READER'S FORUM

Soon-Dong Yun, Sung-Hwan Choi, Jung-Yul Cha,
Hyung-Seog Yu, Kwang-Mahn Kim, Jin Kim,
Chung-Ju Hwang

Effects of recycling on the biomechanical
characteristics of retrieved orthodontic
miniscrews.

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I want to thank the authors of this interesting article as I find this study provides important answers to what many orthodontists have asked. Since miniscrews became an integral part of contemporary orthodontic practice, some of failed miniscrews have been re-sued for various reasons. Yet, up to date, there is no firmly agreed consensus in our profession regarding this area, and this investigation attempts to show how the relevant factors come into the picture when we try to decide whether to re-use a failed miniscrew or simply grab a new one.

Q1. A, B, C and D, a total of four groups were included in this study. Rather than evenly distributing the sample size among the groups, the authors chose to assign only 4 machined surfaces (MS) and 4 etched surfaces (ES) to groups A and B, but 20 MS and 20 ES to groups C and D. Also, no orthodontic force load was applied to the miniscrews placed in the maxilla during the 4 weeks follow up period, which in my opinion may have been a closer reflection of clinical situations. I would appreciate the authors' comments on the study design.

Q2. While it was reported that the majority of retrieved miniscrews (greater than 84.5%) displayed significant tip deformation,¹ about 40% of recycled MS and ES failed to penetrate the cortical bone area in this study. Apparently, some of the retrieved miniscrews with deformed tips were able to penetrate the cortical bone. What is the authors' view on possible association between the degree of deformation of the miniscrew tip and factors such as insertion sites or presence/absence of root contact during the initial insertion?

Q3. Based on the findings of this study what is the authors' recommendation to ensure greater likelihood of success of the retrieved miniscrews? Also, if any, what is the clinical guideline that is followed by the authors regarding the reinsertion of miniscrews?

Questioned by
Ju-Yeon Nam
Private Practice, Gimpo, Korea

Thank you for your comments. We have tried our best to answer the questions you have presented.

A1. In clinical practice, we sometimes experience miniscrew failure even though we did not apply any orthodontic force for four weeks after placement. We designed the experiment to reflect this situation. A total 56 retrieved orthodontic miniscrews (28 MS and 28 ES) and 40 unused miniscrews were prepared for this study. These miniscrews were further divided into four groups according to the assigned recycling procedure and were used for various experiments as Table 1.

Table 1. Description of sample size according to the type of experiment conducted

Group	Total number of samples ready	Type of experiment	Number of samples used
A	4 MS, 4 ES	Scanning electron microscopy	4 MS, 4 ES
		Energy-dispersive X-ray spectrometry	
B	4 MS, 4 ES	Scanning electron microscopy	4 MS, 4 ES
		Energy-dispersive X-ray spectrometry	
C	20 MS, 20 ES	Scanning electron microscopy	4 MS, 4 ES
		Energy-dispersive X-ray spectrometry	
		Insertion time	5 MS, 5 ES
		Maximum insertion torque	
		Biologic responses	8 MS, 8 ES
D	20 MS, 20 ES	Scanning electron microscopy	4 MS, 4 ES
		Energy-dispersive X-ray spectrometry	
		Insertion time	5 MS, 5 ES
		Maximum insertion torque	
		Biologic responses	8 MS, 8 ES

Group A, Airwater spray; group B, mechanical cleaning; group C, mechanical and chemical cleaning; group D, unused miniscrews; MS, machined surface; ES, etched surface.

A2. In this study, in order to minimize the effects of various factors (placement sites, durations of use, applied force, and storage periods after retrieval) on the retrieved miniscrews, we inserted unused miniscrews in the maxillae of 4 beagle dogs with similar characteristics and maintained them for 4 weeks before retrieval. However, it did not reflect actual clinical factors, so the degree of deformation of the miniscrew tip was not higher than that of a previous study. Therefore, it is necessary to investigate the degree of damage of miniscrew tip according to the hardness of bone surface or the presence of root contact on the site to be implanted, regardless of maxilla and mandible.

A3. The results of our study showed that used orthodontic miniscrews can achieve a surface composition similar to that of unused screws with mechanical and chemical cleaning used together yielding the best effects.

However, screw tip deformation remains a concern and biological responses may differ between recycled and unused screws. Therefore, despite the many limitations of this study, we concluded that the reuse of recycled orthodontic miniscrews may not be feasible from the biomechanical aspect.

Replied by

Chung-Ju Hwang

Department of Orthodontics, The Institute of Cranio-Facial Deformity, College of Dentistry, Yonsei University, Seoul, Korea

Reference

1. Chung CJ, Jung KY, Choi YJ, Kim KH. Biomechanical characteristics and reinsertion guidelines for retrieved orthodontic miniscrews. *Angle Orthod* 2014;84:878-84.

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