Intentional Partial Pulpotomy for Treatment of Immature Permanent Maxillary Incisor with Talon Cusp

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Abstract

We report the successful morphological correction of a maxillary lateral incisor with a talon cusp and the preservation of vital pulp by employing an intentional partial pulpotomy. A talon cusp is a comparatively rare morphological tooth anomaly that may cause multiple clinical problems. An 11-year-old girl was referred to our department for morphological correction of a maxillary lateral incisor with a talon cusp prior to orthodontic treatment. Following a detailed CT examination of the interior morphology, the abnormal cusp was resected and an intentional partial pulpotomy performed. Five years post-operatively, the tooth showed no abnormalities. These results indicate that an intentional partial pulpotomy following a detailed CT examination is effective in correcting complicated morphological anomalies such as a talon cusp containing extended dental pulp.

Key words: Talon cusp — Partial pulpotomy — Computed tomography

Introduction

A talon cusp is a comparatively rare morphological tooth anomaly that forms as a supernumerary tubercle on the lingual surface of an incisor. The shape resembles that of a falcon’s claw, hence its name. A talon cusp is morphologically well-delineated and extends at least half the distance from the cemento-enamel junction to the incisal edge of the tooth. It comprises normal enamel, dentin, and occasionally pulp. This anomaly appears in both deciduous and permanent teeth, primarily in the maxillary incisors. A talon cusp may cause multiple clinical problems, including occlusal interference, esthetic disturbance, accidental cusp fracture leading to loss of pulp vitality, irritation of the tongue during speech and mastication, nursing difficulty, caries, and displacement of the affected tooth.

Treatment for a talon cusp differs depending on its shape and size, and generally include observation, gradual and periodic reduction of the cusp by use of a fluoride varnish as a desensitizing agent, application of a sealant for susceptible fissures, pulpectomy, placement of a resin crown, and extraction. When significant esthetic impairment and/or occlusion problems are present, morphological correction is necessary. However, if pulp is...
found to have extended into the cusp, morphological correction can cause pulp exposure. In such cases, stepwise grinding\textsuperscript{1,10} and/or a pulpotomy\textsuperscript{11–13} are commonly performed. Unfortunately, a tooth with a talon cusp may require extraction if it has complicated root canals, because of the difficulty of root canal treatment\textsuperscript{14}.

A partial pulpotomy has been reported to be an effective treatment for pulp exposure due to crown fracture\textsuperscript{2}. This is generally performed to a depth of 2 mm from the surface of the exposed pulp, and involves application of calcium hydroxide or mineral trioxide aggregate. Thereafter, a dentin bridge is expected to form, covering the area. The advantage of this method is that most of the treated pulp can be maintained in a vital state.

We report an 11-year-old girl with a talon cusp on the right maxillary lateral incisor who underwent morphological correction with an intentional partial pulpotomy procedure. Five years after intervention, the pulp remained vital, occlusion was stable, and a satisfactory dental health condition was maintained.

**Case Presentation**

An 11-year-old girl was referred to our department by an orthodontist for further investigation of an abnormal cusp protruding from the cingulum area of the right maxillary...
lateral incisor. The orthodontist had concluded that orthodontic treatment would be difficult because of the abnormal cusp. Her past medical and family histories were unremarkable. An oral examination revealed a talon cusp on the lingual surface of the right maxillary lateral incisor (Fig. 1a, b), with the protruding portion reaching up to approximately two thirds of the crown from the cingulum area. The mandibular canine opposite the affected tooth was under eruption and did not reach the talon cusp when the teeth were in occlusion (Fig. 1b). The patient was in the late mixed dentition stage, and showed mild maxillary protrusion and malpositioned maxillary teeth. There were no other dental problems except for a fractured fragment of a deciduous tooth near the erupting upper maxillary canine.

Dental radiography revealed that the talon cusp contained a pulp space (Fig. 1c), although its internal structure was unclear. Therefore, computed tomography (CT) was performed to investigate the detailed structure of the space. The root growth of the lateral incisor was incomplete.

Computed tomography revealed a single pulp space in the root area which was divided into two spaces near the cervical margin of the tooth: one that extended into the talon cusp, and one that was continuous with the inside of the crown (Fig. 2).

**Clinical Procedures and Outcomes**

Under local anesthesia, the fractured fragments of the deciduous tooth were removed and the affected incisor isolated using a rubber dam. Next, the cusp was resected using a high-speed air turbine and diamond bur (104R, Shofu Inc., Kyoto, Japan) under water coolant. The small round surface of the exposed pulp chamber was confirmed near the center of the resected surface. A partial pulpotomy was then performed through this access using a no.3 round bur with a high-speed dental handpiece and alternate irriga-
tion under a 10% sodium hypochlorite/3% hydrogen peroxide solution. Calcium hydroxide (Calvital, Neo Dental Chemical Products, Tokyo, Japan) was placed on the amputated pulp and the cavity lined with photo-polymerized glass-ionomer cement. Finally, restoration was performed using composite resin (Fig. 3), which restored the crown shape to that of a normal tooth and created a good occlusal relationship with the opposing canine (Fig. 4).

The postoperative course was uneventful and the patient had no complaints of pain. Electric vitality tests performed 1 and 6 months after the procedure showed positive reactions. Five years after treatment, the patient had no complaints or feelings of discomfort. The referring orthodontist completed orthodontic treatment without any cuspal interference during the mixed dentition period. Radiographs and other examinations obtained after 5 years showed no abnormal findings and vital pulp (Fig. 5).

**Discussion**

A talon cusp commonly emerges on the lingual surface of a maxillary incisor and can lead to occlusal interference and accidental cusp fracture after complete eruption of the mandibular anterior teeth. Although orthodontic treatment is often necessary if occlusal interference occurs due to a talon cusp, this defect can disturb such treatment. Depending on their size, talon cusps are classified as type 1 (talon), type 2 (semi-talon), or type 3 (trace talon). In the present case, the cusp reached up to approximately two thirds of the crown from the cingulum area, and was therefore categorized as type 1. In fact, talon cusps can appear in various sizes, with larger cusps likely to cause several clinical problems. In spite of its large size, the cusp in the pres-
ent patient had not caused any problems prior to treatment, probably because the mandibular canine was still in the process of eruption and not yet in occlusion. Nevertheless, the probability of later problems developing without intervention was deemed to be high.

Previous reports have described a variety of procedures for treatment of a talon cusp, such as grinding\(^3\), crown restoration\(^{1,15}\), and a pulpotomy followed by crown restoration\(^{11-13}\). The shape and internal structure of a talon cusp are complicated, and the treatment method differs widely on a case-by-case basis. Therefore, it is necessary to determine in advance the precise internal structure of the target cusp. Unfortunately, dental and panoramic radiographs provide overlapping images of the area between the crown and talon cusp of the malformed tooth, making it difficult to clearly visualize the inner portion.

Previous reports have described use of CT\(^{8,13}\) and magnetic resonance imaging\(^{16}\) for detailed examinations. In the present case, CT was used to examine the internal structure, which revealed a single pulp canal in the root that was divided into two chambers, one in the normal crown near the neck of the tooth and the other extending into the talon cusp. As a result, it was assumed that pulp exposure could not be avoided if the morphology was to be adequately corrected, leading to the decision to perform pulp therapy to morphologically alter the tooth. The CT findings proved useful in the subsequent treatment planning.

Various treatment methods were then considered. The talon cusp was large, and the pulp horn highly extended. Therefore, adequate grinding for satisfactory morphological correction was considered to be impossible without pulp treatment. When a high pulp

Fig. 5 Images of maxillary right lateral incisor at 5 years after procedure (a) Photograph showing occlusal view, (b) Photograph showing occlusal relationship, (c) Dental radiograph.
horn is present within the cusp, a pulpotomy is often recommended to deal with pulp exposure, followed by composite resin restoration. This is believed to be advantageous as it can be completed in a single sitting. A few reports on other pulpotomy methods used in cases of pulp exposure during removal of a talon cusp, such as by direct pulp capping and a partial pulpotomy, have been presented. However, when possible, it is better to avoid a highly invasive pulpotomy for premature teeth without dental caries or pulpitis.

Taking these points into consideration, sufficient grinding to correct the crown morphology and then a partial pulpotomy following intentional exposure of the dental pulp was selected. Five years after intervention, the pulp remained vital, and the crown shape was satisfactory in regard to both occlusal and esthetic considerations, indicating a good treatment outcome.

Conclusion

Here, we have reported successful morphological correction with preservation of vital pulp in a maxillary lateral incisor with a talon cusp by use of an intentional partial pulpotomy. Detailed examination findings obtained by CT were effective in providing detailed information on the interior morphology of the abnormal cusp. These results indicate that an intentional partial pulpotomy can be effective in correcting a complicated morphological anomaly such as a talon cusp containing extended dental pulp.

References


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