

# Thyroid storm



ต้องตรวจต่อม

# Thyroid storm

- Extreme accentuation of thyrotoxicosis
- Association with Graves 'disease but sometime with TMNG in the elderly
- The mechanism
  - worsen thyrotoxicosis may be related to cytokine release and acute immunologic disturbance caused by the precipitating condition

# Precipitating factor

## Iatrogenic

- Radiation therapy
- Withdrawal ATD
- Thyroid surgery
- Non-thyroid surgery
- Iodinated contrast
- Vigorous palpation

## Acute illness

- Infection
- CVA
- Parturition
- DKA
- Pulmonary embolism
- Trauma

# Uncomplicated thyrotoxicosis vs Thyroid storm

Clinical	Thyrotoxicosis	Thyroid storm
Thermoregulatory	Heat intolerance, diaphoresis	Hyperpyrexia
CNS	Hyperkinesia, nervousness	Confusion, seizure, coma
CVS	Tachycardia (90-120bpm)	Accelerated tachycardia (>130 bpm), HF
GI	Hyperdefection	Nausea, vomiting, diarrhea
Liver	Mild transminitis	Hepatic dysfunction, jaundice
Psychiatric	Agitation	Psychosis
Precipitating Hx	Absent	Present
Death	Rare	10-20%

## Diagnosis

- No uniform criteria for diagnosis
- Bruch and Watofsky score vs JTA

## Bruch and Watofsky score

Diagnostic Criteria for Thyroid Storm		Cardiovascular Dysfunction	
Diagnostic Parameter	Points*		
<b>Temperature (° F)</b>		<b>Tachycardia (beats/min)</b>	
99-99.9	5	90-109	5
100-100.9	10	110-119	10
101-101.9	15	120-129	15
102-102.9	20	130-139	20
103-103.9	25	≥140	25
≥104.0	30	<b>Congestive Heart Failure</b>	
<b>Central Nervous System Effects</b>		Absent	
Absent	0	Mild (pedal edema)	
Mild (agitation)	10	Moderate (bibasilar rales)	
Moderate (delirium, psychosis, extreme lethargy)	20	Severe (pulmonary edema)	
Severe (seizures, coma)	30	<b>Atrial Fibrillation</b>	
<b>Gastrointestinal-Hepatic Dysfunction</b>		Absent	
Absent	0	Present	
Moderate (diarrhea, nausea/vomiting, abdominal pain)	10	<b>Precipitating Event</b>	
Severe (unexplained jaundice)	20	Absent	
		Present	

Score  $\geq 45$  = suggestive of thyroid storm

Score 25-44 = suggestive of impending storm

Score  $< 25$  = unlikely to represent thyroid storm

## JTA diagnostic criteria

- Prerequisite for diagnosis
  - Presence of thyrotoxicosis with elevated levels of FT3 or FT4
- Symptoms
  - CNS : Restlessness, delirium, mental alteration/psychosis, somnolence/lethargy, coma
  - Fever :  $\geq 38^{\circ}\text{C}$
  - Tachycardia :  $\geq 130$  beats per minute or HR  $\geq 130$  in atrial fibrillation
  - CHF : Pulmonary edema, moist rales over more than half of the lung field, cardiogenic shock, or Class IV NYHA or  $\geq$  Class III in the Killip classification
  - Gastrointestinal (GI)/hepatic manifestations : nausea , vomiting, diarrhea, or a total bilirubin level  $\geq 3.0$  mg/dL

## JTA diagnostic criteria

- Prerequisite for diagnosis
  - Presence of thyrotoxicosis with elevated levels of FT3 or FT4
- Symptoms
  - CNS : Restlessness, delirium, mental alteration/psychosis, somnolence/lethargy, coma
  - Fever :  $\geq 38^{\circ}\text{C}$
  - Tachycardia :  $\geq 130$  beats per minute or HR  $\geq 130$  in atrial fibrillation
  - CHF : Pulmonary edema, moist rales over more than half of the lung field, cardiogenic shock, or Class IV NYHA or  $\geq$  Class III in the Killip classification
  - Gastrointestinal (GI)/hepatic manifestations : nausea , vomiting, diarrhea, or a total bilirubin level  $\geq 3.0$  mg/dL

## JTA diagnostic criteria

Grade	Thyrotoxicosis with
TS1	CNS and Fever or tachycardia or CHF or GI
TS1	3 of 4: Fever, tachycardia, CHF, GI
TS2	2 of 4: Fever, tachycardia, CHF, GI
TS2	Patients who met the diagnosis of TS1 except that serum FT3 or FT4 level are not available

TS1 = definite  
TS2 = suspected

## Therapeutic Targets

- Inhibit thyroid hormone synthesis/release
- Peripheral effects of thyroid hormone
- Physical removal of thyroid hormone
- Systemic support
- Find and Treat precipitant

## Inhibit thyroid hormone synthesis/release

- Antithyroid drug
  - Prefer PTU > MMI (peripheral conversion)
  - PTU  $\geq$  400 mg decrease peripheral conversion
  - PTU 500-1,000 mg loading then 250 mg q 4 hr
  - Other route: PTU 600 mg in 90 ml sterile water retention enema then 250 mg q 4hr

## Inhibit thyroid hormone synthesis/release

- Iodine
  - Inhibit thyroid hormone secretion need iodine 200-2,000 mcg/day
  - Lugol's solution or SSKI
  - Wolff-Chaikoff effect
  - Wait until 1 hr after 1<sup>st</sup> dose of ATDS
  - SSKI 1-5 drops q 6- 12 hr or Lugol's solution 3-10 drops q 6-12 hr
  - Other route: sublingual or rectal suppository

SSKI 1 drop = KI 50 mg  
Lugol's solution 1 drop= iodine 6.3-8 mg

## Peripheral effects of thyroid hormone

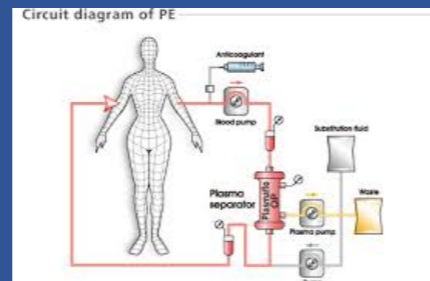
- Glucocorticoid
  - Decrease peripheral conversion and prevent relative adrenal crisis
  - Hydrocortisone 300 mg loading then 100 mg IV q 8 hr or Dexamethasone 2 mg IV q 4-6 hr

## Peripheral effects of thyroid hormone

- Beta-blocker
  - Propranolol most frequently cite
  - Propranolol dose > 160 mg inhibit peripheral conversion
  - Dose 60-80 mg q 4 hr
  - Associated with cardiovascular collapse
  - JTA suggest landiolol, esmolol

## Physical removal of thyroid hormone

- Plasma apheresis
  - Indication: fail medical treatment, hepatic dysfunction, emergency thyroidectomy
  - Remove thyroid binding globulin, free thyroid hormone, 5 $\alpha$ deiodinase
  - Frequency q 2-3 days



## Systemic support

- ICU admit
- Antipyretic and cooling blankets
- Hydration and nutrition
- Invasive monitoring
- Find and treat precipitating factor
- Definite treatment