Case Report

CT-guided cryoablation of mediastinal parathyroid adenoma: an alternative to surgery✩✩

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A B S T R A C T

Primary hyperparathyroidism is most commonly caused by adenoma formation in one of the 4 parathyroid glands. The presence of ectopic parathyroid tissue is relatively common and can lead to difficulties in identification and treatment if affected by adenoma. This report describes the case of a 45-year-old female who presented 10 years status post thyroidectomy with symptomatic hyperparathyroidism and found to have ectopic parathyroid adenoma in the anterior mediastinum. Parathyroid scintigraphy with 99m-Technetium sestamibi and computed tomography were used for localization of the adenoma to a 1.9-centimeter para-aortic nodule. Computed tomography-guided transsternal cryoablation was subsequently performed for treatment, with intraoperative evaluation of serum parathyroid and calcium levels for confirmation. This case highlights that a sharp increase in parathyroid hormone immediately after cryoablation is not necessary for successful confirmation of the procedure. It additionally contributes to the growing literature on computed tomography-guided cryoablation as a legitimate alternative to surgery for treatment of ectopic parathyroid adenoma.

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Case presentation

We report the case of a 45-year-old female with ectopic parathyroid adenoma in the anterior mediastinum treated with cryoablation. Her past medical history was significant for papillary thyroid cancer status post total thyroidectomy in February 2009. The patient’s calcium levels had been periodically elevated over the past year, and she experienced increased fatigue and difficulty concentrating during this timeframe, which had begun to interfere with her activities of daily living. Her 24-hour urine calcium was also found to be elevated to 415.8 mg (normal range: 100 to 250 mg). She underwent a neck ultrasound, which was negative, and Parathyroid scintigraphy with 26.5 mCi 99m-Technetium sestamibi (Fig. 1), which showed no radiopharmaceutical accumulation in the neck, but significant accumulation in the anterior mediastinum, which localized to a 1.9 cm para-aortic nodule on computed tomography (CT). The patient declined surgical intervention and was seen in the interventional radiology (IR) clinic, where she was deemed a good candidate for cryoablation given the ideal anatomical positioning of the adenoma for transternal access.

The patient was placed under general anesthesia for the procedure. Scout CT imaging demonstrated the mass in the left anterior mediastinum subjacent to the sternum and abutting the ascending aorta (Fig. 2a). Percutaneous transternal access was obtained at the anterior midline chest wall using an 11-gauge OnControl power assisted biopsy needle (Teleflex Inc., Wayne, PA), which served as a guide needle. The needle was advanced in an oblique path through the sternum and positioned with tip immediately posterior to the posterior sternal cortex. Through this needle, a PCS 17R 15 cm cryoprobe (Endocare Inc., Irvine, CA) was coaxially advanced and positioned through the center of the lesion (Fig. 2b), with confirmation of proper placement using axial limited noncontrast chest CT. A double-freeze cryoablation cycle was performed as follows to achieve complete tissue necrosis: 10-minute freeze to a minimum temperature of -154°C, 8-minute thaw, and a second 10-minute freeze achieving a minimum temperature of -152°C. Cryoprobe was thawed and removed after completion of the second freeze cycle, with intraprocedural CT revealing ice ball formation enveloping the adenoma.

Limited postprocedural contrast-enhanced CT of the chest was performed, showing several locules of gas in mediastinal fat adjacent to ablation zone and increased soft tissue density suggestive of mild procedure-related swelling (Fig. 2c). No complications were evident at the conclusion of the procedure.

Serial evaluation of the serum parathyroid hormone and serum calcium was performed spanning the course of the procedure, with a baseline preprocedural, intraprocedural and 1-hour postprocedural blood draws. Her parathyroid hormone (PTH) values during these time points were as follows: 115, 23, and 33 pg/mL, respectively. PTH was again measured 1-day postprocedure and was 10 pg/mL. Corresponding serum calcium levels at these time points measured 10.0, 9.3, 9.3 and 10.3 mg/dL, respectively. Patient was scheduled for a 1-month follow-up nuclear medicine scan and repeat lab work but was lost to follow-up. However, she presented to the emergency department 11 months postprocedure with unrelated symptoms of cholecystitis and was found to have a serum calcium level of 8.5 mg/dL. Although no PTH value was recorded, this latest result provides some confirmation of the long-term success of the cryoablation.

Discussion

Primary hyperparathyroidism (PHPT) is a disease process with a range of presentations from asymptomatic laboratory values, to symptomatic hypercalcemia. Patients can present with fatigue, weakness, bone pain, pathological fracture, and nephrolithiasis [2,4]. Neurocognitive symptoms, such as depression and impaired concentration, have also been associated with PHPT [2]. It has been reported that up to 16% of patients with primary hyperparathyroidism may harbor ectopic parathyroid tissue, with 62% of these arising from the inferior parathyroid glands. As many as 1 in 5 of these ectopic inferior parathyroid glands may be located in the anterosuperior mediastinum [1].

While surgical procedures such as median sternotomy, and more recently video-assisted thoracoscopic surgery, have typically been used for resection of ectopic parathyroid glands, CT-guided cryoablation can be utilized in certain cases provided ideal access to lesion and minimal risk to adjacent critical structures. There have been at least 3 reported cases of CT guided ectopic parathyroid cryoablation in patients seeking to avoid open surgery [3,4]. Two of the 3 reported patients were symptomatic of their hyperparathyroidism. In 2 of these 3 cases, the patients’ elevated PTH and serum calcium were found 6 months post parathyroidectomy, and subsequent parathyroid scintigraphy revealed anterior mediastinal
nodules. In the third case, a symptomatic patient was known to have a mediastinal ectopic parathyroid and underwent unsuccessful internal mammary artery ethanol embolization before CT-guided cryoablation [4]. All 3 patients were assessed with pre- and postablation measurements of PTH and calcium.

Our case demonstrates a few variations from those previously reported. First, whereas the other 3 patients were noted to have symptoms of hypercalcemia or elevated PTH within 6 months of parathyroidectomy or attempted ethanol embolization, our patient was found to have elevated PTH and corresponding symptoms 10 years post total thyroidectomy. Secondly, one of the previously reported cases measured PTH levels immediately after cryoablation and noted a sharp but transient increase from 239 pg/mL preablation to 526 pg/mL 10 minutes postablation, which was attributed to release of stored PTH upon tissue necrosis [3]. In the present case, the 2 intraoperative PTH measurements demonstrated a much less profound increase in PTH (23 pg/mL and 33 pg/mL), which suggests that although a transient spike may be seen, it is not necessary to confirm target tissue destruction.

In conclusion, our case redemonstrates the utility of pre-, intraprocedural, and postablation serum PTH measurement as confirmatory testing for efficacy of ablation. Also, while some cases may demonstrate a lysis phenomenon of transient intraprocedural PTH spike, we have shown it is not necessary for confirmation of successful ablation. Finally, our case
lends itself to the growing evidence that CT-guided cryoablation of ectopic parathyroid adenoma is a legitimate alternative for those patients with ideal anatomy seeking to avoid re-operation for recurrent hyperparathyroidism following initial parathyroid surgical resection.

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