Introduction

Playing is the shortest route between children and their creative calling. At times, minor injuries occurring during playing are ignored. Children often place foreign objects in the oral cavity, which when get stuck may lead to foreign body impactions in the oral mucosa. One such common object can be the pencil as many children have pencil-chewing habits. They even rotate it while chewing. Further stab injuries by pencil caused due to minor conflicts during playing can be another reason. Children ignore such injuries or at times do not report them to their parents because of fear of being scolded. If these pencil lead wounds are left untreated, they can result in undesirable local pain, pigmentation, graphite foreign body reaction, and granuloma or abscess formation. The occurrence of pencil core granulomas is very rare and only a few case reports have been documented in the literature. Most of these are reported on limbs as hyperpigmented nodules in the skin, secondary to a retained pencil core. Hatano et al in 2000 reported a pencil core granuloma from an injury that had occurred about 30 years ago on the medial aspect of her left big toe. Fukunaga et al in 2011 reported two rare cases of pencil core granuloma on the face and summarized nine previously reported cases with only one case being on the face, the oldest of which was 58 years old.

This study presents the rarest case of intraoral pencil core granuloma where pencil lead was impregnated in the oral mucosa at a young age, which led to granuloma formation and resulted in malformed and impacted permanent central incisor. In the literature, very few cases have been reported on graphite tattoos in the oral cavity but no intraoral case of pencil core granuloma with retained graphite lead inside has been reported.

Case Report

A 13-year-old male patient reported to a private dental practitioner with a chief complaint of mal-aligned teeth in the upper front region. Intra-oral examination revealed missing 11.

Abstract

Foreign body impactions can be frequently seen in childhood as children have a habit of putting different objects in the mouth. These impacted foreign bodies if not removed timely, at times can lead to severe reactions leading to granuloma formation. A simple injury, if ignored, can result in severe damage to oral tissue and even loss of the permanent tooth. Therefore, all penetrating injuries should be carefully assessed and treated timely. This study describes a rarest intraoral case of pencil core granuloma with retained graphite lead inside it that led to severe tissue reactions. Pencil core granuloma has been reported extra orally and on limbs. This case report describes the rarest case reported intraorally.

Keywords: Foreign body reaction, graphite tattoos, pencil core granuloma, pencil lead
and mesially tipped 12. The patient was advised fixed orthodontic treatment for alignment of teeth. Intraoral periapical radiograph revealed impacted 11 with a well-defined radiolucency around it [Figure 1]. The tooth seemed to have an abnormal shape. A surgical exposure of the tooth was then planned to expose it and extrude it orthodontically. The patient was explained the procedure and the treatment was carried out. The site was prepared and the incision was placed to expose the tooth [Figure 2]. As the tooth was negotiated, some black and yellow foreign objects were observed, which were then removed. The tooth was also mobile and seemed to be of abnormal shape. It was then planned to remove the tooth also as it was malformed and not possible to retract it orthodontically. On removal, the foreign object was found to be pencil lead pieces measuring nearly 4–5 mm and a yellow crayon too [Figure 3]. The site was surgically curetted and all the granulation tissue was removed [Figure 3] and sent for histopathological examination. Sutures were placed and the patient was recalled [Figure 4]. The site showed good healing in follow-up visits.

Discussion

Pigmented entities are common in the oral mucosa and may be endogenous or exogenous in nature.[5] Among these, the most frequently found are amalgam tattoos, followed by graphite tattoos.[6] The objects may get either impregnated in the oral mucosa of gums, tongue, and floor of the mouth or the cavities of the broken or fractured teeth and the root canals of the teeth with open pulp chambers.[5] These objects may be symptomless and may be incidental finding. Clinical presentation may be in the form of a simple abscess or occasionally mimicking granulomas, tumors, and anthroliths.[1]

Graphite tattoo presents as a black or gray macular patch on the oral mucosa[7] commonly found in the palate of young children and results from pencil lead that is traumatically implanted, usually during the early school years. Some children have a habit of rotating pencil lead tips in the mouth and accidents can be caused by these tips.[5] In our case, because the overlying mucosa was normal, no previous injury was suspected as the patient also did not remember any such incident, and thereby, the surgical exposure and orthodontic extrusion of teeth were planned after observing an impacted tooth on the radiograph.

The lead of a pencil is composed of graphite (elementary carbon), clay (aluminum silicate), various waxes, and lacquers. Though graphite and clay are biologically inert, if left in the tissue for a long time, these can result in undesirable local pain, pigmentation, abscess formation, and foreign body reaction.[2] Several reports from the literature indicate that stab injuries by pencil can cause such soft tissue reactions. The sites most affected are the limbs because they are areas that are more exposed to mechanical traumas. Only a few cases of granulomas affecting
the face have been reported due to less frequent mechanical stimuli on the face compared to the limbs.\[5\] However, granulomas secondary to a retained pencil core are rarely reported in the literature.\[8\] Our case was unique in that it was an intraoral case and a 4–5 mm of cylindrical pencil lead was recovered and we were able to write with it.

Although the lead of a pencil is generally known to induce a non‑allergic granulomatous reaction,\[9] every component could induce a tissue reaction. Silica can result in an epithelioid granulomatous reaction. Graphite particles may cause graphite pneumoconiosis, a chronic granulomatous reaction in the lungs.\[2\] Rarely, graphite foreign body granuloma, also known as pencil core granuloma, can occur that is characterized by a delayed foreign body reaction against the fragments of pencil lead, which at the macroscopic level resembles malignant melanoma.\[5\] The reaction against the pencil lead takes a long time until the graphite particle disintegrates to a critical size in the skin. The particles are then dispersed in the interstice and induce a granulomatous reaction.\[10\] The lag period as reported in the literature is 1.5 to 58 years between the injury and granuloma formation. This is the time required for the dispersal of graphite particles that cause the accumulation of macrophages, which in turn release various cytokines and growth factors that induce the proliferation of fibroblasts. Ischemia caused by ectatic changes in the blood vessels in the lesion then induces tissue fibrosis.\[5\] Pencil core granuloma may have macroscopic and some radiologic features of malignant melanoma and blue nevus.\[8,10\] Most cases may show a hyperpigmented nodule secondary to the pencil core retained.\[8\] However, in the present case, no such nodule formation was observed and the impregnated lead was an accidental finding on surgical exposure.

Histologically, in pencil core granuloma, giant cells and epithelioid cells have been observed\[6–8\] [Figure 5]. In the present case, dense sclerosis with focal granulation tissue formation and entrapped dark black pigment showing chronic reparative changes, suggesting a foreign body reaction was observed in histological sections. A previous report suggests faster growth of lesions and a higher degree of tissue injury by colored pencils when compared with non‑colored graphite pencils.\[6,9\] In our case, the injury occurred by both colored and non‑colored pencils leading to greater tissue response. The injury caused in the young years of life due to negligence had affected the development of the permanent tooth, leading to malformed impacted tooth and finally tooth loss. If the patient had been under proper follow‑up examination and the missing anterior tooth had been timely looked upon, it would have reduced the impact of this oral disease, which is subtle and pervasive, influencing the work and social roles of a child.\[10\]

**Summary and Conclusion**

As seen in the present case, a simple injury that was ignored has resulted in the loss of the permanent tooth. Therefore,

- All penetrating injuries caused by a pencil should be carefully assessed and treated with all pieces of lead being carefully removed from the wound.

**Clinical significance**

Pencil core granuloma has been reported extra orally and on limbs. This case report describes the rarest case reported intraorally. Foreign body impactions in oral tissues can lead to severe tissue reactions. Hence, parents should have a regular check‑up for all penetrating injuries that have occurred in the past.

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**Conflicts of interest**

There are no conflicts of interest.

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