Implants for orthodontic anchorage
An overview
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Abstract
Implant anchorage continues to receive much attention as an important orthodontic anchorage. Since the development of orthodontic implants, the scope of applications has continued to increase. Although multiple reviews detailing implants have been published, no comprehensive evaluations have been performed. Thus, the purpose of this study was to comprehensively evaluate the effects of implants based on data published in review articles.

An electronic search of the Cochrane Library, Medline, Embase, Ebsco and Scicencedirect for reviews with “orthodontic” and “systematic review or meta analysis” in the title, abstract, keywords, or full text was performed. A subsequent manual search was then performed to identify reviews concerning orthodontic implants. A manual search of the orthodontic journals American Journal of Orthodontics and Dentofacial Orthopedics (AJODO), European Journal of Orthodontics (EJO), and Angle Orthodontist was also performed. Such systematic reviews that evaluated the efficacy and safety of orthodontic implants were used to indicate success rates and molar movements.

A total of 23 reviews were included in the analysis. The quality of each review was assessed using a measurement tool for Assessment of Multiple Systematic Reviews (AMSTAR), and the review chosen to summarize outcomes had a quality score of >6. Most reviews were less than moderate quality. Success rates of implants ranged in a broad scope, and movement of the maxillary first molar was superior with implants compared with traditional anchorage.

Abbreviations: AMSTAR = assessment of multiple systematic reviews, TPA = transverse palatal bar.

Keywords: implant, molar movement, orthodontics, overview, success rate

1. Introduction
Orthodontic anchorage is used to resist the force applied to teeth. Thus, successful orthodontic treatments rely on the adequate control of anchorage. Anchorage can be divided into strong, moderate, and weak anchorage. Traditionally, strong and moderate anchorage requires a headgear, a Nance bow, or a transverse palatal bar (TPA); however, recently implant anchorages have been increasingly used because of their small size, simple operation, high efficacy, and low cost.†

Successful orthodontic treatments rely on the control of orthodontic anchorage; however, in many cases, traditional orthodontic anchorage cannot achieve satisfactory results. For example, headgear is dependent on patient appliance, the Nance bow is large and oppress the mucosa, and TPA lacks sufficient strength.‡

Recently, implant anchorages have been used for auxiliary anchorage reinforcement. The implant anchorage is typically made of stainless steel, commercially available titanium, or titanium alloy. The diameter of them is from 1 to 2 mm whereas the length is generally 8 to 20 mm. Implant anchorages and dental implants are different in that implant anchorages are not bone-binding, but instead, bind mechanically. Multiple types of implant anchorages are available, mostly including palatal plates, onplants, miniplates, and miniscrews.¶

1. Palatal plates: The implant position is primarily on the maxillary hard palate, which is located in the median palatine suture or on either side of the median palatine suture behind the foramina incisivum. Most palatal implants are made of titanium alloy and are screw-like with a cylindrical surface. Following implantation in the oral cavity, impressions are obtained to produce the TPA, which connects the 2 sides of the maxillary teeth to the implant to strengthen the anchor.

2. Onplants: The onplant has the same role as the palatal plate and is implanted in the median palatine suture. Onplants are button shaped and implanted between the periosteum and jaw. Such implants require secondary surgeries, whereas palatal plates require a single surgery.
3. Miniscrews: Miniscrews are made of pure titanium or titanium alloy, with a diameter of 1 to 2 mm and a length of 10 mm. The shape of the implant below the bone surface is screw-like, and is not generally used for surface treatment. The advantage of the miniscrew is its simple operation. Miniscrews are self-drilling or auxiliary. Owing to their small size, microscrew implants can be applied to nearly all locations in the jaw or alveolar bone. The most common implant positions are between the buccal-apical side of the upper and lower teeth. The use of miniscrew implants (MBs) controls the movement of teeth in the mesial, distal, and vertical directions, without the need for additional anchorage.

Currently, orthodontists use various temporary anchorage devices (TADs) for anchorage. A considerable body of research has tested the efficacy and success rates of implant anchoretes and the aim of this review was to provide information to orthodontists and balance the benefits and harms associated with orthodontic implants anchorage. In this overview, we address the following.

1. Success rates vary widely among reviews, with no clear conclusions.
   2. The success application of implant anchoretes is based on comparisons with traditional anchors, and the movement of teeth. Thus, the overall effectiveness of implant anchorage remains unknown.
   3. Since the advent of orthodontic implant anchoretes, multiple reviews have been published; however, only 1 is included in the Cochrane Library database. The remaining reviews are published in magazines and have unknown qualities.

2. Material and methods

2.1. Inclusion criteria for review articles

2.1.1. Types of studies. In accordance with the standard criteria for reviews of orthodontic implant anchoretes, we included studies using trials to estimate molar movement and success rates.

2.1.2. Types of participants. All orthodontic implant-based reviews were included and comprised data for teenagers and adults from both sexes and different nationalities and ethnicities.

2.1.3. Types of interventions. Interventions included palatal plates, onplants, miniscrews, and miniscrews. Such interventions were delivered as monotherapies or combinations. Success rates and molar movements were evaluated for different orthodontic implants.

2.1.4. Types of outcomes. The primary outcome was success rates of orthodontic implants (i.e., implants remained in the position in which they were implanted). Secondary outcomes included the mean loss of molar anchorage and molar destabilization.

2.2. Search methods to identify reviews

The Cochrane Library, Medline, Embase, Ebsco, and Science-direct were searched for reviews with “orthodontic$” and “systematic review or meta-analysis” in the title, abstract, keywords, or full text. A subsequent manual search was then performed to identify reviews concerning orthodontic implants. A manual search of the 3 orthodontic journals AJODO, EJO, and Angle Orthodontist was also performed. The search was performed in September 2016, and the inclusion and exclusion criteria were as follows:

Inclusion criteria:
1. Systematic reviews or meta-analysis
2. Randomized controlled clinical trials (RCTs)
3. Prospective controlled clinical trials (CCTs)
4. Retrospective controlled cohort studies
5. Other human studies
6. No restrictions were applied concerning the publication year or status.

Exclusion criteria:
1. Studies that failed to perform systematic reviews or meta-analyses.
2. Studies contains animal studies or corpse research

2.3. Data collection and analysis

2.3.1. Selection of reviews. Two authors (XZ and YS) independently assessed all reviews identified by the search strategy.

2.3.2. Data extraction and management. The data extraction form summarizes the key information obtained from each review, including the participant details, the interventions, comparisons, and outcomes. One author (XZ) extracted the data, whereas the second (YS) verified the extracted information. Disagreements were referred to a third author (YZ) for discussion and resolution.

2.3.3. Assessments of methodological quality of reviews. We used the AMSTAR measurement tool[4] to assess the quality of the reviews. The modified assessment comprised the following 11 factors:

1. Was an “a priori” design provided?
2. Were study-selection and data-extraction methods duplicat-ed?
3. Was a comprehensive literature search performed?
4. Were published and unpublished studies eligible, irrespective of language of publication?
5. Was a list of studies (included and excluded) provided?
6. Were the characteristics of the included studies assessed and documented?
7. Was the scientific quality of the included studies assessed and documented?
8. Was the scientific quality of the included studies used appropriately when formulating conclusions?
9. Were appropriate methods used to combine results?
10. Was the likelihood of publication bias assessed?
11. Was a conflict of interest disclosed?

Each criterion was rated as “Yes” (done), “No” (not done), “Can’t answer” (unclear), or “Not applicable.” A “Yes” rating indicated adequate quality and was given a score of 1. Criteria rated as “Not applicable” were not counted against the review, but were removed from the denominator with appropriate
adjustment to the ranking. A “No,” “Can’t answer,” and “Not applicable” were given a score of 0. The sum of the scores provided the overall quality score.

All reviews were ranked as being of high quality (scoring 8–11), of medium quality (scoring 4–7), or of low quality (scoring 0–3). Reviews were not excluded based on AMSTAR rankings.

2.4. Data synthesis

To analyze the success rates of implant anchorages and the levels of molar movement compared to traditional anchorage, we analyzed the outcomes of reviews. Owing to the large number of reviews pertaining to orthodontic implants and the complex definition of outcomes, we did not analyze the outcomes by network meta-analysis, but instead extracted high quality data of orthodontic implants for clinicians’ use.

To assess the efficacy of orthodontic implants, we performed this overview at the review level, and did not reanalyze the studies. Although we intended to update the overview immediately using the Cochrane policy, this was not added to the reviews included. Additionally, our decision to update the overview depended on whether the reviews could essentially change the findings from the previous overview.

3. Results

3.1. Description of included reviews

In this study, we screened 2253 articles of all the orthodontic systematic reviews and meta-analyses electronically. And we manually searched 38 reviews concerning orthodontic implants in those 2253 articles beyond the consideration of language, style or if the experiment in the review is about animals but strictly follow our criteria. Then we screened the 38 reviews last time and chose 23 reviews in the 38 articles according to our criteria. A flow chart detailing the articles included is shown in Figure 1. The characteristics of all the 23 reviews are listed in Table 1.[2,3,6–26]

Of the 23 articles selected, the most recent were published in 2016. Among the reviews, some were restricted and included RCT, CCT, and retrospective studies. All others included live humans. The written language was English. The outcomes of the reviews were broad, and included success rates for orthodontic implants and the degrees of molar movements. The remaining outcomes detailed the probability of implants to contact the root, or have front traction in the maxilla. Owing to the small number of articles analyzed, we focused on the success rates and the level of molar movement between implant anchorages and traditional anchorages.

3.2. Methodological quality of the reviews

AMSTAR ratings for the reviews are summarized in Table 2.[2,3,6–26] All 23 reviews were classified as high, medium, or low quality based on 11 domains. Following our previous classification criteria, a grade of 0 to 3 was considered low quality, 4 to 7 was considered medium quality, and 8 to 11 was considered high quality. A total of 3 articles were deemed to be of low quality,[3,6,7] whereas 15 were of medium quality,[2,8–21] and 5 were of high quality.[22–26]

3.3. Effects of interventions

Orthodontic implants are palatal plates, onplants, miniplates, and miniscrews. All reviews concerning orthodontic implants illustrated the efficacy and application of the 4 implants. To summarize the outcomes of such studies, high-quality reviews were selected. For those studies, the AMSTAR score was 11. We used 50% as the reference and summarized reviews with scores >6. There were 22 outcomes, with most detailing the success rate for implantations and the level of molar movement. Other
| Review                  | Date assessed as up to date | Population                          | Interventions                                      | Comparison                                      | Outcomes for which data were reported                                                                 |
|------------------------|----------------------------|-------------------------------------|----------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| Yi et al[8]            | 2016.5                     | Patients needs TAD treatment       | Self-drilling miniscrew                            | Self-tapping miniscrew                          | No difference between the 2 types of screws in the success rates.                                      |
| Hong et al[24]         | 2016.5                     | Clinical human studies             | MIs placed in the buccal area only                | Before and after                                | OR of the success of MIs with a subgroup meta-analysis                                               |
| Alsafadi et al[9]      | 2016.3                     | Patients who have open bite malocclusion | Molar intrusion with temporary anchorage        | No                                              | Mandibular counterclockwise rotation was found to be between 2.3 and 3.9 degree in 6 studies (assessed by mandibular plane angle, between MeGo or GoGn and SN or PH plane), whereas it was <2 degree in the remaining studies. |
| Winsauer et al[11]     | 2014.10                    | Studies on human subjects          | Studies measuring VBH or bone thickness in the palate | No                                              | Optimal sites for OMI insertion                                                                        |
| Dalessandri et al[11]  | 2014.6                     | Patients need orthodontic temporary anchorage devices | TAD used as orthodontic anchorage                  | No                                              | The success rates was reported >80%                                                                    |
| Rodriguez et al[12]    | 2014.4                     | Subjects using implants            | Implants placed in maxilla and mandible and Implants placed in hard palate | No                                              | Survival rate of the implants                                                                        |
| Grec et al[13]         | 2013.5                     | Subjects with Class II malocclusion | Intraoral distalizers with conventional anchorage | Intraoral distalizers with skeletal anchorage  | Efficiency in the correction of Class II malocclusion                                                 |
| Alsamak et al[9]       | 2013.2                     | Patients need orthodontic implant anchorage | OMs and another detailed search for CT or CBCT | No                                              | Optimal sites for OMI insertion                                                                        |
| Marquzean et al[15]    | 2012.7                     | Patients using skeletal anchorage  | Skeletal anchorage                                | No                                              | There is a positive association between implant primary stability and bone mineral density of the receptor site |
| Tsui et al[8]          | 2012.6                     | Patients need bone anchorage       | Patients using one kind of bone anchorage         | Little study compare another kind of bone anchorage | The success rates for the four groups of bone anchorage systems and bone anchorage systems can achieve effective orthodontic movement with low morbidity. |
| Alves et al[29]        | 2012.5                     | Human clinical studies             | Surgical screws with a diameter less than 2.5 mm   | No                                              | The roots did not exhibit clinical changes after coming into contact with the IMS, but this situation depends on the root damage level |
| Papageorgiou et al[23] | 2012.5                     | Patients needs orthodontic anchorage reinforcement | Patients using miniscrew implants for orthodontic anchorage reinforcement | Patients using other means of orthodontic anchorage reinforcement | Failure rate of the miniscrew implants                                                              |
| Feng et al[24]         | 2012.2                     | Children with maxillary deficiency | TAD anchored MP                                    | Tooth anchored MP                                | TAD-anchored maxillary protraction has a greater maxillary advancement effect and might reduce skeletal and dental side effects compared with tooth anchored maxillary protraction |
| Li et al[8]            | 2011.2                     | Patients needs orthodontic anchorage | Implant anchorage                                 | Headgear anchorage Or headgear + TPA           | Anchorage loss during the treatment                                                                 |
| Papadopoulos et al[23] | 2011.2                     | Patients needs orthodontic treatment | Subjects using MIs                                 | Subjects using Conventional anchorage           | Molar distalizers reinforced with the temporary skeletal anchorage devices seem to effectively |
| Fudalej and Antoszewski[77] | 2011.1                   | Patients needs molar distalization  | Temporary anchorage devices to distalize molars    | No                                              | (continued)                                                                                           |
Table 1 (continued).

| Review                          | Date assessed as up to date | Population                              | Interventions                             | Comparison                              | Outcomes for which data were reported |
|--------------------------------|-----------------------------|-----------------------------------------|-------------------------------------------|-----------------------------------------|---------------------------------------|
| Cristiani et al[6]             | 2010.1                      | Human clinical trials                   | Orthodontic mini-implants or miniscrews   | Before and after                        | move molars distally without unwanted molar tipping |
| Schuette et al[8]              | 2009.5                      | Patients need absolute anchorage        | Different types of TADs                    | Before and after                        | Success rate of subgroups              |
| Reynders et al[18]             | 2009.5                      | Patients need absolute anchorage        | Orthodontic implants                      | Before and after                        | Success rate                           |
| Chen et al[19]                 | 2009.3                      | Patients need orthodontic mini-implants | Mini-implants used as orthodontic anchorage | No                                      | Mini-implants are effective as anchorage, and their success depends on proper initial mechanical stability and loading quality and quantity |
| Jambi[20]                      | 2007.5                      | Patients undergoing orthodontic treatment | Mid-palatal implants, onplants, miniscrews, spider screws, titanium plates, and zygomatic wires | Conventional anchorage                  | Survival rate of subgroups              |
| Ohashi et al[21]               | 2006.7                      | Patients need strong orthodontic anchorage | Implant used as orthodontic anchorage     | Screws used as orthodontic anchorage    | Loading protocols for implants involve a minimum waiting period of 2 mo before applying orthodontic forces. Loading protocols for screws involve immediate loading or a waiting period of 2 wk to apply forces. |
| Labanauskaité et al[7]         | 2005.7                      | Patients need orthodontic anchorage     | Orthodontic implants                      | No                                      | No exact conclusion                    |

CT = computed tomography, IMS = intermaxillary screws, MIs = mini-screw implants, OR = odds ratio, TAD = temporary anchorage device, TPA = transverse palatal bar, VBM = vertical palatal bone height.

3.4. Success rate

The success of an implant is determined by shedding after AMSTAR score = 7. All 7 articles were selected with an AMSTAR score >6. A total of 5 reviews had AMSTAR scores >6 and discussed molars in Table 4.[13,17,20,22,24,26] Only Schraut et al[26] discussed the success rate of 4 implant types. The success rate of implants was 82.8% (81.9%, 86.7%), whereas that of the palatal implant was 89.5% (84.4%, 94.1%), whereas Papadopoulos et al[22] revealed a similar miniscrew success rate of 87.7% (85.3%, 91.1%).
4. Discussion

This study summarized reviews detailing orthodontic implants. Thus, this overview provides a comprehensive analysis of multiple systematic reviews and meta-analyses of orthodontic implants. When performing an overview, the literature must meet the inclusion criteria and cannot be simply excluded or included based on their quality. As overviews summarize all reviews, even low-quality reviews should be included. An inherent limitation to overviews is that not all reviews will be updated as is desired.

There are multiple sources of bias in the overview process. Studies were screened by the Cochrane assessment and were assumed to represent the most comprehensive and consistent evidence. The underlying weakness is that three authors (ZX, SY, ZY) contributed to the comments outlined in this summary, or provided editorial contributions. To reduce this weakness, we used independent objective criteria, including the modified AMSTAR scale to assess the quality and limitations of the included assessments.

Based on the standards of the Cochrane Library, most reviews that met the inclusion criteria were of moderate quality, whereas 1 article was of high quality. In general, the overall quality of implant reviews was low. Additionally, not all studies of medium quality (or higher) collected meta-data. The reason the quality of reviews pertaining to orthodontic implants was low was because

| Review                  | Factors of the AMSTAR | Total |
|-------------------------|------------------------|-------|
| Yi et al[8]             | 0 1 1 0 0 0 1 1 1 0   | 6     |
| Hong et al[24]          | 1 1 1 0 0 0 1 1 1 1   | 9     |
| Alsafadi et al[9]       | 0 0 1 1 0 0 1 1 0 0   | 6     |
| Winsaur et al[11]      | 1 1 0 0 0 1 0 1 0 0   | 4     |
| Dalessandro et al[11]  | 1 0 0 0 0 1 1 1 1 0   | 5     |
| Rodriguez et al[12]    | 0 0 1 1 0 0 1 1 1 0   | 6     |
| Alsamak et al[14]      | 1 1 1 0 0 0 1 0 1 0   | 5     |
| Marquesan et al[15]    | 1 0 0 0 0 1 1 1 0 0   | 4     |
| Tsui et al[3]          | 0 0 1 0 0 1 0 0 0 0   | 3     |
| Alices et al[25]       | 1 1 1 1 0 1 1 1 1 1   | 7     |
| Papageorgiou et al[23] | 1 1 1 1 0 0 1 1 1 1   | 9     |
| Feng et al[26]         | 1 1 1 1 0 0 1 1 1 1   | 7     |
| Li et al[9]            | 1 1 1 0 0 0 1 1 1 1   | 6     |
| Papadopoulos et al[22] | 1 1 1 1 0 0 1 1 1 1   | 9     |
| Fudalei and Antoszewska[7] | 1 1 0 0 0 1 1 1 1 0   | 7     |
| Crismani et al[8]      | 1 0 0 0 0 1 0 1 0 0   | 3     |
| Schatzle et al[9]      | 1 1 0 0 0 1 1 1 1 0   | 8     |
| Reyders et al[23]      | 1 1 1 1 0 0 1 1 1 1   | 6     |
| Chen et al[10]         | 1 1 1 0 0 0 1 1 1 0   | 6     |
| Jamb et al[21]         | 1 1 1 1 1 1 1 1 1 1   | 10    |
| Ghosn et al[8]         | 1 1 1 0 0 0 1 1 1 0   | 5     |

Table 2
AMSTAR score of the 23 reviews included.

### Table 3
Outcomes of success rate of the 7 reviews whose AMSTAR score higher than 6.

| Success rate | Amstar | Comparison                      | Numbers of implants (study) | Absolute effect | Relative effect |
|--------------|--------|--------------------------------|-----------------------------|-----------------|-----------------|
| Papadopoulos et al[22] | 9      | Miniscrew implants             | 297 (8)                     | 87.7% (83.3%, 91.1%) |
| Chen et al[10]           | 6      | Mini-implants                  | 1302 (16)                   | 0%–100%         |
| Yi et al[9]              | 6      | Self-drilling vs. self-tapping | 1308 (8)                    | 0.90 (0.52, 1.52) |
| Papageorgiou et al[23]  | 9      | Mini-screw implants            | 4987 (52)                   | 84.4% (81.9%, 86.7%) |
| Reyders et al[23]        | 9      | Mini-implants                  | 2293 (19)                   | 6.4%–100%       |
| Hong et al[24]           | 9      | Miniscrew implants             | 3473 (17)                   |                 |
| Schatzle et al[9]        | 8      | Onplant                        | 29 (1)                      | 82.6% (64.2%, 94.1%) |
|                           |        | Miniscrew implants             | 2374 (17)                   | 83.6% (70.9%, 86.6%) |
|                           |        | Palatal implants                | 190 (6)                     | 89.5% (81.9%, 93.9%) |
|                           |        | Midplate                       | 586 (7)                     | 92.7% (90.1%, 94.6%) |

AMSTAR = assessment of multiple systematic reviews.
### Table 4
Outcomes of molar movement of the 6 reviews whose AMSTAR is >6.

| Reviews                  | Amstar | Comparison                                      | Mean anchorage loss of MI | Mean difference of anchorage loss ratio Sm-OLP | Average molar distalization | Premolar movement | Molar distal tipping |
|--------------------------|--------|------------------------------------------------|---------------------------|----------------------------------------------|----------------------------|-------------------|---------------------|
| Papadopoulos et al[22]   | 9      | MI vs. traditional anchorage                    | 0.05 mm (95% CI = -0.3 to 0.4) | -0.5 (95% Cl = -0.6 to 0.3)                  |                            |                   |                     |
|                          |        | MI in mandible vs. maxilla                      | -0.6 vs. 0.2 mm           |                                              |                            |                   |                     |
|                          |        | MI in 5.6 vs. palatal                           | -0.2 vs. 1.3 mm           |                                              |                            |                   |                     |
|                          |        | MI of 2 vs. 1                                  | -0.2 vs. 1.3 mm           |                                              |                            |                   |                     |
|                          |        | MI connected directly vs. indirectly            | -0.2 vs. 0.8 mm           |                                              |                            |                   |                     |
|                          |        | Young vs. adult maxilla                         | -0.6 vs. -0.4             |                                              |                            |                   |                     |
|                          |        | Mandible vs. maxilla                            | -0.7 vs. -0.4             |                                              |                            |                   |                     |
| Li et al[2]              | 6      | Midpalatal implant vs. headgear group           | -1.34 mm (-2.02, -0.67)   |                                              |                            |                   |                     |
| Crec et al[13]           | 6      | Skeletal anchorage vs conventional anchorage    | 5.10 mm (-6.09, -4.11) vs. 3.34 mm (-3.85, -2.83) vs. 2.30 mm (1.73, 2.86) | -4.01 mm (-4.80, -3.23) vs. 2.30 mm (1.73, 2.86) vs. |                            |                   |                     |
| Fudalej and Antoszewski[17] | 7     | 3.5–6.4 mm                                      |                            | 0.8 to 12.2 degree                          |                            |                   |                     |
| Jambi[20]                | 10     | Surgical methods vs. conventional methods       |                            |                                              |                            |                   |                     |

AMSTAR = assessment of multiple systematic reviews, CI = confidence interval, MI = miniscrew implant.
the study design of the orthodontic implants wasRCT and most were from perspective and retrospective clinical trials. Thus, trials were unlikely to be blind. Additionally, the duration of orthodontic treatment was long and variable.

Here, we discuss implant success rates and molar movements. We chose a literature score of >6 points and summarized 2 outcomes. High-quality studies were identified that some of them perform meta-analyses. The success rates in high-quality studies were mostly >80%. What’s more, although Reynder et al and Chen et al[16,19] give the results of a large range. Some of them did show extreme circumstance such as very poor bone density and very small sample size that cause the success rate to reach 0. Of course, the immature surgery of implantation is also one of the reasons that cause the total failure. So we can conclude that clinicians can refer the conclusion of the success rate of orthodontic implantation to reach 80%. Additionally, molar movements were superior when implant anchorages were used, compared with those associated with the use of traditional anchorages. Thus, when the planting sites and bones are suitable, orthodontists should use implant anchorages. However, when the patient has poor hygiene and the bone of the implantation site is not sufficiently dense, we recommend a different approach for reinforcing the anchorage.

The high-quality studies analyzed in this research suggest that molar movement is reduced by implants and is superior to traditional anchoring techniques. Thus, if implantation conditions permit, it is recommended that implant anchorages be used.

5. Conclusion

Multiple systematic reviews and meta-analyses have been published on orthodontic implants; however, their qualities vary and only a single review is published in the Cochrane Library database. In this overview, we assessed the quality of such systematic reviews and found that most were of moderate quality. The number of high-quality studies was small. Thus, clinicians should use caution when reviewing such studies. Additionally, the success rates reported between studies were highly variable. Notably, molar movement was reduced when orthodontic implants were used, compared with when traditional anchorages were used.

Author contributions

Conceptualization: F. Sun, J. Lin, T. Cai, X. Zheng, Y. Sun.
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