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# EVALUATION OF BONE HEIGHT IN DENTAL IMPLANT PLACEMENT BY TATUM'S OSTEOTOME SINUS LIFT PROCEDURE VS HYDRAULIC SINUS LIFT PROCEDURE – A RADIOGRAPHICAL STUDY

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**ABSTRACT** **Aim & Objectives:** To evaluate and compare the stability of the implant, and the height gained by augmentation procedure in Tatum's osteotome sinus lift and hydraulic sinus lift procedure. **Material & Method:** We planned a randomized study on 20 patients in which sinus lift procedure for implants placement. Clinical and radiographic comparison was done on the bases of bone height and bone implant contact ratio. **Results:** Resonance frequency was significantly higher among the patients of hydraulic group comparatively other on several intervals. **Conclusion:** Sinus lift with hydraulic pressure has provided a viable restorative solution to edentulous areas especially in a compromised or insufficient alveolar bone volume in areas like posterior maxilla and results are highly predictable with low morbidity; shorten the surgery duration and in turn reducing the cost of treatment comparatively others one.

**KEYWORDS :** Bone implant Contact, Implant Stability Quiescent, Tatum's Osteotome

## INTRODUCTION

Implant dentistry has become an excellent treatment modality since its inception into the modern era of dentistry. It not only allows for a conservative and esthetic alternative to treating partial edentulism, but also provides a stable foundation for treating complete edentulism.[1] Dental implants are a viable treatment option when there is sufficient quantity and quality of bone. However, when patients present with deficient alveolar ridges, implant placement is so difficult. This problem is especially magnified in the posterior maxilla where ridge resorption and sinus pneumatization, compounded with a poor quality of bone[2,3]. The technique of sinus floor elevation has expanded prosthetic options by enabling the placement of additional implant support in maxillary segments with atrophic ridges and pneumatized sinuses. Maxillary sinus floor elevation was initially was so difficult approach to surgeon but now this is so easy and adoptable by so many authors. Present study attempts to compare the efficacy of both Tatum's osteotome sinus lift procedure and Hydraulic sinus lift procedure for dental implant placement in terms of initial and final implant stability and the gain in bone height.

## AIM & OBJECTIVES:

To clinically and radio-graphically evaluate the Stability of the implant, BIC ratio and ISQ values.

## MATERIALS AND METHOD

A prospective, randomized, single centre study (Dept of Periodontics Azamgarh dental college U.P.) was performed among patients with at least one or more missing teeth in posterior maxillary arch. 20 Patients were selected from departmental OPD with seeking of replacement of missing tooth/teeth divided into two groups, group 1 Osteotome group (n=10) in which placement of dental implants with Tatum's osteotome sinus lift procedure and another group 2, Hydraulic group (n=10) in which placement of dental implants with Hydraulic sinus lift procedure. Post procedure clinical parametric assessment done on the bases of Stability of the implant with resonance frequency analysis by intra-oral peri-apical radiograph and evaluate clinically.

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## RESULTS AND OBSERVATIONS:

The Chi-square and Unpaired t-test was used to compare continuous variables between the groups at follow-ups. The Paired t-test was used for intra group comparisons. The p-value<0.05 was considered significant. A total of 10 patients were included in each group.

Table-1 shows the comparison of clinical mobility and perforation of sinus membrane between the groups. Clinical mobility and perforation was found to be absent in all the patients in both the groups.

Table-4 & Fig. 1 shows the comparison of infection between the groups at follow-ups. Infection was present in 20% patients in both Target group and Control group at 1 week. The infection became nil in Target group at 1 month and was in 10% patients of Control group at 1 month. There was no significant (p>0.05) difference in infection between the groups at all the follow-ups also shows in table 4 and Fig: 2 the comparison of soft tissue dehiscence between the groups at follow-ups. Soft tissue dehiscence was present in 30% patients in Target group and in 10% of Control group at 1 week. The soft tissue dehiscence became nil in Target group at 1 month & 3 months and was in 20% patients of Control group at 1 month. There was no significant (p>0.05) difference in soft tissue dehiscence between the groups at all the follow-ups.

**Table 1: Comparison Of Clinical Mobility And Perforation Of Sinus Membrane Between The Groups**

| Comparison of clinical mobility between the groups | | | | | | Comparison of Perforation of sinus membrane between the groups | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Clinical mobility | Target group (n=10) | | Control group (n=10) | | P Value | Clinical mobility | Target group (n=10) | | Control group (n=10) | | P Value |
| | No. | % | No. | % | NA | | No. | % | No. | % | NA |
| Present | 0 | 0.0 | 0 | 0.0 | | Present | 0 | 0.0 | 0 | 0.0 | |
| Absent | 10 | 100.0 | 10 | 100.0 | | Absent | 10 | 100.0 | 10 | 100.0 | |

[1]Chi-square test, NA-Not applicable as all absent in both the groups

**Table-2: Comparison Of Implant Contact Ratio (%) And Gain In Bone Height After 3 Months Between The Groups Between The Groups**

| Groups | Implant contact ratio (%) (Mean±SD) | Gain in bone height (Mean±SD) |
|---|---|---|
| Target group | 78.46±27.71 | 3.00±1.26 |
| Control group | 89.08±2.64 | 4.85±0.81 |
| p-value[1] | 0.24 | 0.001* |

[1]Unpaired t-test

Table-8 shows the comparison of implant contact ratio between the groups at 3 months. Implant contact ratio was insignificantly lower (p>0.05) lower among the patients of Target group (78.46±27.71) than Control group (89.08±2.64 after 3 months also shows the comparison of gain in bone height between the groups at 3 months. Gain in bone height was significantly lower (p=0.001) lower among the patients of Target group (3.00±1.26) than Control group (4.85±0.81) after 3 months.

## DISCUSSION & CONCLUSION

The clinical mobility was absent in both the groups at every follow up.

We could achieve this because of a strict surgical protocol followed ie; in soft bone and in fresh extraction sockets, implants were placed in underprepared osteotomies. It was possible to achieve implant primary stability even when the available bone height was limited down to 5 mm. Expansion-osteotomes were used instead of drills, to avoid ovalization of the osteotomy site and condense the surrounding bone. .It can be attributed to the average initial available bone to place the implant in osteotome group which was significantly more than in hydraulic group and also to the peripheral bone compaction in osteotome group**.**

**Huang HL et al 2011,**[4] to maximize initial stability recommended that the recipient bed should be prepared in a slightly smaller size than the implant diameter; at the same time, the use of a fixture with specific microscopical features may be helpful. In our present study, a strict surgical protocol has been followed: in soft bone (types III and IV) and in fresh extraction sockets, implants were placed in underprepared osteotomies. In addition, the threads of the implant used in this study were designed to provide high insertion torque, by increasing their dimensions toward the coronal end of the implant. This specific macro-topographical feature may allow for axial and radial bone compression during implant insertion, and it may be particularly useful in areas of poor bone quality, providing the increased primary stability that is necessary for immediate loading.

Histomorphologic studies report that the RFA value has a high correlation with the bone implant contact. On the contrary, other reports claim that there is no correlation between the bone density and ISQ. Therefore, RFA signifies the bone anchorage of implants but the relation of RFA and bone structure is not yet clear. Such diverse results showed, RFA value decreases during the first 2 weeks after implant placement, and this change can be related to early bone healing such as biological change and marginal alveolar bone resorption. The relationship of bone structure and RFA is not fully understood. Since primary stability is affected by bone volume or bone trabeculae structure, as well as cortical bone thickness and density, the effect of bone quality on implant stability, cannot be explained by bone **Lai C. H. et al in 2009**[13] had ISQ values over 66 at first measurement, indicating that osteotome procedure provided good primary stability, which is most important basis for implant success. **Marco T et al in 2016**[14] had a mean ISQ value 65.5 at implant placement and it increased to 74.1 at the 6 month examination. The titanium implants used in their study had been subjected to anodic oxidation, **L.Stefan et al in 2004**[15] which results in the growth of the native titanium oxide layer and the formation of a porous surface structure.

The bone implant contact ratio was insignificantly lower ($p>0.05$) among the patients of Target group (87.09±2.89) than Control group (89.08±2.64 after 6 months. There were two possible rationales of endo-sinus new bone formation. One was the osteogenic activation after sinus floor mini-fracture. The osteogenic progenitors required for osteogeneis could derive from bone marrow stroma, periosteum and microvascular walls **(Bruder et al. 1994)**[16]. When the sinus floor was fractured and pushed upwards by osteotome, the bone healing process was stimulated. The new bone might generate upwards, from the original sinus floor to the implant apex, and then reach the displaced bone core to form a new cortical line of sinus floor. Furthermore, the maxillary sinus membrane may play an even direct role in the bone healing process**. Gruber et al. (2004)**[17] conducted an in vitro study and concluded that the sinus mucosa contains mesenchymal progenitor cells and cells committed to the osteogenic lineage. Lundgren et al. (2004) also indicated that, beside the osteogenic properties, the sinus membrane could also protect the blood clot in the healing process as a barrier membrane after surgery. Gain in bone height was significantly lower ($p=0.05$) lower among the patients of Osteotome group (4.00±1.26) than hydraulic group (5.85±0.81) after 6 months. In hydraulic group the amount of bone formation after sinus lift was directly releated to volume of normal saline used for elevation. In hydraulic pressure the more surface area of schneiderian membrane was in contact with normal saline during elevation of sinus membrane as compared to osteototome because of which the area gained in hydraulic group was more. By using osteotome (Nkenke et al. 2002; Artzi et al. 2003; Sotirakis & Gonshor 2005) or combinations of ostetomes and burs (Horowitz 1997, Zitzmann & Scha¨rer 1998, Toffler 2004; Leblebicioglu et al. 2005; Li 2005; Barone et al. 2008; Fermerga ˚rd & Astrand 2008; Schmidlin et al. 2008; Nedir et al. 2009), either with (Horowitz 1997; Nkenke et al. 2002; Toffler 2004; Sotirakis & Gonshor 2005; Barone et al. 2008) or without graft biomaterials (Zitzmann & Scha¨rer 1998, Artzi et al. 2003; Leblebicioglu et al. 2005; Li 2005; Fermerga ˚rd & Astrand 2008; Schmidlin et al. 2008; Nedir et al. 2009), reported a mean vertical bone gain lower than 5 mm[17].

No statistical significant difference was found, the overall patient satisfaction was high in both study groups. In our knowledge there has been a no direct comparison between Tatum's ostetotome and hydraulic sinus lift procedure for dental implant placement, due to limited number of sinus lift procedure in a limited period of study; it is worthwhile to mention that sinus lift with hydraulic pressure has provided a viable restorative solution to edentulous areas especially in a compromised or insufficient alveolar bone volume in areas like posterior maxilla. Results are highly predictable lowered morbidity shorten the surgery duration and in turn reducing the cost of treatment. Further studies with larger number of sample size with longer follow could be done to prove its efficacy.

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