

## CASE REPORT

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### Primary Hyperparathyroidism, Hypercalcemia, Paranoid Delusions, Homicide, and Attempted Murder

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**ABSTRACT:** This report describes a case of primary hyperparathyroidism in a 68-year-old man. The endocrine disorder, while suspected before the commission of homicide and attempted murder, was proven biochemically and histologically a number of months after the commission of the crimes. The acts of homicide and attempted murder followed the development of paranoid delusions, which rapidly resolved upon successful removal of a single cystic parathyroid gland adenoma. The unusual events that immediately followed the acts of violence indicate that the delusions occurred in a clear sensorium (absence of delirium). Psychological measures taken before and after surgery document improvement in subtle organic functioning while intelligence was unchanged. This report discusses the neuropsychiatric manifestations of hypercalcemia and reviews the literature.

**KEYWORDS:** pathology and biology, criminalistics, hyperparathyroidism, homicide, hypercalcemia, paranoid delusion

Primary hyperparathyroidism is an endocrinopathy caused by the excessive production of parathyroid hormone (PTH) by abnormal parathyroid gland tissue. The abnormal functioning tissue is usually found to be a single adenoma of the chief cell type [1]. Parathyroid adenoma is the cause of primary hyperparathyroidism in 75% of patients with the disease. The most common cause of hypercalcemia in the outpatient population and second most common cause in hospitalized individuals is primary hyperparathyroidism [2].

The neuropsychiatric manifestations of primary hyperparathyroidism are not due to elevated concentrations of PTH but are due to the hypercalcemia [3]. These effects include (among others) irritability [4], restlessness [4], depression [3-7], confusion [3,5-7] delirium [3], paranoid ideation [3], psychosis [5-7], and explosiveness [8]. While some authors claim

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that the degree of hypercalcemia directly correlates with the severity of psychiatric symptoms, the reviews carefully evaluating this claim do not find support for a direct correlation in the literature [9]. Until recently, it was assumed that severe paranoid delusions caused by the hypercalcemia of parathyroidism occurred only in the presence of delirium, but there are case reports indicating that severe paranoid delusions may occur in the absence of delirium [9,10].

The psychiatric symptoms caused by hyperparathyroidism frequently mimic major diagnostic categories of mental illness. Petersen's report of the psychiatric evaluation of 54 patients with hyperparathyroidism noted that 36 had affective disturbance, 12 had memory loss, and 5 had organic psychoses [8]. He reported that personality change developed insidiously, but that the organic psychosis was usually "violent" in onset.

### Case History

A 68-year-old male with no prior recognizable psychiatric diagnosis had years of apathy and weakness before the development of anxiety, confusion, and mild paranoia in May of 1984. His family took him to their physician out of concern for his confusion. A metabolic profile showed hypercalcemia, and the patient was treated with intravenous saline. At that time there were several possible causes of the hypercalcemia in this patient, including medications, diet, and endocrinopathy.

In June of 1984 he expressed the idea that people were trying to harm him. On 18 Aug. 1984, he had a severe attack of "anxiety" for which the rescue squad was summoned to his home. Several days before the shootings he became suspicious that one of his medications, the antihypertensive, was poison. Family members later described him as "disturbed" for several days before the shooting.

There was no history of marital discord or domestic violence between this man and his 75-year-old wife or of violence with other relatives. Just after 3 a.m. on 20 Sept. 1984, he awoke from sleep and with a .20-gauge double barreled shotgun fatally shot his wife once in the back and severely wounded a grandson with a second shot as the boy tried to escape. At 3:16 a.m. the patient telephoned the local law enforcement dispatcher to report what he had done. He gave his name, address, and a clear account of the events. During this telephone conversation the dispatcher misstated the address and was corrected by the man.

He was arrested without incident and told the police that his doctor had conspired with his wife to "fix" him so that he would no longer be able to perform sexually. After his arrest he told his attorney and a relative that he had shot these two people because he believed they were plotting to murder him that night.

While in jail awaiting trial he exhibited an episode of unresponsiveness, and later, while depressed and paranoid, engaged in a suicide gesture. Blood tests in jail showed hypercalcemia (the highest was 12.3 mg/dL; normal range 8.7 to 10.2). The ionized calcium was 6.28 mg/dL (normal range 4.44 to 5.24). Other important laboratory data revealed hyponatremia with serum sodium of 121 mEq/L (normal range 135 to 145). Serum phosphorus and magnesium were normal. Albumin was 4.6 g/dL (normal range 3.5 to 6.5). Thyroid studies, hematologic studies, and serum glucose were normal. Hyperparathyroidism was investigated, and the following laboratory results were obtained: parathyroid hormone level 821 pg/mL (normal range 55 to 330); 24-h urine collection for calcium 331 mg/24 h (normal range 50 to 275); 24-h urine creatinine 1.1 g/24 h (normal range 1.0 to 1.9). The intravenous pyelogram study was normal.

On 23 April 1985, he successfully underwent removal of a single parathyroid adenoma. The tissue consisted of a 2.0- by 1.5- by 1.0-cm cyst and a 1.1- by 1.7- by 0.7-cm adenoma. Following surgery the neuropsychiatric symptoms of confusion, memory impairment, and paranoid delusions rapidly resolved.

At trial his defense attorney made use of expert testimony in an attempt to establish the

insanity defense. This legal defense was not accepted by the jury. He was found guilty of both charges and received a long prison sentence.

### Psychological Measures

Before surgery he was given the Wechsler Adult Intelligence Scale-Revised (WAIS-R) and Bender Gestalt Test to assess cognitive functioning. On the WAIS-R he obtained a full scale I.Q. score of 81. There was no significant difference between his verbal and performance scores. The Bender Gestalt revealed significant impairment in his visual motor integration abilities. His errors demonstrated angulation, closure difficulty, perseveration, retrogression, rotation, and simplification of figures. When tested to the limits of his ability he was unable to make a correct unrotated reproduction. These errors are generally associated with organic brain dysfunction [11, 12].

After parathyroidectomy he was given the WAIS-R and Bender Gestalt Test. While there was little change in his WAIS-R full scale I.Q. score (85), he improved on performance subsets which test spatial visualization, nonverbal concept formation, ability to benefit from sensory motor feedback, and ability to anticipate relationships among objects. His performance on the Bender Gestalt Test also improved. He made fewer errors and did not demonstrate the former serious errors of angulation, closure difficulty, and retrogression. He displayed better visual motor coordination, planning, and constructional abilities.

### Discussion

Case studies of patients with primary hyperparathyroidism show that the patient usually demonstrates vague and nonspecific symptoms during a period of subclinical hyperparathyroidism which precedes the onset of marked psychiatric illness by years [8]. The disorder occurs most frequently in women older than 50 years of age. Calcium and other ions are thought to regulate membrane processes and have influences on neurotransmission within the central nervous system.

Alarcon and Franceschini reviewed a number of prior studies with hyperparathyroidism and paranoid psychosis. In the series of patients reviewed, general "neuropsychiatric" symptoms (weakness, lethargy, distractability, and slowness) occurred among 4 to 57% of those with hyperparathyroidism and "dominant" psychiatric symptoms (affective disorders, organic syndromes, and psychoses) occurred among 1 to 25% of the patients [9]. While affective disorders dominate the clinical picture, organic symptoms and paranoid psychoses were clearly documented in a number of individuals. In the best described cases of paranoid psychosis caused by the hypercalcemia of primary hyperparathyroidism, the highest serum calcium levels ranged from 11.6 to 15 mg/dL. In the case described here, serum calcium fell within this range, and the highest serum calcium level was 12.3 mg/dL.

The psychiatric symptoms associated with the hypercalcemia of hyperparathyroidism are wholly reversible. These symptoms resolve rapidly following successful parathyroidectomy. We are unaware of other reported cases of homicide committed by patients with paranoid delusions caused by hypercalcemia.

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