Chronologic vs. Dental Age: A Predictor for Panoramic Radiographs Prescription

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BACKGROUND

- Panoramic radiographs (PRs) are vital for diagnosing developmental dental anomalies and pathology (DDAP).
- Prevalence of DDAP based on chronologic age has been reported to be a determinant for frequency of PRs in children.
- This study hypothesized that "dental age as opposed to chronologic age is a better predictor for recommending PRs in healthy children".
- The primary goal of this study was to evaluate the prevalence of DDAP in healthy children based on chronologic- and dental-age.
- The secondary aim was to identify cut-offs for identification of DDAP in children based on chronologic- or dental-age.

METHODS

- This retrospective chart review study was approved by the University of Colorado's Institutional review Board.
- Medical and dental charts of age- and gender- matched, healthy (ASA I&II) children (6-16 years of age) were reviewed.
- PRs captured during routine dental care were reviewed in a standard setting by calibrated examiners.
- Dental age of each child was calculated based on Demirjian's method by calibrated examiners.
- Data was statistically analyzed after stratifying the study sample as previously defined age-based categories: <9, 9-11, 12-14, >15 years.

RESULTS

- A total of 1037 charts and PRs were reviewed for this study.
- The study cohort included: 36% Caucasian, 20% African American, 3% Asian, and the rest were other races.
- Hispanic children constituted 59% of the study cohort.
- A majority of the study cohort (83%) were publicly insured.
- The mean age at the time PR capture was 11.9±2.4 years.
- Both males (+0.53 years) and females (+0.37 years) demonstrated advanced dental age with respect to their chronologic age.
- Presence of at least one DDAP was noted in 78% of the study cohort.
- The was no significant difference (*P*-value= 0.45) between males (79%) and females (77%) with respect to the prevalence of DDAP.

Table 2: Youden Index Cutoffs of Age for Predicting Presence of Anomalies

Anomaly	Initial			
	N	Cutoff	AUC	Confidence Interval
Number	163	12.05	0.563	(0.51, 0.61)
Shape	504	8.69	0.525	(0.49, 0.56)
Positional	432	17	0.401	(0.37, 0.44)
Any	809	8.91	0.505	(0.46, 0.55)
Anomaly	Above Initial			
	N	Cutoff	AUC	Confidence Interval
Number	104	15.16	0.471	(0.41, 0.54)
Shape	421	16.48	0.433	(0.39, 0.47)
Positional	147	15.6	0.518	(0.46, 0.57)
Any	640	16.56	0.438	(0.39, 0.49)

Table 1: Prevalence of Developmental Dental Anomalies and Pathology

Developmental Dental Anomalies and Pathologies	Females (N=530)	Male (N=507)	Total (N=1037)	*P*-value
Shape Anomalies	**263 (49.6%)**	**241 (47.5%)**	**504 (48.6%)**	**0.534**
Microdontia	16 (3.0%)	12 (2.4%)	28 (2.7%)	0.569
Macrodontia	2 (0.4%)	7 (1.4%)	9 (0.9%)	0.101
Dens evaginatus	15 (2.8%)	10 (2.0%)	25 (2.4%)	0.422
Taurodontism	114 (21.5%)	106 (20.9%)	220 (21.2%)	0.820
Pyramidal molars	25 (4.7%)	21 (4.1%)	46 (4.4%)	0.763
Short root anomaly	16 (3.0%)	9 (1.8%)	25 (2.4%)	0.227
Dilacerated roots	14 (2.6%)	21 (4.1%)	35 (3.4%)	0.228
Idiopathic root malformation	9 (1.7%)	7 (1.4%)	16 (1.5%)	0.803
Enamel pearls	24 (4.5%)	16 (3.2%)	40 (3.9%)	0.264
Pulp stones	11 (2.1%)	7 (1.4%)	18 (1.7%)	0.479
Lingual pits	68 (12.8%)	50 (9.9%)	118 (11.4%)	0.143
Radiculomegaly	39 (7.4%)	53 (10.5%)	92 (8.9%)	0.082
Number Anomalies	84 (15.8%)	79 (15.6%)	163 (15.7%)	0.932
Hypodontia	69 (13.0%)	64 (12.6%)	133 (12.8%)	0.853
Hyperdontia	15 (2.8%)	16 (3.2%)	31 (3.0%)	0.856
Position Anomalies	210 (39.6%)	222 (43.8%)	432 (41.7%)	0.186
Ectopic eruption	90 (17.0%)	68 (13.4%)	158 (15.2%)	0.120
Primary failure of eruption	10 (1.9%)	18 (3.6%)	28 (2.7%)	0.125
Rotation	116 (21.9%)	135 (26.6%)	251 (24.2%)	0.082
Infra-occlusion	6 (1.1%)	9 (1.8%)	15 (1.4%)	0.443
Mesially displaced premolars	8 (1.5%)	16 (3.2%)	24 (2.3%)	0.098
Distally displaced premolars	12 (2.3%)	12 (2.4%)	24 (2.3%)	1.000
Impacted teeth	12 (2.3%)	9 (1.8%)	21 (2.0%)	0.662
Other Anomalies	77 (14.5%)	92 (18.1%)	169 (16.3%)	0.130
Idiopathic osteosclerosis	18 (3.4%)	22 (4.3%)	40 (3.9%)	0.519
Sclerosing osteitis	2 (0.4%)	2 (0.4%)	4 (0.4%)	1.000
Sinus opacities	5 (0.9%)	14 (2.8%)	19 (1.8%)	0.036*
Elongation of styloid process	18 (3.4%)	20 (4.0%)	38 (3.7%)	0.741
Periapical cyst	3 (0.6%)	1 (0.2%)	4 (0.4%)	0.625
Dentigerous cyst	6 (1.1%)	1 (0.2%)	7 (0.7%)	0.124
Bifid mandibular canal	18 (3.4%)	29 (5.7%)	47 (4.5%)	0.075
Hyperplastic dental follicle	11 (2.1%)	10 (2.0%)	21 (2.0%)	1.000

CONCLUSIONS

- The mean chronologic age at PR capture was 11.9±2.9 while the dental age was 12.6±2.8 years.
- The presence of at least one DDAP was noted in 78% of the study population including shape (48.6%), number (15.7%), positional (41.7%), and other (16.3%) anomalies.
- Similar to previous reports, the Optimal Youden index cutoffs for anomalies were found at chronologic ages 9, 12 and 15 years.
- The chronologic age was a better predictor for DDAP and determining the frequency of PR in healthy children as compared to dental age.

HIGHLIGHTS AND CAVEATS

- This study included age- and gender-matched healthy children and provided objective data based on prevalence of DDAP using PRs
- Children are sensitive to radiographic exposure and hence, this study data provides evidence-based knowledge to determine frequency of PR capture in children.
- A multicenter study is warranted to confirm the findings of the study.

ACKNOWLEDGEMENTS

- Statistical analysis was provided via support from the Center for Research Outcomes in Children's Surgery (ROCS), Children's Hospital Colorado, Aurora, CO.