

ANGULAR CHANGES AND IMPACTION
INCIDENCE OF MANDIBULAR SECOND MOLARS
IN MIXED DENTITION LLHA TREATMENT

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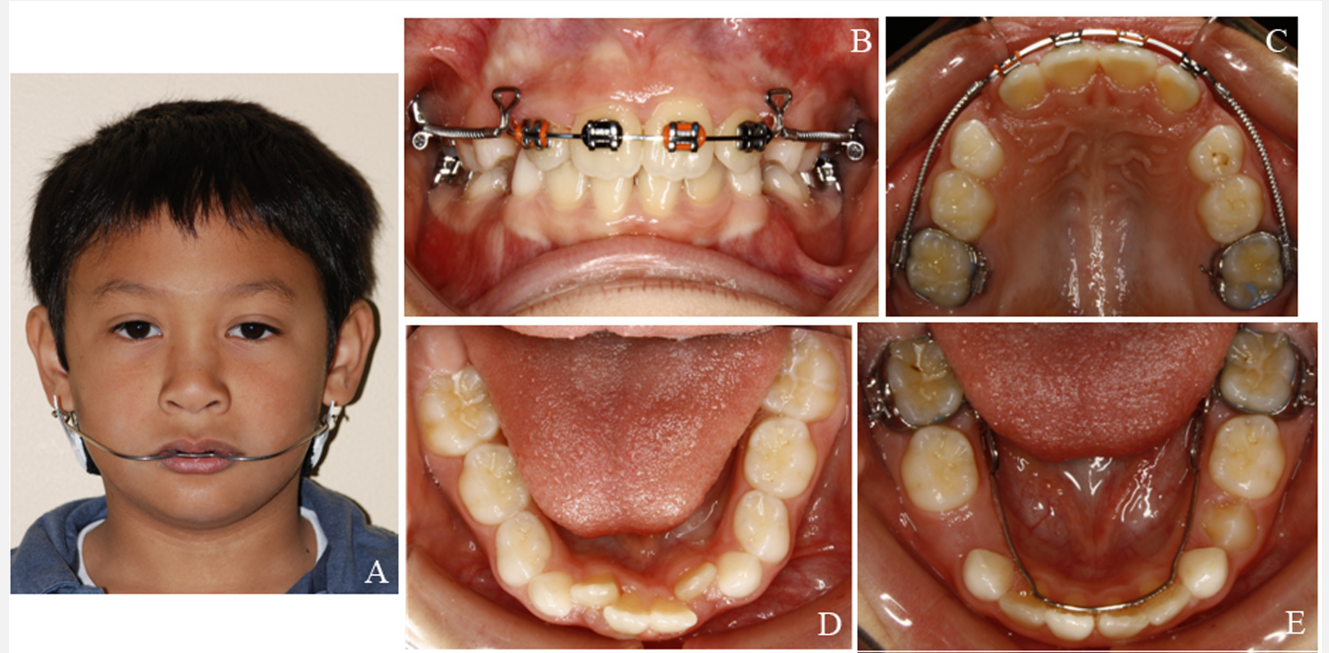
BACKGROUND

- Phase I mixed dentition treatment starts after eruption of the 1st molars and incisors (7-8 years)
- LLHA is not just a space maintainer, prevents the relapse of lower anterior crowding prior to the eruption of permanent 2nd molars.
- Goal of Phase I treatment is to reduce/eliminate permanent dentition treatment



TYPICAL COMPREHENSIVE MIXED DENTITION TREATMENT.

- A. Cervical headgear; B&C. intraoral frontal view for the upper 2x4 appliance; D&E, before and 6-month after placing lower lingual arch with the extraction of the first primary molar

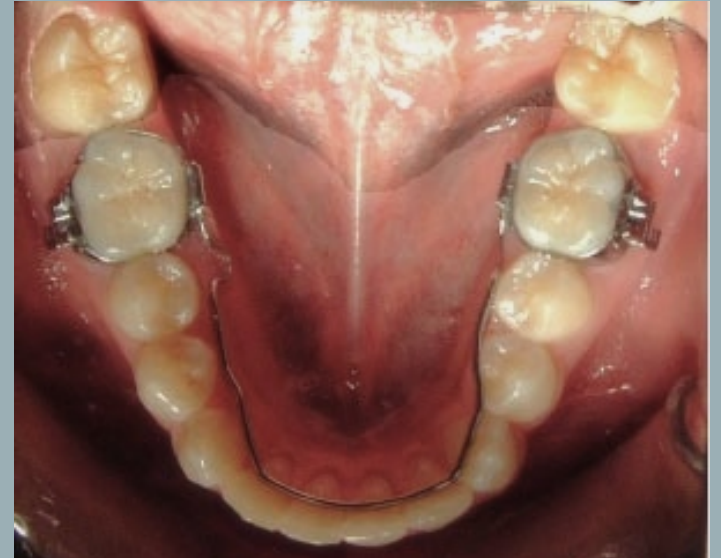


Before



After

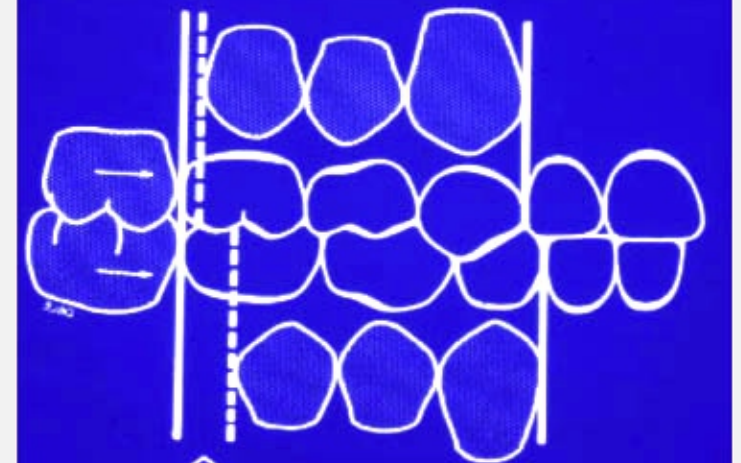




LINGUAL ARCH IN THE MIXED
DENTITION TO RESOLVE CROWDING

LINGUAL ARCH IN THE MIXED DENTITION TO RESOLVE CROWDING

- ⑥ Leeway Space – permanent canines and premolars are smaller than primary canines and molars
 - ⑥ 1.7mm on each side in lower (3.4mm total)
 - ⑥ 0.9mm on each side in upper (1.8 mm total)
- ⑥ Mesial migration closes the spacing difference
 - ⑥ By holding the molars back, orthodontics can overcome some crowding (~3.4mm in lower and ~1.8mm in upper)





CLINICAL IMPLICATION

- Previous studies have shown that the passive LLHA has had a 6.53 times higher incidence of impaction compared to control groups in patients who are not undergoing orthodontic treatment.



SCOPE

- To see if mixed dentition orthodontic treatment with an adjustable LLHA exhibits increased impaction incidence and angular discrepancies compared to the control and passive LLHA appliances

MATERIALS

Retrospective study

97 patients (47 M/ 50F) who underwent mixed dentition treatment

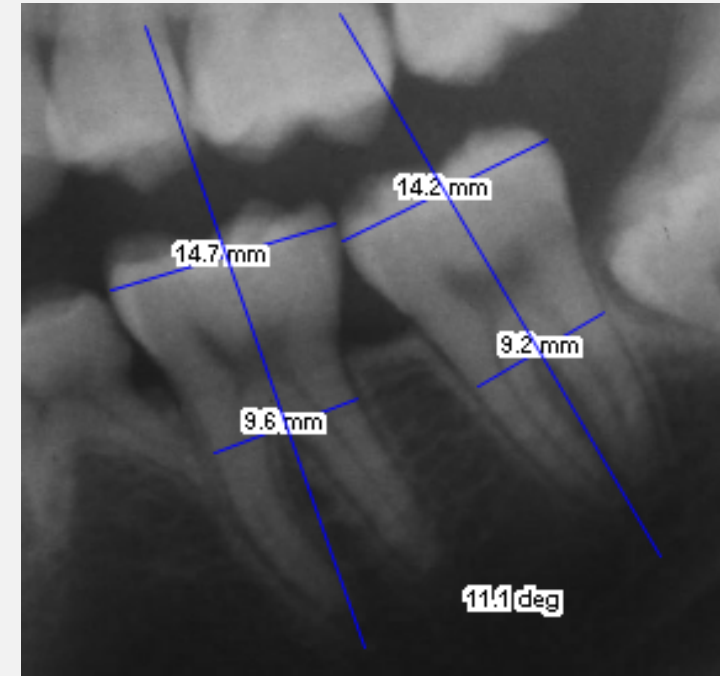
38 patients were treated with a LLHA with an average age at beginning of treatment of 8.6 years and average age at end of treatment of 15.2 years

59 patients who were not treated with a LLHA with an average at beginning of treatment of 8.8 years and average age at end of treatment of 15.1 years

Treatment types consisted of two-phase treatment, phase-one treatment, phase two treatment, serial extractions, and limited treatment

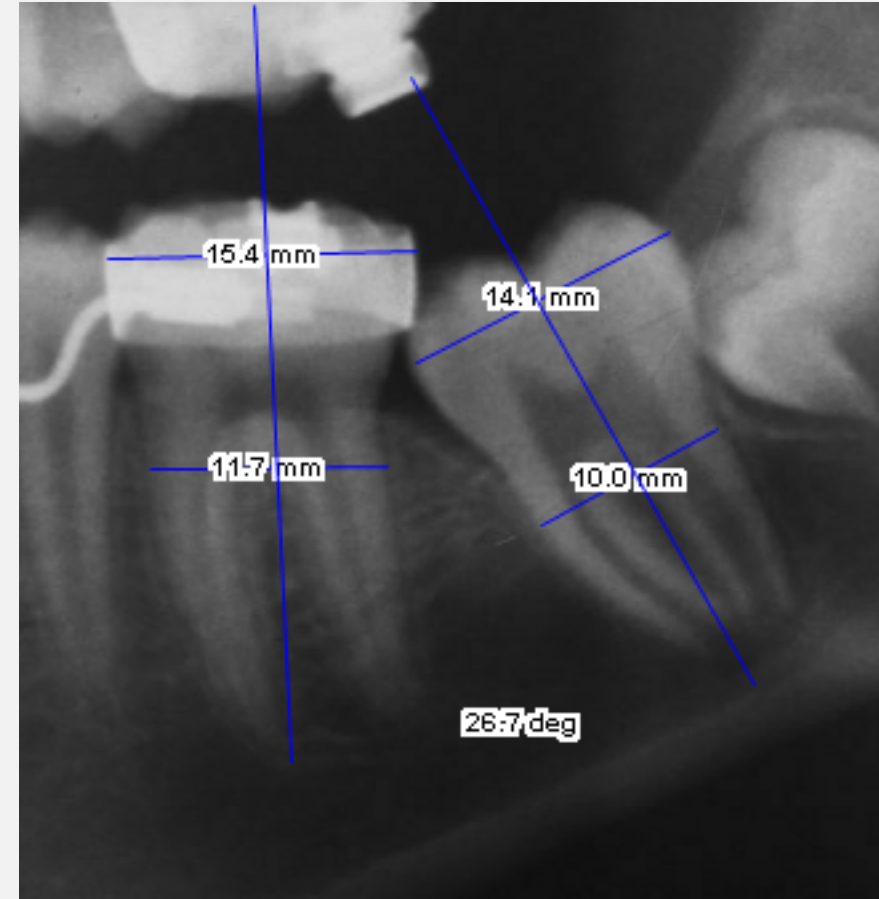
METHODS

- Two judges analyzed all available panoramic radiographs throughout the course of orthodontic treatment
- Using Dolphin imaging software, intra-molar angulations were recorded using the midpoint of crown and root furcation to establish the long-axis of the tooth
- Root lengths were measured in order to determine if second molars were impacted



IMPACTION CRITERIA

- The second molar was determined to be impacted if eruption to the occlusal plane was prevented by contact with an adjacent tooth and $> 75\%$ of the root has formed.





RESULTS

Demographics

- Control Group=31 male and 28 female patients. The LLHA group = 16 male and 22 female patients
 - Chi-squared= 0.32 between the distribution of control and LLA
- The LLA group had a mean age of 12.7 years when beginning phase-two treatment, compared to the control group which had a mean age of 12.5 years
 - P-value = 0.37

Inter-judge Reliability

- Single measures had an intraclass correlation of .91 (0.89-0.92)
- Average measures had an intraclass correlation .95 (0.94-0.96)

ANGULATION SHIFTS

Mean Second Molar Angulation beginning of T2	Mean
LLHA present	11.2 ± 6.7
No LLHA	9.0 ± 5.7
P-value	0.09

Mean angle difference between T1 and T2	Mean
LLHA present	2.3 ± 8.4
No LLHA	4.2 ± 7.9
P-value	0.52

LLA=0						LLA=1					
Variable	N	Mean	Std Dev	Minimum	Maximum	Variable	N	Mean	Std Dev	Minimum	Maximum
R_01	20	11.98	6.45	3.45	31.15	R_01	12	13.83	5.64	6.15	24.65
L_01	20	14.88	7.39	2.3	29	L_01	12	14.81	6.66	4.5	26
R_02	4	10.65	11.2	1.55	26.75	R_02	14	12.9	8.38	1.05	26.55
L_02	4	13.51	11.11	2.8	29.05	L_02	14	13.04	10.35	1.4	35
R_03	59	9.63	5.88	0.6	26.7	R_03	38	12.13	7.85	1.1	30.85
L_03	59	8.44	7.07	0.85	44.35	L_03	38	10.28	7.24	0.55	30.3

Variable indicates the inter-molar angle at each side of the mandible and at what timepoint the panoramic x-ray was taken

IMPACTION INCIDENCE

- 59 patients, 118 teeth not treated with LLHA. 28 treated in phase I, 31 treated in phase II.
 - 4 teeth determined to be impacted
- 38 patients, 76 teeth treated with LLHA in two phase treatment
 - 7 teeth determined to be impacted

VARIABLE	IMPACTION INCIDENCE (%)
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LLHA Present	9.2
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No LLHA	3.4
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Chi-squared	0.087
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Fisher's exact test comparing R & L	0.061
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DISCUSSION & FUTURE DIRECTIONS

Previous studies created a right angle at the widest mesio-distal dimension of the tooth to establish intermolar angles, but our calibrations resulted in worse inter-judge reliability when compared to our established methods.

The results disagree with previous studies which suggest that LLHA are associated with increased impaction incidence.

We see there is less correction of second molar angulation in the LLHA group compared to control once phase II treatment has begun, results were not statistically significant.

Impactions where right vs. left impaction incidence were examined demonstrated an almost statistically significant result.

CONCLUSIONS

An adjustable lower lingual holding arch appliance is not associated with an increased risk of second molar impaction in patients being treated in the mixed dentition.

The LLHA does not result in increased second molar angular discrepancies.

The LLHA is an excellent choice to resolve lower incisor crowding by preserving arch length in the mixed dentition and does not pose an increased risk of serious complications for the patient and clinician.