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Petrified Ear – A Case Report and Review of the Literature

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Abstract

Petrified ear is the transformation of normal, flexible auricular cartilage into rigid, immobile auricular cartilage due to abnormal calcification or ossification. Etiologies of petrified ear include tissue injury, systemic endocrine diseases, congenital disorders, or petrified ear of unknown origin. We present a case of a 69-year-old male with a one-month history of non-painful rigidity of the right ear that was found to have petrified ear of unknown etiology confirmed by radiography.

Keywords: petrified ear, petrified auricle, ectopic ossification

Case Synopsis

A 69 year-old Caucasian male with a history of Malignant Melanoma in situ and non-melanoma skin cancer of the chest presented to the dermatology clinic for routine skin surveillance. Upon examination and further questioning, he reported a one-month history of non-painful rigidity of the right ear, which had recently progressed to involve the left ear. Although asymptomatic at baseline, he did report some mild discomfort while sleeping on his ipsilateral side. He first noted the rigidity approximately one month prior to our evaluation but did not recall any local trauma. He has otherwise felt well and denied fatigue, muscle cramps, vision changes, fevers, chills, bowel changes, heat or cold intolerance, or other skin changes. His past medical history is significant only for chronic kidney disease (CKD) Stage III secondary to hypertension. On examination, the patient's right auricle was completely rigid with no pliability, but with complete sparing of the lobule. There were

no overlying skin changes (**Figure 1**). Similarly, the superior portion of the left auricle was fixed but the remainder of the auricle had minimal change. The nasal cartilage was unremarkable.

Laboratory evaluation revealed creatinine of 1.59 mg/mL and hypovitaminosis D (16.1 pg/mL). Other laboratory values including parathyroid hormone, morning cortisol, c-reactive protein, thyroid-stimulating hormone, free thyroxine (T4)/ triiodothyronine (T3), follicle-stimulating hormone, luteinizing hormone, prolactin, serum free testosterone, calcium, basic metabolic panel, aspartate aminotransferase (AST)/alanine aminotransferase (ALT), bilirubin, blood urea nitrogen were within normal limits. Skull radiograph demonstrated opacities in the bilateral cartilaginous structures of the ear, consistent with aberrant bone deposition into auricular cartilage (**Figure 2**).

This presentation was consistent with petrified ear, most likely idiopathic, given the lack of significant laboratory abnormalities and no identifiable triggers by history. The patient was given an orthotic pillow to prevent further trauma to the ear and relieve discomfort while sleeping. Biopsy was deferred given the results would not provide data to alter current management.

Case Discussion

Petrified ear is a rare clinical entity describing the transformation of normal flexible auricular cartilage into partial or complete auricular rigidity. Petrification can arise from either calcification or ossification. Calcification is the deposition of calcium onto the auricular cartilage, whereas ossification describes new bone formation with both calcium



Figure 1. On examination, the patient's right auricle was completely rigid with no pliability, but with complete sparing of the lobule. There were no overlying skin changes.

and phosphorus in areas that are not normally ossified [1,2]. Auricular ossification occurs much less frequently than calcification, with less than 20 pathologically confirmed cases reported in English-language literature listed in **Table 1**.

Calcification can either be dystrophic or metastatic in origin. Dystrophic calcification describes calcium deposition onto altered or necrotic tissue despite

normal serum calcium levels. Dystrophic calcification is thought to be secondary to tissue injury, most commonly frostbite or mechanical trauma, leading to increased tissue alkalinity and subsequent abnormal calcium deposition into damaged tissue [2]. In contrast, metastatic calcium deposition stems from alterations in calcium and phosphorus metabolism, with subsequent deposition of calcium into tissues. Vitamin D excess, milk-alkali syndrome, primary and secondary hyperparathyroidism, hyperphosphatemia, and sarcoidosis have been associated with metastatic calcification [20]. Systemic diseases including Addison's disease, acromegaly, diabetes mellitus, and ochronosis have also been reported to cause ectopic calcium deposition, although the exact mechanism remains unclear [1,2, 21].

Ectopic ossification refers to new bone formation in tissue that does not normally ossify, as first described by Bochdalek in 1866 [22]. Ectopic ossification can be either primary or secondary. Primary ectopic ossification occurs in rare congenital syndromes, including osseous heteroplasia, fibrodysplasia ossificans progressive, Albright hereditary osteodystrophy, and congenital plaque-like osteomatosis [10]. Secondary ectopic ossification

Table 1. Previous cases of auricular ossifications.

Year	Author	Patient		Etiology
		Age	Sex	
2011	Chang ³	72	F	Calcium supplementation
2009	Mastronikolis et al ⁴	73	M	Addison's disease & diabetes mellitus
2008	Carfrae-Foyt ⁵	49	M	Unknown
2007	Sterneberg-Vos ⁶ et al	70	M	Frostbite
2006	Gonzalez-Sixton et al ⁷	65	M	Hypothermia
2005	Manni et al ⁸	63	F	Unknown
2004	High et al ⁹	60	M	Unknown
2000	Stites et al ¹⁰	65	M	Frostbite
1998	Yeatman and Varigos ¹¹	66	M	Cold injury
1994	Lautenschlager et al. ¹²	66	M	Recurrent cold exposure
1991	Cohen et al ¹³	46	M	Addison's disease
1989	Lari et al ¹⁴	17	M	Trauma
1989	Cohen et al ¹⁵	70	M	Addison's disease
1984	DiBartolomeo ²	72	M	Frostbite
		77	M	Frostbite
1969	Lister ¹⁶	58	M	Clinical gout
1948	E. Gordon ¹⁷	34	F	Perichondritis
1932	Scherrer ¹⁸	53	F	Exophthalmos
1890	Knapp ¹⁹	24	M	Perichondritis

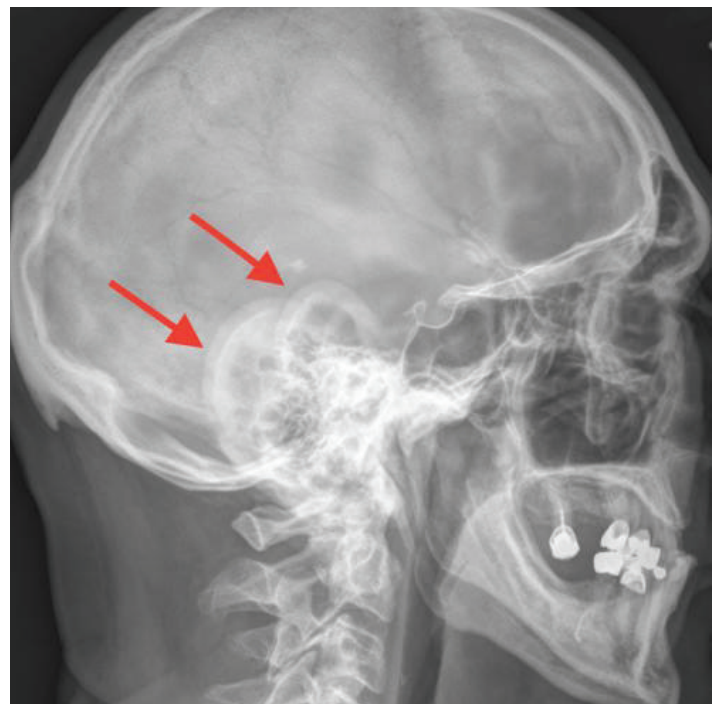


Figure 2. Skull radiograph demonstrated opacities in the bilateral cartilaginous structures of the ear, consistent with aberrant bone deposition into auricular cartilage.

Table 2. Laboratory evaluation for petrified ear.

Complete Blood Count
Basic Metabolic Panel
Thyroid Function Tests
Parathyroid Hormone Levels
Vitamin D
Serum Calcium
Serum Phosphorus
Morning Cortisol
Fasting Glucose

most commonly occurs after trauma (fracture, joint dislocation, soft-tissue trauma, or surgery). It is hypothesized that trauma produces bone morphogenic protein, which causes differentiation of mesenchymal cells into osteoprogenitor cells [23].

Patients with petrified auricle are usually asymptomatic and may be incidentally recognized by imaging or physical exam. Notably, both ossification and calcification spare the ear lobes. Other presentations include ear pain occurring with pressure or, more rarely, it can present with hearing impairment and skin ulceration [21].

Given its implication in several systemic diseases, a complete workup is necessary when suspecting a petrified ear. Comprehensive laboratory evaluation may be required to reveal underlying endocrine or metabolic abnormalities. The recommended initial work-up in a patient with suspected calcification or ossification of the auricle is listed in **Table 2** [24]. Radiography is usually diagnostic. Skull X-ray will show hyperdense areas where calcification or new bone formation has occurred. To differentiate between these two entities, a temporal CT scan may be performed, in which uniform hyperdensities represent calcification and radiolucent spaces within hyperdense areas represent the trabecular bone formation seen in ossification [8]. Definitive diagnosis is made through histopathological exam, which distinguishes between calcification and ossification.

Identifying and treating the underlying metabolic or endocrine disease may help prevent further calcification and hardening of the external pinna. Since the majority of patients with auricular ossification are asymptomatic, further research is needed to direct therapy in those patients who are symptomatic. While supportive therapy is sufficient for most, improvement of pain and insomnia associated with petrified ear has been reported with wedge biopsy removal of the calcified portion of the ear [16, 8]. Our patient was relatively asymptomatic and laboratory work-up was within normal limits, therefore no treatment was pursued.

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