

Supplementary Data 1. Basic characteristics of the included studies (Part A).

| Author (Year) | Study Location | No. Px | Age | Sex | Follow-up Duration / Status | Underlying Thyroid Disease | Hyperthyroid Emergencies / Status on Admission | BWPS | On First Discharge | Clinical Conditions After Readmission (if any) | Any Persisted / Uncurable Other Conditions | Final Thyroid Status | Clinical Characteristics | | | | | | | | | | | | | |
|--|----------------|--------|-----|--------|-----------------------------|-----------------------------|--|------|--|--|--|--------------------------------------|---|--|---|-----|-----------|--|---|--|--|--|--|---|---|---|
| | | | | | | | | | | | | | Clinical Presentation | Valve-unrelated Comorbidities | Routine or History of Medication | SBP | DBP | HR | Palpatory rhythm | RR | T | Head/neck PE | Heart PE | Lungs PE | Abdominal PE | Extremity PE |
| Oduah, Perera, & Brenes-Salazar (2021) | US | 1 | 52 | Female | N/A | Graves' disease | Thyroid storm | 50 | Unclear | No readmission | N/A | Unclear | - Acute-onset, nonradiating 9/10 abdominal, and right flank pain started the day before - Abdominal distention over the past 1 month, lower-extremity edema over the past 5 months, mild shortness of breath and DoE over the past 5 months, and intermittent palpitations over the past 6 years - Iron deficiency anemia - Occasional alcohol consumption - Herbal supplements - MMI (discontinued) | 115 | 61 | 143 | Irregular | N/A | Afebrile | - Bilateral exophthalmos - Diffusely enlarged nontender thyroid - Elevated JVP at ear lobe with the bed at 30 with prominent cv wave | - Hyperdynamic precordium - 3/6 systolic murmur appreciated at the RLSB | Clear lung fields | - Soft abdomen with tenderness in all quadrants without rebound or guarding - Positive fluid wave - Hepatic pulsations | - Bilateral upper extremity tremors - Brisk reflexes - Symmetric bilateral 2+ lower extremity edema | | |
| Lozanov et al. (2010) | Sofia | 1 | 52 | Female | 15 days | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Reduced physical capacity (DoE) and shortness of breath at rest, an enlarged liver, congestive edema on the lower extremities | None | MMI and PTU 2-4 doses (uncontrolled) | 150 | 80 | 100-120 | Regular | N/A | N/A | - Conjunctival injection and chemosis of 2nd stage - Expansion of both eye fissures - Positive Graefe's and M\"obius' signs - Proptosis 20 mm according to Hertell - Diffusely enlarged thyroid gland (3rd stage by ETA) with increased density and pronounced trill over both lobes | Holosystolic murmur over the entire precordium | Positive congestion | Enlarged liver of 4 cm | - Significant reduction of subcutaneous adipose tissue - Moist skin - Pronounced distal tremor of the hands |
| Khoo, Chu, & Fung (2018) | Malaysia | 1 | 59 | Male | 2 months | Unspecified hyperthyroidism | Thyroid storm | 65 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | - Progressive worsening dyspnea, orthopnea, and PND for 1 month - Epigastric discomfort and vomiting - Heat intolerance, sweating, weight loss, and muscle weakness for several months | None | None | 130 | 87 | 150 | Irregular | 32 | 37,3 | - Elevated JVP - Lid retraction, lid lag, and bilateral mild proptosis to suggest Graves' ophthalmopathy - Grade II diffuse goiter with no thyroid bruit | Displaced apex beat | Bibasilar crepitations | Normal | - Minimal ankle edema - Fine tremors |
| Nigam & Morton (2012) | New Zealand | 1 | 35 | Female | 6 weeks | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Palpitations, dyspnea, and muscle weakness | - Mild episodic asthma - 10-pack year smoking history | Carbimazole, ceased 4 months prior to presentation | 120 | 80 | 120 | Irregular | N/A | N/A | - Elevated JVP (5 cm) - Diffusely enlarged thyroid with a bruit on auscultation - Ophthalmopathy with tethering of the right medial rectus muscle | Dual heart sounds | Normal | Normal | Normal |
| | | 2 | 75 | Female | 12 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, off medication | Palpitations, fatigue, and heat intolerance | - Hypertension - Dyslipidemia - Ex-smoker | Unspecified hypertension and dyslipidemia medications | 120 | 80 | 120 | Irregular | N/A | N/A | - Elevated JVP (4 cm) with V waves - Nodular goitre approximately 60 g in volume without bruit - No ophthalmopathy | Dual heart sounds | Normal | Normal | Normal |
| | | 3 | 41 | Female | 4 weeks | Graves disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Tachycardia after a minor motor vehicle accident | 10-pack-year smoking history | Thionamide, ceased medication 3 months prior to presentation | 110 | 70 | 120 | Irregular | N/A | N/A | - Elevated JVP (4 cm) with V waves - Diffuse goitre approximately 120 g with no bruit | Loud pulmonary component of S2 | Normal | Normal | Normal |
| Baagar et al. (2017) | Qatar | 1 | 35 | Female | 3 months | Graves' disease | Thyrotoxicosis | 15 | Improved with any persisted conditions | No readmission | Lower limb edema | Euthyroid, on medication | - Two weeks of breathlessness, palpitations, and generalized edema - 10 kg weight loss over last 3 months, but had regained weight in the month before presentation | None | None | 103 | 58 | 92 | Regular | 20 | Afebrile | - Exophthalmos - Elevated JVP - Diffuse goiter with a positive bruit | Third heart sound | Bilateral fine basal crepitations | Unremarkable with no tenderness or organomegaly | Bilateral pedal edema extending to the thighs |
| Alam & Zaman (2019) | UK | 1 | 65 | Female | 3 months | Graves' disease | Impending thyroid storm | 40 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | - Progressive shortness of breath and cough for the last 3 weeks - DoE progressed to dyspnea at rest - Productive cough with scanty amount - Three pillow orthopnea - PND - Three stone weight loss over a period of 4months, but there was an intentional element to it - More frequent bowel opening for the last 4-6 weeks | - DMT2 - Hypertension - Occupational asthma - Ex-smoker - Social drinker | Poor compliance - Metformin - Steroid inhalers - Valsartan | 140 | 100 | - On admission: 120 - After 4 days: 70 - After 3 months: 50-60 | - On admission: Irregular - After 4 days: N/A - After 3 months: Sinus | 24 | Afebrile | - Pale, but not icteric - Struggling to finish sentences due to shortness of breath | Normal | Bibasilar crackles | Normal | Normal |
| Sadiq & Chamba (2021) | Tanzania | 1 | 31 | Female | 6 months | Toxic goitre | Thyroid storm | 60 | Improved followed by readmission | Deceased / died | N/A | Uncontrolled, poor compliance | - 6 months of progressive difficulty in breathing, generalised body swelling, and jaundice - Dry cough without chest pain | None | None | N/A | N/A | 90-120 | Irregular | 28 | N/A | - Exophthalmos - Conjunctival pallor - Jaundice - Elevated JVP - Audible bruit on thyroid | Systolic murmur grade V over the mitral area | Normal | Normal | Sacral and bilateral lower limb edema |
| Hsieh et al. (2010) | China | 1 | 39 | Female | 4 weeks | Graves' disease | Thyrotoxicosis | N/A | Improved with any persisted conditions | No readmission | Mild cardiomegaly and AF | Euthyroid, on medication | Progressive dyspnea, orthopnea, palpitations, distended abdomen, and bilateral leg edema for 1 week | None | None | 125 | 63 | Rapid & bounding | Irregular | N/A | 36,7 | - Mild proptosis - Periorbital edema - Distended neck vein - Diffusely enlarged, nontender thyroid gland | S3 gallop | Bilateral basilar crackles | Distended and soft without tenderness | Lower extremities pitting edema |
| Uchiyama et al. (2022) | Japan | 1 | 28 | Female | 10 months | Graves' disease | Thyroid storm | 50 | Improved / recovered | No readmission | N/A | Unclear | 1 month of abdominal swelling, DoE, diarrhea, and palpitations | Atopic dermatitis | None | 133 | 96 | 171 | Irregular | 16 | 36,7 | - Enlarged thyroid gland - Elevated JVP | Normal | Normal | - Distended without tenderness - Shifting dullness | Severe bilateral lower extremities pitting edema |
| Argote, Colsy, & Alloussi (2007) | France | 1 | 55 | Female | 2 months | Graves' disease | Thyroid storm | 70 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Sudden onset of severe pain in the left iliac fossa associated with diarrhea | None | None | 140 | 90 | 180 | Irregular | N/A | Afebrile | Conjunctival jaundice | Normal | Bilateral pulmonary crackles | Ascites | Edema of the lower limbs |
| Suzuki et al. (2022) | Japan | 1 | 46 | Female | 1.5 years | Graves' disease | Thyroid storm | 65 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | - 3 months of DoE and referred to our hospital for dyspnea at rest - 3 years of hyperthyroidism, but did not receive any medical follow-up | None | None | 181 | 131 | 198 | Irregular | 36 | 38,5 | - Exophthalmos - Thyromegaly | Normal | Normal | Normal | Pretibial myxedema |

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|------------------------------------|-----------|---|----|--------|----------|--------------------------------------|-------------------------|-----|--|----------------|---|--------------------------------------|--|---|--|--|---|--|---|-----|----------|---|--|---|----------------------|---|
| Subahi, Ibrahim, & Abugroun (2018) | US | 1 | 39 | Female | 11 days | Unspecified hyperthyroidism | Thyroid storm | 75 | Deceased / died | No readmission | N/A | Unclear | Sweating, palpitations, agitations, dyspnea, chest pain, and diarrhea | None | Compliant to MMI for unspecified hyperthyroidism | - On admission: 158 - 3 hours after diltiazem IV drip: 60 | - On admission: 88 - 3 hours after diltiazem IV drip: 30 | - On admission: 169 - 3 hours after diltiazem IV drip: 42 | - On admission: Irregular - 3 hours after diltiazem IV drip: N/A | N/A | 37,6 | Normal | Normal | Normal | Normal | Normal |
| Herzallah et al. (2023) | UAE | 1 | 37 | Female | N/A | Unspecified hyperthyroidism | Thyroid storm | 55 | Deceased / died | No readmission | N/A | Unclear | - Palpitations for 5 days along with 1 day of dyspnea, vomiting, and diarrhea - According to her relative, the patient had lost a significant amount of weight over the past year with heat intolerance and irregularities in her menstrual cycle | None | None | 104 | 64 | - On admission: 170-180 - 5 mins after esmolol: 40 | Irregular | 18 | Afebrile | - A thyroid swelling involving both lobes, soft, and not tender to touch - Non-icteric - Non-cyanotic | No clinical signs of heart failure were noted | Normal | Normal | Normal |
| Chen, Wee, & Sonawane (2019) | Singapore | 1 | 55 | Female | N/A | Graves' disease | Thyroid storm | 70 | Improved / recovered | No readmission | N/A | Unclear | 3 days of fever, dyspnea, lower limb swelling, and one episode of hemoptysis | None | None | 140 | 54 | 140 | Regular | N/A | 38,7 | - Large diffuse goiter - No signs of thyroid eye disease | - Dual heart sounds without any murmurs on admission - Presence of a new systolic murmur over the mitral area due to clinical deterioration 2 hours after arrival | Left-sided basal crepitations | Normal | Pedal edema |
| Kamalanathan et al. (2012) | India | 1 | 38 | Male | 4 months | Graves' disease | Thyrotoxicosis | N/A | Improved with any persisted conditions | No readmission | AF | Euthyroid, on medication | - Swelling of both feet for 2 months - Intermittent palpitations and sweating for the past 6 months - Breathless on walking a few feet in level ground | None | None | N/A | N/A | 110 | Irregular | N/A | N/A | - Distended neck veins - Elevated JVP with very prominent v waves and steep y descent | - S3 - Pansystolic murmur over the LLSB | Normal | Normal | Bilateral pitting pedal edema |
| Hiroi et al. (2007) | Japan | 1 | 50 | Female | 3 months | Graves' disease | Thyrotoxicosis | N/A | Improved with any persisted conditions | No readmission | Persistent hypocalcemia and hypoalbuminemia | Unclear | Severe diarrhea, hyperphagia, irritability, severe pitting edema of the legs, and weakness | None | MMI, but nonadherent due to symptoms improvement | 120 | 78 | 108 | N/A | 24 | 36,8 | - Bilateral proptosis and periorbital edema - Normal extraocular movements - Diffusely enlarged thyroid with rubbery consistency on palpation - Elevated JVP - Positive Chvostek's sign | - Hyperdynamic precordium - Grade 2/6 systolic murmur on the left sternal border | Decreased breath sound on right lung | Normal | - Warm and severely tremor hands - Severe pitting edema of both legs - Brisk reflexes |
| Aujayeb & Dundas (2021) | UK | 1 | 30 | Female | 7 weeks | Graves' disease | Thyroid storm | 65 | Improved / recovered | No readmission | N/A | Unclear | - Short history of increased dyspnoea, fatigue, cough, left sided pleuritic pain, and coryzal symptoms - Regular palpitations over the preceding 72 hours and intermittent high temperatures - 3 days of dyspnea, palpitations, and epigastric abdominal pain - Not taking his MMI for the past 45 days | - Pernicious anaemia - 10-pack year smoking history - Drank minimal alcohol | Regular vitamin B12 injections | Normotensive | Normotensive | 158 | Regular | 24 | 38,9 | - Goitre - No lymphadenopathy - No jaundice | Normal | Normal | Normal | Normal |
| Allencheril & Birnbaum (2015) | Texas | 1 | 29 | Male | N/A | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Unclear | - Bipolar disorder and depression - Not taking his MMI for the past 45 days | Bipolar disorder and depression | MMI | N/A | N/A | N/A | N/A | N/A | N/A | Normal | Normal | Normal | Normal | Normal |
| Kishida et al. (2018) | Japan | 1 | 35 | Male | 9 months | Graves' disease | Thyroid storm | 50 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Palpitation and dyspnea 1 month prior to presentation | None | None | 125 | 89 | 183 | Irregular | 20 | 36,5 | Normal | Levine II/IV systolic murmur with point of maximum intensity located at the apex | Moist rales over the lower lung fields | Normal | Edema in the lower extremities |
| Li et al. (2022) | China | 1 | 37 | Female | 3 months | Graves' disease | Impending thyroid storm | 40 | Improved / recovered | No readmission | N/A | Euthyroid, off medication | - 18 years of intermittent palpitations and easy fatigability - 6 weeks before admission: exertional dyspnea, lower extremity edema | None | - Methimazole (low compliance) - Herbal remedies 2 years (no detailed prescription) 4 weeks ago (before this admission): - Furosemide 40 mg/day IV - Compound ammonium glycyrrhizinate 40 ml/day - Metoprolol 50 mg/day - Aspirin 100 mg/day | 116 | 65 | 105 | Irregular | N/A | Afebrile | - Mild generalized icterus - Diffusely enlarged thyroid gland without pain - Two red spots on the upper chest characterized by central arteriole with radiated blood vessels - Elevated JVP - Neck veins engorged | Systolic murmur at the lower left sternal border | Normal | Ascites | Mild bilateral lower extremity edema |
| Jain et al. (2015) | India | 1 | 55 | Female | 3 weeks | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | - 10 month history of gradually progressive generalized weakness - Significant weight loss of 9 kg - History of multiple episodes of loose stools that weren't associated with mucus or blood and used to get relieved without treatment - 3 weeks before admission: fever, associated with myalgia and petechial spots all over the body, followed by shortness of breath NYHA class II, not associated with orthopnea and PND - History of swelling in both feet and facial puffiness - Yellow discoloration of | None | None | 120 | 60 | 110 | Regular with water hammer characteristic | N/A | N/A | - Pallor - Icterus - Elevated JVP (10 cm) | - Hyperdynamic apex beat with parasternal heave - Pansystolic murmur in tricuspid and apical area - Ejection systolic murmur in the pulmonary area | Decreased air entry in the right infrascapular region | Normal | - Fine tremors in hands - Reduced muscle bulk - Brisk reflexes |
| Whitner et al. (2005) | US | 1 | 43 | Female | 4 years | Unspecified indolent hyperthyroidism | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - 10 days of progressive swelling in her feet, ankles, and legs - Over the last few months: heat intolerance, increased perspiration, 19-lb (8.6 kg) weight loss | None | None | 130 | 70 | 104 | N/A | N/A | 37,2 | Elevated JVP with a prominent v wave | - Parasternal heave - Soft 2/6 systolic murmur at the left sternal border | Normal | Normal | Bilateral lower extremity edema |
| Dhital et al. (2018) | US | 1 | 31 | Female | 2 months | Graves' disease | Thyroid storm | 60 | Improved with any persisted conditions | No readmission | - Cirrhosis - Improved ascites | Euthyroid, off medication | Abdominal distention, leg swelling, and DoE | None | On and off medication for thyroid condition | Normotensive | Normotensive | 160-190 | Irregular | N/A | Afebrile | - Conjunctival pallor - Scleral icterus - Elevated JVP | Systolic murmur at the lower left sternal border and cardiac apex | Normal | Abdominal distention | Leg swelling |

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|---|-------------|---|----|--------|------------|---|----------------|-----|--|----------------|-----|--------------------------------------|---|---|---|--|---|---|--|---|-------------------------------------|--|---|--|---|--|----------------------------------|-----------------------|
| Alkhuja, Pyram, & Odeyemi (2013) | US | 1 | 53 | Female | 2 days | Iodinated contrast-induced hyperthyroidism in Graves' disease | Thyroid storm | 75 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - Worsening dyspnea with hemoptysis for 1 day - Intermittent bilateral lower extremity edema for 1 month - After CT with IV iodinated contrast: worsening dyspnea and increased anxiousness, tachycardia | - Spinal surgery - Tonsillectomy - Vaginal hysterectomy | None | - On admission: 169 - After CT w/ contrast: 237 | - On admission: 78 - After CT w/ contrast: 105 | - On admission: 128 - After CT w/ contrast: 162-78-pulseless | - On admission: Regular - After CT w/ contrast: Regular-regular-pulseless | - On admission: 18 - After CT w/ contrast: 24-30 | 36,6 | Mild enlargement of thyroid gland without palpable thyroid nodules or cervical adenopathy | Normal | Bilateral basal crackles | Normal | Lower extremities edema | | |
| Shang & Ma (2020) | China | 1 | 51 | Female | 5 days | Graves' disease | Thyroid storm | 80 | Deceased / died | No readmission | N/A | Unclear | Diarrhea and fever for 4 days | None | Irregular intake of medications and stopped taking them 6 months previously | 155 | 86 | - On admission: 131 - After treatment: 100-110 | Irregular | 24 | - On admission: 38.9 - Day 5: 39 | | Mild fainting - Proptosis - Goitre - Jaundice | Normal | Normal | Normal | Warm and sweaty | |
| Kim HR et al. (2017) | South Korea | 1 | 48 | Female | N/A | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Intermittent chest pain and exertional dyspnea for 2 months | None | None | N/A | N/A | N/A | Regular | N/A | N/A | | Normal | Normal | Normal | Normal | Normal | |
| Neto et al. (2005) | Brazil | 1 | 47 | Female | 3 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Hypothyroid | Clinical symptoms of hypertension, progressed to dyspnea on exertion, lower extremity edema, and ascites | Hypertension | None | None | N/A | N/A | N/A | Irregular | N/A | N/A | | - Diffuse goiter - No exophthalmos | Normal | Normal | Ascites | Lower extremity edema |
| | | 2 | 48 | Female | N/A | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, off medication | Lower extremity edema and mild DoE progressed to resting dyspnea and generalized edema | None | None | N/A | N/A | N/A | Irregular | N/A | N/A | | - Diffuse goiter - Mild bilateral proptosis - Elevated JVP with hepatojugular reflex | Right pleural effusion | Painful liver enlargement | Prominent lower extremities edema | | |
| | | 3 | 52 | Female | 10 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - HT for 5 months - Tachycardia, exertional dyspnea, and lower extremity edema - Dyspnea at rest - Fever for 3 days - 4 months of progressive shortness of breath and generalized body swelling - Increased sweating | Hypertension | None | None | N/A | N/A | N/A | Irregular | N/A | N/A | | - Diffusely enlarged thyroid - No exophthalmos | Normal | Right pleural effusion | Enlarged liver and spleen | Lower extremity edema |
| Shyamali & Ponnamparuma (2020) | Sri Lanka | 1 | 53 | Female | 6 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - Fever for 3 days - 4 months of progressive shortness of breath and generalized body swelling - Increased sweating | None | None | N/A | N/A | 101 | N/A | N/A | Febrile | Elevated JVP | Pansystolic murmur over the left sternal border | Normal | Extensive abdominal wall edema | Bilateral ankle edema | | |
| Okada et al. (2001) | Japan | 1 | 25 | Female | 6.5 months | Unspecified refractory hyperthyroidism | Thyrotoxicosis | 10 | Improved / recovered | No readmission | N/A | Unclear | Neck swelling | None | None | 138 | 60 | 96 | Regular | N/A | 37,4 | - No anemia - Bilateral thyroid swelling (7 x 3 cm) - No tenderness | - No heart murmur - S2 pulmonary component sound markedly increased - S4 | Normal | Flat and soft | Edema in the lower extremities | | |
| Soroush-Yari et al. (2005) | US | 1 | 59 | Male | 7 years | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Unclear | Heat intolerance, tremor, diarrhea, weakness, palpitations and a weight loss of 75 pounds over 4-5 months | Hypertension | None | None | N/A | N/A | N/A | Irregular | N/A | N/A | | - Lid lag - Exophthalmos - Thyromegaly | - Right ventricular heave - Rapid AF | Normal | Normal | Smooth, velvety skin |
| Hegazi, El Sayed, & El Ghoussein (2008) | Kuwait | 1 | 43 | Female | 14 months | Graves' disease | Thyrotoxicosis | N/A | Improved with any persisted conditions | No readmission | PH | Euthyroid, on medication | Lower limb swelling, fatigue, no DoE | None | None | N/A | N/A | 98 | Regular | N/A | N/A | | - Elevated JVP - Mild bilateral exophthalmos - Diffuse goitre - Significant bruit over both thyroid lobes | Systolic murmur over the left lower sternal edge | Normal | Normal | Marked pitting lower limb oedema | |
| Saleem, Sheikh, & Masood (2011) | Pakistan | 1 | 50 | Female | 1 year | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Hypothyroid | Weight loss, palpitations, and anxiety for the past 4 weeks | Right thyroid lobectomy 4 years ago | None | None | N/A | N/A | 110-120 | Irregular | N/A | N/A | | Diffuse enlargement of left thyroid lobe and thyroid bruit | Normal | Normal | Normal | Normal |
| Ismail (2007) | US | 1 | 56 | Female | N/A | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Weight loss of 25 lbs (11 kg) for 3 months, dyspnea at rest, weakness, intermittent palpitations, nervousness, and heat intolerance | None | None | 100 | 60 | 110 | Irregular | N/A | N/A | | - Diffuse, nontender goiter without palpable nodules - Elevated JVP | Pansystolic murmur at the left sternal border | Normal | - Hepatomegaly - Abdominal distention | Bilateral leg edema | |
| Lozano & Sharma (2004) | US | 1 | 29 | Female | 6 months | Graves' disease | Thyrotoxicosis | 10 | Improved / recovered | No readmission | N/A | Euthyroid, off medication | - 4-week history of progressive DoE and orthopnea, profound weight loss (approximately 30 lbs in one month), bilateral leg edema, fatigue, palpitations, cough with whitish expectoration, and early satiety - No history of paroxysmal nocturnal dyspnea - No attempts of losing weight or the use of appetite-suppressant medications | None | None | 132 | 80 | 92 | Regular | 22 | 36,3 | - Pale conjunctivae and muddy sclera - Brittle hair - Normal skin with no excessive sweating - Intact extracocular movements without exophthalmos or lid lag - Diffuse, non-tender thyromegaly without palpable nodules and bruit - Elevated JVP (10 cm) with prominent V waves | - Left parasternal heave - Prominent second heart sound at the pulmonary area - Pansystolic murmur at the lower left sternal area | - Suggestive of a right pleural effusion - No rales | Enlarged, pulsatile liver | - 3+ bilateral leg edema - Cachectic | | |
| Lee JY, Lee SH, & Kim WH (2021) | South Korea | 1 | 41 | Female | 6 months | Graves' disease | Thyrotoxicosis | 20 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Worsening generalized edema and dyspnea for a month despite of resuming MMI for 1 month | None | - MMI for 10 months, then discontinued for 8 months after euthyroid - Graves' disease relapsed and methimazole resumed since 1 month | 116 | 73 | 91 | Irregular | 20 | 36,2 | - Exophthalmos - Diffuse goiter | Grade 3/6 systolic murmur at the left lower sternal border | Normal | Normal | Grade 3 pitting edema at both lower legs | | |
| Park et al. (2006) | South Korea | 1 | 71 | Female | 4 weeks | Unspecified hyperthyroidism | Thyrotoxicosis | 15 | Improved / recovered | No readmission | N/A | Unclear | - 10 days of progressive shortness of breath and indigestion - Weight loss of approximately 15 kg for 5 months | None | None | 127 | 70 | 100 | Irregular | N/A | 36,2 | Elevated JVP with a prominent V wave | Soft 2/6 systolic murmur at the left sternal border | Normal | Normal | Mildly tremulous | | |
| Fakri, Michel, & Tamilia (2021) | Canada | 1 | 32 | Female | 10 months | Graves' disease | Thyrotoxicosis | 20 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - 3 months of menorrhagia and extreme fatigue, progressive fatigue, occasional palpitations, and unintentional weight loss (7.5 kg) - DoE and bilateral leg swelling over the same period without orthopnea and PND | None | None | 149 | 81 | 120 | Regular | N/A | Afebrile | - Proptosis - Periorbital edema - Non-tender diffuse goitre - Elevated JVP | - Holosystolic murmur best heard at the apex with radiation to the left axilla - Left sternal heave | Normal | Normal | 1+ bilateral pitting edema | | |

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| Hariforoosh et al. (2022) | US | 1 | 69 | Male | 6 days | Toxic thyroid adenoma | Thyrotoxicosis | N/A | Unclear | No readmission | N/A | LTFU | 3 weeks of shortness of breath, intermittent chest pain, and lower extremity edema | None | None | 150 | 86 | 73 | Regular | N/A | N/A | Markedly elevated JVP (12 cm) | Normal | Sparse bibasilar crackles | Normal | 1+ pitting pedal edema | | | |
| Singarayar et al. (2018) | Malaysia | 1 | 25 | Female | 5 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - 2 days of fever, abdominal pain, diarrhoea, and vomiting - 2-month history of palpitation, heat intolerance, weight loss, and reduced effort tolerance (DoE) | None | None | NA | N/A | 104 | N/A | N/A | N/A | N/A | - Exophthalmos - Diffuse goitre - Elevated JVP with c-v wave | Systolic murmur over the left sternal edge | Normal | Pulsatile hepatomegaly | Normal | | |
| | | 2 | 45 | Female | 9 days | Toxic multinodular goitre | Impending thyroid storm | N/A | Deceased / died | No readmission | N/A | Unclear | 3 days of fever preceded by one-week history of cough and diarrhoea associated with palpitation, weight loss, hand tremors, and dyspnea | None | Refused RAI and defaulted treatment in the past three years | NA | N/A | 120 | Irregular | N/A | N/A | N/A | Multinodular goitre | Systolic murmur over the left sternal edge | Right pleural effusion | Normal | Bilateral pedal edema | | |
| Hamed, Palumbo, & Taaha (2022) | US | 1 | 43 | Male | N/A | Graves' disease | Thyroid storm | 50 | Improved with any persisted conditions | No readmission | Cardiomyopathy | Euthyroid, on medication | >2 months of heat intolerance, palpitations, diaphoresis, tremors, nausea, diarrhoea, and unintentional weight loss | None | None | N/A | N/A | 170 | Regular | N/A | N/A | N/A | - Pronounced stare - Bilateral lid lag - Diffusely enlarged, palpable thyroid | Normal | Normal | Normal | Normal | | |
| Karashima et al. (2018) | Japan | 1 | 53 | Female | 2 months | Graves' disease | Thyroid storm | 50 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | DoE, hyperthermia, increased sweating, and diarrhea after 9 months MMI was stopped | None | - Low-dose MMI - MP IV pulse therapy | - On admission: 160 - On day 30: 88 - After thyroidectomy on day 45 and cardiac surgery on day 59: 102 | - On admission: 75 - On day 30: 49 - After thyroidectomy on day 45 and cardiac surgery on day 59: 63 | - On admission: 100 - On day 30: 94 - After thyroidectomy on day 45 and cardiac surgery on day 59: 82 | - On admission: Irregular - On day 30: Regular - After thyroidectomy on day 45 and cardiac surgery on day 59: Regular | N/A | - On admission: 40.0 - On day 30: 36.9 - After thyroidectomy on day 45 and cardiac surgery on day 59: 36.7 | N/A | N/A | Normal | Apical systolic murmur (Levine scale 4/6) | Normal | Normal | Normal | Bilateral pitting edema in lower extremities |
| Nigusse et al. (2020) | US | 1 | 31 | Female | 10 weeks | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Palpitations, shortness of breath, weakness, and eye turning yellow over last several weeks | None | Non-compliant with medications | 151 | 92 | 122 | Irregular | 22 | N/A | - Icteric sclera - Exophthalmos - Bilateral lid lag - Firm, non-tender, well-defined, symmetrical enlarged goitre - Elevated JVP - No lymphadenopathy | Normal | Normal | - Distended abdomen with positive fluid shift - Palpable liver 3 cm below the right costal margin along with the midclavicular line | - 3+ bilateral lower extremity edema - Fine resting tremors | | | |
| Hamagawa et al. (2009) | Japan | 1 | 83 | Female | 6 months | Graves' disease | Thyroid storm | 55 | Improved / recovered | No readmission | N/A | Euthyroid, on medication | DoE appeared 6 months after bilateral cataract surgery and gradually increased to dyspnea at rest | Cataract surgery 1 year ago | None | 170 | 76 | 120 | Regular | 24 | 37.3 | - Mild anemic conjunctival palpebra - Icteric sclera - No proptosis - No thyroid enlargement - No vascular murmur in the thyroid gland - No cervical lymphadenopathy - Elevated JVP | - Systolic ejection murmur of Levine class III/IV with the strongest point at the 3rd ICS on the left sternal margin - Pansystolic murmur of Levine class II/VI with the strongest point at the heart apex | Wet rales in the bilateral lower lung fields | - Flat and soft - Unpalpable liver and spleen | Bilateral pitting edema on lower extremities | | | |
| Syriou et al. (2008) | Greece | 1 | 48 | Female | 16 months | Multinodular goitre with cystic degeneration | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | - Previous hospitalisation 8 months ago in other hospital due to low-grade fever, anorexia, cough, weight loss, and palpitations - Ankle edema progressively deteriorated in the last 3 months, followed by fatigue - Currently fatigue, palpitations, and severe pedal edema | None | Previous hospitalisation: - Furosemide 40 mg/day - Warfarin with INR 2.5-3 - Spironolactone 25 mg/day - Digoxin 0.25 mg/day - Diltiazem 60 mg tds - Quinapril 5 mg/day - Propranolol 40 mg tds | 140 | 80 | 120 | Irregular | N/A | N/A | - Elevated JVP - No dyspnea - No exophthalmos - Macronodular enlarged thyroid without thrill or bruit | - Apical systolic murmur - A third heart sound | - Dull to percussion in lung bases - Decreased breath sounds in lung bases | Normal | - Mildly tremulous - Bilateral severe pedal edema (anasarca) - Moderately warm not moist skin | | | |
| Xenopoulos, Braden, & Applegate (1996) | US | 1 | 47 | Male | N/A | Graves' disease | Thyrotoxicosis | N/A | Improved followed by readmission | Improved / recovered | N/A | Euthyroid, on medication | Lower extremities edema, increasing abdominal girth, and progressive dyspnea | None | - BB - Radioactive iodine (I131) | 120 | 60 | N/A | Regular | N/A | N/A | Normal | Normal | Mild orthopnea | Normal | - Tremulous - Bilateral lower extremity edema | | | |
| Tam & Fung (2008) | Hong Kong | 1 | 45 | Male | 2 years | Unspecified hyperthyroidism | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, off medication | Diarrhea and vomiting for 2 weeks, and weight loss of 9 kg over the past 2 months | None | None | N/A | N/A | 100 | Irregular | N/A | N/A | - Elevated JVP - No goitre - No exophthalmos | Normal | Normal | Normal | Bilateral ankle edema | | | |
| Bonou et al. (2012) | Greece | 1 | 34 | Female | 10 months | Unspecified hyperthyroidism | Thyrotoxicosis | N/A | Improved followed by readmission | Improved / recovered | N/A | Euthyroid, unclear medication status | 3 months of progressive shortness of breath with palpitations and diaphoresis | None | None | 90 | 50 | 140 | Irregular | N/A | N/A | Elevated JVP | - Marked RV heave - Holosystolic murmur at the LLSB accentuated with inspiration | Normal | - Hepatomegaly - Ascites | Bilateral ankle edema | | | |
| Iranzo Vázquez et al. (1997) | Spain | 1 | 60 | Female | 2 months | Multinodular colloid goiter | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Worsening ankle edema a few days before admission | None | - Digoxin - Furosemide | N/A | N/A | 120 | Irregular | N/A | N/A | - Jaundice - Mild exophthalmos - Elevated JVP with prominent v wave - Diffuse goiter grade III | - Grade 2/6 systolic murmur at the lower parasternal border - Grade 1/4 diastolic murmur at the lower parasternal border - Right S3 gallop | Normal | - Distention - Ascites - Hepatomegaly | - Fine distal upper extremity tremor - Bilateral ankle edema | | | |
| Aronson et al. (1987) | Israel | 1 | 49 | Male | 2 months | Graves' disease | Thyroid storm | 45 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Suddenly awoke with severe chest pain, fever, cough and dyspnea | None | PTU 400 mg/day | 100 | 70 | 100 | Regular | N/A | 38.8 | Normal | - A long, grade 4/6, blowing pansystolic murmur at the apex - Positive S3 gallop | Normal | Normal | Normal | Normal | | |
| Neiva et al. (2018) | Portugal | 1 | 30 | Female | 6 months | Graves' disease | Thyroid storm | N/A | Improved / recovered | No readmission | N/A | Unclear | Few days of evolution of peripheral edema, palpitations, and minimal exertional dyspnoea with a few months of weight loss, excessive sweating, irritability, hair thinning, amenorrhoea, tremor, and fatigue | None | None | 175 | 91 | 150 | Irregular | N/A | N/A | - Elevated JVP - Positive goitre | Systolic murmur III/IV more audible in tricuspid and mitral area | Bibasilar crepitations | Normal | Marked bilateral lower limb pitting edema | | | |
| Pierre et al. (2017) | US | 1 | 42 | Female | N/A | Graves' disease | Thyroid storm | 55 | Improved / recovered | No readmission | N/A | Unclear | RUQ abdominal pain which worsened with food, intermittent nausea and vomiting, dyspnea on exertion, fatigue, and chronic palpitations | - Asthma - Corrected PDA | None | 136 | 88 | 149 | Irregular | N/A | Afebrile | Normal | Irregularly irregular rhythm | Mild expiratory wheezing | RUQ tenderness | Normal | | | |
| Ma et al. (2005) | China | 1 | 48 | Female | 26 months | Graves' disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Euthyroid, on medication | Diarrhea, recent weight loss, and recent onset of shortness of breath | - Type 2 diabetes mellitus - Immune thrombocytopenic purpura with a stable platelet count of 44x10 ⁹ /L | Glibenclamide 7.5 mg/day | N/A | N/A | 120 | Regular | N/A | N/A | - Diffuse goiter - Elevated JVP with prominent cv waves | Pansystolic murmur at the tricuspid area | Normal | Normal | Normal | Normal | | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------|-----------|---|----|--------|---------|---------------------|----------------|-----|----------------------|----------------|-----|--------------------------------------|--|---|--|-----|-----|-----|-----------|---------|--------|--|--|--------|---|---|---|
| Evlice & Aksoz (2017) | Turkey | 1 | 64 | Female | N/A | Multinodular goiter | Thyroid storm | 70 | Improved / recovered | No readmission | N/A | Hypothyroid | Jaundice, pruritis diffuse edema, palpitation, shortness of breath, irritability, confusion, and chronic diarrhea | None | Did not see her doctor regularly and did not take any prescribed medications | 110 | 68 | 170 | Irregular | 19 | 37,1 | - Scleral icterus - Soft and asymmetric neck with palpable prominence of the isthmus and pyramidal lobes of the thyroid | Normal | Normal | Normal | Normal | Generalized edema |
| Khalil, Dube, & Woods (2023) | US | 1 | 39 | Male | 6 weeks | Graves' disease | Thyrotoxicosis | 10 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | - Abrupt onset of shortness of breath and palpitations in the evening prior - Chest pain on the left side and neck pain - Worsening chest pain and dyspnea when walking upstairs, not specified whether the pain is radiating or not - Last fentanyl use was one month prior and at the time of admission, he had been in a rehabilitation facility for one month | - History of tobacco, cannabinoid, and fentanyl abuse - Asthma | None | | 131 | 85 | 110 | Regular | 22 | Afebrile | Normal | Normal | Normal | Normal | Bilateral tremors on outstretched hands |
| Lee TI et al. (2002) | China | 1 | 76 | Female | N/A | Plummer's disease | Thyrotoxicosis | N/A | Improved / recovered | No readmission | N/A | Unclear | - Intermittent palpitation, shortness of breath, and orthopnea over 10 days - Intermittent palpitation for several years - PND relieved by sitting up for several minutes | None | None | N/A | N/A | N/A | N/A | N/A | N/A | Right soft thyroid mass | Normal | Normal | Normal | Normal | Normal |
| Wyle, Moore, & Yates (2018) | US | 1 | 23 | Male | 21 days | Graves' disease | Thyroid storm | 45 | Improved / recovered | No readmission | N/A | Euthyroid, unclear medication status | Palpitations and dyspnea | None | None | N/A | N/A | 160 | Irregular | N/A | 37°C | Normal | Normal | Normal | Normal | Normal | Normal |
| Saad et al. (2008) | Argentina | 1 | 34 | Female | 1 week | Graves' disease | Thyroid storm | 65 | Improved / recovered | No readmission | N/A | Unclear | Palpitations, lower extremity edema, diarrhea, and 10 kg weight loss in a month | None | Propranolol 40 mg/day | 150 | 80 | 140 | Irregular | 22 | 38.3°C | - Elevated JVP - Diffuse goiter - Systolic murmur at the right thyroid lobe level | - Apex best displaced downwards and outwards - Grade 3/6 systolic murmur at the tricuspid area, with increased intensity during inspiration | Normal | - Distention - Hepatomegaly - Hepatic pulse | - Distal fine extremity tremor - Bilateral lower extremity edema | |

Supplementary Data 1. Basic characteristics of the included studies (Part B).

| Author (Year) | Study Location | No. Px | Age | Sex | Laboratory | | | | | | | | | |
|--|----------------|--------|-----|--------|--|--|------------------------------|---|------------------------------|--|----------------------|------------------------------|--|--|
| | | | | | TSH | FT4 | T4 | FT3 | T3 | TRAb | TSAb / TSI | TgAb | TPOAb | |
| Oduah, Perera, & Brenes-Salazar (2021) | US | 1 | 52 | Female | <0.1 mIU/L (0.5-5 mIU/L) | 4.2 ng/dL (0.9-1.7 ng/dL) | N/A | N/A | N/A | >40 IU/L (0-1.75 IU/L) | 5.2 (≤1.3) | N/A | N/A | |
| Lozanov et al. (2010) | Sofia | 1 | 52 | Female | 0.005 mIU/mL | 46.6 pmol/L (12-22) | N/A | 13.3 pmol/L (2.8-7.1) | N/A | 32.4 IU/mL (0-1.5) | N/A | N/A | 288 IU/L (0-34) | |
| Khoo, Chu, & Fung (2018) | Malaysia | 1 | 59 | Male | - On admission: 0.001 uIU/ml (0.4-4.7) - After 2 months: < 0.01 uIU/ml | - On admission: 61.6 pmol/L (9-25) - After 2 months: 15.21 pmol/L (9-19) | N/A | 21.8 pmol/L (3.5-6.5) | N/A | Negative | N/A | N/A | N/A | |
| Nigam & Morton (2012) | New Zealand | 1 | 35 | Female | Suppressed | - On admission: 77 pmol/L (10-20 pmol/L) - After 1 month: 17.1 pmol/L | N/A | - On admission: >46 pmol/L - After 1 month: 7.6 pmol/L | N/A | N/A | N/A | N/A | N/A | |
| | | 2 | 75 | Female | Suppressed | - On admission: 68.2 pmol/L - After 2 weeks: 27 pmol/L | N/A | - On admission: 23.6 pmol/L - After 2 weeks: 7.2 pmol/L | N/A | 25 (Elevated) | N/A | N/A | N/A | |
| | | 3 | 41 | Female | N/A | 57 pmol/L | N/A | > 46 pmol/L | N/A | N/A | N/A | N/A | N/A | |
| Baagar et al. (2017) | Qatar | 1 | 35 | Female | - On admission: <0.01 (0.45-4.5 mIU/L) - After 2 weeks: <0.01 - After 3 months: <0.01 | - On admission: 54.69 (9-20 pmol/L) - After 2 weeks: 23.99 - After 3 months: 6.6 | N/A | - On admission: >46.08 (2.6-5.7 pmol/L) - After 2 weeks: 12.98 - After 3 months: 3.97 | N/A | N/A | N/A | N/A | >1000 U | |
| Alam & Zaman (2019) | UK | 1 | 65 | Female | - On admission: <0.01 (0.35-3.50 mIU/L) - After 3 months: 3.42 | - On admission: 28.5 (7.5-21.1 pmol/L) - After 3 months: 9.3 | N/A | - On admission: 8 (3.8-6.0 pmol/L) - After 3 months: 3.3 | N/A | N/A | 3.52 IU/L (<0.56) | N/A | 147.7 kU/L (0-34) | |
| Sadiq & Chamba (2021) | Tanzania | 1 | 31 | Female | - On admission: 0.07 uIU/mL (0.27-4.20 uIU/mL) - After 1 month: <0.01 - After 6 months: 0.08 | - On admission: 59.1 ng/mL (52.0-127.0 ng/mL) - After 1 month: 63.3 - After 6 months: 188 | N/A | - On admission: 14.2 ng/mL (0.69-2.15 ng/mL) - After 1 month: 11.7 - After 6 months: 10.0 | N/A | N/A | N/A | N/A | N/A | |
| Hsieh et al. (2010) | China | 1 | 39 | Female | <0.015 (mIU/L) (0.34-5.60) | 4.33 ng/dL (0.54-1.40) | N/A | 7.12 pg/mL (2.0-4.0) | N/A | 84.5% (<15) | N/A | N/A | N/A | |
| Uchihara et al. (2022) | Japan | 1 | 28 | Female | <0.008 mg/dL | - On admission: 3.36 IU/L - After 5 days: Almost normalized | N/A | - On admission: >20.0 pg/mL - After 5 days: Almost normalized | N/A | 11.9 IU/L (<2.0 IU/L) | N/A | N/A | N/A | |
| Argote, Colsy, & Alloussi (2007) | France | 1 | 55 | Female | Suppressed | Two times normal value | N/A | Four times normal value | N/A | Strong positive | N/A | N/A | N/A | |
| Suzuki et al. (2022) | Japan | 1 | 46 | Female | 0.01 µIU/mL | >7.7 ng/dL | N/A | 25.5 pg/mL | N/A | 39.1 U/L | N/A | N/A | N/A | |
| Subahi, Ibrahim, & Abugroun (2018) | US | 1 | 39 | Female | <0.008 mIU/L (0.20-4.78 mIU/mL) | 6.6 ng/dL (0.8-1.8 ng/dL) | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| Herzallah et al. (2023) | UAE | 1 | 37 | Female | <0.005 mIU/L | >100 pmol/L | N/A | N/A | N/A | N/A | N/A | N/A | N/A | |
| Chen, Wee, & Sonawane (2019) | Singapore | 1 | 55 | Female | <0.005 mIU/L (0.27-4.20 mIU/L) | 75.6 pmol/L (12-22 pmol/L) | N/A | N/A | N/A | 6.6 IU/L (<1.8 IU/L) | N/A | N/A | N/A | |
| Kamalanathan et al. (2012) | India | 1 | 38 | Male | 0.04 mIU/L (0.5-4.5) | 112.14 pmol/L (10.16-24.86) | N/A | 26.18 pmol/L (3.06-6.76) | N/A | N/A | N/A | N/A | N/A | |
| Hiroi et al. (2007) | Japan | 1 | 50 | Female | <0.01 mIU/L (0.32-4.12) | 7.17 ng/dL (1.01-1.67) | N/A | 21.54 pg/mL (2.26-4.15) | N/A | 95.5% (<10) | N/A | N/A | N/A | |
| Aujayeb & Dundas (2021) | UK | 1 | 30 | Female | - On admission: <0.01 mIU/L (0.3-4.5) - After 1 week: <0.01 | 46 pmol/L (10-22) | 4.9 (1 week after admission) | 33 pmol/L (3.1-6.8) | 6.5 (1 week after admission) | 57.7 IU/L (1.0-1.8) (1 week after admission) | N/A | N/A | 129 IU/L (0.0-34.0) (1 week after admission) | |
| Allencherril & Birnbaum (2015) | Texas | 1 | 29 | Male | Suppressed | Markedly elevated | N/A | Markedly elevated | N/A | N/A | N/A | N/A | N/A | |
| Kishida et al. (2018) | Japan | 1 | 35 | Male | - On admission: <0.010 mIU/L - 14th day: <0.010 mIU/L | - On admission: 4.24 ng/dL - 14th day: 11.66 ng/dL - After 9 months: no hyperthyroid | N/A | - On admission: 12.33 pg/mL - 14th day: 45.14 pg/mL - After 9 months: no hyperthyroid | N/A | N/A | N/A | N/A | N/A | |
| Li et al. (2022) | China | 1 | 37 | Female | <0.008 mIU/L (0.55-4.78 mIU/L) | - On admission: 109.13 pmol/L (11.5-22.7 pmol/L) - 6th day: 76.47 pmol/L - 9th day: 57.8 pmol/L - 12th day: 32.2 pmol/L (considered normal) | N/A | - On admission: 24.1 pmol/L (2.8-6.3 pmol/L) - 6th day: 11.2 pmol/L - 9th day: 8.4 pmol/L - 12th day: 4.4 pmol/L (considered normal) | N/A | 37.88 IU/L (<1.75 IU/L) | N/A | N/A | N/A | |
| Jain et al. (2015) | India | 1 | 55 | Female | - On admission: 0.001 mIU/mL (0.3-5 mIU/mL) - After 3 weeks: 0.1 mIU/mL | - On admission: 10.67 ng/dL (0.7-1.51 ng/dL) - After 3 weeks: 6 ng/dL | N/A | - On admission: 8.41 pg/mL (1.71-3.71 pg/mL) - After 3 weeks: 1.88 pg/mL | N/A | N/A | 2.2 IU/L (<1.5 IU/L) | N/A | 1300 U/L (<9.0 U/L) | |
| Whitner et al. (2005) | US | 1 | 43 | Female | - On admission: <0.003 mIU/L - After 3 months: normal | - On admission: 42 pmol/L - After 3 months: normal | N/A | - On admission: 10.0 nmol/L - After 3 months: normal | N/A | N/A | N/A | N/A | N/A | |
| Dhital et al. (2018) | US | 1 | 31 | Female | - On admission: <0.005 mIU/L (0.45-5.33 mIU/L) - After 2 months: <0.005 mIU/L | - On admission: 5.36 ng/dL (0.58-1.64 ng/dL) - After 2 months: 0.60 ng/dL | N/A | - On admission: 28.31 pg/mL (2.2-4.10 pg/mL) - After 2 months: 4.28 pg/mL | N/A | N/A | >500% (≤122%) | 12 IU/mL (≤4 IU/mL) | 3841 IU/mL (≤8 IU/mL) | |
| Alkhuja, Pyram, & Odeyemi (2013) | US | 1 | 53 | Female | - On admission: 0.013 mIU/L (0.34-5.6 mIU/L) - After 48h: 0.013 mIU/L | - On admission: 5.01 ng/dL (0.28-1.64 ng/dL) - After 48h: 2.82 ng/dL | N/A | - On admission: 20.64 pg/mL (2.39-6.79 pg/mL) - After 48h: 5.17 pg/mL | N/A | N/A | 228% (<140%) | N/A | N/A | |
| Shang & Ma (2020) | China | 1 | 51 | Female | 0.01 nU/mL (0.55-4.78 nU/mL) | 4.43 ng/dL (0.89-1.8 ng/dL) | N/A | 13.01 pg/mL (2.3-4.2 pg/mL) | N/A | 34.2 IU/L (≤1.75 IU/L) | N/A | 105.2 IU/mL (<60 IU/mL) | >1300 U/mL (<60 U/mL) | |
| Kim HR et al. (2017) | South Korea | 1 | 48 | Female | ≤0.01 mIU/L (0.35-5.5 mIU/L) | N/A | 4.94 ng/mL (0.89-1.76 ng/mL) | N/A | 4.39 ng/mL (0.6-1.81 ng/mL) | >40.00 U/L (0-1.75 U/L) | Positive (659.2%) | 183.3 IU/mL (10-124.2 IU/mL) | 89.4 IU/mL (5-13.6 IU/mL) | |

| | | | | | | | | | | | | | | |
|------------------------------|-----------|---|----|--------|---|--|----------------------------|---|--|-------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|-------------------------|
| Aronson et al. (1987) | Israel | 1 | 49 | Male | N/A | N/A | 16.0 mcg/dL (on admission) | N/A | 335 ng/dL (on admission) | N/A | N/A | N/A | N/A | N/A |
| Neiva et al. (2018) | Portugal | 1 | 30 | Female | Suppressed (on admission) | >7.70 ng/dL or >99 pmol/L (on admission) (0.70-1.48 ng/dL, 9-25 pmol/L) | N/A | N/A | 16.6 pg/mL or 25.5 pmol/L (on admission) (1.71-3.71 pg/mL, 3.5-7.8 pmol/L) | Positive (on admission) | N/A | N/A | N/A | N/A |
| Pierre et al. (2017) | US | 1 | 42 | Female | <0.1 mU/L (on admission) | 2.82 ng/dL (on admission) | N/A | N/A | N/A | Positive (on admission) | N/A | N/A | N/A | Positive (on admission) |
| Ma et al. (2005) | China | 1 | 48 | Female | 0.02 mU/L (on admission) | 51.6 pmol/L (on admission) (12-22 pmol/L) | N/A | N/A | N/A | N/A | N/A | N/A | Negative (on admission) | N/A |
| Evlice & Aksoz (2017) | Turkey | 1 | 64 | Female | 0.001 U/mL (on admission) (0.2-4.4) | 8.12 pg/mL (on admission) (0.62-1.2) | N/A | 11.83 pg/mL (on admission) (2.88-4.55) | N/A | N/A | N/A | N/A | N/A | N/A |
| Khalil, Dube, & Woods (2023) | US | 1 | 39 | Male | 0.01 µU/mL (on admission) (0.4-4.0) | 6.58 µg/dL (day 2 admission) (0.8-1.8) | N/A | N/A | 459.37 ng/dL (day 2 admission) (100-300) | 39.60 U/L (day 3 admission) (<1.75) | 127 U/L (day 3 admission) (<1.75) | <1.0 U/L (day 3 admission) (115-120) | 281 U/mL (day 3 admission) (<34-35) | |
| Lee TI et al. (2002) | China | 1 | 76 | Female | <0.03 µU/mL (on admission) (0.25-4) | 1.67 ng/dL (on admission) (0.7-1.8) | N/A | N/A | 125 ng/dL (on admission) (86-187) | N/A | N/A | N/A | Normal (on admission) | N/A |
| Wyble, Moore, & Yates (2018) | US | 1 | 23 | Male | - On admission: <0.01 mU/L (0.45-4.70 mU/L) - D6 pre-TPE#1: <0.01 - D6 post-TPE#1: 0.05 - D7: <0.01 - D9: <0.01 - D10 pre-TPE#2: <0.01 - D10 post-TPE#2: 0.10 - D11: N/A - D12: <0.01 | - On admission: 5.20 ng/mL (0.7-1.9) - D6 pre-TPE#1: 1.23 - D6 post-TPE#1: 1.08 - D7: 0.96 - D9: 1.28 - D10 pre-TPE#2: 1.73 - D10 post-TPE#2: 1.18 - D11: 1.09 - D12: 1.10 | N/A | - On admission: 20.86 pg/mL (2.77-5.27 pg/mL) - D6 pre-TPE#1: 3.50 - D6 post-TPE#1: 2.20 - D7: 2.10 - D9: 4.50 - D10 pre-TPE#2: 5.30 - D10 post-TPE#2: 3.00 - D11: 2.20 - D12: 3.00 | N/A | N/A | N/A | N/A | N/A | N/A |
| Saad et al. (2008) | Argentina | 1 | 34 | Female | <0.05 U/ml | N/A | 19.8 ng/dL | N/A | 415 ng/dL | Positive (on admission) | N/A | N/A | N/A | >1,000 U/mL |

Supplementary Data 1. Basic characteristics of the included studies (Part C).

| Author (Year) | Study Location | No. Px | Age | Sex | Echocardiography | | | | | | | | | | | | | | | | Treatment | | | | |
|--|----------------|--------|-----|--------|------------------|--------------------|--------------------|-----------|-------------------------|------------------------------------|----------|---------------------------|--------------------------|------------|---|--------------------|--------------------|--|--------------------|--------------------|--|--|--|--|------|
| | | | | | Method | Regurgitated Valve | TR Degree | MR Degree | Evidence of Clinical HF | Evidence of HF on Echocardiography | LVEF (%) | Evidence of PH | Measured parameter of PH | PVR (mmHg) | Evidence of Atrial Enlargement / Dilation | RA Dilation Degree | LA Dilation Degree | Evidence of Ventricular Enlargement / Dilation | RV Dilation Degree | LV Dilation Degree | Other Examination | Follow-up Result | Pharmacotherapy | Non-Pharmacotherapy | |
| Oduah, Perera, & Brenes-Salazar (2021) | US | 1 | 52 | Female | TTE | TR | Moderate-to-severe | None | Isolated RHF | HFpEF (≥50%) | 55 | Not described | N/A | N/A | Not described | Not described | Not described | RV | Moderate | None | - Severely dilated IVC with no inspiratory collapse - Moderately RV reduced systolic function (TAPSE 14 mm; average peak systolic strain -19; S' 8 cm/s) - Tricuspid annulus dilatation - Normal LV size without regional wall motion abnormalities | None | Inpatient: - Cefotaxime 2 g IV q8h for 5 days - MMI - Metoprolol tartrate 12.5 mg q12h | None | |
| Lozanov et al. (2010) | Sofia | 1 | 52 | Female | TTE | TR and MR | Moderate | Severe | Yes | Not described | Reduced | Moderate | sPAP | 60 | RA and LA | Not described | Not described | None | None | None | - Enlargement of both atria (56/40 mm) - Mitral annulus - 34 mm, mitral prolapse with significant thickening of the leaflets and regurgitation of the 3rd degree - Aortic and tricuspid regurgitation of the 2nd stage - Reduced systolic ejection fraction - Increased systolic pressure in the pulmonary artery (60 mmHg) - No evidence of akinesia or other changes in the apex and midsection of the LV | Day 15: - MR grade 2 (moderate) - Normalization of pulmonary artery pressure (35 mmHg) | Inpatient: - Infusion solutions (NaCl 5%, serum glucosae, potassium chloride) - Oral diuretics - Nebivolol 5 mg/day - Dosed oxygen therapy - Thyrozol 50 mg daily | None | |
| Khoo, Chu, & Fung (2018) | Malaysia | 1 | 59 | Male | TTE | TR and MR | Severe | Moderate | Yes | HFmrEF (41-49%) | 40-50 | Mild | mPAP sPAP | 31 48 | Not described | Not described | Not described | Not described | Not described | Not described | - Mild to moderate LV dysfunction- Impair- | After 3 weeks: - Improvement of LV and RV function - LVEF 60-65% - Pulmonary pressure not raised demonstrated by no significant TR and PR | Inpatient: - IV furosemide infusion - Spironolactone 12.5 mg daily - Carvedilol 9.375 mg twice daily - Perindopril 2 mg daily - Thiamine and anticoagulated with s/c Clexane. - Intracoronary injection of 200 mcg nitroglycerin continued by continuous nitroglycerin infusion - IV atropine and IV adrenaline - IV hydrocortisone - Carbimazole - Oral Lugol's iodine - Propranolol - Cardiprin - Warfarin - Oral mononitrates | Brief CPR | |
| Nigam & Morton (2012) | New Zealand | 1 | 35 | Female | TTE | TR | Moderate | None | Yes | HFmrEF (41-49%) | 45 | Moderate | N/A | N/A | Not described | Not described | Not described | RV | Moderate | None | - Normal LV size with global moderate systolic dysfunction - RVSP 60 mmHg | After 6 weeks - LVEF 55-60% - RVSP 38 mmHg - Normal RV function | Inpatient & outpatient: - Prednisone 50 mg mane (in the morning) - Carbimazole 60 mg per day - Verapamil - Digoxin - Anticoagulant | Thyroidectomy | |
| | | 2 | 75 | Female | TTE | TR | Moderate-to-severe | None | None | HFrEF (≤40%) | 37 | Mild | N/A | N/A | Not described | Not described | Not described | None | None | None | - Normal LV size with globally impaired function - Mild RV impairment - RVSP 45 mmHg | After 4 weeks: - LVEF 45-50% - RVSP 33 mmHg | Inpatient & outpatient: - Carbimazole 40 mg/day - Prednisone 25 mg per day - Propranolol 80 mg per day - Anticoagulant | None | |
| | | 3 | 41 | Female | TTE | TR and MR | Severe | Severe | None | None | None | 60-65 | Moderate | N/A | N/A | Not described | Not described | Not described | RV | Moderate | None | - Normal LV and function - Normal RV function - Normal valve structure - RVSP 57 mmHg | After 4 weeks: - LVEF 65% - RVSP 48 mmHg - Moderate TR - Moderate MR | Inpatient & outpatient: - Single dose of IV metoprolol - Carbimazole 40 mg mane (in the morning) - Prednisone 50 mg mane (in the morning) - Atenolol | None |
| Baagar et al. (2017) | Qatar | 1 | 35 | Female | TTE | TR | Severe | None | Yes | HFpEF (≥50%) | 50-55% | Severe | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | - RSPV 60.16 mmHg | After 3 months - RVSP 52.64 mmHg - Moderate TR | Inpatient: - Lugol's iodine 7 drops (8 mg/drop) q8h - Propranolol 40 mg q8h - Dexamethasone 1 mg q8h - Cholestyramine 4 g q6h, - 2 doses of IV furosemide 40 mg - Carbimazole 60 mg/day | None | |
| Alam & Zaman (2019) | UK | 1 | 65 | Female | TTE | TR and MR | Moderate | Mild | Yes | HFrEF (≤40%) | 14 | Not described | N/A | N/A | LA | None | Severe | LV | None | Not described | - Severe impairment to overall LV systolic contractility (LVIDd 5.5cm (3.9-5.3cm)) - Severe increase in LVESV and LVEDV | After 3 months: - Moderate-to-severe LV impairment - Decreased TR and MR - LVEF 37% | Inpatient: - Carbimazole 20 mg once daily - Bisoprolol 2.5 mg once daily switched to Ivabradine 2.5 mg twice daily (titrated to 7.5 mg twice daily) due to bronchospasm-induced bisoprolol - Ramipril 2.5 mg once daily - IV Furosemide 80 mg twice daily decreased and then switched to bumetanide 1 mg once daily | None | |
| Sadiq & Chamba (2021) | Tanzania | 1 | 31 | Female | TTE | TR and MR | Mild | Severe | Yes | HFmrEF (41-49%) | 46 | Not described | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | Biventricular failure | None | Inpatient: - Oxygen - Furosemide 80 mg IV - Lisinopril 2.5 mg once daily - Digoxin 0.25 mg once daily - Soluble aspirin 75 mg once daily - Carbimazole 15 mg thrice daily - Propranolol 20 mg twice daily - Hydrocortisone 100 mg IV thrice daily | None | |
| Hsieh et al. (2010) | China | 1 | 39 | Female | TTE | TR and MR | Moderate | Moderate | Yes | HFmrEF (41-49%) | 43 | Yes, degree not described | N/A | N/A | None | None | None | None | None | None | None | No structural abnormality | None | Outpatient: N/A Inpatient: - Methimazole 10 mg three times a day - Propranolol 10 mg q8h - ACE inhibitor - IV furosemide - NTG | None |
| | | | | | | | | | | | | | | | | | | | | | | Outpatient: - Methimazole 5 mg - Propranolol 10 mg three times a day - Aspirin 100 mg per day | | | |

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|------------------------------------|-----------|---|----|--------|-------------|-----------|----------|--------------------|--------------|-----------------|--------|---------------|------|------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---|---|---|--|
| Uchihara et al. (2022) | Japan | 1 | 28 | Female | TTE | TR and MR | Severe | Moderate | Yes | HFmrEF (41-49%) | 49 | Mild | sPAP | 38 | Not described | Not described | Not described | Not described | Not described | Not described | Not described | Not described | Diffuse left ventricular hypokinesia | After 56 days: - Complete resolution of systolic dysfunction - No TR | Inpatient: - Methimazole - Glucocorticoids (tapered on day 6) - BB - IV furosemide - Potassium iodide | Paracentesis |
| Argote, Colsy, & Alloussi (2007) | France | 1 | 55 | Female | TTE | MR | None | Severe | Yes | Not described | N/A | Mild | sPAP | 35 | Not described | Not described | Not described | Not described | Not described | Not described | Not described | None | After 2 months: - MR grade 1 (mild) - Normal RV and LV pressures | Outpatient: - VKA - Propranolol - ACE inhibitor - Benzodiazepine - Carbimazole | None | |
| Suzuki et al. (2022) | Japan | 1 | 46 | Female | TTE | TR and MR | Severe | Mild | Yes | HFrEF (≤40%) | 15-20 | None | sPAP | 18 | RA and LA | Not described | Not described | Not described | Not described | Not described | Not described | Not described | - LVDD (mm): 48; 47; 46; 50; 51; 49; 52; 49; 45; 42; 51; 48; 53 - LVDs (mm): 43; 42; 40; 42; 41; 41; 37; 40; 43; 38; 44; 37; 39 - LVEF (%): 21; 23; 27; 33; 37; 35; 53; 40; 12; 19; 30; 46; 51 - LVOT-VTI (cm): 5.4; 9.5; 14.8; 13.3; 14.4; 11.5; 20; 11.9; 4.8; 5.5; 13.9; 15.2; 22 - TAPSE (cm): 11.0; 11.1; 13.4; 13.7; 15.5; 15.5; 23.4; 14.3; 8.69; 8.76; 19.3; 16.8; 20.3 - PAWP (mmHg): 14; 16; 13; 13; 16; 18; 17; 13; 14; 13; 13; 14 - RAP (mmHg): 6; 11; 7; 7; 10; 14; 13; 9; 11; 10; 11; 7 - CI (L/min/m ²): 1.8; 2.4; 2.3; 2.3; N/A; 1.6; 3.3; 1.9; N/A; N/A; 2.4; 4.2 | Inpatient: - Nitroglycerin IV - Landiolol IV - Thiamazole - Potassium iodide - Hydrocortisone | - Intubation - VA-ECMO - IABP - Plasma exchange | |
| Subahi, Ibrahim, & Abugroun (2018) | US | 1 | 39 | Female | TTE | TR | Moderate | None | Yes | HFrEF (≤40%) | 15-20 | Moderate | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | Not described | Not described | - Global LV hypokinesia - Estimated peak RVSP 47.7 mmHg (<40 mmHg) - Dilated IVC with poor inspiratory collapse (50%) consistent with elevated RAP - Estimated RAP 15 mmHg (10–20 mm Hg) | None | Inpatient: - Celtriaxone IV - Hydrocortisone IV - MMI - Diltiazem IV drip 10 mg/h - 2 doses of atropine - 1 dose of epinephrine - Milrinone - Norepinephrine - Vasopressin - Vancomycin - Cefepime - PTU 250 mg/4h - Lugol iodine | - 3 minutes of CPR - Plasmapheresis - CRRT |
| Herzallah et al. (2023) | UAE | 1 | 37 | Female | TTE | MR | None | Moderate-to-severe | Yes | HFrEF (≤40%) | 40 | Not described | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | Not described | Not described | Dilated cardiomyopathy | None | Inpatient: - Esmolol infusion at a rate of 50 mcg/kg/min - Hydrocortisone 100 mg - IV fluids 500 ml of normal saline - Norepinephrine infusion - Propranolol - Carbimazole - Unspecified antibiotics IV | - 3 cycles of CPR - Intubation - CRRT |
| Chen, Wee, & Sonawane (2019) | Singapore | 1 | 55 | Female | TTE and TEE | TR and MR | Moderate | Very severe | Yes | Not described | N/A | Severe | N/A | N/A | RA and LA | Not described | Not described | Not described | Not described | Not described | Not described | Not described | - Flail posterior MV leaflet with torrential MR, which confirmed by pre-surgery TEE to be a pre-existing posterior MVP with an acute flail due to rupture of the chordae tendineae - Hyperdynamic LV function | None | Inpatient: - Hydrocortisone 100 mg IV q8h - PTU 200 mg q4h - Lugol's iodine 10 drops q8h - Cholestyramine 4 g three times daily - Amoxicillin-clavulanate IV - Furosemide 40 mg IV - Norepinephrine infusion | - Continuous positive airway ventilation - Intubation - IABP - Cardiac surgery (bioprosthetic MV replacement and TV repair) |
| Kamalanathan et al. (2012) | India | 1 | 38 | Male | TTE | TR | Severe | None | Isolated RHF | Not described | N/A | Moderate | N/A | N/A | RA | Not described | None | RV | Not described | None | None | None | - Global RV dysfunction - Estimated RVSP 54 mm Hg - RAP 8 mm Hg - TRPG 46 mm Hg - Normal LV systolic and diastolic functions - Normal MV | After 4 months: - Estimated RVSP 26 mmHg | Outpatient: - Titrated carbimazole dose to 20 mg/day - Low-dose propranolol | None |
| Hiroi et al. (2007) | Japan | 1 | 50 | Female | TTE | TR and MR | Moderate | Moderate | Isolated RHF | HFpEF (≥50%) | 57,3 | Mild | sPAP | 48,7 | RA and LA | Not described | Not described | RV and LV | Not described | Not described | Not described | Not described | No structural heart valve abnormalities were noted | None | Inpatient: - IV drip infusion of fluid, calorie, and mineral replacement - MMI 15 mg/day - Iodine 50 mg/day - Propranolol 30 mg/day - BB | None |
| Aujayeb & Dundas (2021) | UK | 1 | 30 | Female | TTE | TR | Mild | None | None | None | Normal | None | sPAP | 24 | RA | Mild | None | RV | Not described | None | None | None | - Normal LV size and function - Normal RV function - Paradoxical interventricular septal motion (or LV "D-shaping") in systole due to RV volume overload - Bulging interatrial septum from right to left without any evidence of trans-septal flow - Thin layer of pericardial fluid around the heart without any evidence of haemodynamic compromise | None | Outpatient: - Amoxicillin 500 mg three times a day for five days - Ferrous sulphate 200 mg three times a day - Propranolol 40 mg four times a day reduced to once a day after 1 week - Carbimazole 40 mg once a day switched to PTU 100 mg twice a day for 6 weeks due to neutropenia after 4 weeks | None |
| Allencherril & Birnbaum (2015) | Texas | 1 | 29 | Male | TTE | MR | None | Moderate | Yes | HFrEF (≤40%) | <20 | Not described | N/A | N/A | LA | None | Severe | LV | None | Mild | None | None | After 6 days on ECMO: - LVEF improved to 35–39% - Decreased LV dilatation - Decreased MR | Inpatient: - PTU - Propranolol - High doses of epinephrine, norepinephrine, and vasopressin drips to maintain blood pressure | - CPR - Intubation - IABP - VA-ECMO | |
| Kishida et al. (2018) | Japan | 1 | 35 | Male | TTE | TR and MR | Moderate | Severe | Yes | HFrEF (≤40%) | 26 | Moderate | N/A | N/A | RA and LA | Not described | Not described | Not described | Not described | Not described | Not described | Not described | - RVSP 60 mmHg - Distended IVC | After 9 months: - LVEF 53% | Inpatient: - Thiamazole - Beta blockers - Diuretics - Anticoagulants | None |

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| Li et al. (2022) | China | 1 | 37 | Female | TTE | TR and MR | Severe | Severe | Yes | HFpEF (≥50%) | 60 | Mild | sPAP | 35 (15-30) | RA and LA | Not described | Not described | RV | Not described | None | - LVDD 53 mmHg (35-55 mmHg) - RVDD 47 mmHg (<25 mmHg) - SV 82 ml/bet (40-90 ml/bet) - CO 5.7 L/min (4-8 L/min) | None | Inpatient: On admission: - Furosemide 40 mg/day IV - Metoprolol 50 mg/day (switched to these because AF and BNP didn't improve); - Methimazole cream 0.1 g (MMI 5 mg) 2/day - Bisoprolol 2.5 mg/day - Torsemide 20 mg/day IV → 80 mg/day - Spironolactone 40 mg/day 2nd day of admission: - Ademetionine IV - Ursodeoxycholic acid capsule 4th day of admission: - Therapeutic plasma exchange (TPE) - Replacement fluid: half FFP and half 4% albumin - Methylprednisolone 40 mg/day IV After 10th course of TPE: - RAI 50 mci Outpatient: - Bisoprolol - Oral diuretics - Methylprednisolone tablets - UDCA capsules | None | | |
| Jain et al. (2015) | India | 1 | 55 | Female | TTE | TR and MR | Not described | Not described | Isolated RHF | Not described | N/A | Not described | N/A | N/A | RA and LA | Not described | Not described | Not described | Not described | Not described | - Left ventricular diastolic dysfunction - Hyperdynamic circulation (increased turbulence to blood flow across the aortic and pulmonary valves) | None | - Carbimazole 10 mg TDS - Propranolol 40 mg TDS | None | | |
| Whitner et al. (2005) | US | 1 | 43 | Female | TTE | TR | Moderate-to-severe | None | Isolated RHF | HFpEF (≥50%) | Normal | Moderate | N/A | N/A | RA | Not described | None | Not described | Not described | Not described | - Preserved left ventricular systolic and diastolic function - Incomplete systolic coaptation of the tricuspid leaflets - Estimated RVSP 46 mmHg | After 3 months: - Normal RA - Trace TR | Inpatient: - Low dose furosemide - Propranolol - PTU | Thyroid ablation | | |
| Dhital et al. (2018) | US | 1 | 31 | Female | TTE | TR and MR | Severe | Very severe | Yes | HFmrEF (41-49%) | 43 | Moderate | N/A | N/A | RA and LA | Severe | Severe | RV | Not described | None | - Global hypokinesia - Grade 2 diastolic dysfunction - Anterior MVP | After 2 months: - LVEF 61% - No regional wall motion abnormalities - Normal diastolic function - Moderate MR and TR - Top-normal right-sided pressure | On admission: - Metoprolol - Methimazole Discharged: - BB - Diuretics | - Radioactive iodine ablation - Paracetamol | | |
| Alkhuja, Pyram, & Odeyemi (2013) | US | 1 | 53 | Female | TTE | MR | None | Mild | Yes | HFmrEF (41-49%) | 45 | Not described | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | - Mildly reduced LV systolic function - Apical septal and apical anterior hypokinesia | None | Inpatient after CT w/ contrast: - Pantoprazole 40 mg IV - Methylprednisolone 40 mg IV - Phenhydramine 25 mg IV - Propofol infusion IV - Lorazepam infusion IV - Solucortef 20 mg IV stat, every 6 h - Methimazole 20 mg stat, every 8 h via OGT - Propranolol 10 mg stat, with titration every 8 h up to HR of 60-90 bpm, maintenance dose 120 mg every 8 h | - CPR for 5 mins and intubated - Mechanical ventilation | | |
| Shang & Ma (2020) | China | 1 | 51 | Female | TTE | TR and MR | Severe | Moderate | Yes | HFpEF (≥50%) | 55 | Moderate | sPAP | 70 | RA and LA | Not described | Not described | Not described | Not described | Not described | - Mild AR - Dilated IVC - Decreased respiratory mobility | None | Inpatient: - Diuresis IV - Beta-blockers - PTU - Corticosteroids - Amiodarone 300 g IV (during CPR) | CPR | | |
| Kim HR et al. (2017) | South Korea | 1 | 48 | Female | TTE | TR | Mild | None | Yes | Not described | N/A | Moderate | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | RVSP 55.7 mmHg | None | MMI 5 mg twice a day | None | | |
| Neto et al. (2005) | Brazil | 1 | 47 | Female | TTE | TR and MR | Severe | Mild-to-moderate | Isolated RHF | Not described | N/A | Moderate | sPAP | 60 | RA | Not described | None | RV | Not described | None | None | 3 weeks after admission: - Normal LV - Dilated RV - Severe TR - PAH with dilated main pulmonary artery | After RAI (3 months later): - Normal RA and RV - No sign of PAH - Mild prolapse of anterior leaflets of both mitral and tricuspid valves | Inpatient: - Antithyroid drug - BB - Diuretic | 3 months after admission: - RAI | None |
| | | 2 | 48 | Female | TTE | TR and MR | Severe | Mild | Isolated RHF | Not described | N/A | Moderate | sPAP | 70 | RA and LA | Not described | Not described | RV | Not described | None | None | After 2 doses of RAI:- Normal-sit | Presently: - Normal EC | Inpatient and outpatient: - PTU 900 mg/day - Beta blocker - Diuretic - Anticlotting agent - RAI 2 doses | None | |
| | | 3 | 52 | Female | TTE | TR and MR | Severe | Mild | Isolated RHF | Not described | Reduced | Mild | sPAP | 40 | RA and LA | Not described | Not described | RV | Not described | None | - Normal LV with a mildly diminished systolic function - Severe RV systolic dysfunction - Mild AR | After 10 months: - Normal LV and RV, including systolic function - LAE - Minimal AR - Moderate MR - sPAP normal - No TR | Inpatient and outpatient: - MMI 20 mg/day | Several thoracenteses | | |
| Shyamali & Ponnamperna (2020) | Sri Lanka | 1 | 53 | Female | TTE | TR | Not described | None | Isolated RHF | Not described | N/A | Mild | sPAP | 45 | Not described | Not described | Not described | RV | Not described | None | None | After 6 months: - sPAP 29 mmHg | Inpatient and outpatient: - Unspecific antithyroid drugs (thyrostatic type) | None | | |
| Okada et al. (2001) | Japan | 1 | 25 | Female | TTE | TR | Mild-to-moderate | None | Isolated RHF | Not described | N/A | Severe | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | - Hypercontractile LV systolic function - Flattening of the interventricular septum from the end diastole to the systole - No clear shunt disease or RVOTO - RVSP approximately 70 mmHg | 13 days after subtotal thyroidectomy: - No evidence of interventricular septal compression - No TR - Improved PH | Inpatient & outpatient: - Thiamazole 40 mg/day, then increased weekly to 80-100 mg/day, and drug eruption occurred, thiamazole was discontinued - Propranolol 30 mg/day - PTU 1 g/day as the replacement, then discontinued due to fever and liver dysfunction - Low-dose thiamazole (30 mg/day) was started again, then drug eruption reappeared and all oral antithyroid drugs had to be abandoned - Iodine and prednisolone 30 mg for 1 week before surgery | Subtotal thyroidectomy | | |

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| Soroush-Yari et al. (2005) | US | 1 | 59 | Male | TTE | TR | Severe | None | None | Not described | N/A | Moderate | sPAP | 51 | RA | Not described | None | RV | Not described | None | None | After almost 2 years: - sPAP 34 mmHg - Normal RA & RV | Inpatient & outpatient - Anticoagulant - Digoxin - Propranolol - PTU - RAI | None |
| Hegazi, El Sayed, & El Ghoussein (2008) | Kuwait | 1 | 43 | Female | TTE | TR | Moderate | None | Isolated RHF | HFpEF (≥50%) | 65 | Moderate | sPAP | 65-70 | Not described | Not described | Not described | RV | Not described | None | - Normal diastolic function - Intact inter-atrial septum with negative bubble contrast study | After 2 months: sPAP still 70 mmHg After 4 months: - Unsatisfactory reduction in sPAP - sPAP 55 mmHg After 11 months: sPAP 50 mmHg After 14 months - sPAP approached the upper normal limit - sPAP 30 mmHg | Inpatient: - Carbimazole 30 mg/day - Diuretics - Captopril Outpatient: - Diuretics stopped - Titrated carbimazole | None |
| Saleem, Sheikh, & Masood (2011) | Pakistan | 1 | 50 | Female | TTE | MR | None | Moderate-to-severe | None | HFpEF (≤40%) | 35-40 | Not described | N/A | N/A | RA and LA | Moderate | Severe | Not described | Not described | Not described | No evidence of a thrombus | None | Inpatient & outpatient: - Aspirin - Propranolol - Heparin - Carbimazole (initial dose of 30 mg/day and increased up to 90 mg/day), then switched to maximum dose of PTU after no improvement with carbimazole - Prednisolone 1 mg/kg/day along with lithium 400 mg twice daily in addition to PTU - RAI 15 mCi after 5 days of stopping PTU (12 weeks from initial presentation) - Potassium iodide for 2 weeks after first dose of RAI - PTU 1200 mg/day restarted after 3 days of first dose of RAI - RAI 20 mCi after 6 months from first dose - Thyroid replacement therapy 50 mcg/day | None |
| Ismail (2007) | US | 1 | 56 | Female | TTE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | 60 | Severe | sPAP | 75 | RA | Not described | None | RV | Not described | None | - RV systolic dysfunction - Severe PR - No LV systolic or diastolic dysfunction | After few weeks of MMI: - Normal RV size and function - Mild TR - sPAP 45 mmHg | Inpatient: - Diltiazem IV - Anticoagulant Outpatient: - Metoprolol - Warfarin - MMI | None |
| Lozano & Sharma (2004) | US | 1 | 29 | Female | TTE | TR and MR | Severe | Mild | Isolated RHF | HFpEF (≥50%) | Normal | Moderate | sPAP | 51 | RA | Not described | None | RV | Not described | None | - RV systolic dysfunction - No evidence of intracardiac shunt - Normal LV size and function | After 3 months: - Normal RA and RV size - Normal RVEF - Minimal TR - Normal sPAP - Trace MR - Normal LV size and function | Inpatient & outpatient: - PTU 150 mg 3 times a day - Oral furosemide - Potassium iodide | Subtotal thyroidectomy (6 months after initial presentation) |
| Lee JY, Lee SH, & Kim WH (2021) | South Korea | 1 | 41 | Female | TTE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | 59 | Moderate | sPAP | 59 | Not described | Not described | Not described | RV | Not described | None | - Incomplete systolic coaptation of TV - Normal LV size and function - Borderline elevation of LV end-diastolic pressure with E/E0 ratio of 12.5 - Preserved RV systolic function | After 6 months: - Scanty TR - Normal RV size - sPAP 27 mmHg | Inpatient and outpatient: - Furosemide - Propranolol - MMI | None |
| Park et al. (2006) | South Korea | 1 | 71 | Female | TTE | TR | Severe | None | Isolated RHF | Not described | N/A | Severe | N/A | N/A | RA | Not described | None | None | None | None | - Normal LV size with preserved systolic and diastolic function - Incomplete systolic coaptation of the tricuspid leaflet - Estimated RVSP 65 mm Hg - Measured maximal tricuspid regurgitant velocity 3.7 m/sec | After 4 weeks: - Normal RA and RV - Trivial TR - Disappeared resting PH | Inpatient & outpatient: - Low-dose furosemide - Spironolactone - Digoxin - Atenolol - MMI | None |
| Fekri, Michel, & Tamilia (2021) | Canada | 1 | 32 | Female | TTE and TEE | MR | None | Moderate-to-severe | Yes | HFmrEF (41-49%) | 45-50 | Not described | N/A | N/A | LA | None | Severe | RV and LV | Not described | Mild | - Biventricular failure - Hypokinetic RV | After 2 weeks: - Moderate-to-severe, posteriorly directed MR (jet originate predominantly from the A1/P1 junction and extend to the A2/P2 junction - No MVP - Cleft could not be excluded - Proceed to TEE, MV not significantly thickened nor myxomatous, severe MR likely secondary to multisegmental mitral prolapse (combination of focal bileaflet prolapse and annular dilatation) 10 months after cardiac surgery: - Normal LV size with an LVEF 65% - Normal mitral function with no inflow gradient - Trace MR | Inpatient: - MMI 10 mg q8h - Oral Lugol solution 5 drops q12h - Propranolol 10 mg q6h - One unit of PRC | Cardiac surgery (robotic-assisted MVR) |
| Hariforoosh et al. (2022) | US | 1 | 69 | Male | TTE | TR and MR | Severe | Moderate | Isolated RHF | HFpEF (≥50%) | 68 | Yes, degree not described | N/A | N/A | RA and LA | Not described | Not described | RV | Moderate | None | - LV diastolic function E/A ratio of 2.91, E/e' ratio of 11.15, and deceleration time of 151 msec - Malcoaptation of the TV leaflets - Myxomatous MV - Moderately reduced RV systolic function | None | Inpatient & outpatient - Methimazole 10 mg once daily - Furosemide - Carvedilol - Losartan | None |
| Singarayar et al. (2018) | Malaysia | 1 | 25 | Female | TTE | TR | Mild | None | Isolated RHF | Not described | N/A | Mild | sPAP | 47 (15-30) | Not described | Not described | Not described | RV | Not described | None | Mild PR | 5 months: - Normalized sPAP to 24 mmHg - Normalized chamber sizes | Inpatient & outpatient: - Carbimazole - Propranolol | None |
| | | 2 | 45 | Female | TTE | TR | Moderate | None | Yes | HFpEF (≤40%) | 35 | Moderate | sPAP | 65 | RA | Not described | None | RV | Not described | None | No thrombus or vegetation | None | Inpatient: - High-dose PTU - Propranolol - Lugol's iodine - Hydrocortisone - Unspecified broad spectrum AB | CPR |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-----------|---|----|--------|-------------|-----------|--------------------|------------------|--------------|---------------|--|---------------------------|------|-----|---------------|---------------|---------------|---------------|---------------|---------------|--|---|---|---|------|
| Hamed, Palumbo, & Taaha (2022) | US | 1 | 43 | Male | TEE | MR | None | Severe | Yes | HFpEF (≤40%) | 15 | Not described | N/A | N/A | Not described | Not described | Not described | LV | None | Severe | None | After cardioversion: - Severe MR persisted - LVEF improved to 25-30% | Inpatient: - PTU - Esmolol - Hydrocortisone - Potassium iodide - Cholestyramine - Propranolol - Adenosine Outpatient: - MMI - Hydrocortisone - Lisinopril - Carvedilol | Cardioversion | |
| Karashima et al. (2018) | Japan | 1 | 53 | Female | TTE and TEE | TR and MR | Moderate | Severe | Yes | HFpEF (≥50%) | - On admission: 74 - On day 30: 70 - After thyroidectomy on day 45 and cardiac surgery on day 59: 61 | Severe | N/A | N/A | LA | None | Mild | LV | None | Mild | - LAD (mm): 50.4; 50.1; 40.3 - LVDd/LVDs (mm): 55/31; 53/32; 44/32 - TRPG (mmHg): 67.2; 31.4; 23.0 - Estimated RAP (mmHg): 82; 60; 5 - RVSP (TRPG + RAP): 149.2; 91.4; 28 - IVC (mm): 22; N/A; 5 - No vegetation or calcification on valve - Prolapse of the posterior mitral leaflet | - On day 30: TR degree, MR degree, LA dilation, and LV dilation still persisted - After cardiac surgery (MV repair) on day 59: Mild MR, decreased LA dilation | Inpatient & outpatient: - MMI - Unspecified BB - Hydrocortisone - Potassium iodide - Furosemide - Human ANP - Olmesartan - Spironolactone - Heparin - Ceftriaxone - Levothyroxine 100 mcg/day | - Thyroidectomy - Cardiac surgery (MV repair) | |
| Nigussie et al. (2020) | US | 1 | 31 | Female | TTE | TR | Moderate | None | Isolated RHF | HFpEF (≥50%) | 60 | Moderate | N/A | N/A | Not described | Not described | Not described | Not described | Not described | Not described | Not described | RVSP (mmHg): 58.18 | None | Inpatient & outpatient: - Propranolol - MMI - Furosemide, - Dexamethasone - Potassium iodine | None |
| Hamagawa et al. (2009) | Japan | 1 | 83 | Female | TTE | TR and MR | Severe | Moderate | Yes | HFpEF (≥50%) | Normal | Severe | N/A | N/A | Not described | Not described | Not described | RV | Not described | None | - TRPG (mmHg): 103 - Moderate AR | After 6 days: - TRPG (mmHg): 57 After 1 month: - Moderate TR - TRPG (mmHg): 45 After 2 months: - Mild TR - Trace MR - Trace AR - TRPG (mmHg): 29 | Inpatient: - Carperitide - Continuous nitroglycerin infusion - Furosemide - Thiamazole 20 mg/day - Propranolol 20 mg/day (discontinued after bradycardia to 50 bpm) - Thiamine supplementation Outpatient: - Thiamazole 10 mg/day | None | |
| Syriou et al. (2008) | Greece | 1 | 48 | Female | TTE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | >55 | Mild | sPAP | 40 | RA and LA | Not described | Moderate | RV | Not described | None | - Peak trans-tricuspid velocity of 3 m/s | After 5 months: - Totally normal | Outpatient: - Carbimazole 60 mg/day - Furosemide 60 mg/day IV Outpatient: - Carbimazole 50 mg/day - Spironolactone 25 mg/day - Warfarin with INR 2.5-3 - Digoxin 0.25 mg/day - Diltiazem 60 mg tds - Quinapril 5 mg/day - Propranolol 40 mg tds/day | None | |
| Xenopoulos, Braden, & Applegate (1996) | US | 1 | 47 | Male | TEE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | Normal | Mild | sPAP | 45 | RA | Not described | None | RV | Not described | None | - Cleft of anterior TV leaflet with incomplete valvular coaptation during systole and dilated TV annulus | After cardiac surgery (TV repair): - Trivial TR - Normal RV size - Adequate RV function On readmission (2 weeks later): - Dilated RV - Mild TR - Normal LV size and function | First inpatient & outpatient: - PTU 150 mg tid to 50 mg tid - ISDN - Enalapril - Furosemide - Spironolactone Second inpatient & outpatient: - Furosemide - Spironolactone - PTU 150 mg tid | Cardiac surgery (TV repair) | |
| Tam & Fung (2008) | Hong Kong | 1 | 45 | Male | TTE and TEE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | 53 (55-75) | None | N/A | N/A | Not described | Not described | Not described | RV | Not described | None | - RV dimension (cm): 3.4 (0.7-2.3) - RVSP (mmHg): 26 (<25) - No structural heart defects | After 5 months: - Mild TR - Mild RV dilation (cm): 2.6 - RVSP (mmHg): 21.6 | Inpatient & outpatient: - Furosemide - Carbimazole - Propranolol | None | |
| Bonou et al. (2012) | Greece | 1 | 34 | Female | TTE and TEE | TR | Severe | None | Isolated RHF | HFpEF (≥50%) | Normal | Mild | sPAP | 45 | RA | Not described | None | RV | Not described | None | - Dilated hyperdynamic RV - Incomplete systolic coaptation of TV leaflets - No ASD in TEE confirmed | After 5 months: - Severe TR - RA and RV dilation persisted - Normal sPAP After 10 months: - Trivial TR - Normal RA and RV size | First inpatient & outpatient: - Unimazole - Propranolol - Furosemide - Spironolactone Second inpatient & outpatient: N/A | None | |
| Iranzo Vázquez et al. (1997) | Spain | 1 | 60 | Female | TTE | TR and MR | Severe | Mild | Isolated RHF | Not described | N/A | None | sPAP | 25 | Not described | Not described | Not described | RV | Not described | None | None | After 2 months: - Normal RV diameter - No TR | Inpatient: - Amiodarone - Digoxin - Furosemide Outpatient: - Antithyroid drugs | None | |
| Aronson et al. (1987) | Israel | 1 | 49 | Male | TTE | MR | None | Severe | Yes | Not described | N/A | Yes, degree not described | N/A | N/A | LA | None | Mild | None | None | None | - Flail posterior MV leaflet - Hyperkinetic normal-sized LV | After 6 days: - Increasing LV dilation | Inpatient: - Erythromycin - Mercaptopurazole - Digoxin - Furosemide - Prazosin Outpatient: - PTU | Cardiac surgery (MV repair) | |
| Neiva et al. (2018) | Portugal | 1 | 30 | Female | TTE | TR and MR | Moderate-to-severe | Moderate | Isolated RHF | Not described | N/A | Moderate | sPAP | 55 | RA | Moderate | None | RV | Moderate | None | - Hyperdynamic LV - Dilated IVC (mm): 32 mm with reduced respiratory variation - MVP of segment A2 | After 6 months: - Mild PH - Mild-to-moderate TR - Mild MR | Inpatient: - BBs - Diuretics - MMI - Glucocorticoids - Cholestyramine Outpatient: N/A | Cardioversion (unsuccessful) | |
| Pierre et al. (2017) | US | 1 | 42 | Female | TTE and TEE | TR and MR | Moderate-to-severe | Mild-to-moderate | None | None | 55-60 | Moderate | sPAP | 52 | RA | Not described | None | RV | Not described | None | - Myxomatous TV with thickening and malcoaptation of the leaflets - Mild thickening of the MV leaflets | None | Inpatient: - Loading dose of diltiazem 20 mg IV, diltiazem drip at 10 mg/h, and later transitioned to oral diltiazem - MMI Outpatient: - Diltiazem - Anticoagulant - MMI | Laparoscopic cholecystectomy | |

Supplementary Table 1. The search strategies in each of five electronic medical databases.

| Database | Keywords |
|-----------------------------------|--|
| PubMed (96) | #1 "tricuspid regurgitation"[All Fields] OR "tricuspid valve insufficiency"[MeSH Terms] OR "tricuspid valve prolapse"[MeSH Terms] OR "tricuspid insufficiency"[All Fields] OR "tricuspid incompetence"[All Fields] OR "tricuspid valve incompetence"[All Fields] OR "mitral regurgitation"[All Fields] OR "mitral valve insufficiency"[All Fields] OR "mitral valve insufficiency"[MeSH Terms] OR "mitral valve prolapse"[MeSH Terms] OR "mitral valve prolapse"[All Fields] OR "mitral insufficiency"[All Fields] OR "mitral incompetence"[All Fields] OR "mitral valve incompetence"[All Fields] OR "heart valve diseases"[MeSH Terms] OR "heart valve diseases"[All Fields] OR "valvulopathy"[All Fields] OR "valvulopathies"[All Fields] |
| | #2 "thyrotoxicosis"[MeSH Terms] OR "thyrotoxicosis"[All Fields] OR "thyrotoxic"[All Fields] OR "thyrotoxicity"[All Fields] OR "thyrotoxics"[All Fields] OR "thyroid storm"[All Fields] OR "thyroid crisis"[MeSH Terms] OR "thyroid crisis"[All Fields] OR "thyrotoxic crisis"[All Fields] OR "graves disease"[MeSH Terms] OR "graves disease"[All Fields] OR "hyperthyroidism"[MeSH Terms] OR "hyperthyroidism"[All Fields] |
| | #3 "case report"[All Fields] OR "case reports"[All Fields] OR "case study"[All Fields] OR "case studies"[All Fields] OR "case series"[All Fields] OR "case reports as topic"[MeSH Terms] |
| | #4 #1 AND #2 AND #3 |
| Scopus (223) | #1 TITLE-ABS-KEY("tricuspid regurgitation" OR "tricuspid valve regurgitation" OR "tricuspid insufficiency" OR "tricuspid valve insufficiency" OR "tricuspid incompetence" OR "tricuspid valve incompetence" OR "mitral regurgitation" OR "mitral valve regurgitation" OR "mitral insufficiency" OR "mitral valve insufficiency" OR "mitral incompetence" OR "mitral valve incompetence" OR "mitral valve prolapse" OR "flail mitral valve" OR "floppy mitral valve" OR "heart valve disease*" OR "valvulopath*") |
| | #2 TITLE-ABS-KEY("thyrotoxic*" OR "thyroid storm" OR "thyroid crisis" OR "thyrotoxic crisis" OR "graves* disease" OR "basedow* disease" OR "hyperthyroidism") |
| | #3 TITLE-ABS-KEY("case report*" OR "case stud*" OR "case series") |
| | #4 #1 AND #2 AND #3 |

| | |
|----------------------------------|--|
| Web of Science (26) | <p>#1 ALL=("tricuspid regurgitation" OR "tricuspid valve regurgitation" OR "tricuspid insufficiency" OR "tricuspid valve insufficiency" OR "tricuspid incompetence" OR "tricuspid valve incompetence" OR "mitral regurgitation" OR "mitral valve regurgitation" OR "mitral insufficiency" OR "mitral valve insufficiency" OR "mitral incompetence" OR "mitral valve incompetence"OR "mitral valve prolapse" OR "flail mitral valve" OR "floppy mitral valve" OR "heart valve disease*" OR "valvulopath*")</p> <p>#2 ALL=("thyrotoxic*" OR "thyroid storm" OR "thyroid crisis" OR "thyrotoxic crisis" OR "graves* disease" OR "basedow* disease" OR "hyperthyroidism")</p> <p>#3 ALL=("case report*" OR "case stud*" OR "case series")</p> <p>#4 #1 AND #2 AND #3</p> |
| ProQuest (260) | <p>#1 "tricuspid regurgitation" OR "tricuspid valve regurgitation" OR "tricuspid insufficiency" OR "tricuspid valve insufficiency" OR "tricuspid incompetence" OR "tricuspid valve incompetence" OR "mitral regurgitation" OR "mitral valve regurgitation" OR "mitral insufficiency" OR "mitral valve insufficiency" OR "mitral incompetence" OR "mitral valve incompetence"OR "mitral valve prolapse" OR "flail mitral valve" OR "floppy mitral valve" OR "heart valve disease*" OR "valvulopath*"</p> <p>#2 "thyrotoxic*" OR "thyroid storm" OR "thyroid crisis" OR "thyrotoxic crisis" OR "graves* disease" OR "basedow* disease" OR "hyperthyroidism"</p> <p>#3 "case report*" OR "case stud*" OR "case series"</p> <p>#4 #1 AND #2 AND #3</p> |
| Taylor & Francis (54) | <p>#1 "tricuspid regurgitation" OR "tricuspid valve regurgitation" OR "tricuspid insufficiency" OR "tricuspid valve insufficiency" OR "tricuspid incompetence" OR "tricuspid valve incompetence" OR "mitral regurgitation" OR "mitral valve regurgitation" OR "mitral insufficiency" OR "mitral valve insufficiency" OR "mitral incompetence" OR "mitral valve incompetence"OR "mitral valve prolapse" OR "flail mitral valve" OR "floppy mitral valve" OR "heart valve disease*" OR "valvulopath*"</p> <p>#2 "thyrotoxic*" OR "thyroid storm" OR "thyroid crisis" OR "thyrotoxic crisis" OR "graves* disease" OR "basedow* disease" OR "hyperthyroidism"</p> <p>#3 "case report*" OR "case stud*" OR "case series"</p> <p>#4 #1 AND #2 AND #3</p> |

Supplementary Table 2. The quality assessment of the included studies.

| Author (Year) | Did the patient(s) represent the whole experience of the investigators? | Was the exposure (thyrotoxicosis and/or thyroid storm with TR and/or MR) adequately ascertained? | Was the outcome (progressivity, clinical characteristics, treatment approaches) adequately ascertained? | Were other alternative causes that may explain the observation ruled out? | Were all important data cited in the report? | Total score | Risk of bias |
|---|--|---|--|--|---|--------------------|---------------------|
| Alam & Zaman(1) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Alkhuja, Pyram, & Odeyemi(2) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Allencherril & Birnbaum(3) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Argote, Colsy, & Alloussi(4) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Aronson et al.(5) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Aujayeb & Dundas(6) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Baagar et al.(7) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Bonou et al.(8) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Chen, Wee, & Sonawane(9) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Dhital et al.(10) | Yes | Yes | Yes | Yes | Yes | 5 | Low |

| | | | | | | | |
|--|-----|-----|-----|-----|-----|---|----------|
| Evlice & Aksoz(11) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Fekri, Michel, & Tamilia(12) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Hamagawa et al.(13) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Hamed, Palumbo, & Taaha(14) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Harirforoosh et al.(15) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Hegazi, El Sayed, & El Ghousein(16) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Herzallah et al.(17) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Hiroi et al.(18) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Hsieh et al.(19) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Ismail(20) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Jain et al.(21) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Kamalanathan et al.(22) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Karashima et al.(23) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Khalil, Dube, & Woods(24) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Khoo, Chu, & Fung(25) | Yes | Yes | Yes | Yes | Yes | 5 | Low |

| | | | | | | | | |
|--|-----|-----|-----|-----|-----|-----|---|----------|
| Kim HR et al.(26) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Kishida et al.(27) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Lee JY, Lee SH, & Kim WH(28) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Lee TI et al.(29) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Li et al.(30) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Lozano & Sharma(31) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Lozanov et al.(32) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Ma et al.(33) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Neiva et al.(34) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Neto et al.(35) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Nigam & Morton(36) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Nigussie et al.(37) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Oduah, Perera, & Brenes-Salazar(38) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Okada et al.(39) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Park et al.(40) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Pierre et al.(41) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Saad et al.(42) | Yes | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Sadiq & Chamba(43) | Yes | Yes | Yes | Yes | Yes | No | 4 | Moderate |

| | | | | | | | |
|--|-----|-----|-----|-----|-----|---|----------|
| Saleem, Sheikh, & Masood(44) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Shang & Ma(45) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Shyamali & Ponnampereuma(46) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Singarayar et al.(47) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Soroush-Yari et al.(48) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Subahi, Ibrahim, & Abugroun(49) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Suzuki et al.(50) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Syriou et al.(51) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Tam & Fung(52) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Uchihara et al.(53) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Vázquez et al.(54) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Whitner et al.(55) | Yes | Yes | Yes | Yes | Yes | 5 | Low |
| Wyble, Moore, & Yates(56) | Yes | Yes | Yes | Yes | No | 4 | Moderate |
| Xenopoulos, Braden, & Applegate(57) | Yes | Yes | Yes | Yes | Yes | 5 | Low |

MR, mitral regurgitation; TR, tricuspid regurgitation.

Supplementary Table 3. Clinical findings of history taking and physical examination on admission.

| Clinical Findings | All Patients | TR Only | MR Only | Both | Number of | Number of |
|--|--------------|-----------|-----------|------------|-------------------------------|------------------------------|
| | (n = 62) | (n = 25) | (n = 9) | (n = 28) | Reported Data (TR/MR/Both) | Missing Data (TR/MR/Both) |
| Complaints on history taking, n (%) | | | | | | |
| Hyperthyroidism-related complaints | | | | | | |
| Abdominal distention | 6 (9.68) | 2 (8.00) | 0 (0.00) | 4 (14.29) | | |
| Diarrhea and/or change of bowel habit | 17 (27.42) | 7 (28.00) | 3 (33.33) | 7 (25.00) | | |
| DoE | 21 (33.87) | 4 (16.00) | 1 (11.11) | 16 (57.14) | | |
| Fatigue | 9 (15.42) | 4 (16.00) | 1 (11.11) | 4 (14.29) | | |
| Fever | 9 (14.52) | 4 (16.00) | 1 (11.11) | 4 (14.29) | | |
| Generalized edema | 7 (11.29) | 3 (12.00) | 0 (0.00) | 4 (14.29) | | |
| Heat intolerance and/or sweating | 15 (24.19) | 9 (36.00) | 3 (33.33) | 3 (10.71) | 62 (25/9/28) | 0 (0/0/0) |
| Hyperphagia / increased appetite | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | | |
| Jaundice / icterus | 4 (6.45) | 1 (4.00) | 0 (0.00) | 3 (10.71) | | |
| Lower extremities edema | 21 (33.87) | 7 (28.00) | 2 (22.22) | 12 (42.86) | | |
| Muscle weakness | 6 (9.68) | 3 (12.00) | 0 (0.00) | 3 (10.71) | | |
| Nausea and/or vomiting | 6 (9.68) | 2 (8.00) | 2 (22.22) | 2 (7.14) | | |
| Neck lump | 1 (1.61) | 1 (4.00) | 0 (0.00) | 0 (0.00) | | |
| Orthopnea | 5 (8.06) | 0 (0.00) | 1 (11.11) | 4 (14.29) | | |

| | | | | | | |
|--|----------------|----------------|----------------|----------------|--------------|-------------|
| Palpitations | 33 (53.23) | 15 (60.00) | 6 (66.67) | 12 (42.86) | | |
| PND | 3 (4.84) | 0 (0.00) | 1 (11.11) | 2 (7.14) | | |
| Symptoms of agitation, irritability, anxiety, or nervousness | 7 (11.29) | 2 (8.00) | 2 (22.22) | 3 (10.71) | | |
| Unspecified dyspnea, progressive dyspnea, and/or dyspnea at rest | 34 (54.84) | 14 (56.00) | 5 (55.56) | 15 (53.57) | | |
| Weight loss | 19 (30.65) | 10 (40.00) | 4 (44.44) | 5 (17.86) | | |
| Hyperthyroidism-unrelated complaints | | | | | | |
| Abnormal menstrual cycle | 3 (4.84) | 0 (0.00) | 2 (22.22) | 1 (3.57) | | |
| Chest pain | 6 (9.68) | 3 (12.00) | 1 (11.11) | 2 (7.14) | | |
| Cough | 6 (9.68) | 2 (8.00) | 1 (11.11) | 3 (10.71) | | |
| Generalized petechial spots | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | | |
| Hair thinning | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | 62 (25/9/28) | 0 (0/0/0) |
| Hemoptysis | 2 (3.23) | 0 (0.00) | 1 (11.11) | 1 (3.57) | | |
| Neck pain | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | | |
| Pain at any abdominal regions | 6 (9.68) | 3 (12.00) | 2 (22.22) | 2 (7.14) | | |
| Pruritus | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | | |
| Tremors | 4 (6.45) | 2 (8.00) | 1 (11.11) | 1 (3.57) | | |
| Physical examination, n (%) | | | | | | |
| SBP (mmHg) | 132.90 ± 21.80 | 125.20 ± 19.64 | 132.40 ± 29.70 | 138.52 ± 20.64 | 41 (15/5/21) | 21 (10/4/7) |
| DBP (mmHg) | 76.90 ± 15.01 | 70.80 ± 12.34 | 76.60 ± 10.04 | 81.33 ± 16.60 | 41 (15/5/21) | 21 (10/4/7) |

| | | | | | | |
|--|----------------------------|----------------------------|----------------------------|----------------------------|--------------|-----------|
| HR (bpm) | 120.00 (105.00; 150.00) | 115.00 (100.00; 126.50) | 138.00 (117.50; 172.50) | 120.00 (108.50; 157.50) | 55 (22/9/24) | 7 (3/0/4) |
| Palpatory rhythm, n (%) | | | | | | |
| Regular | 20 (34.48) | 7 (31.82) | 6 (66.67) | 7 (25.93) | 58 (22/9/27) | 4 (3/0/1) |
| Irregular | 38 (65.52) | 15 (68.18) | 3 (33.33) | 20 (74.07) | | |
| Head and neck | | | | | | |
| Exophthalmos | 19 (30.65) | 8 (32.00) | 2 (22.22) | 9 (32.14) | | |
| Pale or anemic conjunctiva | 6 (9.68) | 0 (0.00) | 0 (0.00) | 6 (21.43) | | |
| Icteric sclera or conjunctiva | 10 (16.13) | 1 (4.00) | 1 (11.11) | 8 (28.57) | | |
| Goiter or thyroid enlargement | 39 (62.90) | 16 (64.00) | 6 (66.67) | 17 (60.71) | | |
| Thyroid bruit | 7 (11.29) | 4 (16.00) | 1 (11.11) | 2 (7.14) | | |
| Elevated JVP | 32 (51.61) | 17 (68.00) | 1 (11.11) | 14 (50.00) | | |
| Thorax (heart and lungs) | | | | | 62 (25/9/28) | 0 (0/0/0) |
| Systolic murmur at tricuspid area or LLSB | 21 (33.87) | 12 (48.00) | 0 (0.00) | 9 (32.14) | | |
| Systolic murmur at mitral area or apex | 12 (19.35) | 1 (4.00) | 2 (22.22) | 9 (32.14) | | |
| Systolic murmur at other or unspecified location | 4 (6.45) | 1 (4.00) | 0 (0.00) | 3 (10.71) | | |
| Diastolic murmur at lower parasternal border | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) | | |
| Prominent pulmonary component of S2 | 3 (4.84) | 1 (4.00) | 0 (0.00) | 2 (7.14) | | |
| S3 and/or S4 gallop | 8 (12.90) | 4 (16.00) | 1 (11.11) | 3 (10.71) | | |
| Displaced apex beat | 3 (4.84) | 1 (4.00) | 0 (0.00) | 2 (7.14) | | |

| | | | | |
|---|------------|------------|-----------|------------|
| Hyperdynamic at any precordial area and/or precordial heave | 10 (16.13) | 4 (16.00) | 1 (11.11) | 5 (17.86) |
| Signs of lung congestion | 12 (19.35) | 1 (4.00) | 2 (22.22) | 9 (32.14) |
| Signs of pleural effusion | 5 (8.06) | 2 (8.00) | 0 (0.00) | 3 (10.71) |
| Decreased breath sound at any location | 3 (4.84) | 1 (4.00) | 0 (0.00) | 2 (7.14) |
| Expiratory wheezing | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) |
| Abdomen | | | | |
| Signs of ascites | 13 (20.97) | 6 (24.00) | 1 (11.11) | 6 (21.43) |
| Signs of congestive hepatopathy or cardiac cirrhosis | 12 (19.35) | 6 (24.00) | 0 (0.00) | 6 (21.43) |
| RUQ tenderness | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) |
| Extremities | | | | |
| Bilateral lower extremity edema | 38 (61.29) | 16 (64.00) | 3 (33.33) | 19 (67.86) |
| Generalized edema | 1 (1.61) | 0 (0.00) | 0 (0.00) | 1 (3.57) |
| Reduced subcutaneous adipose tissue | 2 (3.23) | 0 (0.00) | 0 (0.00) | 2 (7.14) |
| Reduced muscle bulk | 2 (3.23) | 0 (0.00) | 0 (0.00) | 2 (7.14) |
| Tremors | 12 (19.35) | 6 (24.00) | 0 (0.00) | 6 (21.43) |
| Brisk reflexes | 3 (4.84) | 1 (4.00) | 0 (0.00) | 2 (7.14) |
| Moist or sweaty skin | 2 (3.23) | 0 (0.00) | 0 (0.00) | 2 (7.14) |

Data are presented in n (%), or mean \pm standard deviation (SD), or median (interquartile range [IQR]).

DBP, diastolic blood pressure; DoE, dyspnea on exertion; HR, heart rate; JVP, jugular venous pressure; LLSB, left lower sternal border; MR, mitral regurgitation;

PND, paroxysmal nocturnal dyspnea; RUQ, right upper quadrant; SBP, systolic blood pressure; TR, tricuspid regurgitation.

Supplementary Table 4. Pharmacological and non-pharmacological treatment approach towards 62 patients from 57 studies.

| Treatment Approach | All Patients (n = 62) | TR Only (n = 25) | MR Only (n = 9) | Both (n = 28) | Number of Reported Data (TR/MR/Both) | Number of Missing Data (TR/MR/Both) |
|--|--------------------------|---------------------|--------------------|------------------|--|---|
| Pharmacological treatment, n (%) | | | | | | |
| Antithyroid drugs | | | | | | |
| PTU | 16 (25.81) | 7 (28.00) | 4 (44.44) | 5 (17.86) | | |
| MMI | 23 (37.10) | 7 (28.00) | 3 (33.33) | 13 (46.43) | | |
| Carbimazole | 18 (29.03) | 10 (40.00) | 3 (33.33) | 5 (17.86) | | |
| Thiamazole | 5 (8.06) | 1 (4.00) | 0 (0.00) | 4 (14.29) | | |
| Lugol's iodine or potassium iodine | 15 (24.19) | 5 (20.00) | 3 (33.33) | 7 (25.00) | | |
| Other and unspecified antithyroid drugs | 5 (8.06) | 2 (8.00) | 1 (11.11) | 2 (7.14) | | |
| Thyroid replacement therapy (L-thyroxine) | 5 (8.06) | 1 (4.00) | 1 (11.11) | 3 (10.71) | 62 (25/9/28) | 0 (0/0/0) |
| Beta-blockers | | | | | | |
| Propranolol | 30 (48.39) | 15 (60.00) | 7 (77.78) | 8 (28.57) | | |
| Atenolol | 2 (3.23) | 1 (4.00) | 0 (0.00) | 1 (3.57) | | |
| Bisoprolol | 3 (4.84) | 0 (0.00) | 0 (0.00) | 3 (10.71) | | |
| Esmolol | 3 (4.84) | 0 (0.00) | 2 (22.22) | 1 (3.57) | | |
| Metoprolol | 6 (14.52) | 2 (8.00) | 0 (0.00) | 4 (14.29) | | |
| Carvedilol | 3 (4.84) | 0 (0.00) | 1 (11.11) | 2 (7.14) | | |

| | | | | |
|--|------------|------------|-----------|------------|
| Other and unspecified beta-blockers | 12 (19.35) | 0 (0.00) | 2 (22.22) | 10 (35.71) |
| Diuretics | | | | |
| Furosemide | 24 (38.71) | 11 (44.00) | 1 (11.11) | 12 (42.86) |
| Spironolactone | 7 (11.29) | 4 (16.00) | 0 (0.00) | 3 (10.71) |
| Other and unspecified diuretics | 11 (17.74) | 1 (4.00) | 1 (11.11) | 9 (32.14) |
| ACE inhibitors | 9 (14.52) | 3 (12.00) | 2 (22.22) | 4 (14.29) |
| ARBs | 2 (3.23) | 0 (0.00) | 0 (0.00) | 2 (7.14) |
| CCBs | | | | |
| Diltiazem | 4 (6.45) | 3 (12.00) | 0 (0.00) | 1 (3.57) |
| Other CCBs | 3 (4.84) | 1 (4.00) | 0 (0.00) | 2 (7.14) |
| Corticosteroids | | | | |
| Short-acting (hydrocortisone) | 11 (17.74) | 3 (12.00) | 3 (33.33) | 5 (17.86) |
| Intermediate-acting (prednisone, prednisolone, methylprednisolone) | 8 (12.90) | 3 (12.00) | 2 (22.22) | 3 (10.71) |
| Long-acting (dexamethasone) | 2 (3.23) | 2 (8.00) | 0 (0.00) | 0 (0.00) |
| Unspecified corticosteroids | 3 (4.84) | 0 (0.00) | 0 (0.00) | 3 (10.71) |
| Nitrates | | | | |
| Nitroglycerin | 4 (6.45) | 0 (0.00) | 0 (0.00) | 4 (14.29) |
| Other and unspecified nitrates | 2 (3.23) | 1 (4.00) | 0 (0.00) | 1 (3.57) |
| Anticoagulant | | | | |

| | | | | | | |
|--|-----------|-----------|-----------|-----------|--------------|-----------|
| VKA | 4 (6.45) | 2 (8.00) | 1 (11.11) | 1 (3.57) | | |
| Heparin group | 3 (4.84) | 1 (4.00) | 1 (11.11) | 1 (3.57) | | |
| Other and unspecified anticoagulant | 8 (12.90) | 4 (16.00) | 0 (0.00) | 4 (14.29) | | |
| Antiplatelet (aspirin) | 3 (4.84) | 0 (0.00) | 1 (11.11) | 2 (7.14) | | |
| Antiarrhythmic | | | | | | |
| Digoxin | 7 (11.29) | 4 (16.00) | 1 (11.11) | 2 (7.14) | | |
| Amiodarone | 3 (4.84) | 0 (0.00) | 0 (0.00) | 3 (10.71) | | |
| Other antiarrhythmic | 2 (3.23) | 0 (0.00) | 1 (11.11) | 1 (3.57) | | |
| Anticholinergic (atropine) | 2 (3.23) | 1 (4.00) | 0 (0.00) | 1 (3.57) | | |
| Sympathomimetic | | | | | | |
| Epinephrine | 3 (4.84) | 1 (4.00) | 1 (11.11) | 1 (3.57) | | |
| Norepinephrine | 4 (6.45) | 1 (4.00) | 2 (22.22) | 1 (3.57) | | |
| Other sympathomimetic | 3 (4.84) | 1 (4.00) | 1 (11.11) | 1 (3.57) | | |
| Hormonal therapy (vasopressin, human ANP) | 5 (8.06) | 1 (4.00) | 1 (11.11) | 3 (10.71) | | |
| Other pharmacological supportive therapy | | | | | | |
| Thiamine | 2 (3.23) | 0 (0.00) | 0 (0.00) | 2 (7.14) | | |
| Cholestyramine | 5 (8.06) | 1 (4.00) | 1 (11.11) | 3 (10.71) | | |
| Antibiotics | 9 (14.52) | 4 (16.00) | 2 (22.22) | 3 (10.71) | | |
| Non-pharmacological treatment, n (%) | | | | | | |
| RAI ablation | 8 (12.90) | 3 (12.00) | 1 (11.11) | 4 (14.29) | 62 (25/9/28) | 0 (0/0/0) |

| | | | | |
|--|----------|----------|-----------|-----------|
| TPE or plasmapheresis | 4 (6.45) | 1 (4.00) | 0 (0.00) | 3 (10.71) |
| CPR | 6 (9.68) | 1 (4.00) | 3 (33.33) | 2 (7.14) |
| Cardioversion | 3 (4.84) | 0 (0.00) | 1 (11.11) | 2 (7.14) |
| CRRT | 2 (3.23) | 1 (4.00) | 1 (11.11) | 0 (0.00) |
| VA-ECMO | 2 (3.23) | 0 (0.00) | 1 (11.11) | 1 (3.57) |
| Intubation | 5 (8.06) | 0 (0.00) | 2 (22.22) | 3 (10.71) |
| IABP | 3 (4.84) | 0 (0.00) | 1 (11.11) | 2 (7.14) |
| Valvular repair or replacement surgery | 5 (8.06) | 1 (4.00) | 2 (22.22) | 2 (7.14) |
| Thyroidectomy | 5 (8.06) | 2 (8.00) | 0 (0.00) | 3 (10.71) |
| Other non-pharmacological supportive therapy | 4 (6.45) | 0 (0.00) | 0 (0.00) | 4 (14.29) |

ACE, angiotensin-converting enzyme; ANP, atrial natriuretic peptide; ARBs, angiotensin receptor blockers; CCBs, calcium channel blockers; CPR, cardiopulmonary resuscitation; CRRT, continuous renal replacement therapy; IABP, intra-aortic balloon pump; MMI, methimazole; MR, mitral regurgitation; PTU, propylthiouracil; RAI, radioactive iodine; TPE, therapeutic plasma exchange; TR, tricuspid regurgitation; VA-ECMO, veno-arterial extracorporeal membrane oxygenation; VKA, vitamin K antagonist.

Supplementary Table 5. Echocardiographic methods and findings of the patients on admission.

| Echocardiographic Factors | All Patients (n = 62) | TR Only (n = 25) | MR Only (n = 9) | Both (n = 28) | Number of Reported Data (TR/MR/Both) | Number of Missing Data (TR/MR/Both) |
|---|----------------------------------|-----------------------------|----------------------------|--------------------------|---|--|
| Echocardiography method, n (%) | | | | | | |
| TTE only | 53 (85.48) | 21 (84.00) | 7 (77.78) | 25 (89.29) | 62 (25/9/28) | 0 (0/0/0) |
| TEE only | 2 (3.23) | 1 (4.00) | 1 (11.11) | 0 (0.00) | | |
| Both | 7 (11.29) | 3 (12.00) | 1 (11.11) | 3 (10.71) | | |
| Echocardiographic TR severity, n (%) | | | | | | |
| Very severe | 0 (0.00) | 0 (0.00) | N/A | 0 (0.00) | 51 (24 / N/A / 27) | 2 (1 / N/A / 1) |
| Severe | 26 (50.98) | 11 (45.83) | N/A | 15 (55.56) | | |
| Moderate-to-severe | 5 (9.80) | 3 (12.50) | N/A | 2 (7.41) | | |
| Moderate | 13 (25.49) | 6 (25.00) | N/A | 7 (25.93) | | |
| Mild-to-moderate | 1 (1.96) | 1 (4.17) | N/A | 0 (0.00) | | |
| Mild | 5 (9.80) | 3 (12.50) | N/A | 2 (7.41) | | |
| Trace / trivial | 1 (1.96) | 0 (0.00) | N/A | 1 (3.70) | | |
| Echocardiographic MR severity, n (%) | | | | | | |
| Very severe | 2 (5.56) | N/A | 0 (0.00) | 2 (7.41) | 36 (N/A / 9 / 27) | 1 (N/A / 0 / 1) |
| Severe | 10 (27.78) | N/A | 3 (33.33) | 7 (25.93) | | |
| Moderate-to-severe | 3 (8.33) | N/A | 3 (33.33) | 0 (0.00) | | |

| | | | | | | |
|---|------------|------------|-----------|------------|--------------|-------------|
| Moderate | 10 (27.78) | N/A | 2 (22.22) | 8 (29.63) | | |
| Mild-to-moderate | 2 (5.56) | N/A | 0 (0.00) | 2 (7.41) | | |
| Mild | 8 (22.22) | N/A | 1 (11.11) | 7 (25.93) | | |
| Trace / trivial | 1 (2.78) | N/A | 0 (0.00) | 1 (3.70) | | |
| Echocardiographic evidence of HF, n (%) | | | | | | |
| HFpEF (≥50%) | 20 (45.45) | 12 (70.59) | 0 (0.00) | 8 (40.00) | | |
| HFmrEF (41-49%) | 9 (20.45) | 1 (5.88) | 2 (28.57) | 6 (30.00) | 44 (17/7/20) | 18 (8/2/8) |
| HFrEF (≤40%) | 12 (27.27) | 3 (17.65) | 5 (71.43) | 4 (20.00) | | |
| None | 3 (6.82) | 1 (5.88) | 0 (0.00) | 2 (10.00) | | |
| Echocardiographic evidence of PH, n (%) | | | | | | |
| Severe | 7 (14.29) | 4 (16.67) | 0 (0.00) | 3 (13.04) | | |
| Moderate | 21 (42.86) | 11 (45.83) | 0 (0.00) | 10 (43.48) | 49 (24/2/23) | 13 (1/7/5) |
| Mild | 13 (26.53) | 6 (25.00) | 1 (50.00) | 6 (26.09) | | |
| Yes, degree not described | 3 (6.12) | 0 (0.00) | 1 (50.00) | 2 (8.70) | | |
| None | 5 (10.20) | 3 (12.50) | 0 (0.00) | 2 (8.70) | | |
| Echocardiographic evidence of atrial enlargement / dilation, n (%) | | | | | | |
| RA and LA | 16 (43.24) | 1 (9.09) | 1 (20.00) | 14 (66.67) | | |
| RA | 7 (19.82) | 9 (81.82) | 0 (0.00) | 4 (19.05) | 37 (11/5/21) | 25 (14/4/7) |
| LA | 13 (35.14) | 1 (9.09) | 4 (80.00) | 2 (9.52) | | |
| None | 1 (2.70) | 0 (0.00) | 0 (0.00) | 1 (4.76) | | |

| Echocardiographic evidence of ventricular enlargement / dilation, n (%) | | | | | | |
|---|------------|------------|-----------|------------|--------------|-------------|
| RV and LV | 4 (9.52) | 1 (5.26) | 1 (20.00) | 2 (11.11) | | |
| RV | 27 (64.29) | 15 (78.95) | 0 (0.00) | 12 (66.67) | 42 (19/5/18) | 20 (6/4/10) |
| LV | 5 (11.90) | 0 (0.00) | 3 (60.00) | 2 (11.11) | | |
| None | 6 (14.29) | 3 (15.79) | 1 (20.00) | 2 (11.11) | | |

HFmrEF, heart failure with mildly reduced ejection fraction; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with with reduced ejection fraction; LA, left atrium; LV, left ventricle; MR, mitral regurgitation; PH, pulmonary hypertension; RA, right atrium; RV, right ventricle; TEE, transesophageal echocardiography; TR, tricuspid regurgitation; TTE, transthoracic echocardiography.

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