# Systematic approach to the Insertion of mini-implants As additional pillars

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Mini dental implants have been available in Germany for more than ten years, have been approved for the long-term stabilization of dental prostheses and have since been used by millions. In my practice in Drensteinfurt, the one-piece implants with reduced diameter have been in regular use since 2001, since 2003 also in the indication of pillar augmentation for anchoring partial dentures. In addition to full denture stabilization, this is certainly their greatest potential

According to statistical data, the trend towards the partial denture in Germany and other industrial nations is favored by two developments: Demographic change, with an increasing proportion of older patients and the general improvement in oral health, which leads to a lower percentage of edentulousness [1, 2]. However, since the follow-up effort for partial dentures is great and the most common problem in a lack of stability and in the lower jaw is often a low retention [3, 4], it is important to develop solutions for secure prosthesis anchoring.

These include pillar augmentation with MDI mini dental implants placed at strategically important positions in the jaw. The fewer abutment teeth are present, the worse the prognosis of the residual dentition [5]. This is due to the increased load on the individual tooth, which can lead to a fracture or increased periodontal mobility and ultimately to tooth loss. By inserting mini dental implants, it is possible to increase the support polygon and thus to increase the stability of the prosthesis, to reduce tilting moments and to reduce the load on the natural abutment teeth. The consequences are, in our experience, in the short term a significantly increased patient comfort and long-term prolonged preservation of the remaining teeth. It should be emphasized that mini-implants require less surgical and financial expenditure compared to conventional implants and are therefore also suitable as a treatment option for patients with an anamnestic history.

## Planning additional pillars

So far, the main challenge has been to determine if and how many (mini) implants are needed to improve the stability and retention of a partial denture. Existing classification systems for the classification of the gap dentition [6, 7] were purely descriptive and do not allow to derive direct recommendations on the number and positioning of implants. To provide users with a decision-making tool to evaluate the baseline and identify where to post MDI, a group of implant dentists with many years of MDI experience, including myself, has been working together developed a planning scheme with MDI and the University of Greifswald (Fig. 1 and 2). This is based on the recommendation of the implantology companies, at least six implants for removable dentures in the edentulous maxilla and at least four implants in the lower jaw. The number is reduced depending on the availability, position and value of remaining teeth.

## Classification and planning scheme

To reduce complexity, the newly developed classification for pillar augmentation with MDI is analyzed at quadrant level. There are six classes (class 0 to class 5) for the upper and lower jaws, which are based on the value of different teeth. It is assumed that anterior teeth have the least value, followed by premolars, molars and canines with the highest value. Depending on the class, recommendations are given for the number and position of strategic and



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optional implants. Strategic implants are designed to increase the support polygon and represent the minimum number of MDIs required. Optional implants may be added as needed to compensate for potential weaknesses, such as periodontal damage to abutment teeth or increased stress from fixed dentures in the opposing jaw. Class 0 describes the situation of edentulousness, in which six strategic mini dental implants have to be inserted in the upper jaw and four in the lower jaw analogous to the recommendation of the implantology companies. The same number of strategic implants is recommended if only incisors are present, except that only one tooth is present in class 2, and several teeth are from position 4 in class 3. Thus, for class 2 in the maxilla, the insertion of two, provided in the lower jaw of a strategic MDI, class 3 requires a maximum of one strategic mini-implant in both jaws. If the canine is present (class 4 = without tooth from position 4 / class 5 = at least one additional tooth from position 4), then in both jaws no more strategic implants are to be inserted. In principle, optional implants may be useful in all classes, but their position and number must be determined individually by the treating dentist depending on the patient case. The entire procedure for the use of MDI mini dental implants in the indication of pillar augmentation is presented below by way of example.

## Patient case

The patient, born in 1940, was sent to our practice by his spouse. This had previously presented problems with her alio loco-made telescopic prosthesis, because she had learned of the therapy option with mini implants in an event in the nursing home. She was informed that the few remaining teeth were overstressed and fractures threatened, and MDI mini dental implants were subsequently inserted. Since she was very satisfied with the course of treatment and the result, she asked her husband to also have the stability of his telescopically-supported maxillary denture checked on three natural abutment teeth. In practice, a weakened structure was also found in him. Particularly problematic was the fact that the lower jaw was still almost completely dented, because the lack of balance between the two jaws holds a high risk for the stability of the supply in the upper jaw. Due to the positive experiences of his wife with the minimally invasive surgery and at the same time low cost, it was decided to use mini dental implants in the upper jaw to improve the statics.

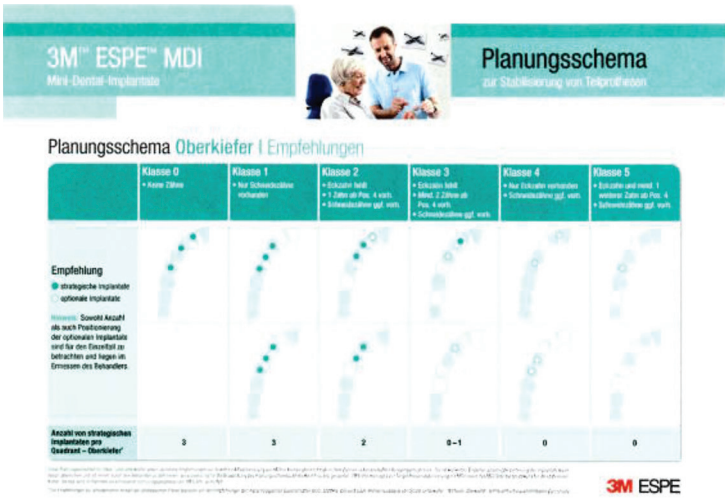


*Fig. 1: Planning scheme for the strategic pillar augmentation of partial dentures in the maxilla ...*

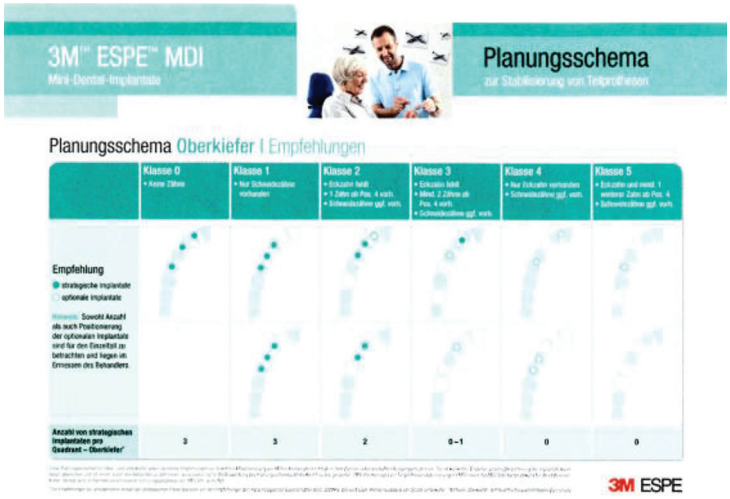


*Fig. 2: ... as well as in the lower jaw.*

## Implant planning

The anterior teeth 11 and 21 as well as the canine 13 were present (Fig. 3). According to the planning scheme, this corresponds to class 4 in the 1st quadrant, in which only mini-implants are optional, and class 1 in the 2nd square cent. Here, as in Toothless Kiefer, three strategic MDI are planned. To increase stability and balance with the opposing jaw, it was decided to position an optional implant in regions 14 to 15 as far as possible. Due to the lower density of the bone in the upper jaw, mini-implants with a larger diameter and more aggressive thread than in the lower jaw should always be chosen, in the present case implants with a diameter of 2.4 mm and a length of 13 mm were used. The exact planning of the implant positions was based on the X-ray image, taking into account the important ana-

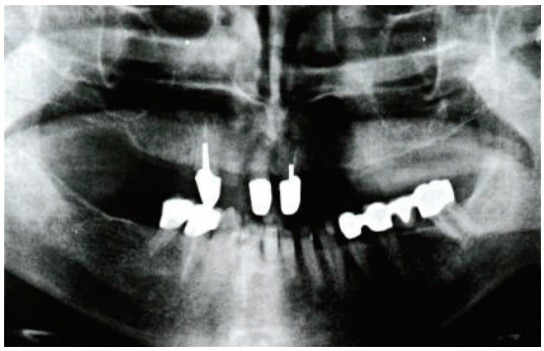

*Fig. 3: X-ray of the initial situation: The new planning scheme is a Class4 in the 1st quadrant and Class 1 in the 2nd quadrant.*

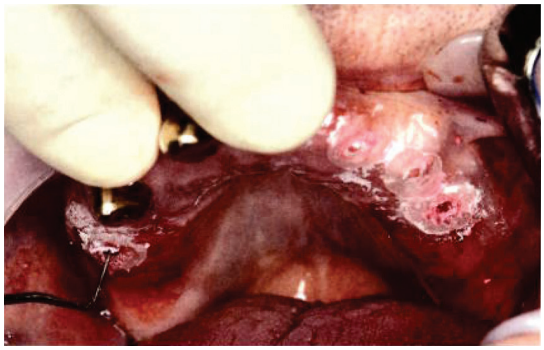

*Fig. 4: Marking the implantation positions with template and probe.*

*Fig. 5: Pilot bore: The angulation is oriented to the insertion direction of the telescope crowns.*

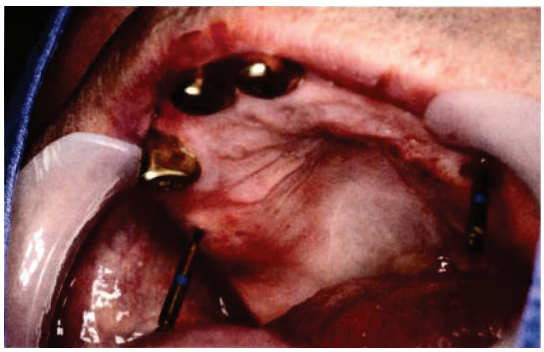

*Fig. 6: Pilot drills used as paralleling aids.*

tomical structures - in this case, the position of the antrum. The planned positions were drawn on the model and then made on this a ball stencil. The steel balls marked the implant positions. By retouching the X-ray template, a drilling template was created which was used for the intraoral marking of the implant positions by means of a probe (Fig. 4)

**Implant insertion**

Since the distal implants are most important for the stability of the restoration, they were first inserted. For this purpose, a pilot bore was made in the first step (Fig. 5). In order to enable the combination of natural teeth and the one-piece mini dental implants, the angulation of the drill must be oriented in the insertion direction of the telescopic crowns. The disposable drill was then left in the drilled hole as a paralleling aid, the second pilot bore was made (Fig. 6) and a control OPG made using two parallelizing aids (Fig. 7). This was followed by the insertion of the two distal implants: These were, as demonstrated here using the example of the second distal implant, slightly screwed into the bone with the cap of the sterile packaging (Fig. 8) and subsequently inserted with an initial screwdriver and wing screwdriver until noticeable Resistance was to be perceived (Fig. 9 and 10). To reach the final position a torque ratchet was used. Thereafter, the achieved torque was checked. This is the time span that is planned for the healing of the implants before they are loaded. For the indication of partial denture stabilization, the manufacturer generally recommends a delayed loading, in which initially a soft relining of the prosthesis takes place. Experience has shown that immediate loading of the MDI is possible in some cases, but overloading must be avoided. Criteria for immediate loading include sufficient bone density (D1 to D2) and primary miniskability of 35 Ncm. In addition, the number and distribution of the existing pillars (natural teeth or healed implants), the proximity of the mini-implants to the pillars (short versus long lever arm) and the payment of the opposing jaw must be taken into account. Finally, the other implants were also inserted in compliance with the same surgical protocol (Figs 11 and 12). Figure 13 shows the radiographic situation after implantation.

**Reprocessing of the denture**

To prepare the existing prosthesis for later delivery without immediately loading the implants, the prosthesis base was lined with silicone and gently pres-

sed onto the heads of the implants to mark their position. With a drill, the markings were made directly on the prosthesis base (Figure 14) and then milled into the prosthesis which was filled with soft relining material (SECURE Soft Reline Material, 3M ESPE) (Figure 15). In addition, the entire denture base was lined with this material. Figure 15 shows the remodeled prosthesis after initial insertion. After three months, impressions were made in practice and sent to the dental laboratory, where the dental prosthesis was reworked by incorporating the metal matrices. These were used to anchor the partial denture to the mini dental implants. Rubber rings (O-rings) in the housings provide a cushioning of the forces acting on the supply (soft-loading concept).

**Patient Feedback**

Although the patient subjectively rated the stability of his partial denture before treatment as acceptable, after the treatment he enthusiastically reported a tight fit without any tilting movements, which he had already become accustomed to over the past seven years in which he was wearing the dentures.

**Conclusion**

MDI mini dental implants are particularly suitable for senior citizens, as the reduced-diameter implants can in many cases be introduced into the jawbone in a less stressful procedure without prior bone formation. If MDI is used to anchor partial dentures, it is recommended to use the newly developed planning scheme, which serves as a guide for the dentist and thus supports him in implementing a structured procedure. An advantage of the use of mini dental implants as additional pillars is that the existing dentures can be used in many cases by simple reworking. Under certain circumstances, it makes sense to strengthen the prosthesis base in this context. Close coordination of the procedure with the dental technician is therefore recommended. Clinical advantages also result from the fact that the static situation in the patient's mouth is decisively improved thanks to the insertion of mini dental implants - resulting in a significantly longer service life of the dental prosthesis according to our meanwhile twelve-year experience with MDI. In addition to the long-term approach of sustainable treatment, experience tells us that it is usually the fast and uncomplicated path to an improved quality of life that encourages patients to recommend our practice.

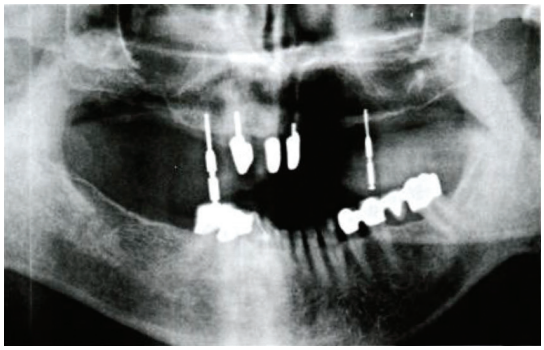

*Fig. 7: Control OPG for checking the angulation of the pilot drill holes.*

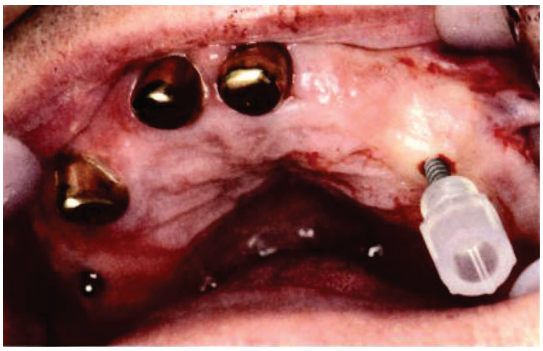

*Fig. 8: Insertion of the second implant with the cap.*

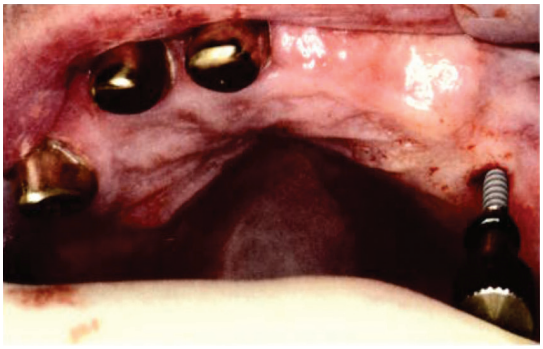

*Fig. 9: Insertion with initial screwdriver.*

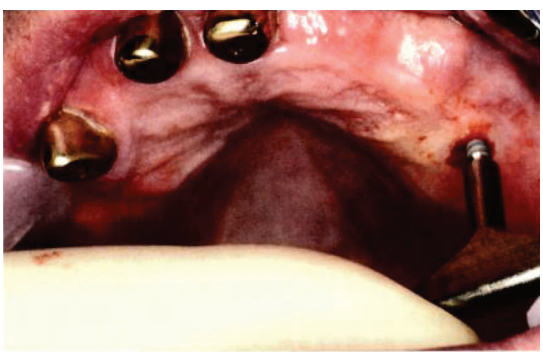

*Fig. 10: Using the winged wrench.*

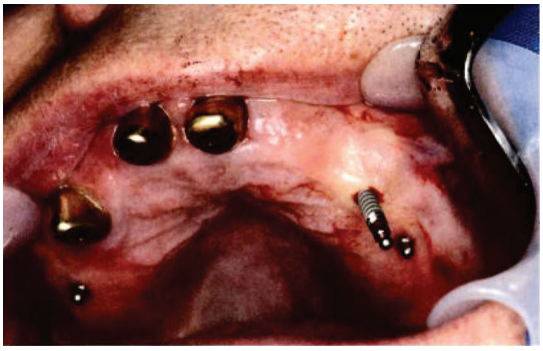

*Fig. 11: Insertion of the third implant.*

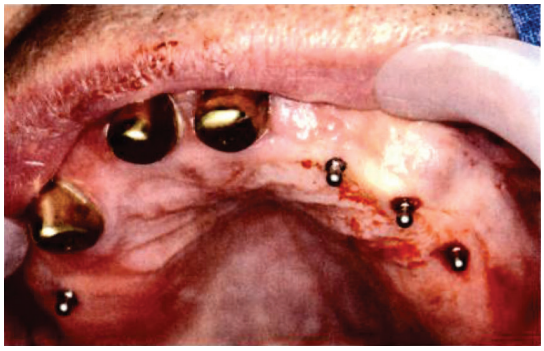

*Fig. 12: Situation after implantation.*

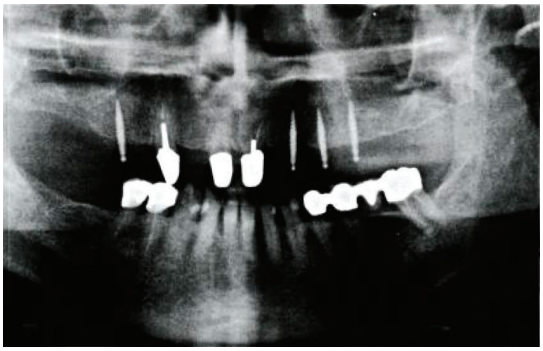

*Fig. 13: Radiological situation after implant insertion.*

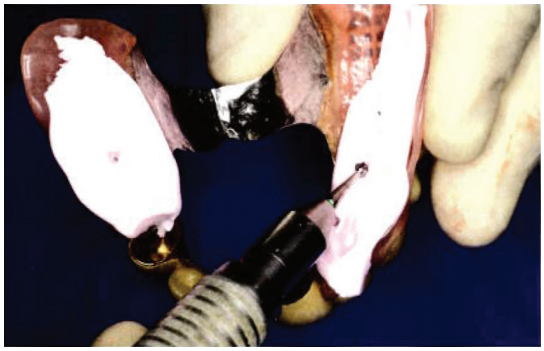

*Fig. 14: Transferring and marking the implant positions in the prosthesis base.*

*Fig. 15: Filling the ground denture base with relining material.*

*Fig. 16: Prosthesis with temporary, soft relining.*

## LITERATURE


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