

## Stability of Mini-screws on Buccal Shelves: A Retrospective Study of 1680 Mini-screw Insertions by the Same Orthodontist

**Background:** Previous studies on inter-radicular screw insertion have shown that there was a significantly higher failure rate for screws inserted through movable mucosa compared to attached gingiva. Furthermore, there are no reports about the stability of the extra-radicular screw insertion into the buccal shelf of the mandible.<sup>1-5</sup> This is an important area of research because extra-radicular mini-screws placed in the buccal shelf are effective anchorage, for retracting the entire lower dentition to correct Class III malocclusion.<sup>6</sup> It is important to understand the success rate and stability for buccal shelf miniscrews placed in different locations.

**Objective:** Compare the failure rates for buccal shelf screws inserted through movable mucosal (MM) as opposed to attached gingiva (AG).

**Design:** Retrospective review.

**Participants:** 840 patients (405 males; 435 females, with the age of  $16 \pm 5$  years) received buccal shelf screw placements that were performed by the same orthodontist between 2009 and 2012, using standardized procedures.<sup>7</sup>

**Methods:** A total of 1680 mini-screws (2x12 mm, stainless steel) were placed on buccal shelves; 1286 mini-screws were in movable mucosa and 394 mini-

screws penetrated attached gingiva. All mini-screws were placed as parallel as possible to the lower 1<sup>st</sup> and 2<sup>nd</sup> molars roots (*extra-radicular approach*). Screw heads, at the insertion point, were at least 5mm above the soft tissue. All mini-screws were immediately loaded with a force ranging from 8 oz. to 14 oz., according to the patients' age. The stability of the buccal shelf screws was tested up to 4 months after placement.

**Result:** 121 mini-screws out of 1680 failed during the course of study. Failure was defined as loose screws that were exfoliated or removed by the clinician. The overall failure rate was 7.2% for the entire sample ( $n=1680$ ). In the movable mucosa group, 94 out of 1286 (7.31%) failed; 27 out of 394 (6.85%) failed in the attached gingiva group. A  $\chi^2$  test showed there was no statistical significance of the failure rates between miniscrews inserted through MM compared to AG.

**Conclusions:** Buccal shelf mini-screws can be placed in either the movable mucosa or attached gingiva. In terms of stability, there was a high success rate for both groups (~93%). This is clinically valuable information because bone buccal to the roots of the teeth is more directly accessible by penetrating the movable mucosa apical to the mucogingival junction. Also many patients have a minimal width of attached gingiva buccal to the molars. Thus in

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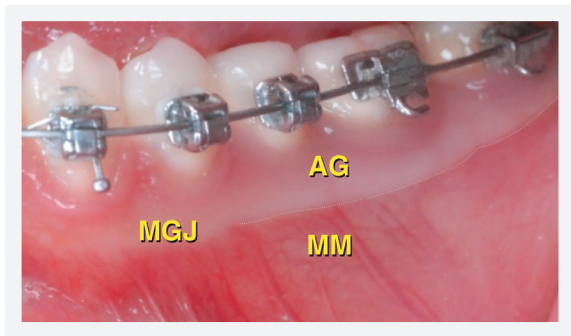
International Journal of Orthodontics & Implantology (Right)



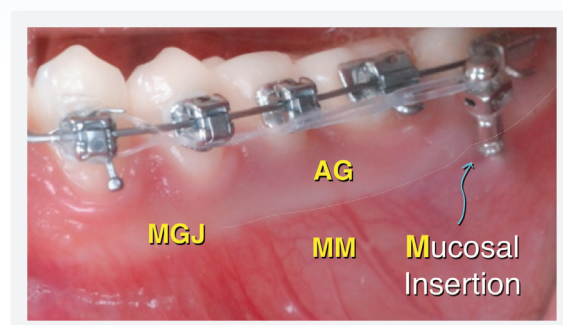
**Fig. 1:**  
Between the 1<sup>st</sup> and 2<sup>nd</sup> molars, a larger buccal shelf bone volume is present.



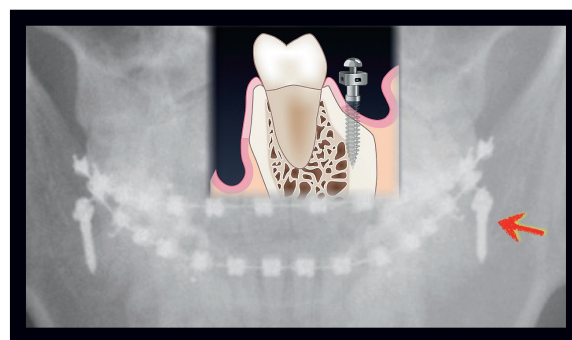
**Fig. 2:**  
There is a safe zone between the 1<sup>st</sup> and 2<sup>nd</sup> molar roots because the inferior alveolar neurovascular bundle is apical to the roots of the teeth.



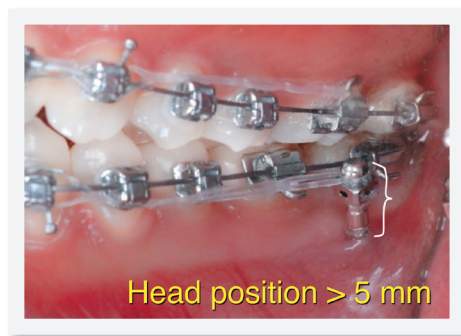
**Fig. 3:**  
The mucogingival junction (MGJ) separates the attached gingiva (AG) and the movable mucosa (MM).



**Fig. 4:**  
Mucosal insertion refers to the position of the buccal shelf screw, when it is inserted in the movable mucosa.



**Fig. 5:**  
The extra-radicular approach, utilizing the buccal shelves, is optimized by placing miniscrews parallel to the lower 1<sup>st</sup> and 2<sup>nd</sup> molar roots as shown in this radiograph.



**Fig. 6:**  
In the extra-radicular approach to the buccal shelves, the insertion point of all screw heads is at least 5 mm above the soft tissue, in order to prevent the soft tissue overgrowth.

this retrospective study, the majority of the buccal shelf mini-screws (1286/1680) were placed through movable mucosa. Due to the elevated position of the screw head, mucosal insertion does not jeopardize the health of the soft tissue. For extra-radicular screw placement, insertion through the movable mucosa is often the preferred procedure for buccal shelf mini-screws, because it accesses more bone volume, facilitates the surgical procedure, and is usually more comfortable for the patient. It is important for the clinician to realize that these advantages can be realized without sacrificing screw stability.

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