

Q&A

Miniscrew Loosening



Dr. Birte Melsen

What should the doctor do when a miniscrew loosens?

When a temporary anchorage device (TAD) is lost, it is important to analyze the reason why it was lost. Was it caused by the selection of the TAD, the doctor, or the patient? Was it lost shortly after insertion or later, having served as anchorage for part of the treatment?

TAD Selection

According to several analyses, the selection of the TAD has little influence, as long as the type of TAD in question was successfully inserted in other sites or in other patients for the same type of treatment.¹⁻⁴

The Doctor: Miniscrew Insertion

Timing of the failure can give an indication of the cause for the failure. If the failure occurs immediately after insertion, the reason is either the site or the insertion procedure. The bone at the site may be insufficient for primary stability⁵; if that is the case, a different site has to be found. If suitable bone quality and quantity cannot be found

along the line of action of the force, the TAD has to be placed in a region with better bone and used indirectly (Fig. 1).

Other reasons for early failure may be wiggling during insertion, which can lead to an abundance of microfractures, or overturning, which can cause loosening in the same way as continuing to turn a screw into a wall after the screw head has made contact with the wall. Whereas wiggling will lead to failure within the first weeks, overturning will lead to immediate failure.^{6,7}

The Doctor: Miniscrew Loading

A third factor contributing to an early failure could be the type of loading. The force level is too high if it results in a strain value generating a resorption.⁸ The strain level is a product of the force magnitude, the line of action of the force, and the bone quantity and quality. Consequently, it is advisable to start with a low force, such as a nickel titanium coil spring or a cantilever delivering a known force of about 50cN. Although the force level as studied on bovine ribs cannot be transferred to the human facial skeleton, a study indicates that the cut of the threaded portion has an impact on the reaction to loading.⁹ Since the force contributes to an increase in density of the bone surrounding the mini-implant, the force level can gradually be increased.

Application of a moment around the long axis of the screw by unscrewing the mini-implant immediately following insertion will lead to instant failure. If, on the other hand, a moment is added around the long axis of the screw after a healing period, it will generate a shearing force and therefore represents a risk of loosening, regardless of

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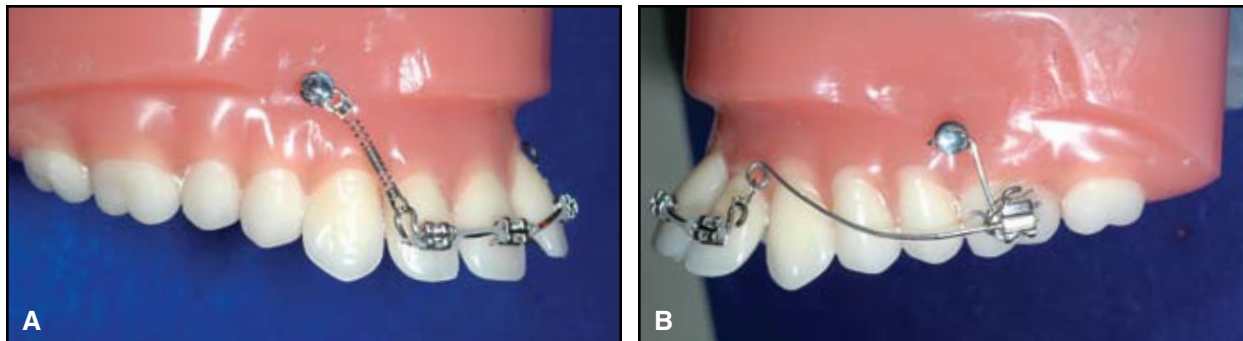


Fig. 1 A. Direct skeletal anchorage: Intrusion against screw placed in line of action of desired force. B. Indirect skeletal anchorage: Intrusion with cantilever extending from molar and consolidated against screw. In case of molar tipping, screw will load with force perpendicular to long axis.

whether the moment is in the direction of insertion or “unscrewing”,¹⁰

Late Failure

Late failure occurs if primary stability is not succeeded by secondary stability and the mini-implants have to serve longer than the cortical remodeling that ensures primary stability. Conical screws provide better stability, but perform less well in pull-out tests; furthermore, the ischemia of the cortex generated during insertion may later lead to loosening.^{6,11} Another reason for late failure may be a change in the local environment: inflammation¹² due to root proximity, or a local increase in turnover—e.g., in relation to resorption of a deciduous tooth.

A loosened screw can be tightened and then serve for an additional short period, but has not been reported to regain stability for a longer period. Considering that bone turnover increases around the screw in an area more than twice the diameter of the screw, a new insertion site has to be found farther from the failed screw. The same criteria apply as with the original insertion: if suitable bone quality and quantity cannot be found along the line of action of the force, the TAD has to be placed in a region with better bone and used indirectly.

A question that has been addressed lately is whether the same screw can be inserted again.¹³

Although the reduction in the success rate was not significantly lower in this study, the tendency was for an increased failure rate with a screw that had already been used. With this in mind, and considering sterilization requirements, it cannot be recommended to reinstall a lost screw.

The Patient

Although there are no specific studies confirming this, it can be anticipated that the factors that have an impact on the prognosis of dental implants will also have an influence on the failure rate of mini-implants. These include smoking, alcoholism, and medication influencing bone turnover. That the risk of losing an implant increases if one has already lost one implant indirectly confirms this hypothesis. Before replacing a lost implant, care should therefore be taken to ensure that general factors are not involved in the loss of the first screw.

Conclusion

In short, the answer to the question will be: In case of an early loss, make sure to take the TAD, insertion site, and loading into consideration and choose a new site. In case of a late loss, control the local environment and root proximity and choose a new site, provided that the patient’s general metabolism was not the cause of the first failure.

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