Percutaneous Transvenous Mitral Commissurotomy in Patients with Mitral Stenosis and Coexistent Hyperthyroidism

Pei-Wen Wang, MD, Jui-Sung Hung, MD, Morgan Fu, MD, Kuo-Ho Yeh, MD, and Jong-Jen Wu, MD

SUMMARY

Percutaneous transvenous mitral commissurotomy (PTMC) was performed successfully without complications in 3 patients with severe mitral stenosis and hyperthyroidism. All 3 patients had pliable, noncalcified mitral valves. One patient who had been treated with methimazole for 6 months was still in a hyperthyroid state when she presented with intractable congestive heart failure and was found to have severe mitral stenosis. The heart failure improved immediately after PTMC, but the patient remained in New York Heart Association functional class 2 until a euthyroid state was achieved with 131I therapy. In the other 2 patients, hyperthyroidism was unsuspected at the time of PTMC. Unexpectedly suboptimal symptom improvement led to the diagnosis of hyperthyroidism 1 month after the intervention. In all 3 patients, PTMC resulted in an immediate hemodynamic and clinical improvement. However, complete clinical improvement occurred only when euthyroid state was achieved after antithyroid treatment. The present study suggests that PTMC is a safe and effective intervention modality in patients with coexisting hyperthyroidism and severe mitral stenosis. The procedure may be considered a therapeutic option in patients with hyperthyroidism and severe mitral stenosis. (Jpn Heart J 1996; 37: 131-136)

Key words: Hyperthyroidism Mitral stenosis Balloon mitral commissurotomy

Coexistent rheumatic mitral stenosis and hyperthyroidism are rare. To the best of our knowledge, there have been only two such cases reported in the Japanese literature.1,2) When these two conditions do occur together, they present a therapeutic dilemma.3) Mitral valve surgery and anesthesia pose a significant morbidity and mortality in hyperthyroid patients.3) On the other hand,
antithyroid drugs and/or I\(^{131}\) treatment do not provide an immediate therapeutic effect in improving patients’ symptoms as it usually takes 4–6 weeks to achieve a euthyroid state. Since the introduction of percutaneous transvenous mitral commissurotomy (PTMC) by Inoue et al\(^4\) in 1984, this procedure has established itself as a safe and effective non-surgical therapeutic alternative for the treatment of selected patients with mitral stenosis.\(^5\),\(^6\) This report describes the usefulness of PTMC in patients who had severe mitral stenosis and hyperthyroidism.

**Case Reports**

From January 1987 to March 1995, 804 patients (229 males and 575 females) with severe mitral stenosis underwent PTMC with the Inoue balloon catheter technique\(^4\)–\(^6\) in our institution. Thyroid function tests were performed only when indicated in this population and 8 females were documented to have hyperthyroidism. Two patients who had been treated for hyperthyroidism 18 and 24 months earlier, respectively, presented with heart failure despite being euthyroid. Severe mitral stenosis was then diagnosed and successful PTMC performed. Three other patients were diagnosed as having hyperthyroidism 16, 19 and 48 months after PTMC, respectively, because of a recurrence of dyspnea, palpitations and the development of other symptoms of hyperthyroidism. The additional three patients who were in a hyperthyroid state at the time of successful PTMC constitute the subjects of this report.

Of these three patients, one was still hyperthyroid despite having been treated for hyperthyroidism. The other two had unsuspected hyperthyroidism and had no previous history of thyroid disease, goiter or ophthalmopathy. These patients’ clinical characteristics, hemodynamic data, and treatment outcomes are outlined in Table I. All patients had pliable, noncalcified mitral valves. There was no echocardiographic evidence of mitral restenosis (defined as loss of > 50% gain in the mitral valve area after PTMC) and they were in New York Heart Association (NYHA) Functional Class 1 at a follow-up period ranging from 60 to 84 months. The clinical histories of these three patients are detailed as follows.

**Case 1:** A 51-year-old woman developed palpitations, orthopnea and paroxysmal nocturnal dyspnea one week prior to admission. Six months earlier, she was diagnosed elsewhere as having hyperthyroidism because of exertional dyspnea, palpitations and weight loss and commenced on antithyroid medications. She discontinued them 2 months later because of symptomatic improvement. Recurrent hyperthyroidism was diagnosed at admission. However, cardiac examination showed atrial fibrillation with a rapid ventricular rate of 140/minute and a loud first heart sound. There were no murmurs. Chest X-ray showed severe pulmonary venous congestion and an uncharacteristically mild cardiomegaly (a
Table I. Clinical Characteristics, Hemodynamic Data and Treatment Outcomes

<table>
<thead>
<tr>
<th>Pt</th>
<th>Age/ Sex</th>
<th>Rhythm</th>
<th>Hemodynamic data</th>
<th>NYHA Class</th>
<th>Clinical outcomes</th>
<th>Follow-up post-PTMC (months)</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>LA pre/post</td>
<td>MV gradient pre/post</td>
<td>MVA pre/post</td>
<td>MR pre/post</td>
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<tr>
<td>1</td>
<td>51/F</td>
<td>af</td>
<td>29/20</td>
<td>14/6</td>
<td>1.0/1.7</td>
<td>0/0</td>
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<td></td>
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<tr>
<td>2</td>
<td>45/F</td>
<td>sinus</td>
<td>25/11</td>
<td>17/5</td>
<td>0.8/1.9</td>
<td>0/0</td>
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<td></td>
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<tr>
<td>3</td>
<td>31/F</td>
<td>sinus</td>
<td>26/15</td>
<td>19/6</td>
<td>0.9/2.0</td>
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af = atrial fibrillation; F = female; LA = mean left atrial pressure in mm Hg; MR = mitral regurgitation (by Sellers' angiographic criteria); MV gradient = mitral valve gradient in mm Hg; MVA = mitral valve area in cm² (by Gorlin formula); NYHA Class = New York Heart Association Functional Class; pre/post = before/after PTMC; PTMC = percutaneous transvenous mitral commissurotomy; Pt = patient.

cardiothoracic ratio of 0.56). Therefore, echocardiography was performed and this revealed severe mitral stenosis. Thyroid function tests showed serum T₄ of 19.3 μg/dl, T₃ of 690 ng/dl and an undetectable TSH level. Despite treatments including diuretics, digitalization with digoxin, propranolol (10 mg qid) and propylthiouracil 100 mg tid and a decrease in ventricular rate to 108/minute, the patient remained in intractable heart failure. Therefore, in an attempt to expeditiously control the patient’s condition, PTMC was performed 4 days after admission. This resulted in an immediate improvement to NYHA Functional Class 2. One month later, the patient was no longer symptomatic. The ventricular rate was 84/minute, chest X-ray showed resolution of pulmonary congestion and the serum T₄ and T₃ levels had normalized. The patient received I¹³¹ radiotherapy at 3 months after PTMC and remained euthyroid at 60 months of follow-up. Medication consisted of only digoxin 0.25 mg qd.

Case 2: A 45-year-old woman was diagnosed as having mitral stenosis in July 1987 and was treated with diuretics and propranolol. In September 1988, she had deteriorated with symptoms of exertional dyspnea on mild exertion, orthopnea, paroxysmal dyspnea and leg edema. On admission, her pulse was 90/minute and regular on propranolol 10 mg qid. Chest X-ray showed a cardiothoracic ratio of 0.49, an enlarged left atrium and mild pulmonary congestion. PTMC immediately improved her heart failure, and she was discharged without medications two days after the procedure. Persistent exertional dyspnea and sinus tachycardia of around 110/minute led to a suspicion of possible hyperthyroidism one month after PTMC. This was confirmed by laboratory tests (serum T₄ of 31.3 μg/dl and T₃ of 666 ng/dl), and she was then treated with methimazole 10 mg tid and propranolol 20 mg bid. Her symptoms were alleviated after another month and her heart rate decreased to 84/minute without propranolol. She has since been maintained on methimazole 10 mg qd. Her
thyroid function in March 1995 was normal.

Case 3: A 31-year-old woman had been well until 3 months before admission when she developed gradually worsening exertional dyspnea. On physical examination, the pulse was 116/minute and regular. The first heart sound was accentuated and there was a diastolic rumbling murmur. Chest X-ray showed a cardiothoracic ratio of 0.5, an enlarged left atrium and mild pulmonary congestion. Severe mitral stenosis was confirmed by echocardiography and PTMC performed. Despite the improvement in dyspnea, palpitations with a heart rate of 120 persisted and hand tremor was noted. Her thyroid function tests conducted 1 month after PTMC revealed a serum T4 > 24 µg/dl and T3 of 765 ng/dl. Propranolol 20 mg bid and propylthiouracil 100 mg tid were commenced and she further improved after another month, with a ventricular rate of around 90/minute. Propranolol was discontinued after two months and propylthiouracil after 1 year. She remained euthyroid and free from symptoms 7 years after PTMC.

**DISCUSSION**

The coexistence of hyperthyroidism and rheumatic mitral stenosis is rare, and is most likely coincidental because the incidence of 1.4% (8 of 575 females) in our experience is similar to that (2% of the female and 0.2% of the male population) of hyperthyroidism diagnosed in the general population.7) Coexistence of hyperthyroidism and severe mitral stenosis may present a diagnostic challenge because both disorders may share a common presentation of cardiomegaly, atrial fibrillation, or congestive heart failure, and thus concomitant hyperthyroidism may be overlooked. This was exemplified in two of our three patients, in whom hyperthyroidism was detected only after successful PTMC when the dyspnea improved less than was expected and sinus tachycardia persisted despite excellent PTMC hemodynamic results. Therefore, when a patient’s dyspnea is out of proportion to the severity of mitral stenosis (and if other more common causes of dyspnea, such as respiratory diseases and anemia have been excluded) and unexplained sinus tachycardia persists, hyperthyroidism should be suspected. Another clue for coexistence of hyperthyroidism is difficulty in controlling the ventricular rate of atrial fibrillation with digoxin.8) Once the coexistence of hyperthyroidism is suspected, its confirmation is readily made by thyroid function tests. However, in critically ill patients, such as those with severe congestive heart failure, the diagnosis of hyperthyroidism may be difficult because the thyroid hormone levels may provide falsely negative results.9)

There is a paucity of experience in the management of patients with hyperthyroidism and mitral stenosis because there have been only two such re-
ported cases,12) The patient reported by Aoyagi et al1) underwent uneventful mitral valve replacement surgery after a euthyroid state had been attained after 9 months of antithyroid treatment with methylmercaptoimidazol. The other patient of Fujiwara et al13) was treated with antithyroid medication and subsequent subtotal thyroidectomy. The planned surgical mitral commissurotomy was not carried out because the patient became asymptomatic and cardiac catheterization performed after achievement of the euthyroid state showed the mitral stenosis to be mild.

The recent advent of PTMC4) has provided an additional therapeutic option in patients with coexisting hyperthyroidism and mitral stenosis. In our Patient 1 with intractable congestive heart failure, PTMC was performed based on the following reasons: 1) mitral valve surgery and anesthesia pose a significant morbidity and mortality in hyperthyroid patients,3) 2) antithyroid drugs and/or I131 treatment do not provide an immediate therapeutic effect in improving patients' symptoms as it usually takes 4–6 weeks to reach the euthyroid state, and 3) the patient had a pliable, noncalcified mitral valve suitable for PTMC.5,6) In Patients 2 and 3 in whom hyperthyroidism was unsuspected, PTMC was performed because both also had pliable, noncalcified mitral valves. In all 3 patients, PTMC resulted in an immediate hemodynamic and clinical improvement. However, complete clinical improvement occurred only when the euthyroid state was achieved with antithyroid treatment.

Although there have been reports of thyroid storm or hyperthyroidism induced by the use of contrast medium in patients with autonomous thyroid nodules,10–12) this occurrence in iodine-sufficient areas is rare, especially in patients without a prior history of thyroid disease.13) In Patients 2 and 3, hyperthyroidism was diagnosed 1 month after PTMC; it was probably preexistent and unsuspected rather than induced by the contrast medium administered during PTMC. Both patients had no goiter or a previous history of thyroid disease and reside in an iodine-sufficient area.14)

In conclusion, the present study suggests that PTMC is a safe and effective intervention modality in patients with coexisting hyperthyroidism and severe mitral stenosis. It may be considered a therapeutic option, especially for those patients with both hyperthyroidism and mitral stenosis who need urgent hemodynamic stabilization.

REFERENCES