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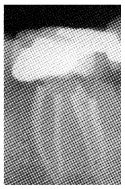

CASE REPORT

Management of a talon cusp using mineral trioxide aggregate

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Abstract

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Aim To report on the successful conservative management of three patients having a talon cusp with pulpal involvement using mineral trioxide aggregate (MTA).

Summary Mineral trioxide aggregate was used to induce hard-tissue formation following the direct pulp capping of a resected talon cusp in three cases.

Key learning points

- Talon cusp is an odontogenic anomaly which can cause occlusal interferences, displacement of the affected tooth, caries-susceptible developmental grooves and speech difficulties
- Direct pulp capping using MTA following the resection of a talon cusp is a suitable treatment option.

Keywords: dentine bridge, direct pulp capping, mineral trioxide aggregate, mineral trioxide aggregate angelus, talon cusp.

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Introduction

Talon cusp is an uncommon dental anomaly that manifests as an accessory cusp-like structure, projecting from the lingual or buccal surfaces of anterior teeth. 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 (Davis & Brook 1985). 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 (Mader 1981, 1982, Hattab *et al.* 1996). A talon cusp is composed of normal enamel and dentine and may involve a pulpal extension (Hattab *et al.* 1995, Gungor *et al.* 2000, Nadkami *et al.* 2002). Appearing to arise in early odontogenesis (Sicher & Bhaskar 1972), its precise cause

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remains unclear, although it may be a result of aberrant hyperactivity of the anterior part of the dental lamina (Rantanen 1971). To date, anecdotal reports of a genetic influence in the aetiology of talon cusps have not been substantiated. Clinical variations of talon cusp include those of location, shape, size, structure and number (Abbott 1998, Shashikiran *et al.* 2005). Various treatment regimens have been followed for the management of talon cusps depending on the absence/presence of pulpal extensions.

Mineral trioxide aggregate (MTA) has been shown to have a number of clinical applications in endodontics (Parirokh & Torabinejad 2010a,b). The favourable characteristics of MTA have been utilized in the apexification of immature incisors with necrotic pulps (Giuliani *et al.* 2002), direct pulp capping procedures of traumatized teeth (Parirokh & Torabinejad 2010a,b) and pulpotomy procedures in primary teeth (Moretti *et al.* 2008).

This report describes the clinical management of three cases of Talon cusp using mineral trioxide aggregate (MTA-Angelus, Londrina, PR, Brazil).

Case report

Case 1

A south Indian girl aged 11 years reported to the Department of Pedodontics and Preventive Children Dentistry, A.B.Shetty Memorial Institute of Dental Sciences, Nitte University, Mangalore, India, complaining of an extra tooth lingual to the erupted maxillary right central incisor. The patient was concerned about her appearance and also complained of associated food trapping, difficulty in brushing and interference during speech and mastication.

After medical and dental histories were reviewed, clinical and radiographic examinations were conducted. The clinical examination revealed a talon cusp on the palatal aspect of left maxillary central incisor; the tooth was displaced labially. A developing distal occlusion of the left lateral incisor was also noticed. The tooth was not fully erupted because of the premature contact of the additional cusp and the crown height measured 8.6 mm. On the palatal aspect, the crown had a pronounced, well-defined accessory cusp extending from the cemento-enamel junction to within 0.5 mm of the incisal edge. The talon cusp was pyramidal in shape and measured 8.5 mm in length (incisocervically), 3.3 mm in width (mesiodistally) and 3.1 mm in thickness (labiolingually).

Initial carious pits were noticed at the junction of the talon cusp and the palatal surface of the tooth. The distal groove was deep and full of dental plaque. No irritation of the soft tissues was observed.

The affected tooth responded normally to percussion, palpation, electric (Parkell electric pulp tester; Parkell Inc., Farmingdale, NY, USA) and thermal (ENDO-ICE; Coltene/Whaledent Inc., Cuyahoga Falls, OH, USA) pulp tests. Periapical radiography showed a V-shaped radiopaque structure superimposed on the image of the affected crown, with the point of the 'V' towards the incisal edge. The talon cusp was outlined by two distinct white lines converging from the cervical area of the affected tooth towards the incisal edge. A pulp extension could be traced radiographically to the middle of the cusp.

The patient was scheduled for complete reduction of the talon cusp in a single appointment. Written consent was obtained from the parent before treatment. As pulp exposure was anticipated, an aseptic environment was strictly maintained throughout the surgical procedure. Following oral prophylaxis and administration of a local anaesthetic (Lignocaine and Adrenaline injection I.P; Harson Laboratories, Baroda, Gujarath, India), the tooth was isolated with a rubber dam (Fig. 1). Deep carious grooves were debrided of carious tissue using a number eight round bur mounted on a slow-speed handpiece (NSK, PANA AIR Σ; Nakanishi Inc., Shimohinata, Tochigi-Ken, Japan) and restored with

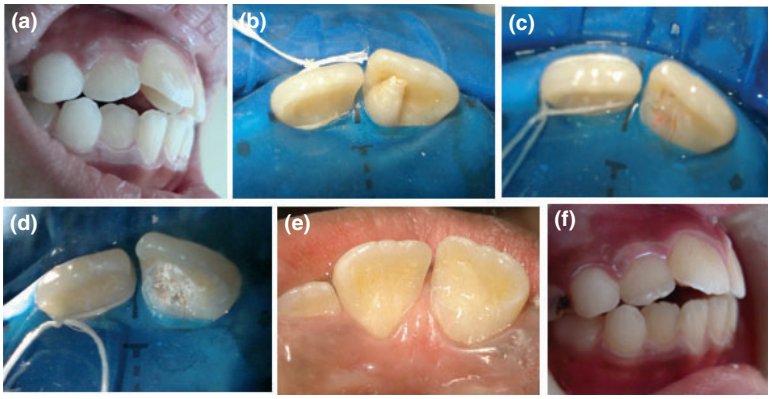

Figure 1 (a) Talon cusp interfering with occlusion (b) rubber dam placed and tooth isolated (c) talon cusp resected with a pinpoint pulp exposure (d) mineral trioxide aggregate placed (e) restoration with glass–ionomer and then finished with composite restoration (f) postoperative occlusal relationship after removal of the talon cusp.

glass–ionomer cement (Fuji II GC; Universal Restorative, GC Corporation, Tokyo, Japan). The cusp was then resected using a diamond bur in a high-speed air turbine handpiece (NSK, PANA AIR Σ; Nakanishi INC). A pinpoint pulp exposure occurred. Haemostasis was established with a sterile cotton pellet soaked in saline solution and MTA (Angelus Prod. Odont, Londrina, PR, Brazil) was applied. After initial setting, a hardened mix was achieved in <15 min and the excess material was removed. A final restoration of glass–ionomer cement (Fuji II GC; Universal Restorative, GC Corporation) was placed. The cusp was then recontoured using microhybrid light-activated resin composite (FILTEK^{TM} Z350; Universal Restorative, 3M ESPE dental products, St. Paul, MN, USA). All materials were manipulated and applied according to the manufacturer's instructions.

Initially a biweekly visit for 2 months and later a recall schedule programme of every 3 months with clinical and radiographic examinations were instituted. A 12-month review revealed the procedure to be successful in maintaining pulp health and also in resolving the other associated problems (Fig. 2). The forced distal occlusion of the left lateral incisor and the partial eruption of the affected tooth corrected spontaneously.

The criteria for clinical success were defined as the absence of pain or sensitivity, tenderness on percussion and palpation, fistula, soft-tissue abscess formation and/or abnormal mobility of the tooth at the recall visit, whereas the radiographic criteria for success were as follows: normal periodontal ligament space on the periapical radiograph

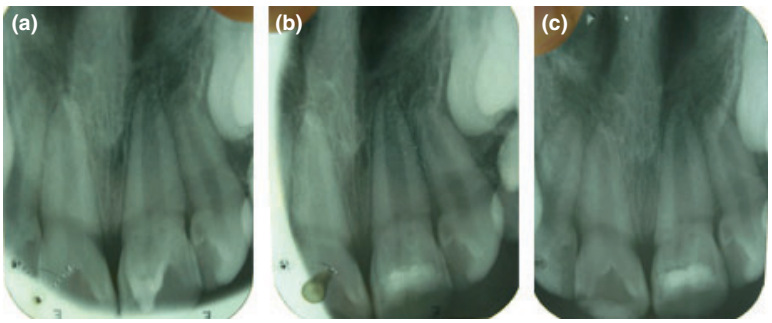

Figure 2 (a) Radiograph showing talon cusp with incomplete root formation (b) Postoperative radiograph (c) Twelve months post-treatment.

absence of internal and/or pathologic external root resorption and no sign of any pathologic process including thinning of the trabecular pattern to large radiolucencies in the furcation and/or periapex.

Case 2

A south Indian boy aged 9 years reported complaining of an extra tooth lingual to the maxillary left central incisor. The mother was concerned with its presence as it was visible when the child spoke or laughed. The patient appeared healthy and of normal physical development for his age and was born from non-consanguineous parents. His dental history revealed that the primary teeth were erupted at their normal dental age with no abnormalities reported.

Clinical examination revealed a mixed dentition with the permanent maxillary central incisors, maxillary lateral incisor, mandibular central incisors and all first molars erupted. The crown of the maxillary central incisors was large, with the right central incisor larger in both mesiodistal and buccolingual dimensions than the contralateral tooth (10.4 × 9.8 mm) versus 10.1 × 7.1 mm, respectively. In addition, the left central incisor exhibited a pronounced, well-demarcated accessory cusp on the palatal surface, resembling a supernumerary tooth. The anomalous cusp projected from the cemento-enamel junction occupied the mesial half of palatal surface and extended to within 0.5 mm of the incisal edge, forming with the incisal edge a Y-shaped outline. The tip of the cusp was sharp and projected away from the rest of the crown. The cusp was 5.5 mm long, 4.1 mm wide and 4.4 mm thick. A deep groove and accumulated plaque was present on the mesial aspect of the cusp where it joined the palatal surface of the tooth.

An anterior open bite was observed because of the interfering cusp, and the left lateral incisor was rotated because of the tooth size-arch length deficiency in the maxillary segment. The occlusion was Angle's Class I molar relationship on both sides. The tooth with the talon cusp responded normally to percussion, palpation, electric and thermal pulp tests. Periapical radiography showed a V-shaped radiopaque structure superimposed on the image of the affected crown, with the point of the 'V' towards the incisal edge. A pulp extension could be traced radiographically in the gingival third of the cusp but not reaching its middle third (Fig. 3).

The patient was scheduled for a similar management protocol as performed in Case I. An 8-month review of the procedure has shown successful maintenance of pulp vitality with minor corrections of the anterior open bite.

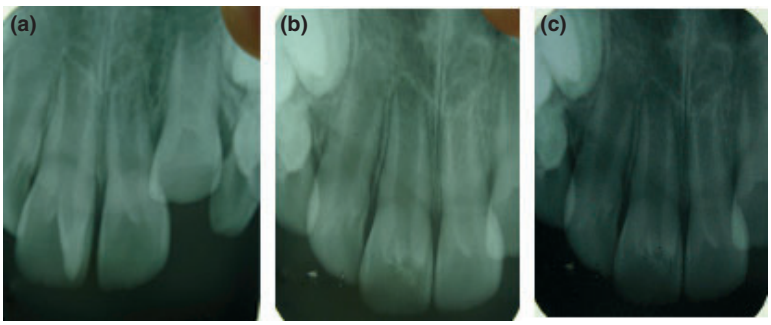

Figure 3 (a) Talon cusp with incomplete root formation (b) six months post-treatment (c) Eight months post-treatment.

Case 3

An 8-year-old boy reported with a complaint of interference during normal occlusion and mastication. The constant pressure delivered by the maxillary tooth on biting on the mandibular incisor was causing occasional sensitivity and intermittent pain. The patient was born from consanguineous parents, but appeared healthy and of normal physical development for his age. His past dental and medical history revealed no abnormalities or complications.

Clinical examination revealed the presence of a well-demarcated accessory cusp on the palatal surface of the maxillary right central incisor, appearing as a talon. The crowns of the maxillary central incisors were relatively small, with the right central incisor slightly larger in dimension than the contra-lateral tooth. The anomalous cusp that projected from the cemento-enamel junction occupied the mesial half of the palatal surface and extended to within 2 mm from the incisal edge. The cusp was 7.5 mm long, 4.1 mm wide and 3.4 mm thick. A deep groove was present on the mesial aspect of the cusp adjoining the palatal surface of the tooth.

Localized gingival recession and marginal inflammation were noticed with respect to the affected tooth. The maxillary central incisors appeared partially erupted because of the interfering talon. The tooth with the talon cusp responded normally to pulp sensibility tests. Periapical radiography of the maxillary right central incisor revealed a V-shaped radiopaque structure, with the point of the 'V' towards the incisal edge. A pulp extension could be traced radiographically up to the cervical third of the cusp.

The patient was scheduled for a similar management protocol as performed in Case I. At 15-month review, no postoperative complications have occurred and the procedure has been successful in maintaining pulp health, bringing about a physiologic apical barrier formation (Fig. 4). The patient had no further complaints of pain and sensitivity with respect to the mandibular teeth, and favourable changes in the occlusal relationship and gingival health occurred.

Discussion

Talon cusp of anterior teeth is a relatively rare odontogenic anomaly arising during the morphodifferentiation phase of tooth development (Al-Omari *et al.* 1999). Talon cusp may represent the extreme of a continuous variation progressing from a normal cingulum (trace talon) and a small accessory cusp (semi talon) to a talon cusp (Hattab *et al.* 1995).

The occurrence of these talon cusps caused a number of problems for the patients described in this report, including occlusal interference, displacement of the affected tooth, caries-susceptible developmental grooves, irritation of the tongue, speech

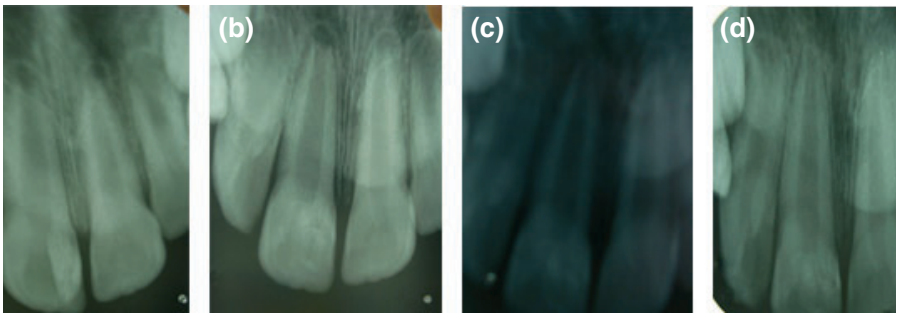

Figure 4 (a) Talon cusp on central incisor with incomplete root formation (b) post-treatment (c) eight months post-treatment (d) fifteen months post-treatment.

difficulties, food trapping and interference with tongue movement. Early diagnosis of talon cusp is important, and, in most cases, a definitive treatment is required. If the grooves are carious, the lesion should be removed and the cavity restored. In cases of premature contact and occlusal interference, the talon cusp should be reduced gradually on consecutive visits over 6- to 8-week intervals to allow time for deposition of reparative dentine for pulpal protection (Danesh *et al.* 2007).

Under certain conditions, less conservative methods can be used such as complete reduction in the cusp followed by calcium hydroxide pulpotomy for an immature tooth or root canal treatment (Gungor *et al.* 2000, Nadkami *et al.* 2002). Cvek *et al.* (1987) originally proposed the use of calcium hydroxide ($CaOH_2$) to be applied directly to the pulpal surface to create an environment that stimulates the formation of a dentine bridge. Studies have demonstrated that the healing is more predictable when there is no bacterial contamination of the pulp (Kakehashi *et al.* 1965). Some investigators have asserted that $Ca(OH)_2$ starts to soften over time, resulting in leakage through the original seal (Cox *et al.* 1985). Because of its caustic action (pH approximately 11.0–12.5), a localized area of coagulation necrosis occurs in the tissues immediately subjacent to the medicament (Banchs & Trope 2004). As a result, pulpal healing and hard-tissue formation are delayed, and a potential for symptoms exists. Adjacent to the zone of necrosis of up to 0.7 mm, cells in the pulp differentiate into odontoblasts that elaborate the matrix for the dentine bridge (Heys *et al.* 1981). The resultant dentine bridge is most often porous (Cox *et al.* 1996), and subsequent bacterial leakage through the porosities may result in pulpal inflammation and necrosis (Saito *et al.* 2004).

Mineral trioxide aggregate is an endodontic cement composed of several mineral oxides and is constituted by fine hydrophilic particles (Lessa *et al.* 2010). When mixed with water, it initially forms a gel that achieves a rigid set (Bogen & Kuttler 2009).

Mineral trioxide aggregate has been shown to induce hard-tissue formation more predictably than $Ca(OH)_2$ in shallow pulpotomy procedures (Koh *et al.* 2001). There is less pulpal inflammation (Junn *et al.* 1998), and the lack of any localized tissue necrosis following the application of MTA to pulpal tissue may be a result of the more rapid set of the hydrophilic material, as compared to $Ca(OH)_2$ that maintains a local state of alkalinity for a longer period.

Mineral trioxide aggregate has excellent sealing properties (Torabinejad *et al.* 1993), actively promotes hard-tissue formation (Parirokh & Torabinejad 2010a), is biocompatible (Torabinejad & Parirokh 2010) and upon setting has higher mechanical strength and better adhesion to dentine and restorative materials compared with $Ca(OH)_2$ (Parirokh & Torabinejad 2010b). Histological examination of the dentine bridge formed following MTA application to the pulp reveals the bridge to form immediately adjacent to the MTA (Nair *et al.* 2008, Parirokh & Torabinejad 2010a). The MTA bridge begins to form sooner, becomes thicker and has less porosity than the hard tissue induced by $Ca(OH)_2$ (Junn *et al.* 1998). The clinical data available on MTA pulp capping of cariously exposed permanent teeth are limited to two studies that have reported a high rate of success, which ranges from 93% to 98% (Farsi *et al.* 2006, Bogen 2008).

Following the set of the MTA, glass–ionomer cement (Fuji II GC, Universal Restorative; GC Corporation) was placed directly onto the surface of MTA creating a protective barrier from potential breakdown by acid-etch gels (Levitan & Himel 2006). Acid-etch procedures affect the compressive strength and surface microhardness of MTA (Kayahan *et al.* 2009).

Conclusion

Three case reports describe the management of a talon cusp using MTA following direct pulp capping. The procedure was successful in maintaining pulp health over an 8- to 15-

month postoperative period. However, further long-term studies of treatment outcomes are necessary to confirm the effectiveness of this protocol.

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References

Abbott PV (1998) Labial and palatal ''talon cusps'' on the same tooth: a case report. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology & Endodontics* **85**, 726–30.

Al-Omari MA, Hattab FN, Darwazeh AM, Dummer PM (1999) Clinical problems associated with unusual cases of talons cusp. *International Endodontic Journal* **21**, 183–90.

Banchs F, Trope M (2004) Revascularization of immature permanent teeth with apical periodontitis: new treatment protocol? *Journal of Endodontics* **30**, 196–200.

Bogen G (2008) Direct pulp capping with mineral trioxide aggregate: an observational study. *Journal of American Dental Association* **139**, 305–15.

Bogen G, Kuttler S (2009) Mineral trioxide aggregate obturation: a review and case series. *Journal of Endodontics* **35**, 777–90.

Cox C, Bergenholtz G, Heys D, Syed S, Fitzgerald M, Heys R (1985) Pulp capping of dental pulp mechanically exposed to oral microflora: a 1–2 year observation of wound healing in the monkey. *Journal of Oral Pathology* **14**, 156–68.

Cox C, Subay R, Ostro E, Suzuki S, Suzuki ZH (1996) Tunnel defects in dentin bridges:their formation following direct pulp capping. *Operative Dentistry* **21**, 4–11.

Cvek M, Granath L, Cleaton-Jones P, Austin J (1987) Hard tissue barrier formation in pulpotomized monkey teeth capped with cyanoacrylate or calcium hydroxide for 10 and 60 minutes. *Journal of Dental Research* **66**, 1166–74.

Danesh G, Schrijnemakers T, Lippold C, Schäfer E (2007) A fused maxillary central incisor with dens evaginatus as a talon cusp. *Angle Orthodontist* **77**, 176–80.

Davis PJ, Brook AJ (1985) The presentation of talon cusp: diagnosis, clinical features, associations and possible aetiology. *British Dental Journal* **159**, 84–8.

Farsi N, Alamoudi N, Balto K, Al Mushayt A (2006) Clinical assessment of mineral trioxide aggregate (MTA) as direct pulp capping in young permanent teeth. *Journal of Clinical Pediatric Dentistry* **31**, 72–6.

Giuliani V, Baccetti T, Pace R, Pagavino G (2002) The use of MTA in teeth with necrotic pulps and open apices. *Dental Traumatology* **18**, 217–21.

Gungor HC, Altay N, Kaymaz FF (2000) Pulpal tissue in bilateral talon cusps of primary central incisors. Report of a case. *Oral Surgery Oral Medicine Oral Pathology Oral Radiology & Endodontics* **89**, 231–5.

Hattab FN, Yassin OM, Al-Nimri KS (1995) Talon cusp-clinical significance and management: case reports. *Quintessence International* **26**, 115–20.

Hattab FN, Yassin OM, Al-Nimri KS (1996) Talon cusp in the permanent dentition associated with other dental anomalies. Review of the literature and report of seven cases. *Journal of Dentistry for Children* **63**, 368–76.

Heys D, Cox C, Heys R, Avery J (1981) Histological considerations of direct pulp capping agents. *Journal of Dental Research* **60**, 1371–9.

Junn DJ, McMillan P, Bakland LK, Torabinejad M (1998) Quantitative assessment of dentin bridge formation following pulp capping with mineral trioxide aggregate (MTA) (Abstract). *Journal of Endodontics* **24**, 278.

Kakehashi S, Stanley H, Fitzgerald R (1965) The effects of surgical exposure of dental pulps in germ free and conventional laboratory rats. *Oral Surgery* **20**, 340–9.

Kayahan MB, Nekoofar MH, Kazandag M *et al.* (2009) Effect of acid-etching procedure on selected physical properties of mineral trioxide aggregate. *International Endodontic Journal* **42**, 1004–14.

Koh E, Pitt Ford T, Kariyawasam S, Chen N, Torabinejad M (2001) Prohylactic treatment of dens evaginatus using mineral trioxide aggregate. *Journal of Endodontics* **27**, 540–2.

Lessa FCR, Aranha AMF, Hebling J, Souza Costa CA (2010) Cytotoxic effects of white- MTA and MTA-Bio cements on odontoblast-like cells (MDPC-23). *Brazilian Dental Journal* **21**, 24–31.

Levitan ME, Himel VT (2006) Dens Evaginatus: literature review, pathophysiology, and comprehensive treatment regimen. *Journal of Endodontics* **32**, 1–9.

Mader CL (1981) Talon cusp. *Journal of American Dental Association* **103**, 244–6.

Mader CL (1982) Mandibular talon cusp. *Journal of American Dental Association* **105**, 651–3.

Moretti AB, Sakai VT, Oliveira TM *et al.* (2008) The effectiveness of mineral trioxide aggregate, calcium hydroxide and formocresol pulpotomies in primary teeth. *International Endodontic Journal* **4**, 547–55.

Nadkami UM, Munshi A, Damle SG (2002) Unusual presentation of talon cusp: two case reports. *International Journal of Paediatric Dentistry* **12**, 332–5.

Nair PN, Duncan HF, Pitt Ford TR, Luder HE (2008) Histological, ultrastructural and quantitative investigations on the response of healthy human pulps to experimental capping with mineral trioxide aggregate: a randomized controlled trial. *International Endodontic Journal* **41**, 128–50.

Parirokh M, Torabinejad M (2010a) Mineral trioxide aggregate: a comprehensive literature review – part III: clinical applications, drawbacks and mechanism of action. *Journal of Endodontics* **36**, 400–13.

Parirokh M, Torabinejad M (2010b) Mineral trioxide aggregate: a comprehensive literature review – part I: chemical, physical and antibacterial properties. *Journal of Endodontics* **36**, 16–27.

Rantanen AV (1971) Talon cusp. *Oral Surgery Oral Medicine Oral Pathology* **32**, 398–400.

Saito T, Ogawa M, Hata Y, Bessho K (2004) Acceleration effect of human recombinant bone morphogenetic protein-2 on differentiation of human pulp cells into odontoblasts. *Journal of Endodontics* **30**, 205–8.

Shashikiran ND, Babaji P, Reddy VVS (2005) Double facial and a lingual trace talon cusps: a case report. *Journal of Indian Society of Pedododontics & Preventive Dentistry* **23**, 89–91.

Sicher S, Bhaskar SN (1972) Enamel. In: Sicher S, Bhaskar SN, ed. *Orban's oral histology and embryology*, 7th edn. C.V. Mosby Co: St Louis, MO.

Torabinejad M, Parirokh M (2010) Mineral trioxide aggregate: a comprehensive literature review – part II: leakage and biocompatibility investigations. *Journal of Endodontics* **36**, 190–202.

Torabinejad M, Watson TF, Pitt Ford TR (1993) The sealing ability of a mineral trioxide aggregate as a retrograde root filling material. *Journal of Endodontics* **19**, 591–5.

