

Mini-screws success rates sufficient for orthodontic treatment

Abstracted from

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Question: What are the success rates for mini-screws use in orthodontics?

Data sources Medline.

Study selection Clinical trials of orthodontic mini-screws with a minimum of 30 cases providing data on the patient, mini-screw, surgery and loading available for correlation with the mini-screws' success rates in English or German were included.

Data extraction and synthesis Data were extracted that correlated with the miniscrews' success rate: patient sex and age, screw length and diameter, method and location of placement, time and amount of loading. The statistical analyses were performed using SPSS software (version 13 for Mac OS X, SPSS, Chicago, Ill).

Results Fourteen clinical trials (452 patients and 1519 screws) were included, with overall success rates ranging from 59.4% to 100%. The mean success rate was 83.6% ±10.2%. Screw diameters of 1 to 1.1 mm yielded significantly lower success rates than those of 1.5 to 2.3 mm. One study reported significantly lower success rates for 6 mm vs 8 mm long mini-screws (72% vs 90%). Screw placement with or without a surgical flap showed contradictory results between studies. Three studies showed significantly higher success rates for maxillary than for mandibular screws. Loading and healing periods were not significant in the mini-screws' success rates. There was no influence of patient sex and one study found significantly greater success in patients over 30 years of age.

Conclusions All 14 articles described success rates sufficient for orthodontic treatment. Placement protocols varied markedly. Screws under 8 mm in length and 1.2 mm in diameter should be avoided. Immediate or early loading up to 200 cN was adequate and showed no significant influence on screw stability.

Commentary

The term "mini-screw" is one of a number used to describe small screws, surgically placed through alveolar cortical bone to be used as temporary anchorage devices in orthodontic treatment. They have become increasingly prevalent in the past decade as they confer a number of advantages when compared to traditional intra-oral and extra-oral anchorage reinforcement.

There is marked heterogeneity in mini-screw design and placement techniques. This review was constructed with the aim of analysing the success rates of mini-screws with a view to defining a set of guidelines for their selection and application. The validity of this review is compromised somewhat by the use of only one database in

collating any relevant articles; the paucity of search terms is also discouraging. However, upon comparison with other relevant papers,^{1,2} it does appear that the studies included are representative of the available literature. A detailed analysis of each article would also have been desirable; however, information such as the design of each study was unreported. Given one of the main aims was to discern the success rates of mini-screws, a discussion of what is deemed a success would seem to be appropriate. Although not forthcoming, it is pertinent to realise that 'success' differs in the discussed articles. It is most frequently seen as gaining 'anchorage for required treatment time' and so mobile/displaced mini-screws can still be seen as a success provided they can still be used to reinforce anchorage.

Accepting these issues, the quoted success rate of over 80% is comparable with that derived in other reviews on the subject. Of worthy mention is one such paper containing more contemporary data on an additional five studies yielding an increase of over 800 mini-screws in its analysis.³ However, the overall success rate changes little.

When comparing the time allowed for the mini-screw to heal before loading, along with the magnitude of the subsequently applied force, there was considerable variation between the studies and within study groups. Along with the poorer performance observed with mini-screws of less than 1.2mm diameter and 8mm in length, these areas generate further avenues for investigation.

Given that this area of orthodontic research is still in its infancy, the data shown here can be seen as a starting point for the design of suitable prospective studies to help elucidate the most efficacious method for mini-screw placement.

Practice points

- Mini-screws can be used successfully to reinforce anchorage in orthodontic treatment with current data suggesting a failure rate of less than one in five.
- A standardised protocol yielding the highest chance of success remains elusive

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