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Original Research

Assessment of factors related to outcome of orthodontic mini-implants

Mir Yasser Abdullah[1], Jan Mohd Bhat[2], Ishfaq Ahmad Bhat[3]

[1]PG 3rd year, Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Studies and Technologies Modinagar U.P., India
[2]PG 1st year, Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Studies and Technologies Modinagar U.P., India;
[3]PG 2nd year Department of Pedodontics and Preventive Dentistry, Institute of Dental Studies and Technologies Modinagar U.P., India;

ABSTRACT:
Background: The clinical application of temporary anchorage devices (TADs) and specifically of orthodontic mini-implants has been increased lately. The present study was conducted to assess factors related to the clinical application of orthodontic mini-implants. **Materials & Methods:** The present study was conducted on 106 patients who were given mini implants of both genders. Factors related to patients such as implant length, systemic diseases, bone width and malocclusion was recorded. **Results:** There were 66 males and 40 females. Males had 80 and females had 52 dental implants. There was 22 mini implants failure in patients with 42 systemic diseases, maximum implant failure was seen in type IV bone (12) followed by type III (10), II (8) and I (12), 10 in 68 >12 mm height, 12 in 42 10-12 mm implant height and 10 in 22 <10 mm height. Implant failure was seen in 15 in bone width <3.75 mm, 20 in 3.75- 4 mm and 7 in >4 mm and 27 out of 62 patients with malocclusion. **Conclusion:** Authors found that factors such as bone height, width, malocclusion, systemic diseases and bone type determine the outcome of mini implants.
Key words: Anchorage, Malocclusion, Mini implants.

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Corresponding author: Dr. Mir Yasser Abdullah, PG 3rd year, Department of Orthodontics and Dentofacial Orthopaedics, Institute of Dental Studies and Technologies Modinagar U.P., India

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INTRODUCTION

The clinical application of temporary anchorage devices (TADs) and specifically of orthodontic mini-implants has been increased lately. Defining specific indications where orthodontic mini-implants can successfully be used has 2 potential benefits.[1] First, using mini-implants appropriately will lead to improved treatment results. Second, not using them when traditional mechanics could lead to equally satisfying results prevents overtreatment. However, because of the versatility of mini-implant– enhanced mechanics, some situations that could be resolved with traditional mechanics might be treated in a shorter time or at least with a more predictable outcome. In these situations, mini-implant anchorage might be indicated if the patient's desires can be better addressed and the benefits outweigh the risks.[2] Mini-implant success is high whereas failure rate is relatively low (13.5%). Most failures occur after orthodontic loading. Failure rate differences between jaws have limited clinical significance. Their use entails risk of complications, which include inflammation, trauma of anatomic structures, implant loss due to mobility, and implant fracture. Successful application of mini-implants is based on factors concerning the patient, selection of insertion site and mini-implant, insertion procedure, and orthodontic loading.[3]

In terms of general patient factors, healthy individuals deprived from systemic disease or condition or

medication compromising osseous healing is ideal for mini-implants. There is no limit in patient's age although their use in very young individuals was questioned.[4] Daily proper oral hygiene improves prognosis since local inflammation was directly associated with failure and a relative risk factor for failure when mobility was excluded. Preventing inflammation is imperative for success, whereas factors affecting inflammation are indirectly related to failure, such as improper oral hygiene and screw emergence at the oral mucosa.[5] The present study was conducted to assess factors related to the clinical application of orthodontic mini-implants.

MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 106 patients who were given mini implants of both genders. They were informed regarding the study and written consent was obtained. Ethical clearance from ethical committee was taken prior to the study.

Data such as name, age, gender etc. was recorded. Patients were recalled regularly to determine the outcome of treatment. Factors related to patients such as implant length, systemic diseases, bone width and malocclusion was recorded. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 106		
Gender	**Males**	**Females**
Number	66	40
Implants	80	52

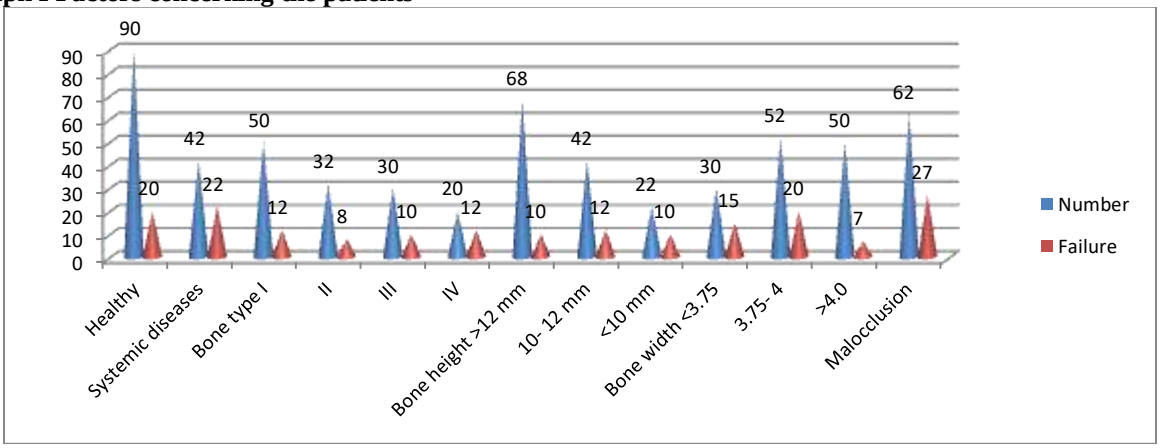
Table I shows that there were 66 males and 40 females. Males had 80 and females had 52 dental implants.

Table II Factors concerning the patients

Factors	Number	Failure	P value
Healthy	90	20	0.05
Systemic diseases	42	22	
Bone type I	50	12	0.04
II	32	8	
III	30	10	
IV	20	12	
Bone height >12 mm	68	10	0.03
10- 12 mm	42	12	
<10 mm	22	10	
Bone width <3.75	30	15	0.01
3.75- 4	52	20	
>4.0	50	7	
Malocclusion	62	27	

Table II, graph I shows that there was 22 mini implants failure in patients with 42 systemic diseases, maximum implant failure was seen in type IV bone (12) followed by type III (10), II (8) and I (12), 10 in 68 >12 mm height, 12 in 42 10-12 mm implant height and 10 in 22 <10 mm height. Implant failure was seen in 15 in bone width <3.75 mm, 20 in 3.75- 4 mm and 7 in >4 mm and 27 out of 62 patients with malocclusion.

Graph I Factors concerning the patients



DISCUSSION

Orthodontic anchorage is defined as resistance to undesired tooth movement. In the anteroposterior dimension, 3 anchorage situations are traditionally defined by the ratio of incisor retraction to molar protraction.[6] While moderate anchorage entails reciprocal space closure, maximum anchorage means that most of the space is closed by retraction of the incisors, and minimum anchorage means that most of the space is closed by protraction of the buccal segments.[7] Implant failure might delay treatment time. Some systems offer mini-implants of significantly larger diameter that can be placed immediately in the site of the failed implant. Extreme caution must be used to prevent damage of the adjacent roots.[8] A healing time of 2 to 3 months before placing a new implant of the same diameter in the same location is necessary to allow for the bone to fill in. Another alternative could be to replace the original monocortical screw with a longer bicortical screw.[9] The use of bicortical screws when monocortical screws fail needs further investigation. The greatest danger of mini-implant failure is aspiration if the implant becomes completely dislodged from the appliance. However, since aspiration of foreign objects is a rare occurrence in awake patients, the risk of this is negligible in a neurologically normal person.[10] The present study was conducted to assess factors related to the clinical application of orthodontic mini-implants.

In this study, there were 66 males and 40 females. Males had 80 and females had 52 dental implants. Motoyoshi et al[11] found the success rate was 63.8% in the early-load group (less than 1-month latent period) of adolescents, 97.2% in the late-load group (3-month latent period) of adolescents and 91.9% in the adult group. The success rate of the early-load group of adolescents was significantly inferior to those of the other groups ($P < 0.01$). In measurements of the placement torque in adolescents, the success rate of the 5–10 N cm group was significantly higher than the other groups only in the maxillary arch of the early-load group. Although the optimum torque could not be defined, a latent period of 3 months before loading is recommended to improve the success rate of the mini-implant.

We found that there was 22 mini implants failure in patients with 42 systemic diseases, maximum implant failure was seen in type IV bone (12) followed by type III (10), II (8) and I (12), 10 in 68 >12 mm height, 12 in 42 10-12 mm implant height and 10 in 22 <10 mm height. Implant failure was seen in 15 in bone width <3.75 mm, 20 in 3.75- 4 mm and 7 in >4 mm and 27 out of 62 patients with malocclusion.

High anchorage demanding cases involving distal movement of molars or extrusion and intrusion of teeth require careful planning and anchorage control. Traditionally both intra-oral and extra-oral methods are used in both non-extraction and extraction cases. Unfortunately often the orthodontist has to rely on patient compliance ie wear of headgear to ensure unwanted tooth movements and loss of space does not occur. Within the literature mini-implants have also been described as mini-screws, micro-implants, skeletal anchorage devices, temporary anchorage devices and orthodontic implants. Mini-implants have been recently introduced within orthodontics for skeletal based anchorage.[12]

CONCLUSION

Authors found that factors such as bone height, width, malocclusion, systemic diseases and bone type determine the outcome of mini implants.

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