Rogoleva Gjurovski, S. (2022). Evaluation of the efficiency of sinus lifting techniques, *MEDIS - Medical Science and Research, 1*(2), 37-41. doi: 10.35120/medisij010237r
UDK: 616.314-089.843:616.716

EVALUATION OF THE EFFICIENCY OF SINUS LIFTING TECHNIQUES

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Abstract: Right after teeth extraction in posterior regions, there is a following process that consists of physiological resorption and nonfunctional atrophy of the remained alveolar bone ridge. That also impacts the quality on the quality and quantity of the remained bone tissue, what later makes the implant incorporation and the prosthetic restoration much harder and complicated than usual it is. In the posterior region of the upper jaw additional complication of the prosthetic restoration process causes the existing of paranasal sinus that is located right in the body of the upper jaw maxilla. It's post extraction pneumatization reduces the height of bone tissue what causes difficulties in dental implants placement.

The aim of this survey is to evaluate the clinical outcome and the efficiency of the most often used sinus lifting techniques.

Were analyzed totally 78 published studies that were done in the last 12 years. The study is made on narrative review of published articles that were investigating the related subject. Research was done by using the most common data bases: NCBI (US National Library of Medicine), Emedicine, PubMEd, Webmd.

By using the open method for sinus lifting there needs to be formed lateral window in the bone tissue first by elevating the mucoperiosteal flap on the vestibular surface of the maxillary alveolar ridge and after that creating iatrogenic fenestration on the cortical lamina without perforating the sinus membrane. After the sinus membrane is being separated, the following step is augmentation. For this step are used four different types of bone substituent: autogenous, allogeneic, xenogeneic bone graft and synthetic alloplastic materials.

The closed method for sinus lifting is performed after previous created place for the future implant in the residual alveolar bone ridge in the maxilla, after that with special instruments a perforation is being made in the bone floor of the maxillary sinus and carefully elevating the sinus membrane up for a few millimeters. In the created space a bone graft material is being placed and at the same time a dental implant is being applied.

From the gathered results, both of the techniques are considered to be effective, in all of the followed cases the implant placements were successful with high rate of postoperative osseointegration, the healing period was without complications and also successful. There was no prosthetic failure in any case.

From this survey the final conclusion is that both of the techniques are successful when it comes to sinus lifting. Very important is to have a qualitative imaging like computed tomography or roentgen before placing the implants to be able to estimate the bone volume and height. If the residual bone height is less than 5 mm the survival rate of the future implants is not guaranteed.

Keywords: Sinus lift techniques, implant placement, bone augmentation, alveolar bone resorption.

INTRODUCTION

Implants treatment in posterior regions of upper and lower jaw can be big challenge for oral surgeons. Right after teeth extraction in posterior regions, there is a following process that consists of physiological resorption and nonfunctional atrophy of the remained alveolar bone ridge. That also impacts the quality on the quality and quantity of the remained bone tissue, what later makes the implant incorporation and the prosthetic restoration much harder and complicated than usual it is [1,2].

In the posterior region of the upper jaw additional complication of the prosthetic restoration process causes the existing of paranasal sinus that is located right in the body of the upper jaw maxilla. It's post extraction pneumatization reduces the height of bone tissue what causes difficulties in dental implants placement with required length that is necessary for correct osseointegration. If the alveolar bone in the posterior regions on the both jaws is left without physiological stimulation for a long time, the changes in the bone structure become more serious. In the lower jaw by passing the years, the upper surface of the alveolar ridge is getting closer to the canalis mandibularis and the anatomic structures inside [3,4].

Because of these changes, there is a good need for additional surgical procedures that will ensure the needed conditions for dental implants placement[5].

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Aim

The main goal of this survey is to evaluate the clinical outcome and the efficiency of the most often used sinus lifting techniques.

MATERIAL AND METHODS

Research strategy

To create this study were analyzed totally 78 published studies that were done in the last 12 years. The study is made on narrative review of published articles that were investigating the related subject, evaluation of the efficiency of the most often used techniques of sinus lifting, written in English.

Research was done by using the most common data bases: NCBI (US National Library of Medicine), Emedicine, PubMEd, Webmd and Google scholar. The key words that were used for this research were the following: sinus lift techniques, implant placement, bone augmentation, alveolar bone resorption, implant placement preparation. The search included: systematic reviews, qualitative studies and clinical studies. The research was made online by selecting the articles that contained the research key words, then the articles that met the needed criteria were selected and analyzed in details. So from the total number of 78 studies that were initially found with the research, 32 were selected for detailed analysis about the researched topic, evaluation of the efficiency of sinus lifting techniques used in patients preparing for implants placement.

Inclusion criteria for the articles analyzed for this study were: studies made in vivo; articles published in the last 15 years; articles that are written in English; studies on patients with sinus lift treatment; studies evaluating the sinus lift techniques; studies on patients preparing for implant treatment.

The exclusion criteria were: studies done in vitro; articles older than 15 years; case report articles; articles about patient with other additional sinus surgical procedures.

The collected data was gathered in a database in order of these parameters: first author's name; the year when the article is published; number of analyzed cases; treatment technique; and the clinical outcome after the intervention.

EVALUATION AND RESULTS

The sinus lifting procedure is augmentative technique that is used in cases with huge pneumatisation of the maxillary sinus. The main aim of this procedure is to offer enough height of the residual alveolar bone ridge in the posterior regions of the maxilla [6]. There are many methods that can be used for this cause, most often used are: open method for sinus lift also known as Lateral window technique; and closed method for sinus lifting known like Transcrestal approach[7,8,9].

By using the open method for sinus lifting there needs to be formed lateral window in the bone tissue first by elevating the mucoperiosteal flap on the vestibular surface of the maxillary alveolar ridge and after that creating iatrogenic fenestration on the cortical lamina without perforating the sinus membrane [10,11,12].

In the next phase the sinus membrane is being carefully separated from the bone tissue of the maxillary sinus and in that space bone graft material is being placed to fill the void. That is also known as augmentation of the maxillary sinus foundation [13]. For performing this technique, there need to be conducted clinical examination and paraclinical roentgen imaging, after that a certain plan for each case individually is being created[15]. The surgical procedure starts with applying local anesthetics on the needed region, after that horizontal crestal incision is being done in the middle of the residual alveolar bone ridge, and two vertical relaxation incisions that will allow the mucoperiostal flap to be elevated in its full thickness. The vertical incisions need to be placed on healthy bone base and not on the place where the future bone fenestration will be done. The vertical incisions are supposed to be enough long to offer a good visibility during the surgical procedure[16,17,18].

After the lateral bone wall of the sinus is being exposed, the bone fenestration is being created. It can be in a shape of a rectangle or in oval shape. For that purpose are used instruments like surgical drills that are specifically created for this purpose [19]. The fenestration placement is being planned in order of the planned future implants position, their number and their length. The inferior horizontal edge of the bone window is placed 2 mm above the bone floor of the maxillary sinus that is previously located by using a roentgen image. The superior edge of the window is planned in relation with the future implants length[20,21].

The process of fenestration needs to be done carefully in order to avoid perforation of the sinus

membrane. After marking the bone window we create bone island that can be used like a base for elevation of the sinus membrane. The surgical procedure goes on with careful separating the sinus membrane from the bone walls of the maxillary sinus, that is performed by using specific instruments for that cause knows as sinus elevators. After the membrane is separated and it can be easily moved around, the separation continues until the sinus elevator reaches the medial wall of the sinus. The membrane is supposed to be mobile totally in full length of the created bone window[22,23].

This step of the operative procedure is very important and it has a crucial meaning for the whole treatment. Unfortunately the most common complication is perforation of the sinus membrane that happens if the attention to this step is not full, and if this mistake is not recognized during the surgical treatment, it can lead to more serious complications after the operation and even to result with inflammation of the maxillary sinus[24,25].

After the sinus membrane is being separated, the following step is augmentation. For this step are used four different types of bone substituent: autogenous, allogeneic, xenogeneic bone graft and synthetic alloplastic materials. In some cases there can be also used bioresorptive collagen membrane in combination with the bone graft, to prevent sinus membrane perforation with the grafting material and to offer more stability of the tissue[26,27].

The bone substituent that is used for augmentation also can be mixed with platelet enhanced plasma that will accelerate the process of the revascularization of the bone graft and will offer growth factors in the local area. In the final step of the operative procedure the mucoperiosteal flap is being repositioned on the previous place and sutures are placed to fixate it [28].

The closed method for sinus lifting is performed after previous created place for the future implant in the residual alveolar bone ridge in the maxilla, after that with special instruments a perforation is being made in the bone floor of the maxillary sinus and carefully elevating the sinus membrane up for a few millimeters. In the created space a bone graft material is being placed and at the same time a dental implant is being applied. This method is used in cases where the residual alveolar bone ridge is at least 5 mm and with that a primary stability of the future implants can be ensured. The sinus bottom can be elevated for 5mm with this approach. Which compared to the open technique, with this technique of augmentation the bone tissue is smaller [29].

The closed technique starts with local anesthetic placement, after what crestal incision follows on the middle of the alveolar ridge, and if needed there can be also created two vertical incisions. After that the mucoperiostal flap is elevated and a preparation of the future implant bunk is created with drilling in the bone tissue. The procedure continues with special instruments osteotoms that can be with different diameter. With that the bone bottom is carefully being reduced at the same time with attention on the sinus membrane to not get punctuated. Before the augmentation it is recommended to do some test to try if the sinus membrane is being perforated or is it intact. After that the next step is bone augmentation and elevating of the sinus membrane for 3 to 5 mm. Next thing to do is to place the implant and the bone integration time is 4 to 9 months depends on the graft used. At the end the flap is being repositioned and sutured on the previous place [30,31].

From the gathered results, both of the techniques are considered to be effective, in all of the followed cases the implant placements were successful with high rate of postoperative osseointegration, the healing period was without complications and also successful. There was no prosthetic failure in any case [32].

CONCLUSION

From this survey the final conclusion is that both of the techniques are successful when it comes to sinus lifting. Very important is to have a qualitative imaging like computed tomography or roentgen before placing the implants to be able to estimate the bone volume and height. If the residual bone height is less than 5 mm the survival rate of the future implants is not guaranteed. The open approach of sinus lifting can increase the height of the residual bone up to 9 mm, and the other closed approach can offer bone enlargement for 3 to 9 mm. With that it can be concluded that the residual bone height is one of the most important factors that needs to be taken seriously when implants are planned to be placed.

SOURCE OF FUNDING
None

CONFLICT OF INTEREST

None

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