Author’s response to reviews

Title: Influence of interradicular and palatal placement of orthodontic mini-implants upon the success (survival) rate

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Author’s response to reviews:

To:

Thomas Stamm, Prof
Managing Editor-in-Chief
Head & Face Medicine

Ref.: "Influence of interradicular and palatal placement of orthodontic mini-implants upon the success (survival) rate" (HAFM-D-16-00140)

Dear Professor Stamm,

We found the remarks made by the reviewers very helpful and modified our manuscript accordingly. We payed emphasis on every comment of the reviewers for further clarification and improvement of our work.

I would like to thank you for receiving our revised manuscript. We appreciate your time and look forward to your response.
Our answers can be found in the appendix of this letter

Kind Regards,

Björn Ludwig

Revision Notes

HAFM-D-16-00140

Influence of interradicular and palatal placement of orthodontic mini-implants upon the success (survival) rate

Jan Hourfar; Dirk Bister; Georgios Kanavakis; Jörg A. Lisson; Björn Ludwig Head & Face Medicine

Reviewer reports:

Reviewer #1: "All buccal OMIs were loaded on the day of insertion. Palatal OMIs were loaded within 3 days after placement since a laboratory appliance construction was required. All OMIs were used for direct anchorage. Several biomechanics were applied to the OMIs, all of which produced a force of >2N."

Q1: The primary stability of the MIs is dependent of specific and structural properties of the bones (Cha et al., 2010; Çehreli & Özçirpici, 2012). Does not have too much initial force at buccal MIs?

Thank you. In a similar study by Manni et al., 2011, OMIs were also exposed to loads >2N. They found that immediate loading with latter forces led to even higher success rates compared to delayed loading. Therefore we do not think, that initial force application have compromised the results our investigation.

Q2: Were the forces applied for buccal and palatal MIs different? Is it possible to put both together?

Thank you for your comment! Referring to our research design (as stated in the “Background” section) we do not think that pooling the data is useful for our investigation.
"The success rate was 98.9%. All palatal OMIs in this study were used as anchorage support for maxillary molar distalization [46] (Figure 2a), or for rapid palatal expansion using a hybrid RPE ("hybrid hyrax", Wilmes et al. [45]) (Figure 2b). Both of these appliances were directly connected to the OMIs and applied equally heavy forces (>2N) per implant. Exact force values produced by these appliances have been reported previously [46, 51]. Only 2 out of 190 palatal OMIs were lost. Those were inserted in the same patient, providing anchorage for molar distalization, and had to be removed because they were loose."

Q3: Is it possible to know how many MIs were used for distalization at the palatal area?

Thank you for your question. 90 OMIs (for 45 Distalizers) were inserted in the anterior palate.

"Interradicular OMIs were successful in 71.1% of the cases. The typical use was molar protraction with a force >2N, using standardized Nickel-Titanium (NiTi) coil springs (Figures 1a and 1b, Figure 2c). There was no statistically significant difference in success rates between maxillary inter-radicular and mandibular inter-radicular OMIs (p=0.628)."

Q4: It is known that the mandible (Cheng et al., 2004, Park et al., 2006, Cheng et al. 2007) have shown significant influence in success rates. How many MIs were put in the mandible?

Thank you for your question. 143 OMIs were placed between the roots of teeth in the mandible and 40 of these were lost. 54 OMIs were placed buccal between the roots of teeth in the maxilla and 17 OMIs were lost. No statistical significant difference (p=0.628) was found.

"OMIs inserted in patients older than 30 years were found to have a 29.5% failure rate compared to those used in younger patients that showed lower failure rates of 14.8% (20-30 years) and 13.3% (6-20 years). However, this difference was statistically significant only for the youngest group (6-20 years)."

Q5: Some authors found slightly lower success rate in patients younger than 20 years old (Miyawaki et al., 2003, Chen et al., 2007). It was also found that the maxillary and mandibular cortical bones at commonly used MIs placement sites are thicker in adults than in adolescents (Farnsworth et al., 2011). Was the difference of the number of patients older than 30 a few?

Please see table 2 for information: compared to patients older than 30, the majority of the patients were comparatively young, i.e. 6 to 20 years of age.
"Only in one patient in our cohort both palatal OMIs were lost; these were providing skeletal anchorage for a distalization appliance. Orthodontic mini-implants inserted in the buccal alveolus were successful in 71.1% of all cases and similar values have also been reported by other investigators [10, 11, 17, 24, 38, 39]."

Q6: Some studies, found a high success rate of 85.5% (Park et al., 2006, Miyawaki et al., 2003, Kuroda et al., 2007a, Kim et al., 2010, Reichow et al. 2015), but in your study, the success rate, in the buccal area, was 71.1%. Was it caused only of the high force?

Thank you for comment. As mentioned earlier, in a similar study by Manni et al., 2011, OMIs were also exposed to loads >2N. The authors found, that immediate loading led to even higher success rates compared to delayed loading. Therefore we think, that higher force levels were not an issue in our study.

"of those had been inserted between roots to support space closure mechanics. It appears that the combination of inter-radicular insertion and type of use resulted in a poorer survival rate."

Q7: The operators learning curve (Kim et al., 2010, Oh et al., 2011), high mandibular plane (Miyawaki et al., 2003, Moon et al., 2010), systemic alterations in the bone metabolism, medication, heavy smoking (Melsen, 2005), have shown significant influence on success rates. Were those items checked?

Thank you for your comment. We acknowledge the multitude of co-factors possibly contributing to lower success rates. All OMIs were inserted by an experienced clinician. Patients in our sample were young and no medical issues were known. At this young age, heavy smoking is not usually prevalent. In addition to that (and confirming our data) a very recent ten-year cross sectional study by Melo et al. (2016; PMID:27783770DOI: 10.1590/1807-3107BOR-2016.vol30.0124) investigating 1356 OMIs installed in 570 patients revealed that patient-related factors, such as sex, age, smoking habit and craniofacial pattern, do not affect MSI success.

Reviewer #3: Reviewer Recommendations and Comments for Manuscript Number HAFM-D-16-00140

Influence of interradicular and palatal placement of orthodontic mini-implants upon the success (survival) rate

by Jan Hourfar, Dirk Bister, Georgios Kanavakis, Jörg A. Lisson, Björn Ludwig

Article type: Research
Referee: Cosimo Nardi

Recommendation: Major revision

Comments to Author:

Outline. Devices for skeletal anchorage in orthodontics improve biomechanical possibilities for tooth movement. Hence, to know what are the insertion sites with high success rate is critical since it will affect clinical behavior.

Main strengths

- Wide sample size.

Thank you.

- Patients followed up.

Thank you.

Main Limitations

- Topic extensively investigated. Lack of novelty.

Thank you for your comment. We agree that the topic itself has been extensively investigated. Due to its significant relevance for orthodontics further research in this field is needed because many questions still remain unanswered. The latter notion is supported by systematic reviews and meta analyses (Papageorgiou et al, 2012, AJODO; Dalessandri et al. 2014, EJO). We strongly disagree with the remark “Lack of novelty”. In the “Background” section we clearly stated: “Success rates of two joined palatal OMIs have not yet been compared to success rates of appliances supported by inter-radicular insertion sites and to our knowledge no conclusive data on this subject is currently available.”

- Strengths and limitations of the study are missing.

Thank you for your comment! Please see below, we have added a relevant section.
- Too many outdated references. I can see only 5 articles out of 60 from 2013 to 2017.

Thank you for your comment. Following your recommendation, we added some newer references, however older references can still be valuable to support arguments.

General Recommendations

- What controversies can arise from this study? Describe strengths and limitations of your research. How the limitations can be resolved?

Thank you for your comment. Following your recommendation, we added a paragraph to the revised version of the manuscript.

- Need better explanations about what the study adds to the available evidence.

Thank you. We stated (in the “Background” section) what our study adds to the available evidence: “Success rates of two joined palatal OMIs have not yet been compared to success rates of appliances supported by inter-radicular insertion sites and to our knowledge no conclusive data on this subject is currently available.

- Include Future research directions.

Thank you for your comment. We have added a paragraph to the revised version of the manuscript.

Abstract

Well written

Thank you.

Background

- Please, remove the names Männchen et al. and Schätzle et al. Keep only the reference citation number.
Thank you, we removed names and the paragraph was rephrased.

- The aim of the research is not linked with the conclusions. The aim of the abstract is more clear than the aim of the background. You should mention what are the mini-implant insertion sites.

Thank you. We amended the aim of the background sections in the final version of the manuscript.

Methods

- Please, remove the following sentence at the beginning of the methods section: This study investigated the success rates of OMIs inserted for orthodontic anchorage. I think that methods is not the appropriate section for this statement.

Thank you. We deleted the sentence in the revised version of our manuscript.

- The brand of mini-implants is repeated twice. Remove one of them.

Thank you. We deleted the first citation of the brand in the revised version of our manuscript.

- What does the following sentence mean? "All OMIs were inserted in an orthodontic practice following a standardized protocol". Which standardized protocol did you follow?

Thank you, we agree with you that our sentence was unclear. We modified it so, it is easier to understand.

Results

- Please, remove the sentence "Data were divided into groups based on anatomical position; 1. Anterior palate and 2. buccal inter-radicular sites." You already described it in the methods. Results is not the appropriate section for this statement.

Thank you. We removed this sentence from the revised version of the manuscript.
The paragraphs Palatal mini-implants and Interradicular mini-implants are not necessary in this section because the text is not extensive and is easy to organize. I suggest you remove the two above mentioned paragraph. Keep the subheading "Analysis by anatomical site" in which you can also include the first sentence of the results section. Remove the second sentence of the results section "Data were divided into groups based on anatomical position; 1. Anterior palate and 2. buccal inter-radicular sites." You already described it in the Methods.

Thank you. The paragraphs were reorganized in the revised version of the manuscript.

Please, include the following sentences in the Methods section since they are not results: "All palatal OMIs in this study were used as anchorage support for maxillary molar distalization [46] (Figure 2a), or for rapid palatal expansion using a hybrid RPE ("hybrid hyrax", Wilmes et al. [45]) (Figure 2b). Both of these appliances were directly connected to the OMIs and applied equally heavy forces (>2N) per implant. Exact force values produced by these appliances have been reported previously [46, 51]."

Thank you. We moved the latter paragraph to the “Methods” section.

Please, include the following sentence in the Methods section since it is not a result: "The typical use was molar protraction with a force >2N, using standardized Nickel-Titanium (NiTi) coil springs (Figures 1a and 1b, Figure 2c)."

Thank you. We moved the latter sentence to the “Methods” section.

Discussion

You stated: "Success rates were significantly influenced by the combination of load and insertion site. Palatal orthodontic mini-implants loaded directly with heavy forces (>2N) to support distalization appliances or hybrid RPE were successful in 98.9% of cases. Buccal mini implants employed to e.g. support molar protraction were less successful (71.1%)." It is already stated both in the results and discussion. It is a repetition.

Thank you. We rephrased the paragraph to avoid repetition.

Please, remove the following sentence. Patient-related parameters gender, age and oral hygiene were also assessed (Table 2). It is a further repetition.
Thank you. We removed this sentence from the revised version of the manuscript.

- You stated: "Throughout the entire study period" Which is the entire study period. Include it in methods section.

Thank you. We included this in the revised version of the manuscript.

Conclusions

- You attached importance to the force of the load (greater than 2N). Why did not you mention the load in the background and especially in the aim?

We only mentioned the load to state that OMIs were loaded with equal forces.

- The load is repeated twice. Remove the last one.

Thank you, we removed the last “load” was removed from the revised version of the manuscript.

- I suggest you include the percentage of the buccal implant success rates.

We added the success rate of buccal orthodontic mini-implants in the conclusion.

Figures

OK

Thank you.

Figure captions

Make (a) (b) and c) uniform.

Thank you for your comment! This was changed in the revised version of the figures.

Tables

Top-left boxes had to be completed in table 1.
Thank you for your comment! We added “Insertion site” to the top left cell of table 1 in the revised version of the manuscript.

Some boxes had to be completed in table 2.

Thank you for your comment. All the tables are complete and provide relevant data.

Table captions

OK

Thank you.