

COMPARISON OF THE RATES OF BONE REGENERATION IN SINUS LIFT GRAFTING WITH A CALCIUM- PHOSPHATE PASTE BETWEEN THE 6TH AND THE 9TH MONTH – A CLINICAL CASE

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ABSTRACT

Maxillary sinus floor augmentation has been used for occlusal rehabilitation with prosthetic appliances installed over dental implants in the posterior maxilla despite the fact that this region often presents loss of alveolar bone and increased maxillary sinus pneumatization, particularly when all of the molars are absent. The shortage and quality of the remaining bone often implies a challenge when rehabilitating with dental implants. Different kinds of grafts have been used in an endeavour to solve these problems. The aim of this study is to find out if there is a significant difference in the bone formation between the 6th- and the 9th-month periods after sinus lift grafting with a calcium- phosphate paste (Maxresorb inj. (Botiss Dental, Berlin, Germany)). For this purpose a bilateral sinus lift has been made by own methodology. Results showed no significant difference in the percentage of newly formed bone in the sixth and the ninth month, which warrants the dental implants to be placed on the sixth month post-sinus lifting.

Key words: sinus lift grafting, a calcium- phosphate paste, histomorphometry, lateral sinus floor elevation, dental implants, graft

INTRODUCTION

Dental implantology is the most dynamic area of the dental medicine and today it is an integral part of the daily practice. Often the placement of dental implants must be combined with various augmentation procedures. Such case is the deficiency of verti-

cal bone in the distal portions of the upper jaw where the placement of dental implants, proceeds or is performed simultaneously with the lifting of the floor of the maxillary sinus (7). This method was first described by Boyne & James in 1980 (2) and Tatum in 1986 (11) using autogenous bone. In recent years, the procedure known as „sinus lift“ has turned out to be a viable predictable treatment for partially or totally edentulous patients with atrophy of the posterior maxilla. This procedure requires the use of autogenous bone or biomaterial grafts or a combination of both (4). Subsequently, the method undergoes various modifications, both in terms of the technique itself and the materials used (9). Peev et al. (8) also suggest their modification of the procedure in which they isolate the sinus membrane with a collagen fleece (Ja-

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son Fleece - Botiss Dental, Berlin, Germany) instead of a collagen membrane. In their research they use different types of bone-substitute materials for augmentation procedures instead of originally used autogenous bone and compare the rates of bone regeneration induced from each of them. One of these materials is the calcium- phosphate paste (Maxresorb inj. (Botiss Dental, Berlin, Germany)).

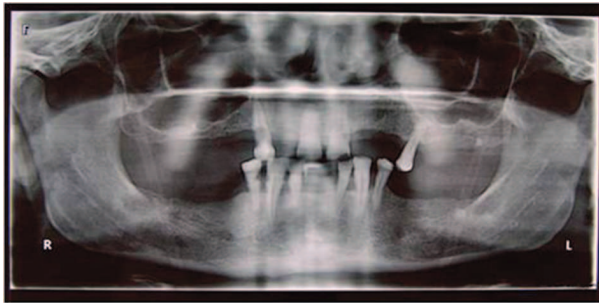


Fig. 1. A panoramic X-ray of the initial situation

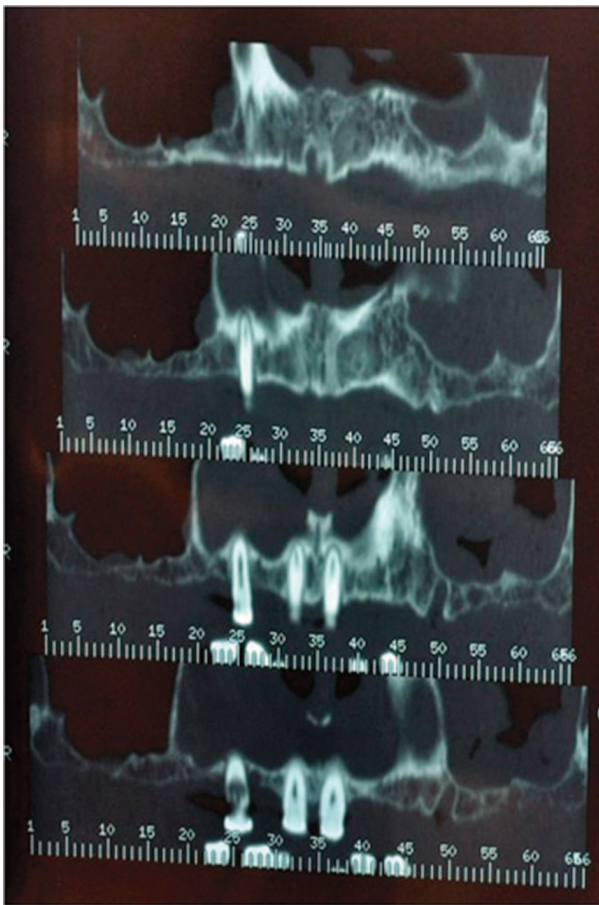


Fig. 2. CT of the initial situation with shading of the left maxillary sinus

Case report

A clinical case of a partially edentulous 58-year old patient is reported. He was forwarded to the Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine, Medical University of Varna by a general practitioner. The patient complained of difficulty in eating due to the reduced dentition and the inability to use a removable denture due to a pronounced vomiting reflex. He had no concomitant diseases and from the family history it became clear that his parents lost their teeth early due to periodontal problems. The clinical and radiographic examinations (fig.1) established teeth # 13, 11, 21, 25 which had degree 2 mobility. The willingness of the patient for a fixed construction and its medical and family history determined the treatment plan with dental implants. A computed tomography (CT) of the maxilla was administered. CT revealed that there is deficiency of vertical bone in the distal portions of the upper jaw and the placement of endosteal implants had to be preceded by sinus floor elevation. The thickness of the subantral bone in its highest point was less than 4.5 mm and that determined a sinus lift with lateral approach. CT also showed left maxillary sinus shading with irregular borders which imposed a consult with an ENT specialist to clarify the subsequent treatment plan (fig.2). The formation was removed endoscopically and the patient was directed

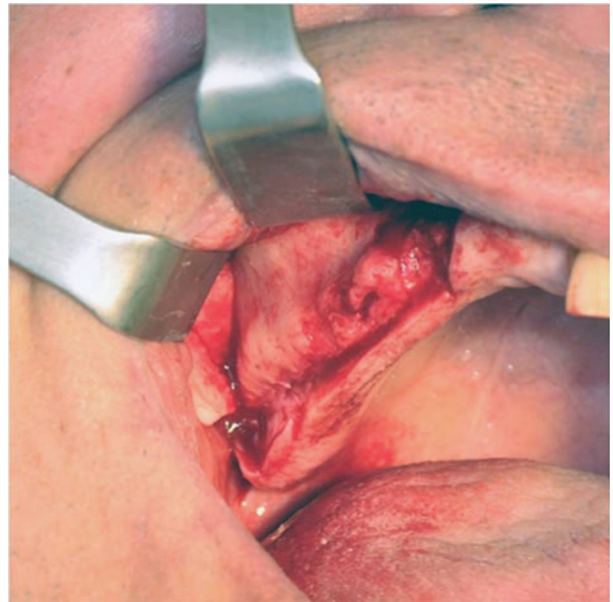


Fig. 3. An elevated muco-periosteal flap

to a treatment after 6 months. Meanwhile teeth # 13, 25 were extracted.

The treatment plan included bilateral sinus lift, placing six dental implants and a fixed denture. The patient was aware of the treatment plan and accepted it. Routine blood tests showed no abnormalities.

A right sinus lift was performed first. The residual bone height was 4mm. On the CT a septa on the floor of the maxillary sinus was found (fig.2). Under local anesthesia a horizontal incision was locat-

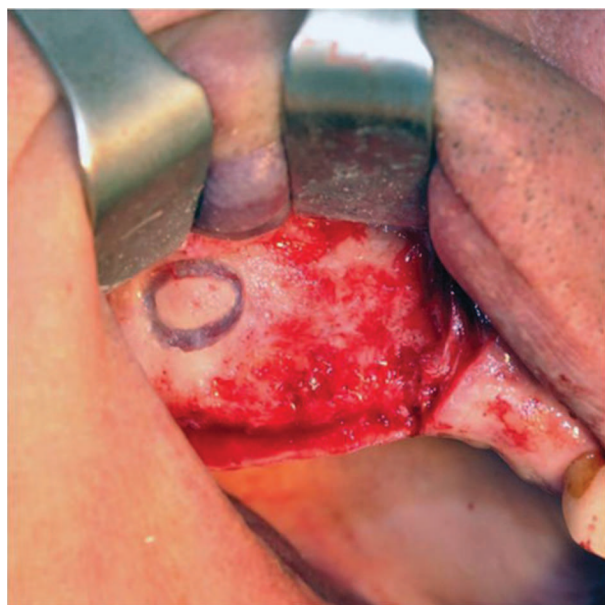


Fig. 4. The shaped window access-on the right



Fig. 5. Elevation of the sinus membrane



Fig. 6. A perforation of the Schneider membrane

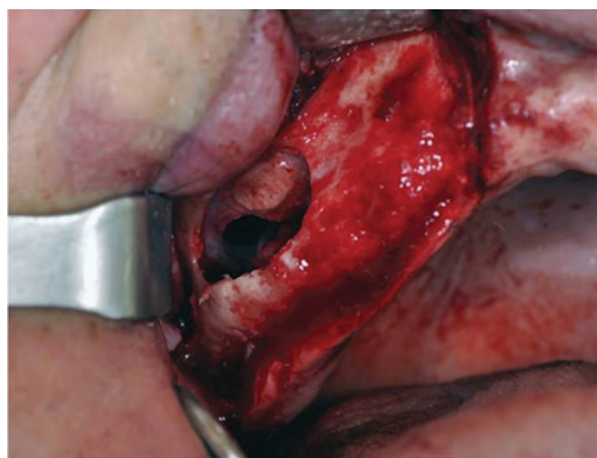


Fig. 7. The localized perforation

ed 2 mm palatally on the crest of the alveolar ridge and two vertical incisions were made. A mucoperiosteal flap was elevated and the lateral surface of the upper jaw was uncovered (fig.3). With a periodontal probe the points which define the upper and lower border of the planned lateral window were determined. With a round bur with a diameter of 3.5 mm using continuous saline solution cooling, the bone was removed and the sinus membrane was protected (fig.4, fig.5). During the membrane elevation a perforation occurred (fig.6). The lateral window was extended and the perforation has been localized (fig.7). A collagen fleece was inserted under the elevated sinus membrane (Jason Fleece - Botiss Dental, Berlin, Germany) and the perforation was covered (fig.8). It is a wet-stable haemostypt made of native collagen, which protects the bone graft material and induces

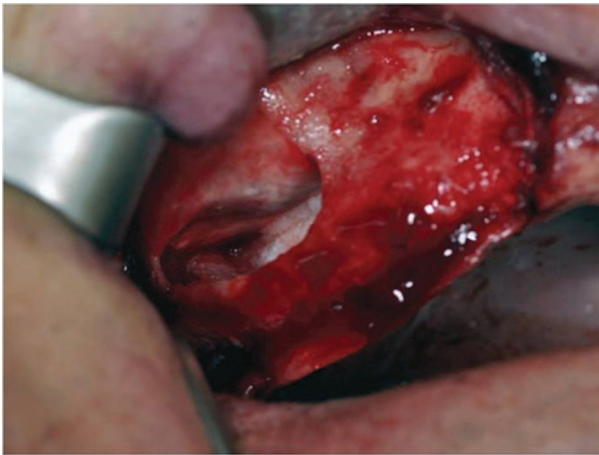


Fig. 8. Covering the perforation with a collagen fleece

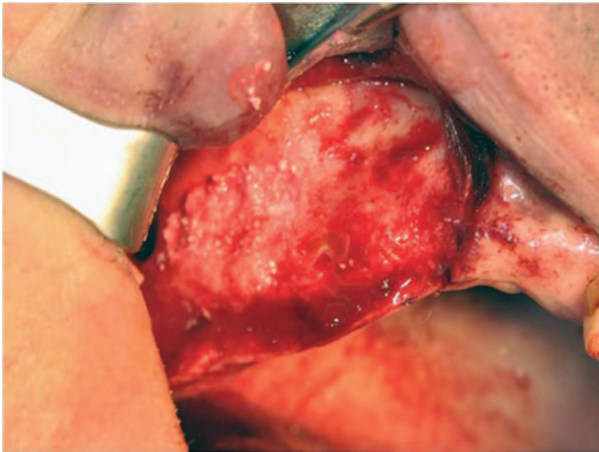


Fig. 9. An inserted bone-substitute material



Fig. 10. An inserted pericardial collagen membrane

blood clot formation and stabilization of the wound. Then 2.5 cc calcium- phosphate paste was applied

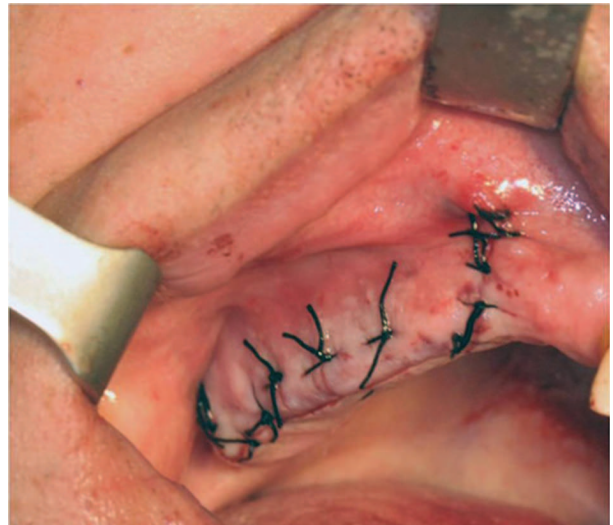


Fig. 11. The sutured wound

(fig.9). The access window was covered with a pericardial collagen membrane (Jason Membrane-Botiss Dental, Berlin, Germany) (fig.10). The flap was repositioned and sutured with 4/0 silk (fig.11). Used were: Dalacin C 300mg three times a day for 7 days, Afrin 0,05% two or three sprays in each nostril twice a day for 10 days, Claritine 10mg once a day for 7 days, Eludril Mouthwash (Chlorhexidine digluconate - 0.10 %) for 14 days, Methylprednisolone 40 mg i.m. for the first day and analgesics were prescribed to the patient. On the 12th postoperative day a control panoramic X-ray was done to assess the condition of the maxillary sinus and that of the augmented area (fig.12). Three months later the same procedure was performed without any complications on the left side of the patient, where the residual bone height was

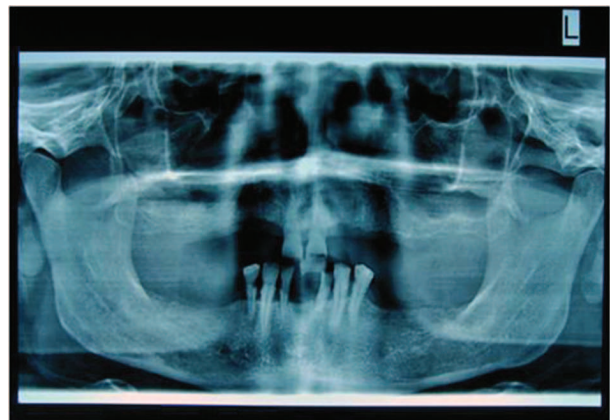


Fig. 12. A control panoramic X-ray



Fig. 13. The cut



Fig. 14. An elevated muco-periosteal flap



Fig. 15. The Shaped window access-on the left

3mm (fig.13, fig.14, fig.15, fig.16, fig.17, fig.18, fig.19, fig.20, fig.21).

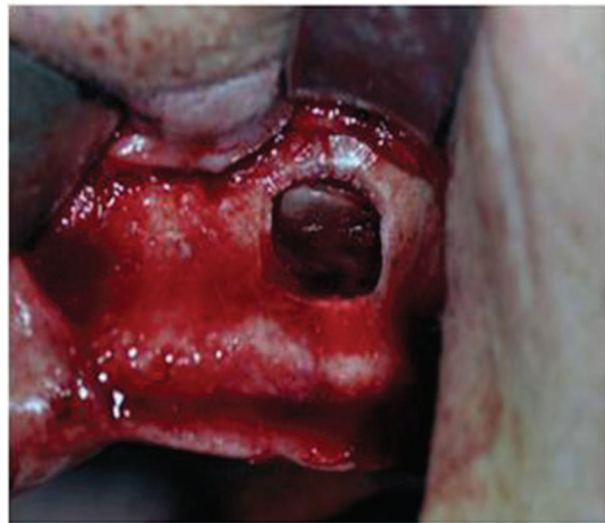


Fig. 16. Elevation of the sinus membrane

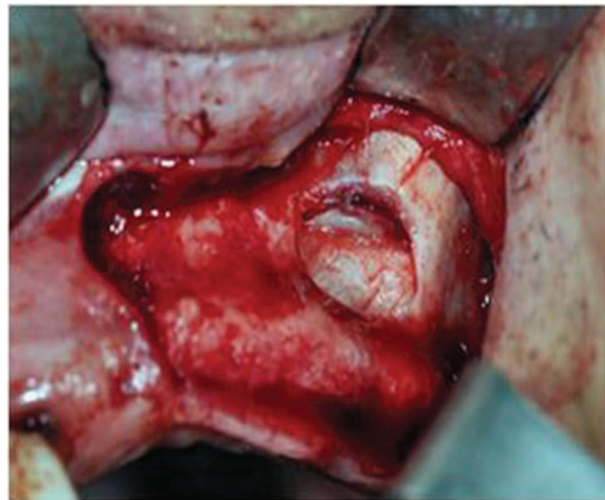


Fig. 17. Covering the perforation with a collagen fleece



Fig. 18. An inserted bone-substitute material

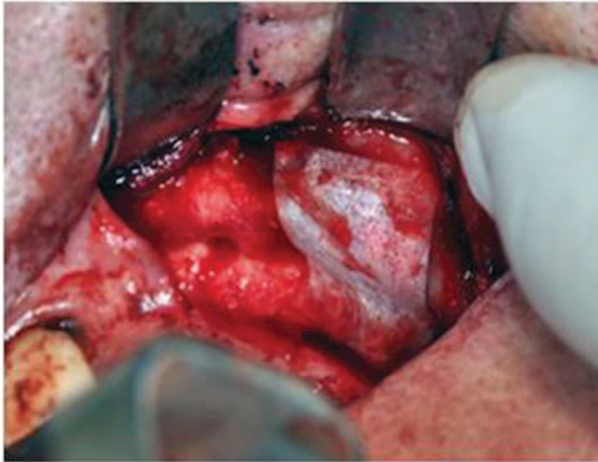


Fig. 19. An inserted pericardial collagen membrane

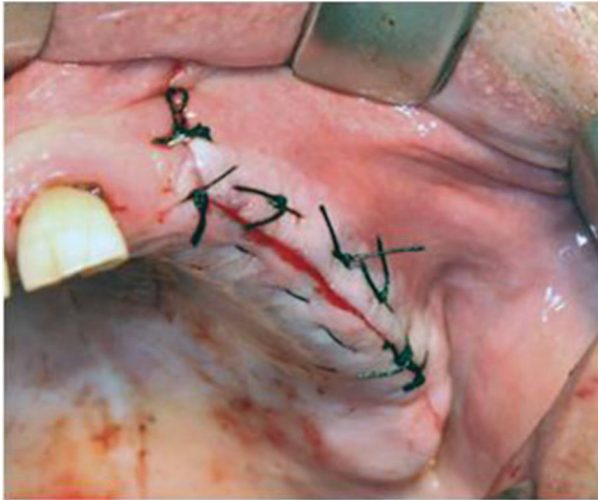


Fig. 20. The sutured wound

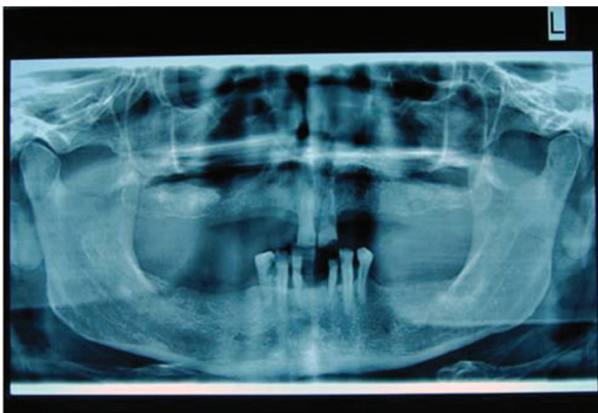


Fig. 21. A control panoramic X-ray- the left maxillary sinus

The healing period ran smoothly and nine months after the first and six months after the second operation the patient was sent for CBCT. It was

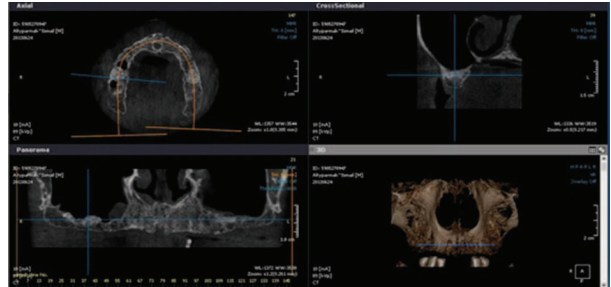


Fig. 22. CBCT 9 months after the right operation and 6 months after the left

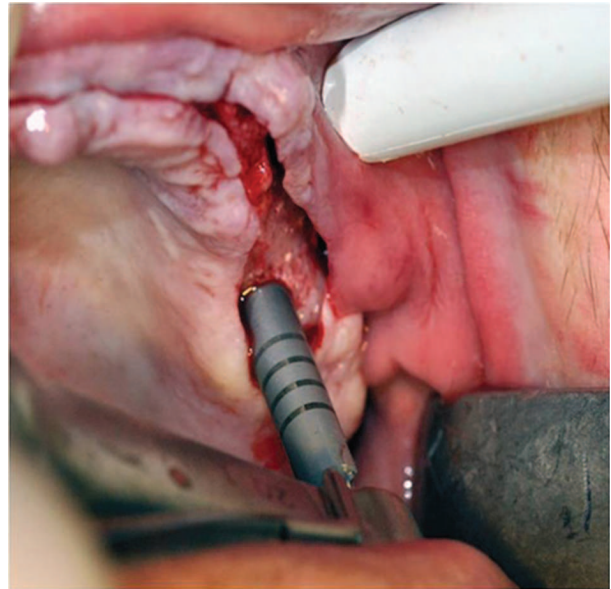


Fig. 23. An obtained biopsies

used to define the height of the augmented subantral bone (fig.22), which was 9 mm in the right side (regio 16) and 8 mm in the left one (regio 26) Six implants on the upper jaw were planned. Simultaneously with the placement of implants biopsy samples of the right and left maxillary sinus were taken (fig.23). The osteotomy was performed using a 4.3 mm trephine bur (fig.24). The depth of its penetration corresponded to the highest point of the corresponding section of the augmented subantral bone. In this way a biopsies for the histological examination were obtained (fig.25, fig.26). They were fixed in neutral formalin and sent for histomorphometry The slides were stained using Azan staining (fig.27, fig.28). Each one of the resulting bars was divided into three equal parts, excluding the residual bone, which height was measured previously. In every part we determined the percentage of newly formed bone using PS CS5 EXTEND-



Fig. 24. A biopsies



Fig. 25. A biopsies



Fig. 26. A biopsies

ED. The results were summarized in tables and were a subject of statistical analysis.

DISCUSSION

Sinus augmentation is a common procedure to increase bone volume and allow proper implant placement in the atrophic posterior maxilla. The grafting material used in maxillary sinus floor augmentation is expected to allow new natural bone formation with capillary infiltration and to provide the

capacity for replacing the bone graft material and supporting the implants with adequate bone volume (3,4). Nowadays lateral sinus floor elevation is performed with different bone-substitute materials (2,6). Some of them are the calcium- phosphate bone-substitute materials (10,13). Such material is Maxresorb inj. which we used in this case. The histomorphometrical analysis showed that the material used has led to the formation of new bone as it follows: 15% in the right side (fig.27) and 21 % in the left side (fig.28) (Diagram 1).

From this result, it is clear that the values did

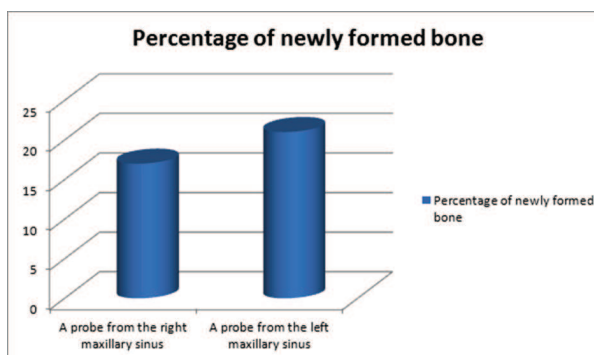


Diagram 1. Percentage of newly formed bone

not show a significant difference during the research



Fig. 27. Histological preparation of the right maxillary sinus (Azan staining)

period. The mean percentage bone areas were 15% and 21%, respectively.

CONCLUSION

The demonstrated case indicates that using the calcium-phosphate paste affords predictable and stable performance over time, enabling the placement of dental implants. It also shows that histologically and histomorphometrically, there was no significant difference between the 6th- and the 9th- month periods of bone formation in the present clinical case. The conclusion that can be drawn is that implants can be placed safely earlier, which is important for reducing the time of the whole treatment and providing comfort to the patient.

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Fig. 28. Histological preparation of the left maxillary sinus (Azan staining)

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