



# Effects of tooth root contact on the stability of orthodontic anchor screws in the maxilla: Comparison between self-drilling and self-tapping methods

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**Introduction:** We evaluated the effects of screw placement angle on the frequency of root contact and the effects of root contact on screw stability, comparing self-drilling and self-tapping methods. **Methods:** In total, 80 patients with 142 screws (diameter, 1.6 mm; length, 8.0 mm) were included. Cone-beam computed tomography images were taken. Cortical bone thickness, interroot distance, shortest distance between the screw and adjacent tooth root, and screw placement angle were measured. **Results:** The success rates of the screws were 91.5% for the self-drilling method and 94.4% for the self-tapping method ( $P > 0.05$ ). The self-drilling screws tended to contact the distal tooth roots in the right maxilla. In the self-drilling method, the failure rate was significantly higher in the root contact group than in the no-contact group ( $P < 0.05$ ). **Conclusions:** The success rate was not significantly different between the self-drilling and the self-tapping methods in the maxilla. Avoidance of tooth root contact may improve the success rate more in the self-drilling method than in the self-tapping method. (Am J Orthod Dentofacial Orthop 2015;147:483-91)

In clinical orthodontics, for some patients a sufficient treatment outcome cannot be achieved because reciprocal tooth movement occurs. Thus, anchorage control becomes important and can affect treatment outcomes considerably. Intraoral devices or extraoral anchorages, such as lingual arch appliances or headgear, have been used in clinics. The absolute anchorage at the least anteroposterior direction would be achieved using headgear constantly as instructed, but the treatment results depend on the patient's cooperation.

Orthodontic anchor screws are frequently used as an absolute anchorage device because the screws can be placed readily at various sites such as in alveolar bone or palatal bone with minimal surgical invasiveness.<sup>1-7</sup> Anchorage by a screw enables more effective treatment with minimum anchorage loss and greater anterior distal movement than conventional anchorage devices such as headgear. These positive treatment outcomes can be obtained even without the patient's cooperation.<sup>8-11</sup> Upadhyay et al<sup>12-14</sup> and Nagaraj et al<sup>15</sup> reported positive treatment outcomes using screws for retraction and depression of anterior teeth, and protraction of molars.

However, several researchers have reported loosening of screws during orthodontic treatment.<sup>16,17</sup> Papadopoulos et al<sup>8</sup> reported that the success rate of the screw was 87.7% in a meta-analysis. A screw is typically placed in small gaps between adjacent teeth, possibly inducing root contact that might contribute to the failure of the screw. Kuroda et al<sup>18</sup> and Chen et al<sup>19</sup> reported that root proximity contributed significantly to screw failure. Kim and Kim<sup>20</sup> reported that screws in contact with the adjacent tooth root may cause or worsen root external resorption. Papageorgiou et al<sup>21</sup> also performed a meta-analysis to summarize current knowledge regarding the failure rates of screws and to

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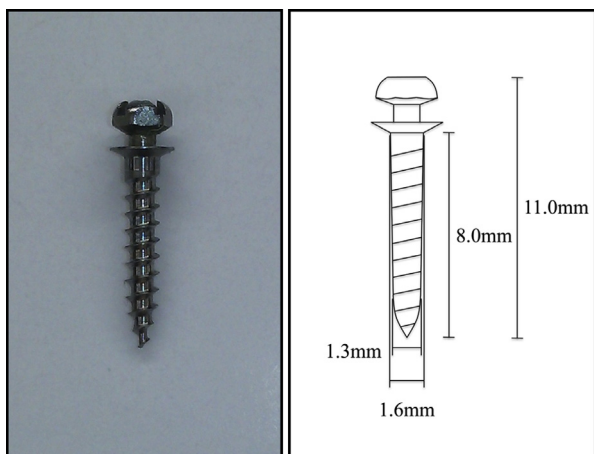
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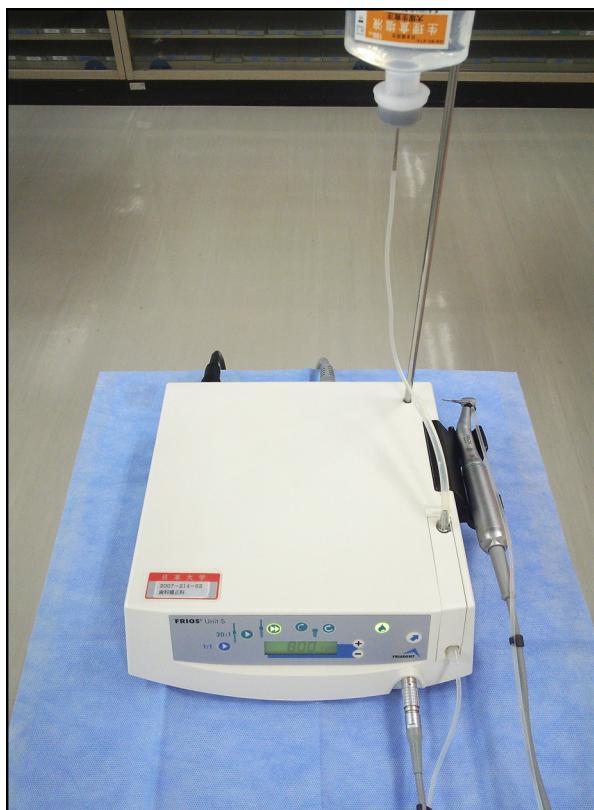
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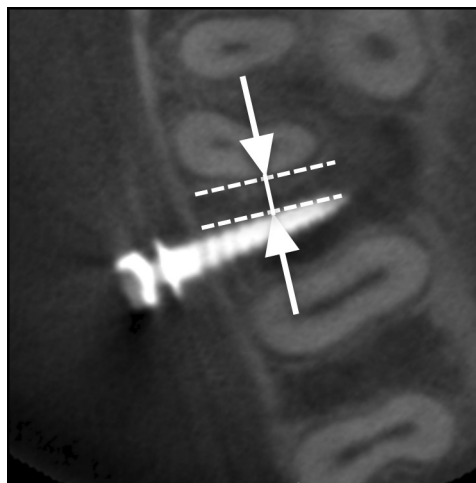


**Fig 1.** An anchorage screw 1.6 mm in diameter and 8.0 mm in length was used.

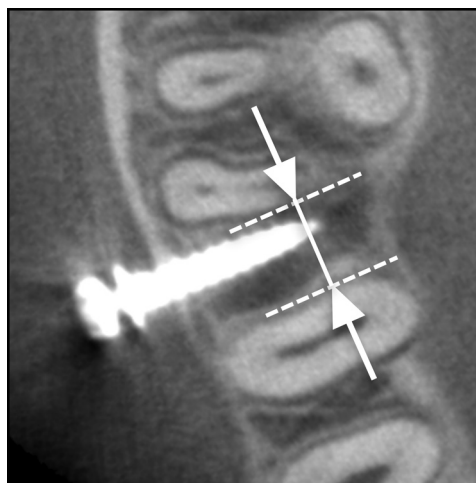


**Fig 2.** A bone drill was used in the self-tapping method.

identify significant risk factors affecting failure rates. They reported that the failure rate of screws was 13.5%, and screws with tooth root contact had a failure rate 3 times as large as those with no contact. Thus, tooth root contact by the screw should be avoided.



**Fig 3.** The mesial and distal distances between the screw and the adjacent tooth root were measured.



**Fig 4.** The interroot distance was measured at the height of the placement point of the screw.

Two methods are used for the placement of screws: the self-tapping method, requiring the preparation of a pilot hole before insertion, and the self-drilling method, which enables the screw to be inserted without predrilling.<sup>22</sup> Tachibana et al<sup>23</sup> recommended using the self-drilling method or the self-tapping method, the latter by drilling a pilot hole of 1.0 mm in diameter when a screw of 1.6 mm in diameter was placed on the maxillary buccal alveolar bone. Son et al<sup>24</sup> compared the 2 methods to identify the influence of root contact on the stability of the screw, and they reported that the self-drilling method showed significantly higher mobility than did the self-tapping method. However, screw mobility does not necessarily result in screw

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