ *Celal Bayar University, Medical Faculty, Department of Internal Medicine, Division of Endocrinology and Metabolism, Manisa, Turkey*

**Iris Kavalalı Oktem** □ *Izmir Atatürk Training and Research Hospital, Endocrinology and Metabolism Unit, Izmir, Turkey*



Consumptive hypothyroidism caused by paraneoplastic production of type 3 iodothyronine deiodinase.

Ruppe MD, Huang SA, Jan de Beur SM

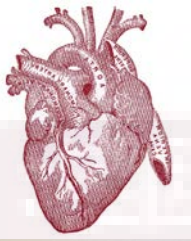
Thyroid. 2005;15(12):1369.

Consumptive hypothyroidism is characterized by excessive inactivation of thyroid hormone by type 3 iodothyronine deiodinase (D3). Previously this rare syndrome was described in association with massive hemangiomas in children and in a single case of a hemangioendothelioma in an adult. Here we report the first case of consumptive hypothyroidism from a nonvascular tumor in a patient who required supraphysiologic doses of levothyroxine prior to the resection of a large malignant solitary fibrous tumor. The tumor expressed D3 message, protein and exhibited functional D3 enzymatic activity. The clinical presentation of this patient expands the differential diagnosis of hypothyroidism, adds to the growing list of paraneoplastic syndromes that impact the endocrine system, and extends the spectrum of tumor types associated with consumptive hypothyroidism.

Department of Medicine, The Johns Hopkins University School of Medicine, Baltimore, Maryland, USA.



# Systemic Hypometabolism



Decreased heart rate and contractility → decreased cardiac output  
Decreased systolic and diastolic heart function  
Increased peripheral vascular resistance → hypertension  
Glycosaminoglycan deposition + increased capillary permeability → accumulation of fluid in extracellular space → Non-pitting edema  
EKG changes → bradycardia, nonspecific ST changes



Respiratory muscle weakness  
Reduced pulmonary responses to hypoxia/hypercapnea → hypoventilation  
Macroglossia → obstructive sleep apnea



Decreased gut motility → constipation  
In severe cases; ileus

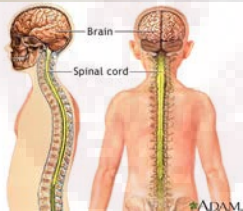


Reduction in renal blood flow and diminished GFR  
Reduced free water clearance, decreased sodium absorption → hyponatremia  
Reversible increases in serum creatinine  
Decreased ability to dilute urine  
Reduced clearance of certain medications

# Systemic Hypometabolism



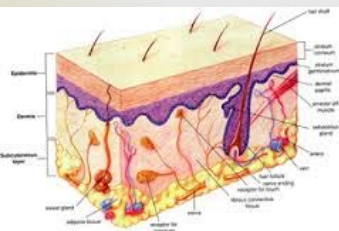
Impaired hemoglobin synthesis, impaired intestinal iron and folate absorption,  
pernicious anemia → Decreased red blood cell mass  
Normochromic, normocytic anemia  
Coagulopathies



Cognitive dysfunction  
Peripheral neuropathy (predominantly sensory)  
Carpal tunnel syndrome  
Cerebellar ataxia  
Myxedema madness (agitation or mania)



Spectrum:  
Asymptomatic serum CK elevation  
Cramps and Myalgias  
Disabling proximal muscle weakness  
Increased prevalence of hyperuricemia and gout



Rough, dry, cool skin  
Reduced conversion of carotene → Vitamin A → yellowish skin