

Synthetic putty and simultaneous short implant placement in crestal sinus lifting procedures: 13–36 months follow-up - a case series

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Abstract

Aim of this investigation is to show in sites with less than 4mm of bone height of the sinus floor, synthetic putty bone graft and simultaneous short implant placement in crestal sinus lifting procedures result in sufficient bone gain, and is a valuable option to the more invasive lateral-window approach.

Synthetic putty and simultaneous short implant placement in crestal sinus lifting procedures: 13–36 months follow-up - A case series

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Abstract:

Introduction: Aim of this investigation is to show that in sites with less than 4 mm of bone height of the sinus floor, synthetic putty bone graft and simultaneous short implant placement in crestal sinus lifting procedures result in sufficient bone gain, and is a valuable option to the more invasive lateral-window approach.

Case presentation: Four patients missing a single tooth or more in the posterior maxilla with remaining alveolar ridge height of less than 4mm underwent crestal sinus lift procedures with bone grafting using a synthetic putty material simultaneously. Loading of the short implants was done with a minimum of 4

months after placement showing bone growth around the implant and lift of the Schneiderian membrane between 2.3mm – 7.3mm.

Conclusion: Crestal sinus lift, in combination with a short implant and a synthetic putty bone graft, is a good alternative for lateral more invasive sinus lift when the thickness of the sinus floor is less than 4mm.

Keywords: Synthetic putty, Short dental implants, Crestal sinus lift, Summers lift

Key Clinical Message:

Crestal sinus lift, in combination with a short implant and synthetic putty bone graft, is a good treatment and simplified way in cases with less than 4mm bone height to the sinus floor, with reduced chair-side times and minimal graft wastage.

Ethics Approval: According to the Law Medical Research(WMO) in the Netherlands no approval is necessary for retrospective research.

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Background

Maxillary sinus augmentation is frequently employed to provide adequate vertical bone dimension for implant placement in sites with insufficient bone height. There are two techniques available: (I) The lateral window approach or (II) the transcresal approach. The sinus lift lateral window technique was introduced by Tatum in 1976 and by Boyne in 1980. Since its introduction by Tatum, the sinus lift has undergone several modifications to expand its feasibility and increase success rates with reduced complications(Sindel et al.2018). One modification has been published by Summers in 1998 when osteotomes were used to access the sinus cavity through a transcresal window. Many different biomaterials have been used, including autogenous bone, particulate alloplastic, xenogeneic or allogeneic bone substitutes. All material groups show promising and predictable results(Aghaloo & Moy 2007). Moldable putty-like materials may be beneficial since they can gently be squeezed through the transcresal osteotomy(Kher et al. 2014), and because of a decent particle distribution size may reduce risk of tearing Schneiderian membrane. The dental putty is composed of a calcium phosphate silicate trapped in a carrier(Mazor et al. 2013). The material is ready to be used. Most studies indicate that 80-90 percent is absorbed within 4-6 months, while regenerating bone at the same time. The putty has consistently proven to regenerate bone when used for socket grafting, grafting of periodontal defects or in crestal sinus lift procedures(Gonshor et al. 2011, Uppal et al. 2011, Mahesh et al.2012, Jodia et al.2014, Kotsakis et al.2014, Sindel et al. 2019, Mazor et al. 2013).

Case Presentation

In this case series, four patients missing one or more teeth in the posterior maxilla and a maximal alveolar ridge height of less than 4mm were included. Patients were healthy, non-smokers and in between 50-65 years. Verbal consent was given to be included in this case series.

Surgical Procedure

Two grams of Amoxicillin and 600mg Ibuprofen were given 1 hour before surgery. Chlorhexidine mouth rinse was used beforehand. A crestal incision with a full thickness flap was performed. The osteotomy was prepared to less than 1 mm from the sinus floor. An Osteotome has been used to gently fracture the sinus floor. The Putty was inserted resulting in a hydraulic pressure onto the Schneiderian membrane, after which the short implants 5mm(w) x 5 or 6 mm(l)² were placed. The implant gently pushes the putty into the sinus area resulting in lifting of the Schneiderian membrane.

Fig. 1a. Osteotome Fig. 1b. Putty application Fig. 1c. Implant in place

Flaps are repositioned in a tension free manner and then are sutured into place. They were removed 10-14 days after treatment. Implants were allowed to heal for at least 4 months before crown placement. None of

the patients had any pain, swelling or other complaints after the surgery.

Case management

Case 1.

The first patient is a 65-year-old female who lost a tooth 26 years ago. The implant was placed with >35Ncm primary stability, after grafting with 0.25cc of Dental Putty. Note the synthetic cloud around the implant (fig. 2b.). The crown was placed 4 months after implant placement.

Fig. 2a. Before surgery Fig.2b. Implant placement Fig. 2c. Crown placement

Bone height (3.5 mm)

Fig. 2d. 3 years follow-up

Case 2.

This patient is a 61-year-old male who lost his molar 4,5 months earlier due to a fracture. The implant was placed with 35Ncm, after grafting with 0.25cc of Dental Putty. The crown was placed 7 months later.

Fig. 3a. Before surgery Fig. 3b. Implant placement Fig.3c. 13 months follow-up

Fig. 3d. 19months follow-up

Case 3.

The third patient is a 53-year old male. He lost his molar due to a failed root canal treatment. A CBCT scan shows residual sinus floor thickness of 3.8 mm. Seven months after tooth extraction the implant was placed with >35Ncm torque level after grafting with 0.25cc of Dental Putty.

Fig. 4a. CBCT

Fig. 4b + c. Treatment day

Fig. 4d + e. 3 months after treatment

Fig. 4f + g. 13 months after treatment

Case 4

The fourth patient is a 54-year old female. The x-ray shows a residual sinus floor thickness of 3.9 mm.7 months after tooth extraction the 5 mm long implant was placed 2-phase, with >35Ncm torque level after grafting with 0.25cc of Dental Putty. The crown was placed 5 months after implant placement.

Fig. 5 a. Before surgery Fig. 5 b. Implant placement Fig. 5c. Crown placement

Fig. 5d. 20 months follow-up

Clinical Outcomes

A radiograph taken three months post grafting x-ray showed probable osseointegration of the implants. All implants were loaded after at least 4 months, and functioning well. Since implant length is 5 or 6mm the lift of the Schneiderian membrane could be analyzed through the measurement tool in the x-ray module and also shows the synthetic putty stays stable in the first three months.

The cases showed 3.5-3.9 mm of bone before the treatment. The lift of the Schneiderian membrane was between 2.3mm – 7.3mm. After maturing of the bone we see pneumatization of the sinus, resulting in less bone apical around the implant. Case 4 has no 3 months x-ray.

Case 1

Fig. 6a. Treatment day Fig.6b. Membrane lift 5.0mm Fig.6c. Result after 3 months

Case 2:

Fig. 7a. Treatment day Fig.7b. Membrane lift 4.6mm Fig. 7c. Result after 3 months

Case 3:

Fig. 8a. Treatment day Fig. 8b. Membrane lift 7.3mm Fig. 8c. Result after 3 months

Case 4

Fig. 9. Membrane lift 2.3mm

Discussion

Most frequent complications of lateral window approach are perforations of the Schneiderian membrane and bleeding. Others include the obstruction of the antral meatal ostium complex, dislocation of the implant into the sinus cavity, perforations in the buccal flap, and less frequently, injury to the infra-orbital nerve(Sindel et al. 2018). The main challenge of the crestal sinus procedure is the uncertainty of a possible perforation of the Schneiderian membrane because the sinus lifting procedure is performed blindly due to the impossibility to visualize the sinus floor(Sindel et al. 2018). The incidence of membrane perforations in crestal sinus lift has been reported to range between 4-25 percent, while such complication has been described in 25-44 percent of external sinus lifting cases making the crestal approach a less risk for perforation (Sindel et al. 2018). The benefit from crestal approach is that it can achieve gain in bone height comparable with the lateral window approach, while maintaining the benefits of the less invasive trans alveolar approach(Mazor et al.2013). Great advantages are reduced chair-side times and minimal graft wastage. In this case review, a minimal invasive crestal approach for sinus augmentation was conceived using a new generation putty-graft. The putty is easy to use and because of its consistency and continuous flow of the biomaterial it results in a gradual and continuous elevation of the minimizing the chance of damaging or perforating the Schneiderian membrane(Mazor et al. 2013). The presented cases show a significant bone formation around the implants radiographically. Lifting the Schneiderian membrane between 2.4 – 7.3 mm. It has been reported that a gain of up to 10 mm in alveolar height can be achieved using several modifications of transcresal approach, it has commonly been assumed that the Schneiderian membrane can be safely elevated for 5 mm through the internal sinus lifting(Sindel et al.2013). The lift stays stable for the first three months, but then after time the volume decreases due to pneumatization of the sinus. This is consistent with other studies. The pneumatization of the maxillary sinus stabilizes after the initial three years shrinkage(Kotsakis & Mazor 2015)

Conclusion

Crestal sinus lift, in combination with a short implant and a synthetic putty bone graft, is a good alternative for lateral more invasive sinus lift when the thickness of the sinus floor is 4 mm or less.

Table 1: Case summary

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The author declares that he has no conflict of interest

¹NovaBone Dental Putty, Biomet 3i, West Palm Beach, FL, USA

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Author Contribution: MJB is the only author of this manuscript.

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TABLES

Table 1: Case summary

Summary

Why are these cases new information?

To the best of our knowledge, this is the first report of the use of synthetic putty and simultaneous short implant placement

What are the keys to successful management of these cases?

The key to a successful crestal approach is the gentle tapping of the sinus floor with the osteotome and lifting the membrane

What are the primary limitations to success in these cases?

Operator inexperience, technique sensitivity of crestal approach using an osteotome rupturing the Schneiderian membrane

Figure Captions

Figure A: Exemplary before

Figure B: Exemplary after

Fig. 1a. Osteotome

Fig. 1b. Putty application

Fig. 1c. Implant in place

Fig. 2a. Before surgery

Fig. 2b. Implant placement

Fig. 2c. Crown placement

Fig.2d. 3 years follow-up

Fig. 3a. Before surgery

Fig. 3b. Implant placement

Fig.3c. Crown placement

Fig. 3d. 19 months follow-up

Fig. 4a. CBCT

Fig. 4b + c. Treatment day

Fig. 4d + e. 3 months after treatment

Fig. 4f + g. 13 months after treatment

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Fig. 6c. Result after 3 months

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Fig. 7b. Membrane lift 4.6mm

Fig. 7c. Result after 3 months

Fig. 8a. Treatment day

Fig. 8b. Membrane lift 7.3mm

Fig. 8c. Result after 3 months

Fig. 9. Membrane lift 2.3mm



































