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FLAPLESS DENTAL IMPLANT SURGERY AS A SUCCESSFUL PATIENT RELEVANT TREATMENT OPTION: A 5-YEAR RETROSPECTIVE CLINICAL AND RADIOGRAPHIC EVALUATION

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ABSTRACT

Background: Dental implants can be done with different surgical protocols. Each surgical protocol has its advantages and disadvantages. **Aim:** The aim of this study was to evaluate the implant flapless technique as a successful patient relevant treatment option. **Methods:** the files of 84 flapless implant patients were retrospectively reviewed and analyzed for success and failure. **Results:** A total of 238 dental implants were done by flapless technique. 224 (~ 94%) flapless dental implants were clinically and radiographically successful through the follow-up period. Fourteen (~ 6%) dental implants showed signs of failure for several reasons upon different time intervals and were analyzed. **Conclusions:** Minimally invasive flapless dental implants surgery offers a predictable patient focused successful outcome.

INTRODUCTION

At first, Implantology has been done through flap elevation surgical concept. Gradually, a mid-crestal incision has been added to the classical protocol. The concept of minimally invasive surgery added the flapless option to the surgical protocol [1]. Easy access and visibility to implant site are among the benefits of flap elevation. It is also considered advantageous when soft tissue or bone augmentation is needed [2].

In the flapless approach, minimal surgical trauma minimizes postoperative pain and discomfort. Furthermore, the intact periosteum reduces bone resorption because of better blood supply [3-5].

However, with flapless technique the true underlying bone topography cannot be observed because of technique blindness and this will increase the risk of implant loss due to perforations. Moreover, thermal damage due to reduced access for external irrigation can be another cause of failure especially if surgical guide is used [6].

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So, despite the advantage of less expected surgical trauma, there is a question about the success rate of flapless surgical protocol. This work was done to answer this question through postoperative evaluation of flapless inserted dental implants.

MATERIAL AND METHODS

All the files of patients who had dental implants inserted with flapless protocol were retrospectively reviewed by the authors. These files were of patients seen at the out-patient dental clinics of SVU and MUST from January 2013 to November 2018.

Inclusion criteria:

- Implants inserted by using the flapless surgical protocol.
- All patients must have full data of clinical examination and radiographic examination.
- No local or systemic contra-indications.
- Minimal follow-up period of 3 years.
- Criteria of successful flapless surgery implant were determined in the study by fulfillment of the following criteria:
  - Implant stability was tested manually by the hand of clinician with a torque wrench using a torque of 30 N-Cm or above.
  - No clinical signs of inflammation or infection around the implant i.e. gingival inflammation, suppuration, increase probing depth or any form of peri-implantitis.
  - No radiolucency or bone rarefaction in the follow up radiographs.
  - Restored implant was functionally loaded without pain or mobility (achieved secondary stability).

SUBJECTS AND METHODS

A total of 238 implants were used in the study, Data of implants and patients are summarized in figure (1) and table (1).

Standard preoperative assessment through clinical examination, study casts and radiographs in the form of cone-beam computed tomography (CBCT) was done for all patients (Figure 2). Radiographic follow up was done by digital periapical radiographs so that the used dose is justified. All patients who received the implant treatment had no systemic or local contraindication to undergo the flapless surgery and to have the dental implants inserted into jaw bones. The study was preapproved by the research and ethics committee of the institute.

Under local anesthesia, the flapless surgical implant technique was applied by drilling with high torque, low speed, and under external irrigating solution, the implants were inserted into the prepared osteotomies with strict follow of manufactures' instructions (Figure 3). Depending on the type of placed implant, the second stage of dental implantation included; implant exposure, gingival formers installation, then prosthetics fabrication in cases of submerged implants, or prosthetics construction directly in non-submerged implants cases.

Documented follow-up period from January 2013 to November 2018, during which clinical data and digital radiographic follow-up records were taken and analyzed (Figure 4).

RESULTS

A total of 224 implants were regarded as successful implants (94%); while only 14 implants (6%) were considered failed Figure(4); according to the determined criteria. Causes of failures were analyzed in table 2. Implants that failed to osseointegrate were retrieved and the treatment planning for patient mouth reconstruction was revised for those cases.

TABLE (1): Stastical Table

Number	Sex	Age	Smoking	Number	Implant Details	Location	Placement Time	Loading Protocol
1	F	34	NS	3	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
2	M	22	S	1	Trate Rootl, RootForm 2-piece	Md	Immediate	2 stages implant
3	M	20	NS	1	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
4	F	25	NS	4	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
5	F	26	NS	2	Trate Rootl, RootForm 2-piece	Md	Immediate	2 stages implant
6	F	22	NS	1	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
7	M	37	S	4	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
8	F	38	S	1	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
9	M	35	NS	5	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
10	M	39	NS	3	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
11	M	41	NS	1	Trate Rootl, RootForm 2-piece	Md	Healed	2 stages implant
12	F	45	NS	5	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
13	F	65	NS	2	Trate Rootl, RootForm 2-piece	Max	Healed	2 stages implant
14	M	63	NS	4	Trate Rootl, RootForm 2-piece	Md	Healed	2 stages implant
15	F	64	NS	8	Trate Rootl, RootForm 2-piece	Max & Md	Healed	2 stages implant
16	M	55	S	2	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
17	M	58	NS	4	Trate Rootl, RootForm 2-piece	Md	Immediate	2 stages implant
18	M	54	NS	4	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
19	F	40	NS	2	Trate Rootl, RootForm 2-piece	Max	Immediate	2 stages implant
20	F	52	NS	8	Zimmer Swiss plus 2-piece	Max & Md	Immediate	2 stages implant
21	F	51	NS	1	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
22	F	53	NS	5	Zimmer Swiss plus 2-piece	Max	Healed	2 stages implant
23	M	38	NS	5	Zimmer Swiss plus 2-piece	Md	Healed	2 stages implant
24	F	39	NS	4	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
25	F	35	NS	2	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
26	F	39	NS	4	Zimmer Swiss plus 2-piece	Md	Healed	2 stages implant
27	F	39	NS	2	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
28	F	23	NS	2	Zimmer Swiss plus 2-piece	Md	Healed	2 stages implant
29	M	29	S	6	Zimmer Swiss plus 2-piece	Max & Md	Healed	2 stages implant
30	F	30	NS	2	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
31	F	33	NS	1	Zimmer Swiss plus 2-piece	Md	Healed	2 stages implant
32	F	33	NS	8	Zimmer Swiss plus 2-piece	Max & Md	Healed	2 stages implant
33	M	36	NS	3	Zimmer Swiss plus 2-piece	Max	Healed	2 stages implant
34	M	38	NS	6	Zimmer Swiss plus 2-piece	Max & Md	Healed	2 stages implant

35	M	30	NS	3	Zimmer Swiss plus 2-piece	Max	Healed	2 stages implant
36	M	39	NS	3	Zimmer Swiss plus 2-piece	Max	Healed	2 stages implant
37	F	36	S	5	Zimmer Tapered screw vent (TSV)	Md	Immediate	2 stages implant
38	M	39	NS	6	Zimmer Tapered screw vent (TSV)	Max	Immediate	2 stages implant
39	M	64	NS	5	Zimmer Swiss plus 2-piece	Md	Immediate	2 stages implant
40	M	64	NS	2	Zimmer Swiss plus 2-piece	Md	Immediate	2 stages implant
41	F	60	NS	2	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
42	F	33	NS	5	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
43	F	59	NS	1	Zimmer Swiss plus 2-piece	Md	Immediate	2 stages implant
44	M	55	NS	4	Zimmer Swiss plus 2-piece	Max	Immediate	2 stages implant
45	F	52	NS	6	Zimmer Tapered screw vent (TSV)	Max & Md	Immediate	2 stages implant
46	F	59	NS	8	Zimmer Tapered screw vent (TSV)	Max & Md	Delayed	2 stages implant
47	F	58	NS	4	Zimmer Tapered screw vent (TSV)	Max	Immediate	2 stages implant
48	M	40	NS	6	Zimmer Tapered screw vent (TSV)	Max & Md	Immediate	2 stages implant
49	M	43	NS	5	Zimmer Tapered screw vent (TSV)	Max & Md	Healed	2 stages implant
50	F	38	NS	2	Zimmer Tapered screw vent (TSV)	Max	Immediate	2 stages implant
51	F	63	NS	2	NucleOss 2 piece	Max	Healed	2 stages implant
52	F	37	NS	3	NucleOss 2 piece	Md	Healed	2 stages implant
53	F	40	NS	1	NucleOss 2 piece	Max	Healed	2 stages implant
54	M	39	NS	1	NucleOss 2 piece	Max	Healed	2 stages implant
55	F	25	NS	1	NucleOss 2 piece	Max	Immediate	2 stages implant
56	M	61	NS	1	NucleOss 2 piece	Md	Immediate	2 stages implant
57	M	41	NS	1	NucleOss 2 piece	Md	Immediate	2 stages implant
58	M	32	NS	3	NucleOss 2 piece	Max	Healed	2 stages implant
59	F	55	NS	7	NucleOss 2 piece	Max & Md	Healed	2 stages implant
60	F	42	S	1	NucleOss 2 piece	Max	Healed	2 stages implant
61	F	37	NS	1	NucleOss 2 piece	Md	Healed	2 stages implant
62	M	63	NS	1	NucleOss 2 piece	Max	Immediate	2 stages implant
63	M	47	S	1	IS II 2-piece	Max	Immediate	2 stages implant
64	M	37	NS	1	IS II 2-piece	Max	Immediate	2 stages implant
65	F	35	NS	2	IS II 2-piece	Md	Healed	2 stages implant
66	M	49	NS	1	IS II 2-piece	Max	Healed	2 stages implant
67	F	28	NS	1	IS II 2-piece	Md	Immediate	2 stages implant
68	F	39	NS	1	IS II 2-piece	Max	Healed	2 stages implant
69	M	65	NS	1	IS II 2-piece	Md	Healed	2 stages implant
70	F	64	NS	1	IS II 2-piece	Max	Healed	2 stages implant
71	F	34	NS	1	IS II 2-piece	Md	Immediate	2 stages implant

72	M	30	NS	1	IS II 2-piece	Md	Healed	2 stages implant
73	F	20	NS	1	IS II 2-piece	Max	Healed	2 stages implant
74	M	29	S	1	IS II 2-piece	Max	Immediate	2 stages implant
75	F	58	NS	1	IS II 2-piece	Md	Immediate	2 stages implant
76	F	27	NS	1	Implant Direct ReActive 2-piece	Max	Immediate	2 stages implant
77	F	29	NS	1	Implant Direct ReActive 2-piece	Max	Immediate	2 stages implant
78	M	61	NS	4	Implant Direct ReActive 2-piece	Max	Healed	2 stages implant
79	M	60	NS	5	Implant Direct ReActive 2-piece	Max	Healed	2 stages implant
80	F	22	NS	1	Implant Direct ReActive 2-piece	Md	Immediate	2 stages implant
81	M	44	NS	2	Implant Direct ReActive 2-piece	Md	Immediate	2 stages implant
82	F	49	NS	2	Implant Direct ReActive 2-piece	Max	Healed	2 stages implant

M:male, F:female, S:smoking, NS:non-smoking, Max: maxilla, Md: mandible, Healed: implant in a healed site, Immediate: immediate implant placement and Delayed: implant placement after 1 week

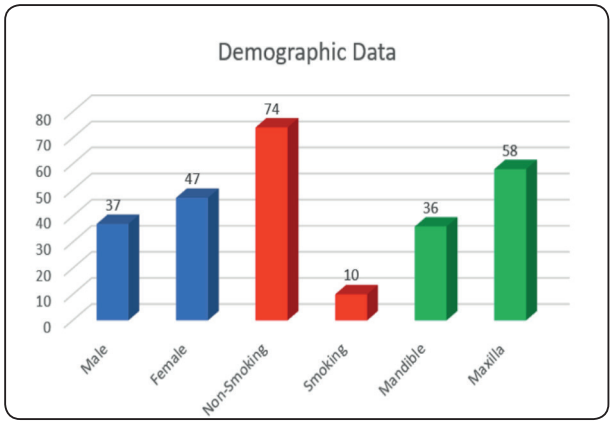

Fig. (1): Demographic data results

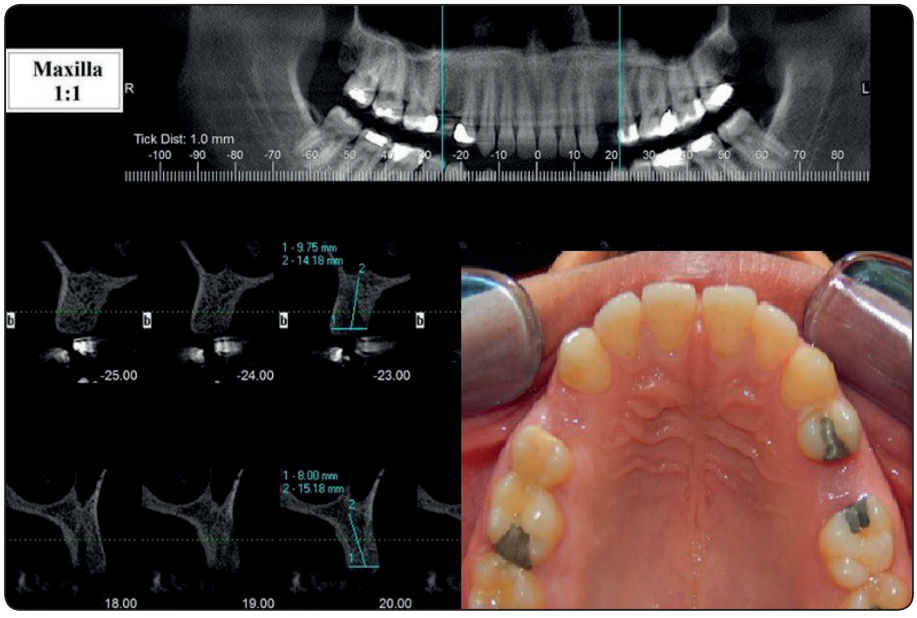

Fig. (2): Preoperative clinical photograph and Cone Beam Computed Tomography of the same case

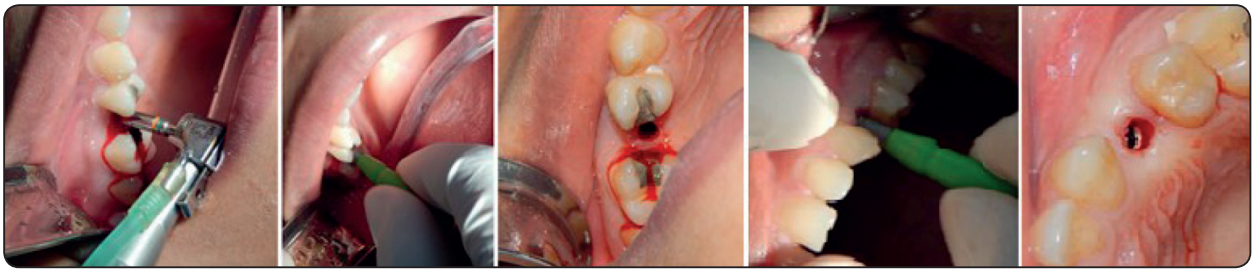

Fig. (3): Clinical intraoral photographs during flapless implant insertion of the right and left side of the patient with free hand technique.

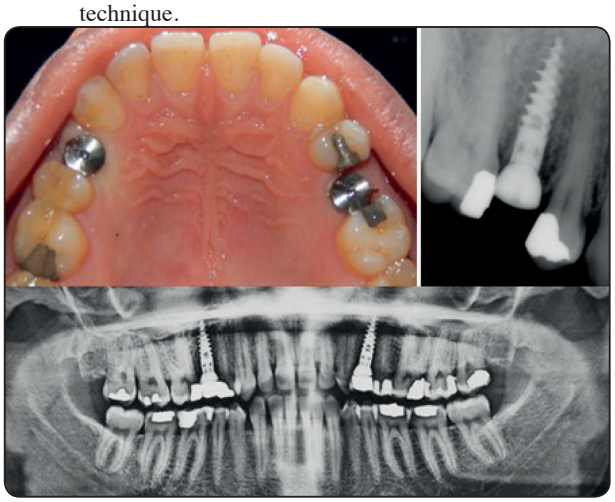

Fig. (3): Postoperative evaluation. A: Clinical intraoral photograph, B: Digital. periapical radiograph and C: Panoramic radiograph

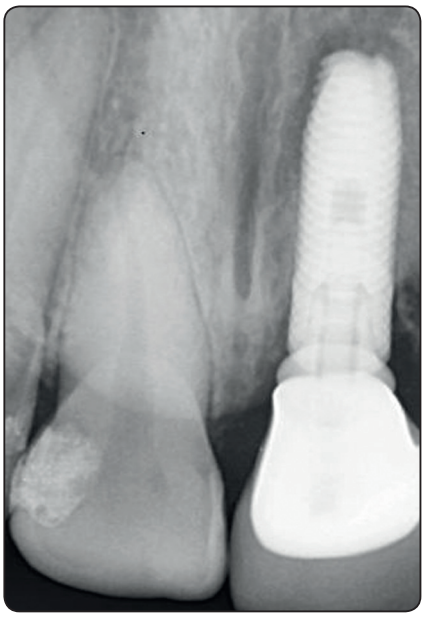

Fig. (4):

DISCUSSION

Flapless implant insertion can be a predictable solution if patient selection and surgical technique are appropriate. It is implant surgeon decision to place implants using a flapless approach depending on the patient status and his or her own surgical expertise and technique [6]. Patients selected for this study were indicated for flapless dental implant surgery and the chosen surgical technique was suitable for them.

The advantageous results of the flapless implant surgery include less traumatic surgery, decreased operative time, rapid postsurgical healing, fewer postoperative complications and increased patient comfort and this is in compliance with Sunitha and Sapthagiri, and Arisan et al [7, 8]. In fact, patients preferred this protocol because of its shorter surgical time and less post-operative complications including pain and swelling compared to the classic flap technique.

The "blindness" of the technique is no longer that problem if the patient has been appropriately selected with enough safe available bone. Today, thanks to advancement in 3D imaging and surgical planning, preoperative planning will make the technique of no blindness anymore. In this study, patients selected for flapless protocol were with enough bone profile as evaluated by CBCT in three dimensions so that if the surgeon is with enough skills and well oriented by the preoperative planning, there is no need for bone exposure and its related complications.

With flapless protocol, preoperative 3D radiographic evaluation is necessary to evaluate the surgical site underneath the soft tissue. Software

can be used for virtual planning and drill guides can be used to link the virtual plan based on the CT images to the real situation during surgery if needed [17-21]. Cone beam computed tomography (CBCT) changes the way by which dental practitioners view the oral and maxillofacial anatomy, thanks to easily manipulated software and reduced radiation dose [22, 23].

The success rate of flapless protocol in this study was as high as 94 % which is comparable to those obtained by other retrospective studies [14, 23] and causes of failures were mainly due to other factors rather than the technique used except for one implant who was retrieved and another implant was placed using the same flapless protocol and was succeeded.

Van der Zee et al [9], in their study on effect of flap reflection on gingiva and bone found that there was statistically significant gingival recession and bone resorption 12 months after surgery favoring the flapless approach versus the flap one.

Following implant surgery, postoperative pain was rated moderate to severe in 89 % of the studied patients according to Bockow et al. [10]. Decreasing postoperative pain is one of the primary goals of any successful patient relevant treatment option. As the cases done in this work were flapless, the incidence of post-operative pain and complications were less as expected [13, 14]. This was attributed to minimal tissue trauma due to avoidance of gingival reflection, evading the need for suturing, placing implants in less time and subsequently rapid tissue healing with least patients' discomfort.

Marinating the soft tissue architecture and hard tissue volume, decreasing the surgical time, allowing the patient to resume normal life immediately is among the benefits of flapless surgery according to Sclar [11] and if the success rate of flapless implant placement when indicated was comparable to the flap approach, flapless implant placement should be the chosen surgical protocol.

There are concerns that in flapless implant surgery tissues might be forced into the osteotomy site which may compromise osseointegration. These claims are not valid anymore because this work and other studies showed that flapless approach is biologically successful, moreover it can be compared to the flap approach without any deleterious effects [15, 16].

The surgeon must balance the benefits of the flapless technique against its risk according to case as bone violation may result in infection and implant loss [24, 25]. This should represent no problem if the patient has been appropriately selected with appropriate bone width of more than 7 mm [2, 26].

The results of the present study have to be interpreted with caution. This study lacks the existence of a control group plus patient randomization but this can be explained by being a retrospective in design. The strengths of this study include the relatively large follow up period and sample size. What motivates the authors to do this work was not only the patient centered care but also the concept of evidence based dentistry in which all documented clinical work should be published so that a proper meta-analysis can be done to reach solid evidence.

CONCLUSION

Flapless surgical implant protocol is a successful patient relevant option as long as it is restricted to well-selected cases with proper preoperative clinical and 3D radiographic planning with and without surgical guide according to case criteria and surgeon skills. Patients with sufficient bone can get benefitted of this minimal invasion technique. A recent meta-analysis is recommended.

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