



## Calcific metamorphosis

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### Purpose

The management of trauma in the permanent dentition can present a significant challenge to the dental practitioner. Proper medical and dental histories, a thorough clinical examination, as well as a detailed history of the dental trauma, will assist the dental provider in assessing orofacial injuries and are instrumental in formulating a proper diagnosis. A common sequelae to dental trauma is pulp canal obliteration, also referred to as calcific metamorphosis (CM). The purpose of this Clinical Update is to review the information necessary for the proper diagnosis and clinical management of teeth with CM.

### Etiology and incidence

CM is defined as a pulpal response to trauma that is characterized by rapid deposition of hard tissue within the root canal space (1). The clinical picture of CM has been described as a tooth that is darker in hue than the adjacent teeth, and exhibits a dark yellow color because of a decrease in translucency from a greater thickness of dentin under the enamel (2). CM is seen most frequently in the anterior teeth. An examination of 881 midshipmen entering the United States Naval Academy revealed that 34 of the patients had a total of 41 anterior teeth exhibiting partial or total obliteration of the pulpal spaces, a patient incidence of 3.86% (3).

### Clinical management of calcific metamorphosis

Does the tooth need a root canal? In 1965, Patterson and Mitchell (2) felt that a tooth that had signs of calcific metamorphosis due to trauma should be regarded as a potential focus for infection and that root canal therapy should be initiated. However, further research and clinical observation provided the foundation for current guidelines. The Naval Academy study (3) found that over a four year period only 3/41 (7.3%) of teeth with CM developed pulpal necrosis, and as a result the only definitive criterion for endodontic treatment was the appearance of a periapical radiolucency. Jacobsen and Kerekes (4) conducted a study of 122 traumatized teeth in which partial canal obliteration was identified in 36% of the cases and total canal obliteration in 64%. Only 13% eventually developed pulpal necrosis. Smith (5) performed a literature review and found that teeth with calcific metamorphosis have a low incidence of periapical pathosis development (0-16%) and recommended delaying treatment until symptoms or radiographic changes develop. **The development of CM following trauma does not justify prophylactic root canal therapy (3,4,6).**

Radiographic appearance. Clinically, the apparent radiographic diameter of the canal does not always correspond to its true width. Kuyk and Walton (7) measured the canal diameters of 36 teeth from radiographs and then compared them with the true widths of the canals as measured by histological sections. They found that all sections of the roots demonstrated a canal histologically, although some regions had no canal visible radiographically. Complete radiographic obliteration of the root canal space does not necessarily mean the absence of the pulp or canal space; in the

majority of the cases, a pulp canal space with pulpal tissue is present.

### Esthetic concerns

If the tooth with trauma becomes discolored and the patient has esthetic concerns, external bleaching should be considered first. However, since the decrease in translucency and acquisition of a yellowish color is due to irregular reparative dentin formation, external bleaching of the enamel may not achieve a clinically successful result. Intentional root canal treatment may be performed to facilitate internal bleaching. This may be carried out whether the pulp is vital or necrotic. Rotstein and Walton felt such teeth could be bleached with fair esthetic results (8). A study by Friedman et al. found that after a recall period of 1-8 years, 79% of internally bleached teeth had clinically acceptable or better esthetics (9).

### Referral guidelines

The American Association of Endodontists (AAE) has designed an Endodontic Case Difficulty Assessment Form that may be used by general dentists when deciding whether to refer endodontic treatment. The conditions listed in the form are potential risk factors that may complicate treatment and adversely affect the outcome (10). Teeth with CM fall into the high difficulty category and achieving a predictable outcome will be challenging for even experienced practitioners. Referral to an endodontist is recommended.

### Summary

The literature suggests that teeth with calcific metamorphosis are frequently treated unnecessarily with non-surgical root canal therapy. Pulpal necrosis as evidenced by periradicular pathology or symptoms, along with esthetic concerns are the definitive criteria for proceeding with endodontic treatment. This article presented information necessary to aid practitioners in the proper diagnosis and clinical management of teeth with CM, including referral guidelines.

The principles addressed in this Clinical Update are illustrated in the the diagnostic flowchart that follows.

### References

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## Calcific Metamorphosis Clinical Decision Flowchart

