

Thyroid Storm with Rare Cardiac Presentations, 10 Year-Intensive Care Unit Experience: Case SeriesWaleed Albaker¹, Yousef Almubarak¹, Amar H. Khamis²1: Department of Internal Medicine, 2: Department of Family & Community Medicine, College of Medicine, University of Dammam, Saudi Arabia. dr_waleed99@hotmail.com

Abstract: Thyroid storm causes serious alterations in cardiac parameters. These include an increase in resting heart rate, myocardial contractility and a predisposition to arrhythmias. As the result, most patients with thyroid storm experienced cardiovascular manifestations. The most common arrhythmia is atrial fibrillation and supraventricular tachycardia, however, ventricular arrhythmia, pulmonary hypertension and right side heart failure have been rarely reported in the literatures. In this report, we have reviewed 7 cases of thyroid storm patients with rare cardiac manifestations.

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Key words: Thyroid storm, Heart failure, Arrhythmia

INTRODUCTION:

Cardiovascular manifestations of thyroid storm are well known documented facts in literatures. The most common arrhythmia is atrial fibrillation and supraventricular tachycardia; however, ventricular arrhythmia, pulmonary hypertension and right side heart failure have been rarely reported in the literatures. In this report, we have reviewed 7 cases of severe thyroid storm patients who presented to our intensive care unit at university hospital with rare cardiac presentation (Table 1).

Case 1: A previously healthy 37 years old lady presented to King Fahd hospital of university in august 2012 with palpitation and bilateral lower limbs swelling. She also reported weight loss of 15 kg over past 4 months and heat intolerance. On physical examination, she had tachycardia, elevated jugular venous pressure 15+, right exophthalmos, goiter, chest auscultation revealed bilateral basal crepitations up to midzone and bilateral legs swelling up to knees. A Chest X-ray showed cardiomegaly with pulmonary edema. Electrocardiography showed atrial fibrillation at rate of 180/min. 1 hours after presentation, she developed cardiac arrest for 2 minutes with ventricular fibrillation. She was intubated and received electrical cardioversion and regained her A.F rhythm and was started on intropic support for cardiac failure then transferred to ICU care. Her thyroid stimulating hormone level was suppressed <0.0025 uIU/ml (reference range 0.35-4.94) and free T4 was 3.24 ng/dl (reference range 0.7-1.48) and her free T3 was 9.91pg/ml (reference range 1.71-3.71). her anti thyroglobulin antibody was 105.78 IU/ml (reference positive level >4.1 IU/ml) and anti thyroid peroxidase > 1000 IU/ml (reference positive level >5.6 IU/ml). She was diagnosed with thyroid storm (Burch score was 85)¹ with acute

pulmonary edema and heart failure with fast rate A.F and received hydrocortisone, propranolol, propylthiouracil and logul'siodine.

A transthoracic echocardiogram revealed reduced ejection fraction (45%), septal hypokinesis, severe dilated left atrium, moderate dilated right ventricle and right atrium with severe mitral and tricuspid regurgitations as well as pulmonary hypertension (pulmonary artery pressure >70 mm hg).

By the 2nd day in ICU, she was off from intropic support and by the 3rd day, she was extubated. She was kept on anti-thyroid medications only, and repeated echocardiogram within 1 week and 3 weeks showed continuous regression and normalization of her cardiac manifestation. By 3rd week, echocardiogram show normal systolic function, normal right ventricle size and normal pulmonary pressure with mild tricuspid and mitral regurgitation.

Case 2: A 40 years old male, who was diagnosed to have grave's disease for 6 months on treatment, presented with shortness of breath on exertion for the last 2 months associated with lower limb swelling. 3 days prior to presentation, his shortness of breath became even at rest associated with orthopnea and paroxysmal nocturnal dyspnea. On physical examination his temperature was 38.2°C and pulse of 110/min. He had elevated jugular venous pressure 16+, chest auscultation revealed bilateral basal crepitations, S3 gallop, distended abdomen with positive shifting dullness and lower limbs swelling. Chest X-ray showed pulmonary congestion. Echocardiogram showed dilated left ventricle with EF 40%, septal hypokinesis and dilated right ventricle with pulmonary artery pressure of >50 mm hg.

His thyroid stimulating hormone level was suppressed <0.0025 uIU/ml and free T4 was 5.23 ng/dl and her free T3 was 9.91pg/ml. He was

diagnosed with thyroid storm (Burch score 55) with acute heart failure and was started on neomercazole, beta blockers and steroid therapy in addition to diuretics. Patient conditions improved and a follow up echocardiogram showed normal left ventricle with EF 55%, normal right ventricle and normal pulmonary artery pressure of 25 mm hg.

Case 3: A 26 years old Indonesian housemaid was admitted to hospital in April 2010 with shortness of breath, palpitations and lower limb swelling for 2 weeks. She also had weight loss and neck swelling for 5 months durations. On admission, her temperature was 39°C, pulse was irregular 150 beats/min. She had jugular venous pressure 15+ with goiter, Variable S1 on heart auscultation with lower limb swelling up to knees. Her thyroid stimulating hormone level was suppressed <0.0025 uIU/ml and free T4 was >6 ng/dl and her free T3 was >30pg/ml. ECG was done and it showed fast rate atrial fibrillation, and her chest X-ray showed pulmonary congestion.

Echocardiogram showed normal left ventricle systolic function, moderate tricuspid regurgitation with dilated right ventricle and severe pulmonary hypertension > 70 mm hg. She was diagnosed with thyroid storm (Burch score 80) with acute isolated right side heart failure. She was admitted to intensive care unit and was started on propylthiouracil, propranolol and steroid therapy with anti heart failure medications. She improved clinically and was discharged home on anti-thyroid therapy.

Case 4: A 49 years old male who was diagnosed to have grave's disease and type 2 diabetes mellitus in June 2004. He was maintained on carbimazole 15mg TID and never achieved eu-thyroidism. He was found to have chronic atrial fibrillation and was maintained on warfarin.

In November 2005, he presented to emergency room with severe shortness of breath even at rest with orthopnea, paroxysmal nocturnal dyspnea and productive cough for one week. On examination, his temperature was 38.8°C, pulse irregular 160 beats/min, blood pressure 170/60, elevated jugular venous pressure 18+, bilateral crepitations of lung up to midzone and lower limb edema up to the middle of thighs. His thyroid stimulating hormone level was suppressed <0.0025 uIU/ml and free T4 was 5.06 ng/dl and her free T3 was 14.5pg/ml. His chest X-ray showed pulmonary edema and his ECG showed atrial fibrillation with rate 160 beats/min.

His echocardiogram showed severe dilated left ventricle with global hypo- hypokinesis, ejection fraction of 25%, moderate mitral regurgitation and moderate tricuspid regurgitation with severe pulmonary hypertension > 70 mm hg.

He was diagnosed thyroid storm with acute heart failure (Burch score 65), patient was started on non-invasive positive airway pressure, carbimazole, propranolol with anti-failure medication and was admitted to intensive care unit. At the same day of presentation, patient developed ventricular fibrillation and died.

Case 5: A previously healthy 42 years old male was brought to emergency room by his brother with severe respiratory distress. His complaint was shortness of breath with fever which started 2 days ago and became worse over the next day associated with cough and chest pain with palpitation. There was no weight loss, sweating other hyperthyroid symptoms.

On examination, he was in respiratory distress with rate of 38 breaths/min and cyanosis, O2 saturation was 80%, blood pressure 160/80, pulse of 145 beats/min and temperature of 38.7°C. His Chest examination revealed bilateral basal crepitations, jugular venous pressure of 18+, normal S1 with loud P2 in cardiac auscultation. His ECG showed sinus tachycardia and CXR show pulmonary edema. His Echocardiogram show moderate systolic dysfunction, severe mitral regurgitation, severe tricuspid regurgitation and pulmonary hypertension more (P.A. pressure > 50 mm hg).

He was intubated in the emergency room because of severe respiratory distress, started on diuretic treatment and anti-biotic with working diagnosis of acute heart failure with possible community acquired pneumonia. 2 days post intubation; his CXR and blood gases were improved but still had persistent tachycardia 140+ beats/min and had a trial of extubation. Post-extubation he became again in respiratory distress with severe tachycardia 160 beats/min and because of his persistent tachycardia, thyroid function test was requested. His thyroid stimulating hormone level was suppressed <0.0025 uIU/ml (reference range 0.35-4.94) and free T4 was 2.23 ng/dl (reference range 0.7-1.48) and her free T3 was 4.81 pg/ml ((reference range 1.71-3.71).

Subsequently, he was diagnosed with thyroid storm (Burch Score 85) with acute biventricular heart failure. He received anti-thyroid treatment with anti-failure management and improved clinically and was discharged home.

Case 6: A 39 years old male presented with history of proximal muscle weakness, palpitation and shortness of breath on mild exertion for 2 weeks durations and diffuse abdominal pain for 2 days. He has positive history of weight loss > 45kg in last 3 months, heat intolerance and profuse sweating for 6 months.

Table 1. Cases

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7
Gender	female	Male	Female	male	Male	Male	Female
Clinical presentation	Cardiac arrest	Heart failure	Right side heart failure	Heart failure	Heart failure	Hyperthyroid symptoms	Hyperthyroid symptoms
Thyroid storm score	85	55	80	65	85	30	45
TSH	< 0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Free T3	9.9	>30	>30	14.5	4.81	>30	>30
Free T4	3.24	5.23	>6	5.06	2.23	4.3	4.7
Management	PTU, Steroid, BB and loguls's	Neomercazole, BB and anti-failure	PTU, Steroid and BB	Neomercazole BB and anti-failure	PTU, Steroid, BB and loguls's	Neomercazole, BB	PTU, Steroid, BB and loguls's
ECG	A.F + V.F	A.F	A.F	A.F + V.F	Sinus tachycardia	Sinus tachycardia	SVT/ P.pulmonale
Echo	EF45%, sever MR+TR	EF45%, dilated LV+RV	EF55% dilated RV with T.R	EF25% global hypokinesia, severe dilated LV	EF 45% sever MR+TR	Normal 70%, dilated RV with severe TR	EF 60% ,dilated RV with TR
P.A. Pressure	>70	>50	>70	>60	>50	40	>60
Euthyroid status	Achieved	Achieved	Achieved	Not achieved	Achieved	Not achieved	Achieved
Repeated Echo	EF65%,mild MR+TR Normal P.A.P	EF 60% normal Pul. pressure					
Outcome	Survive	Survive	Survive	death	Survive	Survive, lost F/U	Survive

On examination, he was agitated, his temperature 38.3°C, pulse regular 130 beats/min, resting tremors, exophthalmos, diffuse enlarged goiter and heart auscultation of normal S1 with loud P2. His thyroid stimulating hormone level was suppressed <0.0025 uIU/ml and free T4 was 4.3 ng/dl and her free T3 was >30pg/ml.

Echocardiogram showed normal systolic function, dilated right ventricle, severe tricuspid regurgitation with pulmonary hypertension > 45 mm hg.

He was diagnosed with thyroid storm with acute isolated right side heart failure. He was started on carbimazole, inderal and steroid with clinical and echocardiographic improvement.

Case 7: A 27 years old office secretary lady with previous diagnosis of grave's disease for 4 years. She presented to our emergency department after 2 weeks of being out of medicine (neomercazole). She was in severe respiratory distress, abdominal pain and palpitation which started 3 days ago and increased in severity. On examination, she was agitated in respiratory distress 30 breaths/min with regular tachycardia 150 beats/min, jugular venous pressure 10+ cm, clear chest auscultation with loud P2 with normal S1 in heart auscultation. Generalized abdominal tenderness with pulsatile hepatomegaly and lower limb edema up to knees.

Her initial ECG showed supra-ventricular tachycardia and after 2h of presentation it showed sinus tachycardia with P pulmonale. Echocardiogram showed normal systolic function with dilated right ventricle, severe tricuspid regurgitation and pulmonary hypertension >60 mm hg.

Her thyroid stimulating hormone level was suppressed <0.0025 uIU/ml and free T4 was 4.7 ng/dl and her free T3 was >30 pg/ml. She was diagnosed with thyroid storm (Burch score 45) with evidence of right side heart failure. She was managed with propylthiouracil, Inderal, steroid and loguil's iodine. She was improved clinically and echocardiographically in anti-thyroid medication only.

DISCUSSION:

In this review, 4 out of 7 cases presented with atrial fibrillation and one with SVT. The most common clinical presentation of thyrotoxic heart disease is atrial fibrillation. Case 1 and case 4 presented with ventricular fibrillation which is extremely rare and serious arrhythmic complication of thyroid storm. Up to our knowledge, 3 reported cases in the literatures presented with ventricular arrhythmia as initial presentation of thyroid storm.² Few hypothesis were postulated including thyrotoxic periodic paralysis with severe hypokalemia,^{3,4} coronary spasm,⁵ QT interval prolongation,⁶ and systolic dysfunction.

In terms of heart failure, 4 out of 7 cases presented with left sided heart failure. Based on clinical and echocardiographic presentation, all patients had complete recovery of systolic function with anti-thyroid medications. High output heart failure is well documented in the literatures, especially in those with severe long standing untreated hyperthyroidism.⁷ Isolated right sided heart failure secondary to thyroid storm has been rarely reported in the literatures.^{8,9} In our review case 3,6,7 presented with isolated right sided heart failure.

Pulmonary hypertension secondary to thyroid storm was reported in all our cases. A limited numbers of observational studies have documented the prevalence of pulmonary hypertension to range 41-65%. The largest observational study by Marvisi et al, evaluated 114 patients with hyperthyroidism and found mild pulmonary hypertension in 43% and no cases of pulmonary hypertension in control group.¹⁰ In our review all patients with thyroid storm had severe pulmonary hypertension which reversed completely in 6 cases following anti-thyroid medications. One of the strong hypothesis have been postulated that auto-immunity is a major contributor to pulmonary hypertension and right sided heart failure.¹¹

Conclusion:

The most common presentation of thyrotoxic heart disease is atrial fibrillation and high output heart failure. However, other rare cardiac presentations can occur including ventricular arrhythmias, isolated right side heart failure and pulmonary hypertension. Internist should be aware of this association and reversibility with anti-thyroid medications. We advised to conduct large study of thyroid storm presentations in intensive care units and estimate true prevalence and nature history.

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