Case Report

Bradycardia secondary to primary hyperparathyroidism

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Abstract
Clinical doctors rarely associate hyperparathyroidism with significant bradyarrhythmia. We report a rare case of a patient initially misdiagnosed with primary sick sinus syndrome, which was eventually shown to be secondary to primary hyperparathyroidism.

Keywords
Bradycardia, hyperparathyroidism, hypercalcemia, sinus node, parathyroidectomy, parathyroid adenoma

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Introduction
Clinical doctors rarely associate hyperparathyroidism with significant bradyarrhythmia. In this report, we demonstrate a rare case of a patient initially misdiagnosed with primary sick sinus syndrome, which was eventually shown to be secondary to primary hyperparathyroidism (PHPT).

Case report
A 55-year-old woman presented with the chief complaints of increasing dizziness and memory impairment for more than 5 years. She had previously been diagnosed in other hospitals with primary sick sinus syndrome and was recommended to undergo pacemaker implantation. Her medical history revealed recurrent nephrolithiasis, hypertension, and osteoporosis. The patient was not on any medication and had no significant family history of related diseases.

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Upon physical exam, her resting pulse varied between 38 and 62 bpm with a systolic blood pressure range of 85 to 105 mmHg. Further clinical examination revealed no other abnormal findings. Twenty-four-hour Holter monitoring showed sinus bradycardia with a mean rate of 44 bpm (range 28–80 bpm). Two-dimensional cardiac echocardiography demonstrated normal systolic ejection fraction with no structural abnormalities. Laboratory evaluations revealed elevated serum calcium (11.8 mg/dL, normal range 8.5–10.5 mg/dL) and serum parathyroid hormone (PTH) levels (19.58 pmol/L, normal range 1.6–6.9 pmol/L). Subsequent parathyroid single-photon emission computed tomography imaging was suggestive of a parathyroid adenoma. Computed tomography-assisted urography and dual-energy x-ray absorptiometry scans confirmed no other abnormalities.

The patient was hesitant to undergo parathyroidectomy and pacemaker implantation, and her hypercalcemia was thus treated conservatively, but this proved to be ineffective. The patient continued to show symptoms of dizziness associated with bradycardia. The patient then consented to parathyroidectomy, which was carried out with the protection of a pacemaker for temporary intraoperative pacing. A 1.9 × 1.1 × 0.7 cm mass consistent with a parathyroid adenoma was removed during surgery. The patient was observed for about 2 months in hospital, and her symptoms gradually resolved and her laboratory test results returned to nearly normal.

During routine follow-up, the patient’s serum calcium level declined to 8.6 mg/dL and her previous symptoms of dizziness and memory impairment resolved. Holter retesting showed a minimum heart rate of 52 bpm (mean 62 bpm).

The patient provided written informed consent for publication of this case report.

Discussion

Classical PHPT, characterized by elevated serum PTH levels, can lead to hypercalcemia and hypophosphatemia, resulting in a multisystemic disorders including overt skeletal and renal complications, as well as neuropsychological, cardiovascular, gastrointestinal, and even rheumatic effects. As a result of the advent of multichannel screening, most patients are diagnosed with PHPT while they are asymptomatic, and patients with PHPT and bradycardia have rarely been reported.

The precise mechanism responsible for bradycardia in patients with PHPT remains unclear. Hyperparathyroidism may lead directly to sinus node dysfunction, which is supported by the fact that exogenous PTH caused necrosis of rat myocytes. In addition, given that chronic hypercalcemia can lead to increased deposition of calcium in the fibrous skeleton of the heart and in valvular cusps in coronary arteries, this phenomenon may be caused by calcification of the sinus node due to an accumulation of calcium in the adjacent muscles. Similarly, a previous case report described a patient who had been implanted with a dual-chamber, rate-modulated pacemaker because of intermittent second-degree (2:1) atrioventricular block, in whom an additional sestamibi-scan of the neck suggested parathyroid adenoma. The patient underwent parathyroidectomy. The percentage of ventricular pacing was 23% at 1 month after parathyroidectomy and <4% at 6 months, with no programmed alteration of pacing parameters, indicating that PHPT could cause reversible AV node dysfunction, presumably via degeneration of the AV node due to calcium deposition. In addition, Nilsson et al. evaluated the abnormal activities of the cardiovascular autonomic nervous system in a series of patients with hyperparathyroidism and noted a blunted nocturnal increase in
heart rate variability, which vanished post-parathyroidectomy. In our case, 24-hour Holter monitoring showed that the nocturnal increase in low frequency was less obvious after surgical resection. This may also suggest that ambulatory blood pressure and 24-hour heart rate variability may be used as early markers to help avoid misdiagnosis.

In conclusion, this report demonstrates a rare case characterized by a presentation of sinus node dysfunction secondary to hyperparathyroidism. However, evidence for the mechanism responsible is still lacking, and more studies are needed to clarify the association between hyperparathyroidism and sinus bradycardia.

**Ethics statement**
The study was approved by the institutional review board of the First Affiliated Hospital of Dalian Medical University, Dalian, Liaoning, China. The patient provided written informed consent. The study was conducted according to the Guidelines of the Declaration of Helsinki. All protocols described here were performed in accordance with the approved guidelines.

**Declaration of conflicting interest**
The authors declare that there is no conflict of interest.

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