Calcified Keratoacanthoma with Tumoral Calcinosis in a 10-year-old Boy: 
A mere Co-incidence?

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Abstract
Keratoacanthoma (KA) is a rapidly evolving benign cutaneous tumor, occurring in elderly individuals with a tendency towards spontaneous regression and histopathologic similarity to squamous cell carcinoma. Tumoral calcinosis is an uncommon condition, associated with the deposition of painless calcific masses. The occurrence of these two conditions in the same patient is a rarity itself, whereas deposition of calcium within the KA lesion in our 13-year-old patient makes it even more intriguing. Such an association has been seldom reported in the literature, and this prompted the current report.

Key Words: Calcified keratoacanthoma, pediatric, tumoral calcinosis

Introduction
Tumoral calcinosis (TC), a special form of idiopathic calcinosis cutis, is characterized by large periarticular calcium deposits resembling neoplasms and is found commonly around hip, shoulder, and elbow joints. On the other hand, keratoacanthoma (KA) is a rapidly evolving benign cutaneous tumor, originating in the pilosebaceous follicles, usually showing spontaneous regression. These tumors frequently affect the central part of face, dorsa of hands, wrist, and forearm.[1] Histologically, it resembles squamous cell carcinoma (SCC), so the recent view is that KAs are low-grade SCC, which will resolve in most cases.[2]

Rarely, these two conditions may co-exist in the same patient, albeit at different sites. However, KA developing over masses of TC has not been reported in the literature. This co-localization is also corroborated histologically demonstrating calcium salt deposits within the KA. Thus, we report the co-localization of two rare conditions, KA and TC, and the current case report might be the first of its kind in the literature.

Case Report
A 13-year-old boy presented to us with several asymptomatic masses at different parts of his body. A large mass was situated over his left shoulder for the last 3.5 months. Initially, it was small which enlarged at a rapid pace. There was a central crater filled with whitish, semi-fluid material. Besides, there were several subcutaneous masses of varying sizes, some clubbed together around the umbilicus and in the right lower quadrant and two large masses with whitish keratinous centers, in the upper part of his right thigh which slowly increased in size over the last 1.5 years. There were also two large masses at the upper part of his buttocks, with similar history of growth, the right mass having a central keratinous crater. Family history was unremarkable and the patient failed to recall any episode of trauma or injection over the affected area, excessive milk or antacid intake, or any local or systemic illness prior to the development of the lesions.

Physical examination revealed multiple skin-colored, well-circumscribed, firm, dome-shaped nodules ranging from 2 cm × 2 cm to the larger ones measuring 9 cm × 10 cm. The lower abdominal masses were surmounted by pedunculated, firm, nontender dome-shaped nodules sized about 2 cm × 2 cm, with a central crater filled with keratinous material. There were variably sized swellings around the umbilicus and...
in the right lower quadrant of the abdomen, better felt than seen. Some nodules were clubbed together at places. These masses sized about 3 cm × 1.5 cm in diameter and felt hard on palpation. Examination also revealed two conspicuous dome-shaped nodules measuring about 6.5 cm × 4 cm, over the right groin, which were firm, nontender, irregular, and the overlying skin being normal except for the presence of a central crater filled with keratinous material [Figure 1]. Two large nontender, firm, subcutaneous masses were present in the lower trunk (posterior aspect) sized about 6.5 cm × 5 cm. The left-sided mass showed an ulceration suggestive of extrusion of whitish chalky material from the same [Figure 2]. There was no associated lymphadenopathy. Systemic examination revealed a malnourished child, weight being 41 kg.

Routine hematological investigations revealed anemia (hemoglobin: 7.5% g); serum calcium, phosphate, uric acid, alkaline phosphatase, creatinine, and blood urea nitrogen levels were within normal limits. Skiagram of the lower abdomen showed irregularly round-to-oval, radiodense-calcified areas [Figure 3]. Fine-needle aspiration cytology showed amorphous granular material with occasional histiocytes. One of the small pedunculated masses over the lower abdomen was excised and sent for histopathological examination (HPE) which revealed irregular, epidermal proliferation with hyperkeratosis extending into the mid-dermis, with a central keratin-filled crater. The epidermis extended like a buttress over sides of the crater, suggestive of KA. Basophilic granular material, suggestive of secondary calcification within KA, was observed [Figure 4]. One of the small firm peri-umbilical subcutaneous masses was also excised for histological examination. Milky fluid came out during sectioning. Basophilic amorphous granular material of varying sizes consistent with calcium deposits was found in a scattered distribution [Figure 5]. An inflammatory infiltrate was also seen in the dermis. Histiocytes were seen occasionally. Thus, HPE revealed the features of both KA and TC in the same lesion.

**Discussion**

KA Keratoacanthoma is a rapidly evolving skin tumor, composed of keratinizing squamous cells, with a tendency toward spontaneous regression if left untreated. Although the precise mechanism remains unknown, sun exposure appears to be a contributory factor. However, stray reports have associated KA with tar, mineral oil, sorafenib,[1] human papillomavirus infection,[3] and xeroderma pigmentosum,[4] but conclusive evidence is still elusive.

Commonly, KA occurs in middle-aged and elderly males, averaging 50–80 years. KA occurring at a younger age has been rarely reported; Sawarn et al. reported a case at 20 years,[4] Feldman and Maize at 9 years,[5] and Maruani et al. at 34 years.[6] Our patient was a 13-year-old boy, thus adding to the literature of KA developing in the pediatric age group.
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There are four types of KA; solitary (most common), multiple (familial, Smith–Fergusson type), eruptive (generalized, Grzybowski variant), and the rare KA centrifugum marginatum. They commonly affect sun-exposed areas such as central part of face (nose, cheeks, eyelids, and lips), dorsa of hands, wrist, and forearm. Rarely, thigh, chest, and shoulder are affected. However, KA at the anal margin and overcutaneous, linear epidermal nevus have also been reported.

Histologically, it resembles SCC, so the recent view is that KAs are low-grade SCCs. There is irregular, epidermal proliferation with hyperkeratosis extending into the mid-dermis, with a central, keratin-filled crater. The epidermis extends like a buttress over the bilateral sides of the crater. The epithelium is acanthotic, with the presence of highly keratinized keratinocytes, i.e., with eosinophilic glassy cytoplasm. The scalloped outer border loses its infiltrative character and is reduced to a thin rim. Presence of acantholysis is incompatible with the diagnosis of KA.

Tumoral calcinosis (TC), a distinct clinico-histological entity, is a form of idiopathic calcinosis cutis, which is characterized by tumor-like periarticular deposits of calcium, mainly found in the regions of hip, shoulder, elbow, and other pressure points, rarely affecting distal locations such as the hands and feet. Mostly, it affects young adults, but it can occur as early as 4 years of age, the present patient being 13 years old. Although the exact cause is unknown, a pathogenesis-based classification has subdivided this entity into three types: (1) primary normo-phosphatemic tumoral calcinosis (NPTC), (2) primary hyperphosphatemic tumoral calcinosis, and (3) secondary tumoral calcinosis, characterized by the presence of underlying disorders. Our case is that of a NPTC, with normal serum phosphorus levels. Although the diagnosis is essentially clinical, confirmation may be obtained by radiology, fine-needle aspiration cytology (which reveals amorphous chalky material), and histopathology (which shows calcium deposition with a surrounding foreign body reaction). Occasionally, imaging studies (computed tomography and magnetic resonance imaging) may show a “chicken-wire” pattern (subcutaneous deposits of rounded opacities surrounded by radiolucent fibrous septa).

In our case, both KA and TC were found, even at the same sites. Calcium deposits were found within the KA lesions, such a pattern being unique. To the best of our knowledge, there is only one report of KA with secondary ossification in the literature, and our case happens to be the second case where calcium salt deposition is found within the KA lesions.

The important differentials in our case may be SCC (rapid development to a larger size, damaged surrounding skin), cutaneous horn, hypertrophic actinic keratosis, molluscum contagiosum, pseudoepitheliomatous hyperplasia, and granulomas of different kinds, which can be ruled out by histopathology. Secondary ossification/calcification has been reported with some benign and malignant tumors, such as melanocytic nevi, blue nevi, organoid nevi, acne, cutaneous mixed tumors, epidermal and dermoid cysts, trichoepithelioma, pilomatrixoma, lipoma, dermatofibroma, pyogenic granuloma, basal cell carcinoma, SCC, and melanoma. To the best of our knowledge, this is the second case of KA with secondary calcification.

It has been proposed that this calcification might have occurred under the influence of certain factors such as bone morphogenetic protein (BMP)-2, BMP-4, β-catenin,
osteopontin, osteonectin, and osteocalcin, secreted by osteoblasts.\(^{[11]}\) However, the reason of this calcification remains to be elucidated.

The treatment of such a case is essentially surgical excision. Concomitant dietary therapy with oral aluminum hydroxide and low calcium, low phosphate diet may be effective to reduce calcium deposition and formation of TC. Some studies have shown 5% imiquimod cream to be an effective treatment for KA,\(^{[12]}\) but further validation is required in this regard.

**Financial support and sponsorship**
Nil.

**Conflicts of interest**
There are no conflicts of interest.

**What is new?**
- Keratoacanthoma (KA) in pediatric age group is rare
- KA with secondary calcification is extremely uncommon
- Co-localization of KA and tumoral calcinosis adds to the singularity of the case.

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