Abstract #:

Cleft vs. Non-Cleft Maxillary Expansion in Unilateral Cleft Palate

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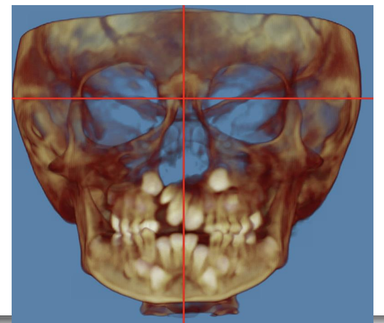
OBJECTIVE

The purpose of this study was to determine if palatal expansion in patients with unilateral cleft palate is symmetrical in areas of cleft sites versus non-cleft sites.

BACKGROUND

Maxillary palatal expansion is a routine orthodontic treatment for patients with unilateral cleft lip and palate prior to bone grafting. Maxillary palatal expansion is necessary to correct the transverse deficiency present in these patients. The treatment is typically performed between 7-10 years of age when the mid-palatal suture is still developing. It would be advantageous to assess the amount of expansion that occurs in the area of the palate without the cleft and with the cleft to analyze if the expansion is symmetrical. In this study, we assessed a group of cleft lip and palate patients that have undergone pre-surgical maxillary palatal expansion. This will determine the efficacy of expansion in sites with unilateral cleft palate.

Unilateral cleft lip and palate is a condition that is followed by a craniofacial team who provides multi-disciplinary care for the patient from birth through to adulthood. Routine dental and craniofacial CBCT scans are standard of care in monitoring craniofacial and dental growth and development while surveilling for additional pathologies. Palatal expansion is necessary in patients with unilateral cleft lip and palate prior to undergoing a bone grafting surgery.



MATERIALS AND METHODS

A retrospective chart review was conducted among all unilateral cleft lip and palate patients seen at Children's Health (CH) with Unilateral Cleft lip and Palate undergoing palatal expansion. Data was collected through review of Epic EHR, and Dolphin imaging software. Chart reviews were conducted from years 2020-2024.

Inclusion Criteria: Non-syndromic, complete unilateral cleft lip and palate patients were included in this study. Patients must have undergone maxillary palatal expansion at CH Orthodontic Center. Pre-and post-expansion CBCTs must be available for all patients. Primary canines and permanent 1st molars must be present in pre- and post- expansion CBCT images.

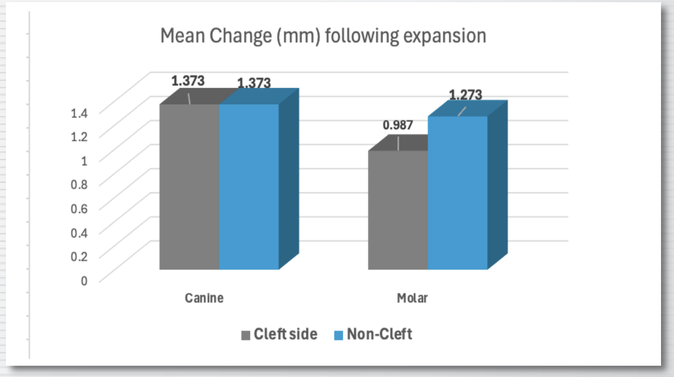
Out of 34 patients, 19 patients were excluded due to natural exfoliation of primary canines or limited CBCT records either not having a pre- or post- CBCT or CBCT not containing landmarks needed to analyze expansion.

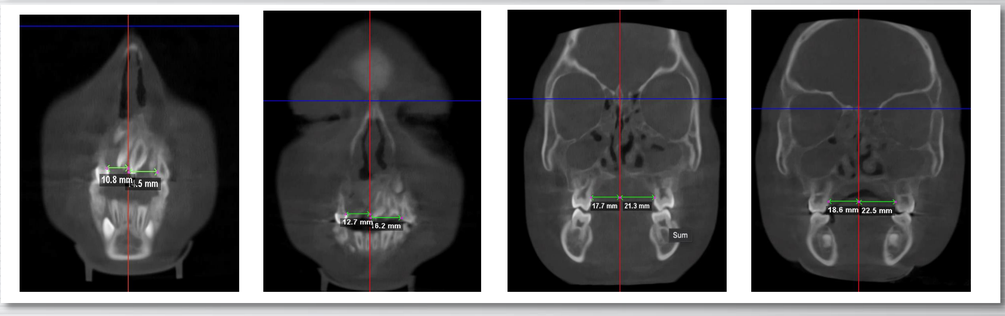
CBCT's were analyzed and measured using Dolphin imaging software. Palatal expansion was assessed by measuring the width of the palate from "mid-sagittal reference line" with the cleft defect and non-cleft defect. The frontozygomatic sutures were used as anatomical references to draw an interfrontozygomatic line. This line was bisected using crista galli and menton as the other reference points to determine the "mid-sagittal reference line" of the patient's alveolar process and palate. Once the "mid-sagittal reference line" was determined, perpendicular measurements from the "mid-sagittal reference line" on the palate to the most palatal location of the primary canines cementoenamel junction (CEJ) and most palatal location of the permanent first molars CEJ were taken on the cleft site and non-cleft site.

RESULTS

The analysis of transverse changes following palatal expansion demonstrated slight increases on both canine and molar widths across the cleft and non-cleft sites.

- Primary canine expansion was identical for both cleft and non-cleft sides. The mean increase width in the palate in the areas of the primary canines for both cleft and non-cleft segments was 1.373 mm.
- At the molar level, the mean increase was 0.987 mm on the cleft side and 1.273 mm on the non-cleft side. Despite observed increases, statistical analysis revealed no significant differences in expansion between cleft and non-cleft sides at either the canine or molar levels ($p>0.05$).





DISCUSSION

Previous studies have reported variable findings, some demonstrating comparable palatal expansion between cleft and non-cleft sides, while others have shown greater expansion on the non-cleft side.

This study was limited due to several factors. Many of the patient records did not have either a pre- or post- CBCT, or CBCT's not containing important landmarks for analyzing or measuring palatal expansion (ex: crista galli not present in CBCT). Many patients were needing to be excluded due to loss of one or both of the primary canines prior to taking the final CBCT.

Future research may include a larger sample size, possibly including multiple institutions.

Conclusions

1. In this study, there was no significant difference in transverse changes between cleft and non-cleft segments.
2. More studies with larger patient populations need to be completed in the future.

REFERENCES

Ayub, Priscila Vaz, et al. "Analysis of the maxillary dental arch after rapid maxillary expansion in patients with unilateral complete cleft lip and palate." *American Journal of Orthodontics and Dentofacial Orthopedics*, vol. 149, no. 5, May 2016, pp. 705–715, https://doi.org/10.1016/j.ajodo.2015.11.022.

Hou X, Xu X, Zhao M, Kong J, Wang M, Lee ES, Jia Q, Jiang HB. An overview of three-dimensional imaging devices in dentistry. J Esthet Restor Dent. 2022 Dec;34(8):1179-1196. doi: 10.1111/jerd.12955. Epub 2022 Aug 15. PMID: 35968802

Kareem, F.A.; Rasheed, T.A.; Rauf, A.M.; Jalal, R.A.; Faraj, B.M. Three-Dimensional Measurements of the Palate and Dental Arch Perimeter as Predictors for Maxillary Palatal Canine Impaction—A Cone-Beam Computed Tomography Image Analysis. *Diagnostics* **2023**, *13*, 1808. https://doi.org/10.3390/diagnostics13101808

Khdairi N, Halilah T, Khandakji M, Bartzela T. Rapid Maxillary Expansion Treatment in Patients with Cleft Lip and Palate: A Survey on Clinical Experience in the European Cleft Centers. J Clin Med. 2023 Apr 27;12(9):3159. doi: 10.3390/jcm12093159. PMID: 37176600; PMCID: PMC10179601.

Lee EH, Yu HS, Lee KJ, Han SS, Jung HD, Hwang CJ. Comparison of three midsagittal planes for three-dimensional cone beam computed tomography head reorientation. Korean J Orthod. 2020 Jan;50(1):3-12. doi: 10.4041/kjod.2020.50.1.3. Epub 2020 Jan 22. PMID: 32042715; PMCID: PMC6995832.

Luyten J, De Roo NMC, Christiaens J, Van Overberghe L, Temmerman L, De Pauw GAM. Rapid maxillary expansion vs slow maxillary expansion in patients with cleft lip and/or palate: a systematic review and meta-analysis. Angle Orthod. 2023 Jan 1;93(1):95-103. doi: 10.2319/030122-188.1. PMID: 36240430; PMCID: PMC9797139.