

## Introduction

- The incidence of impacted or ectopically erupting maxillary permanent canines has been reported to be 0.9 to 2.0% (Ericson and Kuroi 1986)
- Ectopically erupting canines may cause a variety of complications including, but not limited to, root resorption of adjacent teeth (Cernochova et al 2010)
- The exact etiology of root resorption associated with ectopic maxillary canines is unknown.
- Various factors previously studied include: eruption inclination, canine root maturation, and crown to root contact.
  - Significant correlation between resorption and crown to root contact (Ericson and Kuroi 2000)
  - Risk of resorption increases by 50% when eruption inclination exceeds 25 degrees compared to midline (Ericson and Kuroi 1988)
- Accurate early detection of the presence of root resorption on a lateral incisor due to ectopically erupting canine may improve the long-term prognosis
- This will allow for earlier interventions prior to resorption progression

## Objectives

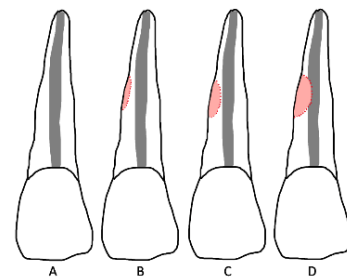
**Specific Aim:** To determine what percentage of maxillary lateral incisors exhibit resorption when an ectopically erupting canine is present.

Further, of those that exhibit resorption, how much resorption is experienced and where on the root it is most commonly located.

Three-dimensional (3D) imaging software may allow for more accurate interpretation of resorption and demonstrate that 3D imaging should be routinely used in screening ectopically erupting canines.

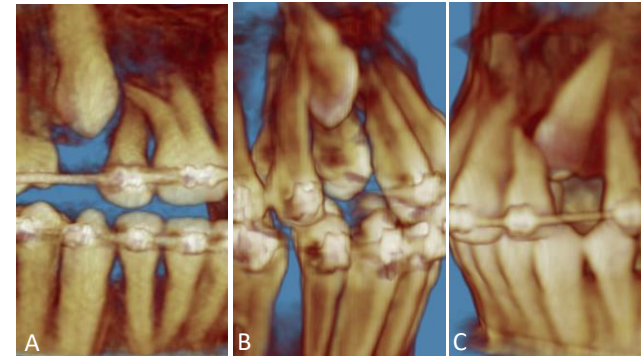
## Methods

- Retrospective chart review with analysis of cone beam computed tomography (CBCT) imaging and use of Dolphin 3D imaging software
- ASA I or II patients aged 10-16 years, who had a CBCT taken at Boston Children's Hospital for impacted or ectopic canines in the last 10 years were considered
- Exclusion criteria included patients with craniofacial anomalies, pathology of anterior maxilla, use of bisphosphonates or growth hormone medications, and agenesis of both lateral incisors
  - 106 charts were reviewed, 37 maxillary canines met inclusion criteria
- Resorption was classified as None, Mild, Moderate, or Severe based on Ericson and Kuroi's paper written in 2000 (Figure 1).
  - Canines were classified in dental arch as ectopic palatally or buccally
  - Canine root was divided into thirds on CBCT and area of resorption was classified as apical, middle, or cervical third
- Statistical Analysis:
  - Descriptive Statistics
  - Cross tabulation grouped by severity of resorption (none/mild vs moderate/severe)
  - Chi square/Fisher exact tests



**Figure 1:** Resorption classifications. A- No resorption. B- Mild (up to half of dentin thickness to pulp). C- Moderate (greater than midway to pulp, pulpal lining unbroken). D- Severe (pulp exposed)

## Results



**Figure 2:** Resorption measured using Dolphin 3D imaging software. A- Mild resorption in middle 1/3 of root with buccally ectopic canine. B- Moderate resorption in apical 1/3 of root with buccally ectopic canine. C- Severe resorption in apical 1/3 of root with palatally ectopic canine.

Severity of Resorption	Frequency
None	22 (59.46%)
Mild	5 (13.51%)
Moderate	5 (13.51%)
Severe	5 (13.51%)

**Table 1:** Frequency of none, mild, moderate, and severe levels of resorption

- 59.46% of patients with ectopically erupting canines exhibited no resorption on the maxillary lateral incisor (Table 1)
- Of those that exhibited resorption, 73.3% experienced in the apical third (or 29.73% of all maxillary incisors studied) (Table 2)
- Palatally ectopic canines are significantly more likely to result in moderate or severe resorption of maxillary lateral incisors (Table 3)

Location of Resorption	Frequency
NA	22 (59.46%)
Apical 1/3	11 (29.73%)
Middle 1/3	4 (10.81%)
Cervical 1/3	0 (0.0%)

**Table 2:** Frequency of location on maxillary lateral incisor root of mild, moderate, or severe resorption

Variable	Fisher's Exact Test Value
Age (10-12, 13-16)	0.716
Gender	0.062
Palatal (vs. Buccal) position of canine	0.038*
Apical (vs. Middle) resorption on root	0.560

**Table 3:** Severity of Resorption (grouped by None/Mild and Moderate/Severe) in relation to studied variables. Asterisk denotes statistically significant value (p<0.05) in doubled sided test.

## Conclusion

- Maxillary lateral incisor root resorption occurs in greater than 40% of cases in the presence of an ectopically erupting canine
- Using 3D imaging software illustrates that resorption occurs more frequently than previously reported in 2D imaging studies (Strbac et al 2012)
- Moderate/severe resorption occurs significantly more frequently in the presence of a palatally impacted canine, which both differs from (Cernochova et al 2010) and corroborates (Ericson and Kuroi 1987) previous studies