



## Data Article

# Meta-analysis dataset comparing orthodontic mini-implants and conventional anchorage reinforcement for maximum orthodontic anchorage

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## ABSTRACT

The present article describes data from systematic review and meta-analysis investigating the efficacy and safety outcomes comparing mini-implants (MIs) and conventional anchorage reinforcement in patients with maximum dentoalveolar protrusion. All relevant RCTs and non-RCTs published up to 2018 were collected from PubMed, Embase and Cochrane database. Thirteen studies assessing the effect of mini-implants were included, of which 4 were randomized controlled trials (RCTs) and 9 observational studies. The efficacy parameters include mesiodistal movements of molars and incisors and vertical movements of molars and incisors. Whereas, the safety parameters were angular and linear measurement of soft tissue change. Subgroup analysis data was provided in terms of patients average age (<18 years and  $\geq 18$  years) at the initiation of treatment. This dataset is suitable for research purpose in the field of orthodontics and

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also helps dental doctors to determine their treatment preferences in the choice of anchorage reinforcement.

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## Specifications Table

Subject	Clinical research, Meta-analysis
Specific subject area	Dental
Type of data	Table
How data were acquired	Articles were screened using the electronic database search.
Data format	Analysed. Secondary data
Parameters for data collection	Electronic database such PubMed, Embase and Cochrane using the keywords, literature searched from inception to 2018
Description of data collection	3720 articles were screened using the electronic database search, and after removing duplicates and excluding articles as per exclusion criteria, 87 full text articles remained for further evaluation by reviewer. Finally, 13 articles remained for final data analysis. Efficacy of the anchorage devices were measured by mesiodistal movement of molars and incisors, and vertical movement of molars and incisors. Safety was measured in terms of angular and linear measurements.
Data source location	Secondary data was sourced from electronic databases. Primary database sources: PubMed, Embase, Cochrane
Data accessibility	With the article. Secondary data
Related research article	Author names: YAN LIU, ZHEN-JIN YANG, JING ZHOU, PING XIONG, QUAN WANG, YAN YANG, YU HU, JIANG-TIAN HU. Title: Soft Tissue Changes in Patients with Dentoalveolar Protrusion Treated with Maximum Anchorage: A Systematic Review and Meta-Analysis. Journal: The Journal of EVIDENCE-BASED DENTAL PRACTICE DOI: <a href="https://doi.org/10.1016/j.jebdp.2019.01.006">https://doi.org/10.1016/j.jebdp.2019.01.006</a> Author names: YAN LIU, ZHEN-JIN YANG, JING ZHOU, PING XIONG, QUAN WANG, YAN YANG, YU HU, JIANG-TIAN HU. Title: Comparison of Anchorage Efficiency of Orthodontic Mini-Implant and Conventional Anchorage Reinforcement in Patients Requiring Maximum Orthodontic Anchorage: A Systematic Review and Meta-Analysis. Journal: The Journal of EVIDENCE-BASED DENTAL PRACTICE DOI: <a href="https://doi.org/10.1016/j.jebdp.2020.101401">https://doi.org/10.1016/j.jebdp.2020.101401</a>

## 1. Data

In total, 3720 articles were screened using the electronic database search, and after removing duplicates and excluding articles as per exclusion criteria, 87 full text articles remained for further evaluation by reviewer. Finally, 13 articles remained for final data analysis.

Bimaxillary anterior dentoalveolar protrusion of both upper and lower jaws is challenging to clinician, which is further complicated by availability of multiple treatment modalities. Therefore, we presented the data comparing the efficacy and safety profile of orthodontic MIs and conventional anchorage reinforcement among patients with maximum dentoalveolar protrusion. Efficacy of the anchorage devices were measured by mesiodistal movement of molars and incisors, and vertical movement of molars and incisors. Whereas, safety was measured in terms of angular and linear measurements.

The mean and standard deviation based on the endpoint of interest of the included studies were pooled together. We used  $I^2$  statistics to assess the heterogeneity among studies included. Random-effect meta-analysis models, to calculate the weighted overall mean and standard deviation of the pooled data were used in the presence of significant heterogeneity of study-level data. Otherwise, fixed-effects (FE) models were used. To account for any bias in the reporting units of the studies included, the standard mean difference (SMD) with 95% confidence inter-

**Table 1**  
Efficacy and safety outcomes of mini-implants (MIs) compared to conventional anchorage.

EFFICACY					SAFETY				
Randomized Controlled Trials (RCTs)									
Slr No.	Author name, Year	Mesiodistal movement of molars	Vertical movement of molars	Mesiodistal movement of incisors	Vertical movement of incisors	SNA	ANB	Nasolabial angle	Upper lip changes
		SMD (95% CI)	SMD (95% CI)	SMD (95% CI)	SMD (95% CI)	SMD (95% CI)	SMD (95% CI)	SMD (95% CI)	SMD (95% CI)
1	Upadhyay M. et al., 2008	-3.22 (-4.21, -2.23)	-0.91 (-1.59, -0.22)	-0.37 (-1.03, 0.29)		0.19 (-0.47, 0.84)	-0.95 (-1.64, -0.26)	1.35 (0.63, 2.08)	-0.25 (-0.91, 0.41)
2	Al-Sibaie S. et al., 2013	-2.94 (-3.70, -2.18)		-0.51 (-1.04, 0.02)		-0.05 (-0.57, 0.48)	0.12 (-0.41, 0.64)	0.72 (0.18, 1.26)	-0.31 (-0.83, 0.22)
3	Y.H Liu et al., 2009	-1.17 (-1.89, -0.44)	-1.49 (-2.25, -0.73)	-1.21 (-1.94, -0.48)	-1.39 (-2.14, -0.64)	-0.24 (-0.92, 0.43)	-0.61 (-1.30, 0.07)	0.22 (-0.45, 0.90)	-0.77 (-1.47, -0.07)
4	J Sandler et al., 2014	-0.58 (-1.05, -0.10)							
Non-RCTs									
5	Park et al., 2012	-1.33 (-2.21, -0.45)	-0.03 (-0.83, 0.77)	-1.75 (-2.69, -0.81)	-1.00 (-1.85, -0.15)				
6	Koyama et al.,	-1.97 (-2.87, -1.07)	1.03 (0.24, 1.82)	0.21 (-0.54, 0.95)	1.19 (0.39, 1.99)	-0.14 (-0.88, 0.60)	-2.05 (-2.96, -1.13)		
7	A-Y Lee et al.,	1.26 (0.58, 1.94)	0.77 (0.13, 1.41)	0.75 (0.11, 1.39)	0.96 (0.30, 1.61)	0.63 (-0.00, 1.27)	0.57 (-0.06, 1.20)		
8	C-C Yao et al.,	-0.64 (-1.23, -0.06)		-0.69 (-1.28, -0.10)		0.70 (0.11, 1.29)	0.61 (0.03, 1.20)		
9	E H-H Lai et al., 2008	-0.79 (-1.44, -0.13)	-0.20 (-0.84, 0.43)	-0.80 (-1.46, -0.14)	0.48 (-0.16, 1.13)				
10	Mu Chen et al., 2015	-0.81 (-1.55, -0.08)		-1.08 (-1.84, -0.33)	-0.58 (-1.30, 0.13)	0.10 (-0.61, 0.80)	-0.02 (-0.73, 0.68)		
11	Upadhyay M. et al., 2008	-2.56 (-3.53, -1.60)	-0.66 (-1.40, 0.07)	-0.20 (-0.91, 0.52)	-1.84 (-2.69, -0.98)				
12	Col S.S. Chopra et al., 2017	-3.39 (-4.26, -2.53)		0.14 (-0.41, 0.70)		0.64 (0.07, 1.21)	0.38 (-0.18, 0.94)	-0.59 (-1.15, 10.02)	
13	Kuroda et al., 2009							0.58 (-0.27, 1.44)	

**Table 2**

Subgroup analysis of skeletal, soft tissue and dental variants with respect to age (<18 and ≥18 years).

Skeletal measurements			
SNA		ANB	
<b>&lt;18 years</b>		<b>&lt;18 years</b>	
Author name, Year	SMD (95% CI)	Author name, Year	SMD (95% CI)
Upadhyay M. et al., 2008	0.19 (-0.47, 0.84)	Upadhyay M. et al., 2008	-0.95 (-1.64, -0.26)
Col S.S. Chopra et al., 2017	0.64 (0.07, 1.21)	Col S.S. Chopra et al., 2017	0.38 (-0.18, 0.94)
<b>≥18 years</b>		<b>≥18 years</b>	
C-C Yao et al.,	0.70 (0.11, 1.29)	C-C Yao et al.,	0.61 (0.03, 1.20)
Al-Sibaie S. et al., 2013	-0.05 (-0.57, 0.48)	Al-Sibaie S. et al., 2013	0.12 (-0.41, 0.64)
Koyama et al.,	-0.14 (-0.88, 0.60)	Koyama et al.,	-2.05 (-2.96, -1.13)
A-Y Lee et al.,	0.63 (-0.00, 1.27)	A-Y Lee et al.,	0.57 (-0.06, 1.20)
Mu Chen et al.,	0.10 (-0.61, 0.80)	Mu Chen et al.,	-0.02 (-0.73, 0.68)
Y.H Liu et al., 2009	-0.24 (-0.92, 0.43)	Y.H Liu et al., 2009	-0.61 (-1.30, 0.07)
<b>Soft tissue measurements</b>			
<b>Nasolabial angle</b>			
<b>&lt;18 years</b>		<b>&lt;18 years</b>	
Author name, Year	SMD (95% CI)	Author name, Year	SMD (95% CI)
Upadhyay M. et al., 2008	1.35 (0.63, 2.08)	Upadhyay M. et al., 2008	-0.25 (-0.91, 0.41)
Col S.S. Chopra et al., 2017	-0.59 (-1.15, 0.10)		
Kuroda et al., 2009	0.94 (0.19, 1.68)		
<b>≥18 years</b>		<b>≥18 years</b>	
Al-Sibaie S. et al., 2013	0.72 (0.18, 1.26)	Al-Sibaie S. et al., 2013	-0.31 (-0.83, 0.22)
Y.H Liu et al., 2009	0.22 (-0.45, 0.90)	Y.H Liu et al., 2009	-0.77 (-1.47, -0.07)
Kuroda et al., 2009	0.53 (0.16, 0.91)		
<b>Dental variants</b>			
<b>Mesiodistal movement of molars</b>		<b>Mesiodistal movement of molars</b>	
<b>&lt;18</b>		<b>&lt;18</b>	
Author name, Year	SMD (95% CI)	Author name, Year	SMD (95% CI)
Upadhyay M. et al., 2008	-3.22 (-4.21, -2.23)	Upadhyay M. et al., 2008	-0.91 (-1.59, -0.22)
J Sandler et al., 2014	-0.58 (-1.05, -0.10)		
Col S.S. Chopra et al., 2017	-3.39 (-4.26, -2.53)		
<b>&gt;18</b>		<b>&gt;18</b>	
Upadhyay M. et al., 2008	-2.56 (-3.53, -1.60)	Upadhyay M. et al., 2008	-0.66 (-1.40, 0.07)
C-C Yao et al.,	-0.64 (-1.23, -0.06)	Koyama et al.,	1.03 (0.24, 1.82)
Al-Sibaie S. et al., 2013	-2.94 (-3.70, -2.18)	A-Y Lee et al.,	0.77 (0.13, 1.41)
Koyama et al.,	-1.97 (-2.87, -1.07)	E H-H Lai et al., 2008	-0.20 (-0.84, 0.43)
A-Y Lee et al.,	1.26 (0.58, 1.94)	Park et al., 2012	-0.03 (-0.83, 0.77)
E H-H Lai et al., 2008	-0.79 (-1.44, -0.13)	Y.H Liu et al., 2009	-1.49 (-2.25, -0.73)
Park et al., 2012	-1.33 (-2.21, -0.45)		
Mu Chen et al., 2015	-0.81 (-1.55, -0.08)		
Y.H Liu et al., 2009	-1.17 (-1.89, -0.44)		
<b>Mesiodistal movement of incisors</b>			
<b>&lt;18</b>		<b>&lt;18</b>	
Author name, Year	SMD (95% CI)	Author name, Year	SMD (95% CI)
Upadhyay M. et al., 2008	-0.37 (-1.03, 0.29)	Upadhyay M. et al., 2008	-0.20 (-0.91, 0.52)
Col S.S. Chopra et al., 2017	0.14 (-0.41, 0.70)	C-C Yao et al.,	-0.69 (-1.28, -0.10)
		Al-Sibaie S. et al., 2013	-0.51 (-1.04, 0.02)
		Koyama et al.,	0.21 (-0.54, 0.95)
		A-Y Lee et al.,	0.75 (0.11, 1.39)
		E H-H Lai et al., 2008	-0.80 (-1.46, -0.14)
		Park et al., 2012	-1.75 (-2.69, -0.81)
		Mu Chen et al., 2015	-1.08 (-1.84, -0.33)
		Y.H Liu et al., 2009	-1.21 (-1.94, -0.48)

vals (CI) were used. The data from the different studies might have unknown biases which were rendered negligible by the statistical pooling of data.

The skeletal, dental and soft tissue measurement with respect to efficacy and safety included in both RCTs and non-RCTs were presented in Table 1. Also, as patient's age seemed to play a vital role, sub-group analysis assessing the difference in the treatment outcomes with respect to patients age (<18 years and ≥18 years) were carried out (Table 2).

## 2. Experimental Design, Materials, and Methods

We searched electronic database through PubMed, Embase and Cochrane using the keywords “Skeletal anchorage”, “temporary anchorage devices”, “miniscrew implant”, “mini-implant”, “micro-implant” and searched the literature from inception to 2018. The search was conducted adhering to the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-analysis) guidelines. Thirteen studies were identified including 4 RCTs [1–4] and 9 observational studies [5–13]. Methodological quality of the RCTs were assessed using Cochrane’s Risk of Bias Tool, whereas non-RCTs were assessed using Newcastle-Ottawa scale. A data extraction protocol was defined and data were extracted using a customized data extraction sheet. The data were extracted from the full-text articles independently by 2 reviewer’s and any disagreements was resolved through mutual consensus between the reviewers. Standard mean difference and 95% confidence interval was used as the absolute treatment effect estimate. The data was extracted and analysed using the Review Manager 5.3 software. The dental, skeletal and soft tissue changes were compared between the MIs and conventional anchorage devices. A subgroup analysis with patients aged <18 years and ≥18 years were also performed. A P value of <0.05 was considered to be statistically significant.

### Ethics Statement

No humans or animals were involved in the data collection, the secondary data was sourced retrieved from PubMed, Embase and Cochrane databases.

### Competing Interests

The authors declare that they have no known competing financial interests or personal relationships which have, or could be perceived to have, influenced the work reported in this article.

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### Declaration of Competing Interest

None.

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