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Recommended Citation

Siraci, Esin; Güngör, H. Cem; Cehreli, Zafer C.; and Taner, B., "Buccal and Palatal Talon Cusps with Pulp Extensions on a Supernumerary Primary Tooth" (2006). *School of Dentistry Faculty Research and Publications*. 478.

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Dentomaxillofacial Radiology (DMFR), Vol. 35, No. 6 (November 2006): 469-472. [DOI](#). This article is © British Institute of Radiology and permission has been granted for this version to appear in [e-Publications@Marquette](#). British Institute of Radiology does not grant permission for this article to be further copied/distributed or hosted elsewhere without express permission from British Institute of Radiology.

Buccal And Palatal Talon Cusps with Pulp Extensions on A Supernumerary Primary Tooth

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ABSTRACT

This paper reports an unusual occurrence of talon cusp on a supernumerary primary incisor, presenting on both labial and palatal sides. The tooth was scheduled for extraction due to its interference with the occlusion. Morphometric analysis of the taloned cusps was performed on digitized replicas of the tooth

crown using open-source image analysis toolkit (ImageJ). Further non-destructive investigation of the taloned crown under cone-beam X-ray computed tomography revealed pulpal extensions in both talon cusps.

INTRODUCTION

Talon cusp is an uncommon dental anomaly that manifests as an accessory cusp-like structure, projecting from the lingual or facial surface of anterior teeth.¹ A talon cusp is morphologically well-delineated and extends to at least half the distance from the cemento-enamel junction to the incisal edge of the tooth.¹ The condition may occur in both primary and permanent dentitions in maxillary and mandibular anterior teeth, and may present unilaterally or bilaterally in both sexes.²⁻⁴ A talon cusp is composed of normal enamel and dentin and may involve a pulpal extension.⁵⁻⁷

Talon cusp had been shown in archaeological specimens as old as 600 years⁸ before it was first described clinically.⁹ Talon cusp appears to arise in early odontogenesis.¹⁰ Its precise cause is unclear, although it may be a result of aberrant hyperactivity of the anterior part of the dental lamina.¹¹ To date, anecdotal reports of a genetic influence in the aetiology of talon cusp have not been substantiated scientifically. Clinical variations of talon cusp include those of location, shape, size, structure and number.^{12,13} Talon cusp may present clinically as an isolated entity or in association with other dental anomalies, and even with a small number of syndromes including incontinentia pigmenti, Mohr syndrome and Rubinstein-Taybi syndrome.^{3,14-16}

The present case reports an unusual presentation of a talon cusp, occurring on both the facial and lingual surfaces of a supernumerary primary tooth. Existence of pulpal extensions was investigated non-destructively using X-ray CT.

CASE REPORT

A 3.5-year-old boy was referred to the paediatric dentistry department with a chief complaint of carious teeth. Reportedly, the patient had undergone cleft lip and palate surgery. On initial examination, a partially erupted supernumerary incisor tooth was detected between the maxillary left central and lateral incisor teeth. The palatally aligned tooth appeared X-shaped in the occlusal view (Figure 1). Enamel projections, extending up to the incisal edge were present on both labial and palatal aspects of the supernumerary tooth. Clinically, the tooth had rotated about 90° distally around its vertical axis, interfering with the occlusion (Figure 2). Periapical radiograph of the tooth indicated delayed root development. Since the accessory cusps were superimposed over the main pulp chamber, the extent of possible pulp horns could not be distinguished (Figure 3). On the basis of their characteristic clinical and radiographic appearance, a diagnosis of facial and palatal talon cusps was made. Upon consultation with the orthodontics and plastic surgery departments, the supernumerary tooth was extracted.

The tooth was scheduled for scanning electron microscopy for morphologic evaluation of the talon cusps and cone-beam X-ray CT for non-destructive evaluation of pulpal extension within the talon cusps. First, three replicas of the tooth crown, each of which function separately for investigation of the facial, palatal and incisal aspects of the tooth, were obtained using vinylpolysiloxane impression material (EliteH-D; Zhermack, Rovigo, Italy) and epoxy resin (Araldite 502; Energy Beam Sciences, CT).

The replicas were mounted on an aluminium stub, sputter coated with 20 A⁰ gold and digitally photographed at 10× under a JEOL 6400 scanning electron microscope (Jeol Corp., Tokyo, Japan). Images were then transferred to a G5 Dual 2.3 GHz Macintosh PC. An open-source image analysis software (ImageJ, v.1.34^{17,18}) was used for morphometric analysis of the images. The height of the palatal and facial cusps was measured as 3.6 mm (cervico-incisal dimension: 5.1 mm) and 5.01 mm, respectively (Figure 4), both presenting as “Type 1” (true) talon cusps.³

The original tooth was scanned in a 3D Accuitomo cone-beam X-ray CT (J Morita Manufacturing Corp., Tokyo, Japan) at 80 kVp, 10 mA in 23.0 s. The computed tomograms were produced with a rotating open vacuum X-ray source, fixed sample stage and image sensor. These revealed distinct existence of pulpal extensions within the facial and palatal talon cusps (Figure 5) without destroying the sample.

DISCUSSION

In many previous publications that have reported the appearance of talon cusps containing a pulpal extension,^{3,5-7,19-21} the diagnosis appears to be based on radiographic evaluations in which the talon cusps were superimposed over the main pulp chamber. According to Mader and Kellogg,²⁰ this is a near impossible way to distinguish the existence of a pulpal extension. The present case confirms their statement. Despite the other two radiographs taken from different angles (not shown), the interpretation of accessory pulp horns was rather uncertain, which necessitated utilization of a cone-beam X-ray CT for a correct diagnosis. It should be noted, however, that this type of CT is not a commonly available diagnostic tool. Thus, even though the absence of a pulpal horn has also been reported previously,²¹ induction of reparative dentin by gradual, periodic reduction of the talon cusp appears to be the safest approach to avoid possible pulp exposures during the removal of talon cusps that create aesthetic or occlusal problems.¹²

Hattab et al³ have classified talon cusps into three categories based on their size and morphology: Type 1 (True Talon), a morphologically well-delineated additional cusp that prominently projects from the palatal surface of a primary or permanent anterior tooth and extends to at least half the distance from the cemento-enamel junction to the incisal edge; Type 2 (Semitalon), an additional cusp of 1 mm or more that extends to less than half the distance from the cemento-enamel junction to the incisal edge and blends with the palatal surface or stands away from the crown; Type 3 (Trace Talon), an enlarged or prominent cingulum with variations such as conical, bifid or tubercle-like. As confirmed by morphometric evaluations herein, both talon cusps satisfied the Type 1 (True Talon) category.³

About 75% of the published studies describe talon cusp in the permanent incisors.³ A literature review⁵ has yielded data on 37 individuals involving the variant, in a total of 50 primary incisors. Only one case of talon cusp was associated with a supernumerary primary tooth.¹⁹ The case described herein is the first presentation of a primary tooth possessing both lingual and labial Type 1 talons. Previously, Abbott¹² and Dunn²² reported two cases of permanent teeth with talon cusps on both the labial and palatal surfaces.

A search of the literature suggests that micro-CT (μ CT) is currently the leading technology for morphological assessment of small specimens and definitely for endodontic research. Non-destructive, *in vitro* and *in vivo* (CT) application, a nominal resolution of 19.6 μ m, improved imaging capabilities and all the expertise gained in the past CT research are characteristics that give μ CT its

current “gold standard” status in endodontic research.²³ Yet, this gold standard is subject to drawbacks, as experienced herein, including the one repeatedly emphasized by various authors:^{24–26} its limited availability to the general research community, *i.e.* scientific use of this technology, is confined to a few centres.^{23,24} This also applies to the cone-beam X-ray CT and, despite published data regarding its image quality with regard to dentin, enamel and pulp cavity,²⁷ dental CT may provide more sharply defined edges, especially along the enamel-dentin interface and the pulp cavity.²⁸

Management of talon cusp varies with the clinical manifestations of each individual case. The treatment objectives for taloned teeth should include preserving pulpal vitality, meeting aesthetic and occlusal requirements, establishing caries prevention or eradication of developmental grooves and eliminating tongue/soft tissue irritation, whenever indicated.^{6,19} It is desirable, however, to evaluate and treat the talon cusp soon after eruption to avoid further clinical problems.¹⁹ In the present case, the extraction of the taloned supernumerary tooth which interfered with occlusion was the treatment of choice.

Figure 1 Occlusal view of the supernumerary tooth revealing the enamel projections located on the facial and palatal aspects of the rotated crown

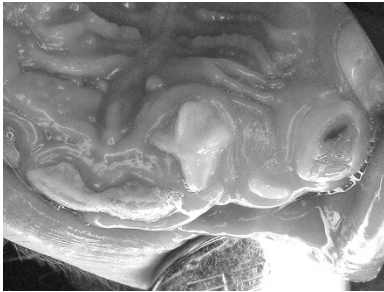


Figure 2 The patient's mouth is in occlusion. Note the supernumerary tooth is interfering with the occlusion

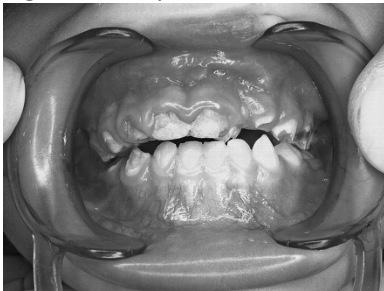


Figure 3 Radiographic presentation of the supernumerary tooth. Incisal extensions of pulp horns are difficult to distinguish. Note the delayed root development



Figure 4 Scanning electron micrographs of (a) the palatal, (b) facial and (c) incisal aspects of the tooth crown (10×). The cervicoincisal dimension of the palatal side was 5.1 mm, confirming a Type I (true) talon cusp. Note the extension of the facial talon cusp up to the incisal edge (b)

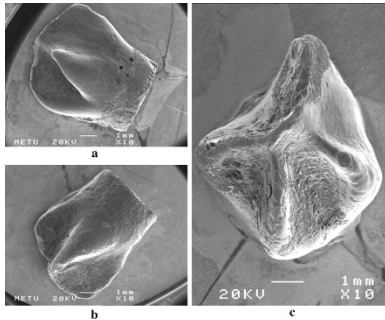
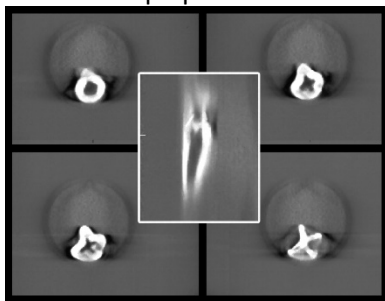


Figure 5 Selected CT scans of the supernumerary tooth crown (from cervical to incisal), revealing distinct existence of pulpal involvement in the facial and palatal talon cusps. The image of the sagittal cutplane (middle) verifies the pulpal extensions



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