ORIGINAL RESEARCH

Postoperative Evaluation of Delayed Implant Placement in Mandibular First Molar

Surya Prakash Bharadwaj, Rudresh KB Gowda, Raju Sikkerimath

ABSTRACT

Aim: To evaluate the effectiveness of delayed implant placement in mandibular first molar by follow-up of patients for 6 months followed by implant placement.

Materials and methods: Eight patients (five men and three women) aged 19 to 35 years were included in this study. Each patient had edentulous space in mandibular first molar for 3 months postextraction. After implant placement surgery the second stage surgical procedure was performed 3 months after the first procedure. The following parameters were evaluated at the time of implant placement and at second stage surgery: Implant mobility and soft tissue dehiscence clinically, peri-implant radiolucency and marginal bone loss evaluated radiographically.

Results: The postsurgical healing period was uneventful for all patients. At second stage surgery, no peri-implant defects or implant mobility were observed (except in one patient).

Conclusion: Successful osseointegration was observed in all patients. The soft tissue healing was satisfactory. Additional mucogingival surgery was not required before definitive prosthetic rehabilitation.

Keywords: Delayed implant, Osseointegration, Mucogingival surgery, Prosthetic rehabilitation, Periodontal support.

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INTRODUCTION

Dental implants have been accepted internationally and have become a vital treatment modality for oral rehabilitation. Since, Branemark and associates began publishing their historic studies, research has shown that good success and prognosis can be achieved when implants are used within the defined treatment parameters.

Implant dentistry has provided treatment planning opportunities that have revolutionized dentistry. The ability to restore completely or partially edentulous patients to function and an esthetic appearance comparable to the dentate state has been demonstrated to be predictable.

The application of endosseous implants for the restoration of single missing teeth is widely accepted and has been reported in number of studies. The option of implants for the replacement of teeth has been a valuable addition to the established conventional methods.[1-8]

Dental epidemiologic studies demonstrate that missing of single teeth is commonly encountered problem in all age groups. The loss of a single tooth is regarded as a common cause of a nonphysiologic occlusion resulting from tipping of neighboring teeth and extrusion of opposing teeth. In visible sites, esthetic concerns may also raise psychological implications which necessities replacement.[2,3]

Single tooth replacement is perhaps the most recent advance in implant dentistry. Surgical requirements of single tooth implant are absence of local pathology or infection, adequate bone volume, suitable socket status, ridge morphology, acceptable bone quality, healthy soft tissue status and absence of vital structures in the surgical field.[4-8]

The posterior regions of the mouth often require placement of single toot. The mandibular first molar is the first permanent teeth to erupt in the oral cavity and unfortunately first teeth to be lost in frequency. Failure to replace missing molar will have variable effect on occlusion, arch form, temporomandibular joint (TMJ) and vertical dimension. Decrease in vertical dimension may lead to various TMJ disorders. The disturbed proximal contact relationship leads to food impaction, gingival inflammation, followed by bone loss and tooth mobility. Reduction in periodontal support leads to further migration of the teeth and disturbance of occlusion.[9,10]

Posterior single tooth implant restoration provides various advantages like the initial available bone width which is greater in posterior regions compared with anterior tooth position. The thicker buccal plate of bone delays bone resorption, the cervical esthetic aspect of the posterior teeth including the interdental papillae are less demanding than anterior esthetic regions, the esthetics relative to overall crown contour and shade is less demanding. Disadvantages inherent to posterior teeth region of the jaw are related to greater forces developed during function, the limited height caused by anatomical landmarks, and the variable bone quality.[11-13]

Immediate implantation has provided implant dentistry an opportunity to achieve better, faster functional and esthetic results. The placement of implants immediately or shortly after tooth extraction has got limited indication which proven to be a predictable treatment strategy but has lesser success rate as compared to delayed implant placement.[14-17]

By delaying the implant placement, the surgeon avoids complication like infection by placing the implant into healthier tissue. Delayed implantation achieves better results

over immediate implantation as immediate implant placed in purulent exudate at the time of extraction, adjacent soft tissue cellulites, granulation tissue and lack of apical bone at the extraction site.[18]

Autotransplantation involves the transfer of a tooth from its alveolus to another site in the same person. This site may be either an extraction site or a newly surgically prepared alveolus. Transplantation has a key role in the replacement of young patients missing teeth. Osseointegrated implants are generally contraindicated for young patients with developing alveolar bone because infraocclusion results when the implant fails to form alveolar bone. Successful tooth transplantation offers improved esthetics, arch form and dentofacial development, mastication, speech and arch integrity. A transplanted third molar also maintains natural space, with little or no root resorption alveolar bone volume and the morphology of the alveolar ridge through proprioceptive stimulation. Advantages of transplantation are: Better alternative than fixed or removable prosthodontics, avoidance of adjacent teeth preparation, comparative cost-effectiveness. Disadvantages of transplantation are surgical involvement superior to that of a simple extraction, poor prediction of the final outcome, eventual loss of the tooth because of possible complications such as root resorption and loss of attachment.[19-22]

NEED AND AIMS OF THE STUDY

To evaluate effectiveness of delayed implant placement in mandibular first molar by follow-up of patients for 6 months followed by implant placement.

MATERIALS AND METHODS

Ten partially edentulous patients (four males and five females) aged 19 to 35 years who were in need of first mandibular molar were included in study. All the patients willing to participate in the study demonstrated good general health and showed motivation to have implant. The procedures to be performed were explained and informed consent taken. Inclusion criteria for the study were: (1) The presence of adequate bone and edentulous space as analyzed clinically and radiographically; (2) the absence of acute inflammation in the treatment area; (3) the absence of systemic pathologies that would compromise bone healing; (4) good oral hygiene.

In each patient, the intra-arch relationship was evaluated using diagnostic casts. Periapical and panoramic radiographs were taken to assess bone architecture and surrounding structures. An individualized acrylic resin occlusal template was fabricated for each patient to obtain an ideal position for implant placement.

Ten partially edentulous first molar areas in 10 patients were selected for replacement by an implant. After initial treatment planning procedures, all patients underwent scaling and received oral hygiene instructions as necessary to provide an oral environment more favorable to wound healing.

Patients were instructed to use chlorhexidine twice daily for 4 weeks and immediately before surgery they rinsed with betadine mouthwash. Under local anesthesia (2% lignocaine), crestal incision was given followed by mucoperiosteal flap reflection (Figs 1 to 6). The implant site preparation was done with standard drills using the surgical template as guide. After implant site preparation the longest and widest possible implants were placed at the buccal-palatal level of bone crest. All implants showed good primary stability. After placement of implant and adequate stability the abutment was removed with the help of hex tool, followed by placement of cover screw.

All implants used are internal hex, the occlusal (platform) aspect of implant is the receiving area for the

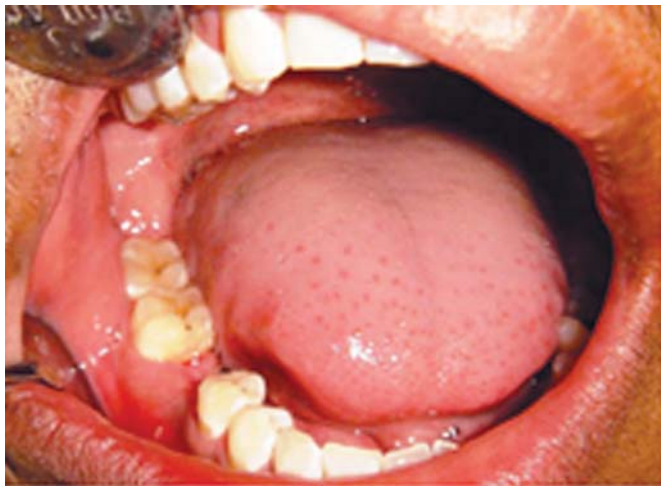


Fig. 1: Edentulous area

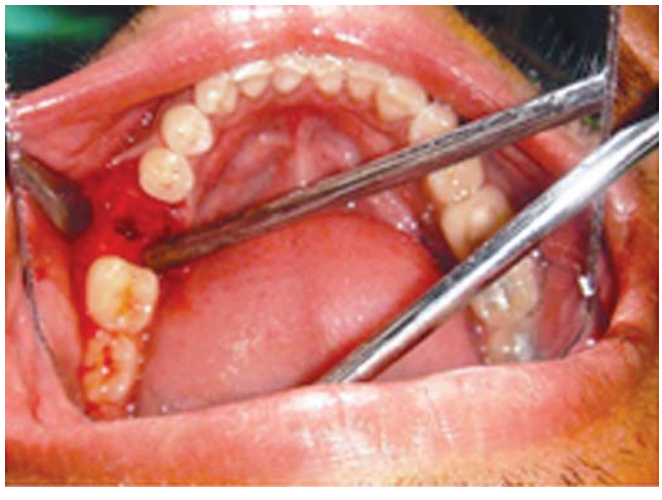


Fig. 2: Implant bed preparation

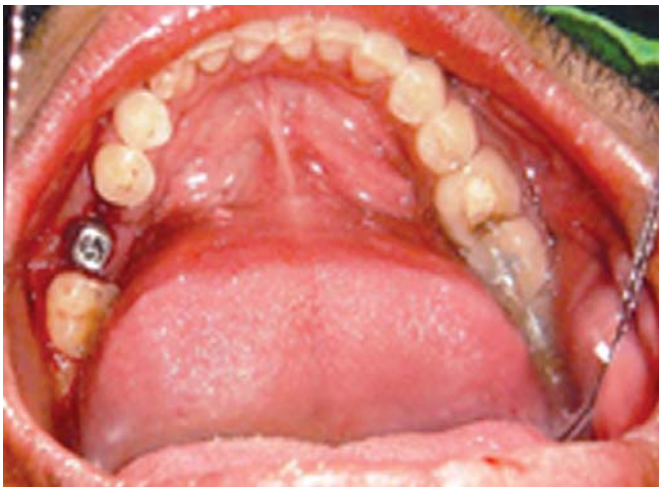


Fig. 3: Placement of implant in implant bed

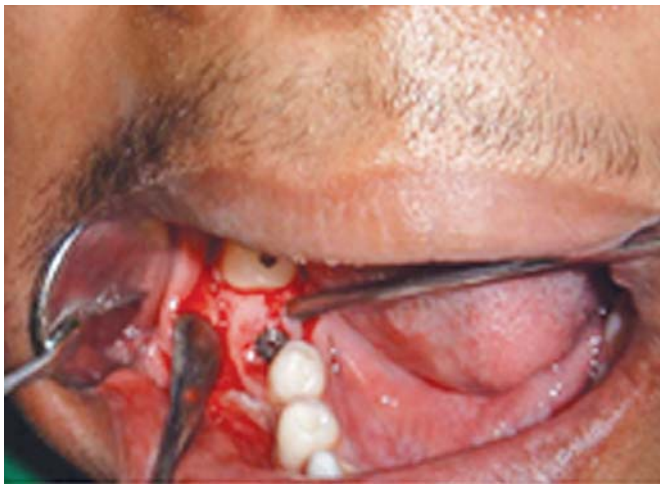


Fig. 5: Cover screw

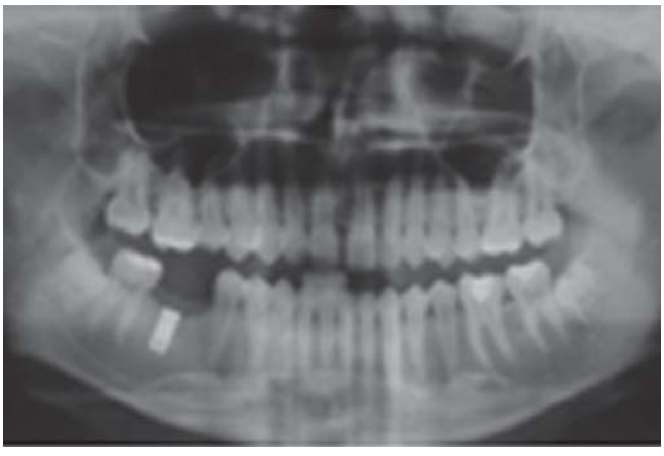


Fig. 4: Postoperative photograph

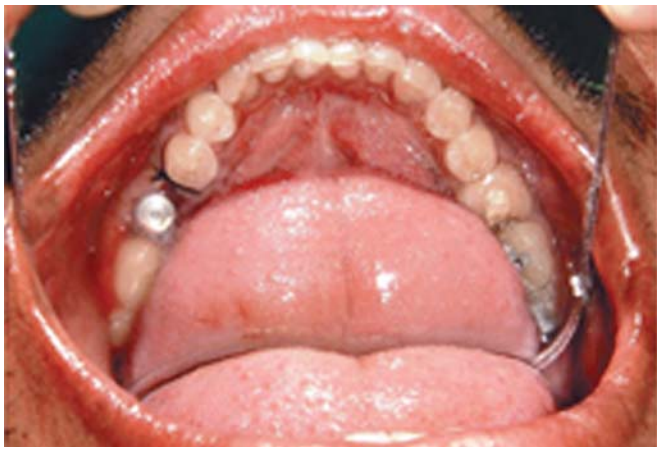


Fig. 6: Healing collar

prosthetic component of restoration. This area of implant is placed level with the crest of bone. The machined neck and MTX microtextured surface portion of implant that included the threaded area are placed subcrestal. Implant length ranged from 8 to 13 mm and diameter from 3.3 to 5 mm. After implant placement, soft tissue edges were sutured to protect the implant sites.

Antibiotics [500 mg amoxicillin thrice a day (tid) for 5 days], anti-inflammatory medication (tablet Dicloran A, tid for 3 days) were prescribed for all patients. Sutures were removed after 7 days. The patients were seen monthly for prophylaxis. Removable prosthesis was given in the esthetic zone, which was relieved form occlusion.

The second stage surgical procedure was performed 3 months after the first procedure. An incision was made at the crestal level to remove the cover screw and to place healing collar (Figs 6 to 9). After 2 weeks of healing, abutment implants were restored with single crown prosthesis (Figs 8 and 9). All patients participated in an individually tailored recall schedule ranging from 2 to 3 months. The total follow-up period was 6 months following placement of prosthesis.

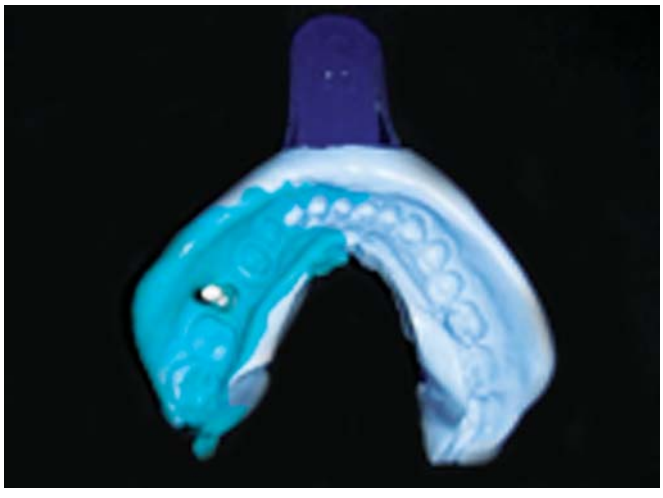


Fig. 7: Impression transfer

The following clinical parameters were evaluated at the time of implant placement and at second stage surgery and prosthetic placement.

1. Presence or absence of implant mobility
2. Soft tissue dehiscence
3. Infection

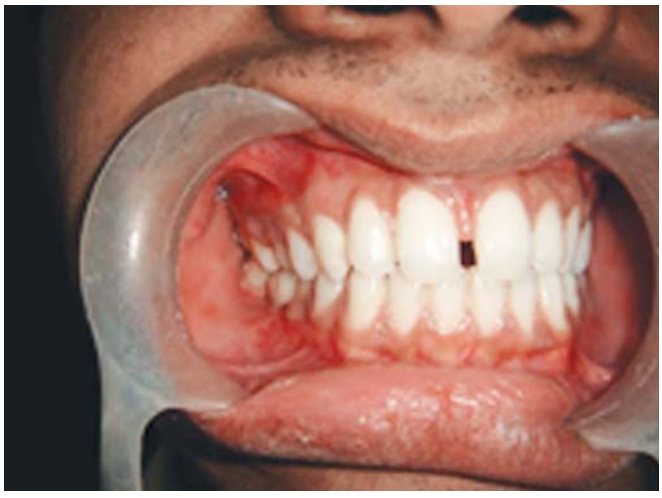


Fig. 8: Prosthetic placement

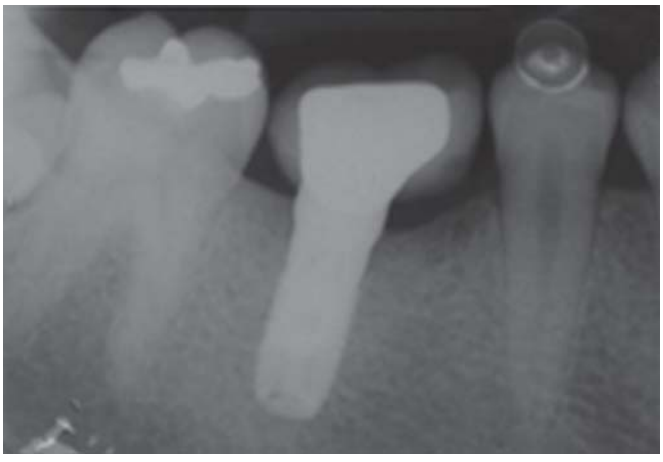


Fig. 9: Post-prosthesis IOPAR

4. Peri-implant radiolucency
5. Bone loss.

To evaluate the last two parameters a periapical radiographic examination was conducted (Fig. 10).

RESULTS

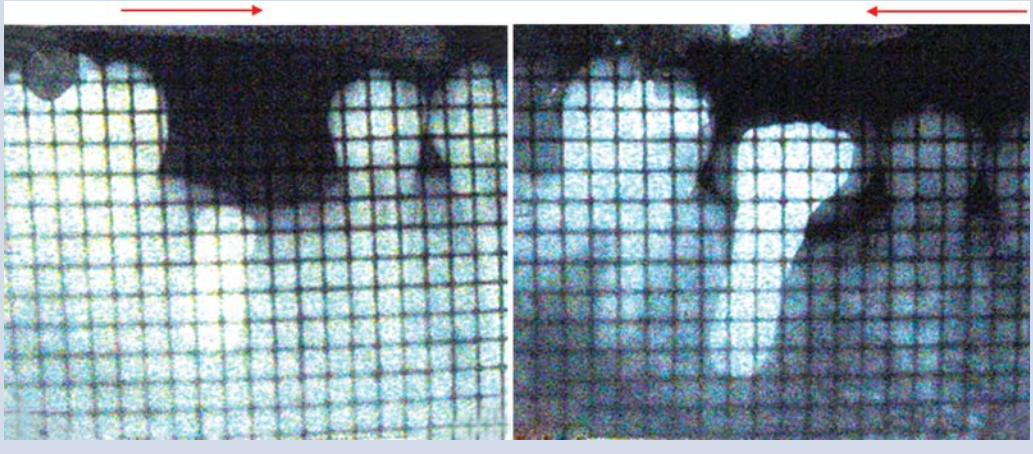
The surgical implant site preparation and implant placement proceeded uneventfully in all the eight patients. A total of eight implants were placed in eight patients.

Prefabricated surgical template was used as a guide while drilling the bone. The postsurgical complaints from the patients were minimal. Pain and swelling were the most frequently mentioned symptoms. The postsurgical healing period was uneventful for all patients. Soft tissue closure was observed to be complete over the implant sites at end of 3 weeks except in one patient. No exposure of the cover screw was noticed at 3 weeks or later except in one patient which was covered at the end of 6 weeks.

At the second stage surgery all implants were asymptomatic, immobile except one patient with progressive implant mobility after 3 months peri-implant bone defects were observed or detected by probing around the implants. Two of 10 implants had excessive bone growth over the implant head. The excess bone was removed with curette so that the healing abutments could be placed.

The soft tissue anatomy was clinically acceptable in all patients. Additional mucogingival surgery to improve the soft tissue morphology was considered unnecessary. The mucogingival junction did not show any change and width of the keratinized mucosa was stable throughout the study. The radiographic examination did not show any peri-implant radiolucency. All implants were deemed successful at 6 months after prosthetic rehabilitation on the basis of the clinical criteria of Albrektsson and associates except one who had implant mobility 3 months following placement which was removed later.

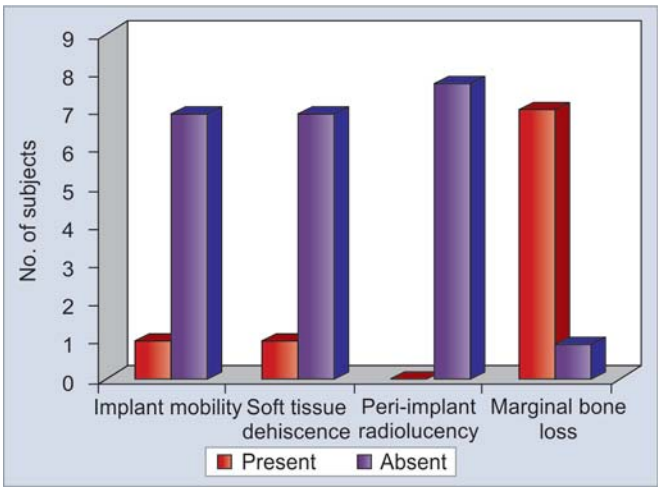
In the present study, the implant mobility was observed in one patient (12.50%), periapical radiolucency was absent in all the patients, soft tissue dehiscence was present in one



Immediate postoperative (bone level): Measured from implant crest

Six months postoperative: 1 mm of bone loss as measured through grid

Fig. 10: Measurement of bone loss after 6 months on 1 mm grid



Graph 1: Distribution of study subjects according to various study criteria

patient (12.50%), marginal bone loss ranged from 0 to 1 mm (0 mm: 12, 50%; 0.5 mm: 75%; 1 mm: 12.50%) at 6 months follow-up (Graph 1).

Observation from this study is an excellent soft tissue healing around the delayed implants with a stable mucogingival junction with respect to the adjacent teeth, the stable width of keratinized tissue, and the preservation of interdental papilla. These clinical results reduced the need for further mucogingival surgery during prosthetic rehabilitation.

DISCUSSION

The purpose of present study is to evaluate the treatment outcome of delayed placement of implant following extraction of mandibular first molar and to evaluate any complication postoperatively for 6 months. The first molar is the first permanent teeth to erupt in the oral cavity and unfortunately first teeth to be lost in frequency. Failure to replace missing molar will have variable effect on occlusion, arch, TMJ, etc. Second and third molar will tilt mesially resulting in decreased vertical dimension.

A zone of safety for placement of posterior mandibular endosteal implants was established by Misch in 1980 by evaluation of 530 consecutive panoramic radiographs of partially edentulous patients and further confirmed by Crawford in 1989. Defined as an area within the bone in which implants may be placed safely without fear of impingement on the neurovascular bundle. Studies indicated radiographic prevalence of the mandibular canal below the zone of safety. A zone of safety was observed in 100% of the radiographs mesial to the middle of mandibular first molar. In the region of distal half of the first molar—97.5%. In the region of mesial half of the second molar—43%. In the region of distal half of second molar—5.5%. The most common position of the canal anterior to the mid first molar region was 2 mm or more apical to the zone of safety representing a gray zone of additional surgical safety mandibular region.

Various short terms has indicated the promising results for placing and maintaining the stability of implants for support of single tooth restorations. The gingival situation around the single crowns was generally healthy and therefore comparable to situation around the natural teeth. Yet signs of local short term inflammation were observed and basically resolved by retightening loose abutment screws.[1-8]

The revized criteria for implant success as proposed by Albrektsson contain vertical bone loss than 0.2 mm annually following the implant's first year of service. This criterion has been satisfied by various studies done on single tooth implantation.[1-8]

Patient's benefits included an improved masticatory apparatus, reduced stress on the remaining anterior segments of the dentition in periodontally compromised dentitions, comfort and psychological benefits. Initially the posterior areas were avoided because of the anatomic structures–the inferior alveolar nerve in the mandible and cancellous nature of bone makes the quality less advantageous. It was therefore important to select a large number of patients with posterior implant and follow the progress of treatment, regardless of the limitation of the retrospective study.[10-12,14]

By delaying the implant placement, the surgeon avoids potential infections and places the implant into healthier tissue. Delayed implantation achieves better results when there is presence of purulent exudate at the time of extraction, adjacent soft tissue cellulites and granulation tissue, lack of bone apical to the extraction site, adverse location of the mandibular neurovascular bundle, maxillary sinus.

A study was conducted to evaluate the clinical effectiveness of implant-supported single-tooth replacement. Forty-one patients received 49 single-tooth implants placed in different jaw locations. One implant was not osseointegrated at stage II surgery. Three successfully osseointegrated implants were not available for follow-up. Forty-five implants were monitored for 1 to 8 years after loading. In this study, 41 consecutively treated patients received total of 49 single tooth implant indifferent jaw areas. Of the 47 implants five implant (11%) experienced soft tissue dehiscence. One implant in this study failed to osseointegrate as observed during stage II surgery. During the follow-up period, the mean annual bone loss was for all implant ranged from 0.36 to 0.40 mm and the marginal bone level ranged from 4.58 of bone loss to 0.74 mm of bone gain.[15]

One of the study evaluated experiences from a prospective study for single tooth restorations supported by osseointegrated implants. Fifty-seven patients were followed for 2 years and 34 patients were followed for 3 years. One implant was lost due to presence of vertical mobility, also there was presence of soft tissue inflammation and recession in one patient. Mean marginal bone loss of 1.33 mm was present at the end of 1 year which ranged from 0.16 to 0.30 at first year.[16]

In the present study the implant mobility is observed in one patient (12.50%), periapical radiolucency was absent in all the patients, soft tissue dehiscence was present in one patient (12.50%), marginal bone loss ranged from 0 to 1 mm (0 mm: 12.50%; 0.5 mm: 75%; 1 mm: 12.50%) at 6 months follow-up. These results coincide with various previous studies.[17,18]

Observation from this study is an excellent soft tissue healing around the delayed implants with a stable mucogingival junction with respect to the adjacent teeth, the stable width of keratinized tissue, and the preservation of interdental papilla. These clinical results reduced the need for further mucogingival surgery during prosthetic rehabilitation.

With the methodology used in present study, and the results obtained concluded that delayed implant can be used successfully to replace the missing first molar with good results which is also supported by various study done previously.

CONCLUSION

Delayed implants placed for replacement for mandibular first molar healed predictably.

Complete bone healing was achieved with soft tissue dehiscence observed in one patient. From this study an excellent soft tissue healing around implants was achieved. Implant mobility was absent in all cases (except in one patient) with minimal marginal bone loss and without peri-implant radiolucency.

Thus, it can be concluded that delayed implantation can be used as successful treatment modality for replacing mandibular first molar.

However, these results are after a short duration of follow-up and a smaller sample size, the future stability of an implant and the soft tissue healing cannot be predicted by this. These questions can only be addressed by studies with larger sample size and a longer follow-up period.

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