REVIEW ARTICLE

Immediate Implant Placement: A Scoping Review

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ABSTRACT

Immediate loading protocol reduces patient discomfort because it reduces treatment time as fewer surgeries are performed and offers ample flexibility. The effect of immediate implant loading on peri-implant tissue has not been much discussed. Therefore, it is necessary to undertake a review of the immediate implant loading protocol and its relationship to the peri-implant tissue in the aesthetic zone, to review the most recent literature on the results of existing treatments and the criteria of the conditions that allow this type of treatment to be given. Moreover, an ideal soft tissue profile can be achieved with provisional restoration. Patients' satisfaction and adaptation can be achieved faster because provisional restoration can be placed immediately after surgery to preserve the patient's appearance.

Keywords: Implant, Immediate loading, Aesthetic zone, Placement, Stability

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INTRODUCTION

Tooth loss is a common dental problem affecting patients' quality of life. Tooth loss results in the loss of orofacial structures, including bone tissue, nerves, receptors, and muscles, resulting in diminished orofacial function.[1] Edentulous patient suffers not only with the difficulties in eating but also the psychological aspect of patients due to anterior tooth loss, which has an esthetic function. Therefore, rehabilitative treatment for tooth loss, especially in the anterior region, needs to be addressed immediately.[2]

Replacing tooth loss with dental implant has been preferred due to advances in technology and its associated benefits.[3] Implant placement techniques have developed to be simpler, more affordable, have more prosthetic options, and reportedly have a high treatment success rate.[2,4] This encourages dentists to recommend dental implants as a treatment to restore missing teeth. Moreover, dental implants provide stability and comfort over conventional dentures.[2]

The "traditional" implant procedure developed by Branemark involves placing the implant below the alveolar bone, providing and maintaining soft tissue closure on the implant surface, keeping the implant area stress-free for 3-6 months and then restoring the implant. The success of this two-stage implant surgery technique has been widely documented. However, efforts are still made to achieve breakthroughs to shorten implant treatment time and to allow minimal number of surgical procedures and can still obtain maximum treatment results.[2,5,6]

As the traditional surgical protocol for dental implant evolved over time, more implant loading protocols are developed. According to the sixth conference of the International Implantology Team (ITI) in Amsterdam in 2018, three implant loading protocols were stated. The first is immediate loading, defined as placement of restoration on dental implants up to 1 week after implant placement. Next is early loading, defined as placement of restorarion on dental implants within 1 week to 2 months after implant placement. Lastly is conventional loading, defined as placement of dentures on dental implants more than 2 months after implant placement.[7]

The concept of immediate loaded implants is gaining popularity among dentists as it allows patients to have surgical and prosthetic procedures simultaneously, reducing the time required for treatment. The concept of immediately loading implants is also supported by numerous studies showing favourable results either immediately after implant placement or within short time after implant placement. This treatment is urgently needed for patients with missing anterior teeth in the aesthetic zone.[2,5,8]

Immediate loading protocol reduces patient discomfort as single surgical procedure is required, reduces treatment time because fewer surgeries are performed, and offers ample flexibility. Moreover, an ideal soft tissue profile can be achieved with provisional restoration. Patients' satisfaction and adaptation can be achieved

faster because provisional restoration can be placed immediately after surgery to preserve the patient's appearance, allowing patient to adapt while preserving aesthetic and function.[2,9]

However, the immediate loading of implants has its disadvantages. Duration of the first surgery usually is increased because a series of sequential operation procedures must be performed. Additionally, an experienced operator is required, as immediate provisionalization requires adequate and precise planning. Moreover, disturbances in the early stages of osseointegration between implants and bone tissue can increase the risk of implant failure.[2,6,9]

A successful implant restoration is described as a condition of the implant that has been well osseo-integrated to the surrounding bone and functioning properly, fully supported by healthy peri-implant tissue, totally pain-free, no inflammation detected, and ensures patients' satisfaction. Marginal bone loss in implant-supported restorations has been considered as the "gold standard" for successful of implant-supported restorations. However, other parameters should also be considered, one of which is the peri-implant tissue, as this directly supports the aesthetic appearance of patients' smile.[10]

The effect of immediate implant loading on peri-implant tissue has not been much discussed. Therefore, it is necessary to undertake a scoping review of the immediate implant loading protocol and its relationship to the peri-implant tissue in the aesthetic area, to review the most recent literature on the results of existing treatments and the criteria of the conditions that allow this type of treatment to be given. As one of the dental implant treatment providers, prosthodontist requires comprehensive knowledge of immediate implant loading protocol. Therefore, a scoping review is needed to provide insight into the latest approach, for example whether this protocol requires connective tissue grafting when evaluating peri-implant tissue to provide the best results in implant restoration.

MATERIALS AND METHODS

This literature review was conducted as a scoping review according to the framework created by Hillary Arksey et al. There are stages of making a scoping review framework, which starts at identification of research questions, identification of relevant research, research selection, preparation of data, compilation, summary and reporting of results.[11]

The research question in compiling this literature is "What is the long-term success of implant treatment in the esthetic area with an immediate loading protocol?". Several parameters were used to evaluate the success or performance of implant treatment, such as peri-implant tissue, success rate (success of restoration without complications), survival rate (resistance of a restoration), and clinical performance (clinical performance), and the anterior maxilla or esthetic zone. This scoping review was carried out following protocols from Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).

The literatures were retrieved from electronic databases, namely PubMed, EBSCO, and Scopus. This collection of literature was selected based on several criteria: published in English involving adult individuals with partial tooth loss in the esthetic area as research subjects and research in the last five years. Research questions and literature search parameters can be seen in Figure I.

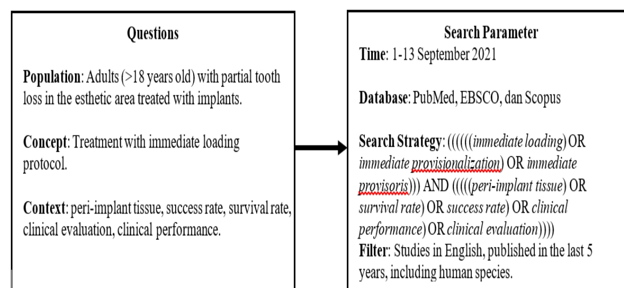

Figure 1: Questions (Population, Concept, and Context) and Framework of Scoping Review

The literature used in this literature focuses on implant treatment with an immediate loading protocol carried out in the aesthetic area, so the literature that discusses implant-assisted removable partial dentures and overdentures is excluded. Research designs compiled in this review include clinical trials, cohort and case-control studies, and clinical trials. The inclusion and exclusion criteria of this review can be seen in Table I.

Table I: Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Period	Published in the past 5 years.	Published before 5 years ago.
Language	English	Non-English
Subject	Adults (> 18 years)	Children (< 18 years)
Concept	Success rate, survival rate, peri-implant tissue, clinical evaluation, clinical performance on treatment with immediate loading protocol on partial tooth loss in maxillary aesthetic zone.	Implant supported dentures (implant-assisted removable partial denture), overdenture, implant treatment other than in maxillary aesthetic zone.
Design	Clinical trials, cohort, case-control.	Case-study, *In-vitro*, Systematic review

The search strategy was made based on each databases' advance search guidelines with the following keywords combination: "*immediate loading protocol*" OR "*immediate provisionalization*" OR "*immediate provisoris*" AND "*peri-implant tissue*" OR "*survival rate*" OR "*success rate*" OR "*clinical performance*" OR "*clinical evaluation*" AND "*anterior maxilla*" OR

"*esthetic zone*". From all the literature obtained from the search results; duplicates were removed from all electronic databases. Then, literatures were selected based on title and abstract by two reviewers (YH & RS). Exclusion is made because it was published more than 5 years ago, is not relevant to the topic under discussion, does not speak English, and the full-text version is unavailable. Subsequently, the remaining literature from the full-text version was extensively searched to obtain literature from eleven scientific journals.

RESULTS

The electronic search yielded 215 documents in detail: 62 from PubMed, 5 from Scopus, and 148 from EBSCO. Then, 23 duplicates were removed from the record. The titles and abstracts were read according to inclusion and exclusion criteria, followed by full-text search. Sixty-six documents did not meet the criteria, and eight documents for full-text access were unavailable. Seventeen documents with full-text access were found and 6 documents were excluded because of the inclusion and exclusion criteria. Finally, 11 publications were included in this scoping review. The literature selection algorithm is shown in Figure 2.

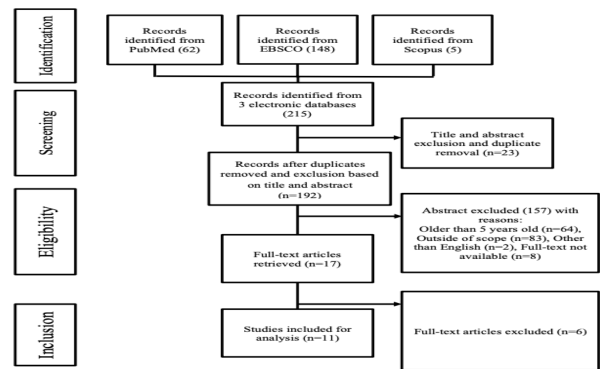

Figure 2: Flowchart of Literature Search and Selection Process

Summaries of information/data were tabulated from the included studies. The extracted data are shown in Table II. This includes the type of study, the number of subjects, the observation period, the type of implant and the technique used, the parameters analysed, and the results obtained.

Tabel II: Included Studies Characteristics and Outcomes Recorded

No	Author, Year	Study Design	Sample Size	Observation Period	Type of Implant and Technique Used	Parameters Evaluated	Outcome
1	Van Nimwegen, et.al.,2016[4]	Retrospective study	64 patients	≤ 4 years	Immediate implant placement with Provisionalization (IIPP) with flapless technique accompanied by xenograft application (Endobon 0.5-1.0mm granules) with Osseotite BL implant inserted with a minimum ISQ (Initial Stability Quotient) 35Ncm.	Survival Rate	Two implants failed within three months after placement.Overall survival rate was 96.9%.
						Marginal bone level (MBL) at baseline, installation of definitive restorations, and at follow-up using X-rays	Mean MBL1 -0.25mm (SD 0.19) was observed over six months. (from baseline- definitive) At follow-up (between 1-7 years), mean MBL2 -0.31 mm (SD 0.2). Changes in MBL1 & MBL2 mean -0.06 (SD 0.11)
					Provitionalization with PreFormance Temporary Cylinder is installed in non-occlusal loading with screw-retained and covered with composite.	Clinical evaluation is seen from •Plaque Index (PI) •Sulcus Bleeding Index (SBI) •Gingival Index (GI)	Average results: - PI 0.18 - SBI 0.45 - GI 0.54
					Definitive restoration placed six months after implant placement. The abutment is a switched platform customized Zirconia abutment (Atlantis)	Aesthetic evaluation is carried out by evaluation of photos (pre & post) which are assessed by • Peri-implant mucosa (PES) & implant crown (WES) • Patient satisfaction	**PES & WES scores (scores 1-4)** •Mucous color 3.4 •Mucous shape 3.2 •3.5" crown color •3.8. crown shape **Average patient satisfaction** 9.0 (1-10)
2	Arora & Ivanovski, 2016[2] 15 females	Prospective study	18 patients	2 years	IIPP with screw retained provisional restoration and non-occlusal loading occlusion	Recession of mesial and distal papillae and mid-facial gingiva	• Mesial papilla 0.06 ± 0.71 mm • Distal papilla 0.25 ± 0.75 mm • Mid-facial gingiva 0.22 ± 0.83 mm
						Aesthetic evaluation using PES	**Average PES pre-operation score** 9 (IQR 8.75-10.25) **PES Post operation average score** 11 (IQR 9.75-12)
						Buccal bone thickness	The buccal bone thickness was between 0.45-1.25 mm. There was no significant correlation between pre-operative and post-operative buccal bone width, gingival recession, and esthetic results with the IIPP technique in the anterior maxillary region.

CONTINUE

No	Author, Year	Study Design	Sample Size	Observation Period	Type of Implant and Technique Used	Parameters Evaluated	Outcome
3	Kolerman et al., 2016[3]	Retrospective study	34 patients	1-4 years (mean 29 months)	IIPP with non-functional restoration	Soft tissue dimension	**Mean peri-implant tissue probing depth** 3.49mm (SD±1.06)
							Mean contralateral teeth probing depth 2.35 mm (SD±0.52) (p<0.001)
						Radiographic bone loss	**Mesial mesial bone loss** 1.10±0.39 mm (range 0.5-2.4 mm)
							Mean distal bone loss 1.19±0.41 mm (range 0.4-2.1 mm)
						Biological and prosthetic complications	• 29.4% BOP in the implant area • BOP 10.4% in contralateral teeth (p<0.001) • IIPP with non-functional provisionalization is an alternative treatment that can provide a good peri-implant tissue
4	Heydecke,et.al 2017[4]	Randomized Controlled Trial	94 patients and 99 implants	≤ 3 years	Early to delayed implant placement with immediate implant loading with anodized, conical connection, tapered implant with platform shifting	Marginal bone level (MBL) changes	**Mean change in MBL in the first six months** -0.92±1.23 mm
							Mean change in MBL after six months – 3 years of follow-up 0.13±0.94mm
					Provisionalization with fixed restoration, cemented or screw- retained	Cumulative survival rate (CSR) and success rate	**Cumulative survival rate after three years of follow-up** 98.9%
					Implant with Nobel Replace Conical Connection by Nobel Biocare		**Cumulative success rate** 96.9%
						Parameters in the soft-tissue area assessed by sign-test	**Papillary index with a score of 2 or 3 at follow-up at year 3** 88.6%
						Oral Health Impact Profile-14 (OHIP-14)	The OHIP score were decreasing; all of them show an improvement in quality of life after three years
5	Hingsammer, et.al, 2017[5]	Retrospective study	24 patients	1.3 years for radiographical evaluation, 1.2 years for aesthetic evaluation	Delayed implant placement with flapless ridge preservation technique with BioOss bone graft and guided implant placement with immediate provisionalization.	Radiographically observed marginal bone loss (MBL) at baseline and six months after implant placement after the definitive restoration has been placed.	**The average MBL measurement:** Mesial: 1.27 mm (SD: 0.25) Distal: 1.05mm (SD:0.14)
							Mean distance from the implant neck to neighboring teeth Distal: 2.18 mm (SD:0.14) Mesial: 3.16 (SD:0.21)
					If the stability of the implant is <30 Ncm, then adhesive-bridges provisonalization was made.	Aesthetic evaluation by assessment of photos with PES scoring and Papilla Index	**PES 10 median value** (IQR: 9-12)
					Definitive restoration cemented on Zr abutment (Nobel Procera) 6 months later.		**Median value of PI** 3 (IQR: 2.5-3)
						Success rate	Implant success in this study is 100%

CONTINUE

No	Author, Year	Study Design	Sample Size	Observation Period	Type of Implant and Technique Used	Parameters Evaluated	Outcome
6	Noelken,et. al, 2018[6]	Randomized Controlled Trial, Cohort	26 patients (20-77 years old)	1-8 years (mean 45 months)	IIPP with the flapless technique with GBR with ABG for facial bones. The implants used are OsseoSpeed (17) and OsseoSpeed Profile (9). The provisionalization used is acrylic denture cemented on titanium abutments using Temp Bond (Kerr) or screw-retained provider. Provisionalization were installed on the same day as the implants. The definitive restoration was inserted three months later with a Zr crown.	Changes in soft tissue levels after IIPP with or without CTG in patients with early mucogingival recession (in the maxillary anterior region 1-3 mm) were observed by comparing the pre and postoperative CBCT.	**Group I (CTG):** 13 patients, experienced recession with a mean of 2.3 ±0.7 mm (range between 1.0 -3.0 mm) **Group II (non CTG):** 13 patients, experienced recession with a mean of 1.8 ±0.6 mm (range between 1.0 -3.0 mm). In the CTG group, the recession improvement was more significant than 2.3 – 0.5mm.
						PES	PES in both groups increased significantly.
						Observation of marginal level of hard & soft tissue	**Bone loss assessment** Group I: No bone loss Group II: 5 of 13 patients experienced 1 mm
						Success rate	All implants are working fine
7	Van Nimwegen,et. al., 2018[7]	Randomized Controlled Trial	60 patients	12 months	IIPP with non-occluding-provisional restoration. Connective tissue graft (CTG) in the test group and non-CTG in the control group. Using implants from Nobel Biocare.	Changes in the volume of mucosal thickness in the peri-implant tissue area with and without CTG.	**Mucosal Thickness of Peri-implant Tissue (CTG vs. Non-CTG)** -0.68±0.59 mm vs. -0.49±0.54mm (p=0.189)
						Changes in the volume of mucosal thickness in the mid-facial area with and without CTG.	**Mucosal Thickness of Mid-facial Area (CTG vs. Non-CTG)** 0.2±0.7 mm vs. -0.49±1.13mm (p=0.014) IIPP with CTG does not cause less mucosal volume loss after 12 months; thus, CTG cannot compensate for bone loss. In IIPP with CTG, mucosa in the mid-facial area is significantly more coronal.
8	Noelken, et.al.,2018[8]	Randomized Controlled Trial	21 patients, 37 implants	5 years (mean 68 months)	IIPP with or without Aulogous Bone Graft (ABG)	Bone height in the interproximal area	The mean interproximal bone height is 0.04 mm coronal to the implant shoulder.
						Facial bone wall thickness	The thickness of the facial bone lamellae increased significantly p=0.002 (comparison between preoperative and after one year postoperatively), and after that, it was stable.
						PES	Mean PES increased slightly from 10.7 (pre-operation) to 11.7 (at last follow-up) (p=0.02). 2 patients with 4 implants dropped-out from the study.
						Implant success	33 implants in 19 patients were successful and functioned well up to 68 months during this study. IIPP, after five years of operation, showed satisfactory results in terms of interproximal bone height, implant success, and stable esthetics.

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No	Author, Year	Study Design	Sample Size	Observation Period	Type of Implant and Technique Used	Parameters Evaluated	Outcome
9	Barroso-Panella, et.al. 2018[9]	Randomized Controlled Trial	14 patients, 15 implants (33-69 years old)	1 year	IIPP flapless were done using a Straumann BL Roxolid SLActive implant treated with Straumann's novel VivOss synthesis (10% hydroxy apatite, 90% beta-tricalcium phosphate) to fill the gap between the socket and the implant. Partially fixed and partially removable provisionalization are installed immediately after implant placement. In this technique, suturing is not performed.	Bone changes around the implant after IIPP in the maxillary anterior region were observed with CBCT. CBCT observed peri-implant tissue changes after IIPP in the maxillary anterior region. Implant success after one year.	The mean bone changes around the vestibular from 1mm under the implant platform range from 3.07mm to 2.62mm at a depth of 4mm under the implant platform. The largest mean bone change is in the coronal section ± -0.9mm Mean clinical measurement of peri-implant tissue changes • Mesial -0.3 mm • 0.2mm Di distal • Gingival Zenith 0.25 mm Implant placement is 100% successful in this study.
10	Sun. et.al, 2020[10]	Randomized Controlled Trial	30 patients	2-years	IIPP was done using Socket Shield Technique (SST) and without SST (using the conventional flapless technique). The implant used is a Replace implant by Nobel BioCare. If there is a gap between the implant and the bone >1mm, a bone graft (Bio-Oss) is given.	Changes in buccal plate width (BPW) from the CBCT Changes in buccal plate height (BPH) from the CBCT Clinical evaluation by measuring implant stability using the Ostell Mentor (ISQ) tool Clinical evaluation of peri-implant tissue recession in the mesial, distal, and mid-facial areas PES Modified PI, Modified SBI, Probing Depth	**Changes in BPW in the two test groups after six months** SST : 1.15 ± 0.27 mm Non-SST: 0.83 ± 0.13 mm (p <0.001) **Changes in BPH in the two test groups after six months** SST : 2.59 ± 0.21 mm Non-SST: 1.82 ± 0.18 mm (p< 0.001) **ISQ scores in the two test groups** SST : 76.01 ± 1.31 mm Non-SST: 75.56 ± 1.07 mm (p = 0.311); indicates no significant difference in implant stability in the two test groups. Measurements of peri-implant tissue recession in the two test groups (SST and non-SST) showed significant differences (p < 0.001 between baseline, six months, and 12 months of follow-up and between the two groups at the same time). The results of measuring PES scores in the two test groups (SST and non-SST) showed no significant difference (p > 0.001 between baseline, 6, 12, and 24 months of follow-up and between the two groups at the same time). The results of the modified PI, modified SBI, and probing depth (PD) scores in the two test groups (SST and non-SST) showed significant differences (p < 0.001 between baseline 12 and 24 months of follow-up). This study shows that IIPP with this SST technique shows good functional and aesthetic results.

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No	Author, Year	Study Design	Sample Size	Observation Period	Type of Implant and Technique Used	Parameters Evaluated	Outcome
11	Mahajan,et. al., 2020[11]	Randomized Controlled Trial	10 patients, 10 implants	3-months	Delayed implant placement with Immediate Implant Loading (24 hours) using conventional full thickness flap technique without GBR. Abutments used were Bio HorizonTitanium abutment. Definitive crown using Zirconia.	Aesthetic comparisons were carried out through photographs taken three months after the insertion of the definitive prosthesis, which the dentist and the patient then assessed. The evaluation results were objectively generated from blinded clinicians' PES and WES scores.	PES mean 9.2 ± 1.03 mm The mean WES 8.7 ± 1.16 mm indicates peri-implant tissue results that clinicians accept well. Statistical analysis showed a significant correlation between the aesthetic perception of patients and dentists on anterior dental restorations.
						Overall esthetic evaluation (soft-tissue, prosthetic, esthetic) by the patient was performed using the VAS (Visual Analogue Scale) technique.	PES and WES are pretty objective in the esthetic assessment of single crown-supported implants and surrounding soft tissues.

Study Characteristics

Out of the 11 studies, there were 8 RCT studies, 1 prospective study and 2 retrospective studies out. The number of participants involved in the studies varied, ranging from 10 participants to 94 participants. The duration of the studies ranged from 3 months to 8 years. Based on the location of the implant site, all of them were in the maxillary anterior region from the incisors to the first pre-molar, which is aesthetically very important for one's appearance.

Types of Implants Used in Included Studies

The type of implant used is the Bone Level Implant type, with various brands of implant including Nobel Biocare, Straumann and other brands. Ten of the 11 studies stated that the provisionalization used was screw-retained with non-occlusal loading, with 1 study used a cement-retained provisionalization with non-occlusal loading. Only 1 of the 11 studies used removable provisionalization.

Parameters Evaluated

Parameters measured in the reviewed studies varied across studies, including marginal bone loss, mucosal volume changes, peri-implant tissue recession, Bleeding on Probing (BOP), Plaque Index (PI), Sulcus Bleeding Index (SBI), Gingival Index (GI), aesthetic assessment using Pink Esthetic Score (PES), White Esthetic Score (WES), and Visual Analogue Scale (VAS) methods as well as patient satisfaction from various sides, Oral Health Impact Profile (OHIP) and patients' satisfaction. One study also collected data on dental examinations, such as the aesthetic assessment of PES and WES on implant-supported single crown restorations that were blinded to dentist examiners.

Several studies also analysed the parameters of this technique's success; two studies evaluated survival rates, and four analysed the success rate of this immediate implant loading protocol. In measuring marginal bone loss, six studies measured changes in CBCT, and 1 study measured 2D radiographs. Some of the results found in the reviewed studies used questionnaires of various types, including the Likert scale, VAS scale, and OHIP questionnaire. Several aspects are often observed in the studies analysing patients' satisfaction. Some of these aspects include aesthetics of the restoration, the comfort of the restoration, masticatory ability, speaking ability, and ease of cleaning.

DISCUSSION

Among the 11 included publications in this review, we found that the most examined parameters are marginal bone loss (MBL), PES and WES, volumetric change in mucosal thickness, and papillary recession. The following is a summary of the results of the parameters reviewed:

Marginal Bone Loss (MBL)

Marginal bone loss after implant placement is considered a physiological mechanism that always occurs in response to the inflammatory process at the postoperative implantation site.[5] A marginal bone loss of no more than 0.2 mm per year is considered within the limits of normal physiological processes. In contrast, excessive MBL in the first year after implant placement may increase the risk of peri-implantitis and collapse of the peri-implant tissue, which has an impact on the survival rate of the implant treatment as well as on the esthetic aspect of the restoration, primarily when it is in the anterior maxilla (aesthetic zone).[12]

Some studies used CBCT to measure MBL, but several others used 2D X-rays. The results of the MBL measurements in general in all studies showed a broader mean during the first year after implant placement than after the follow-up period after one year. This finding

is consistent with finding of Misch that during the first year after implant placement, there is a process of remodelling of the surrounding bone, which is generally accompanied by marginal bone loss. Guided Bone Regeneration (GBR) using collagen membranes in the esthetic zone, with a thin buccal plate, prevented excessive MBL and provided more stable results for immediate implant loading.[13,14,15,16]

MBL in immediate implant loading also affects the peri-implant tissues, especially in the esthetic zone. To prevent excessive MBL and promote the formation of aesthetic peri-implant tissue, Noelken recommends the addition of connective tissue grafting (CTG), which has been shown to provide protection for labial and interproximal alveolar bone.[15] Other authors have also suggested flapless techniques for immediate implant loading because it causes less damage to healthy tissue.[13,16,17]

PES and WES

Almost all the literature aesthetically evaluated peri-implant tissue using PES and WES. These studies showed good PES and WES scores and increased slightly from baseline to subsequent follow-up. According to Van Nimwegen, higher WES value is because the fabrication of implant-supported restorations is generally performed immediately after implant placement surgery, so the results appeared to be more harmonious.[13] Arora and Ivanovski added that the PES and WES results gradually declined and stabilized after two years of follow-up.[17] No significant difference was found in a study comparing PES and WES values in the test group with CTG and without CTG. High PES score is closely related to the contours of the alveolar process and sufficient thickness of the facial lamella.[15]

Changes in Mucosal Thickness and Papilla Recession

Most of the literature examining mucosal thickness parameters showed no significant difference between CTG and non-CTG groups.[15] Meanwhile, it was found that there was a significant difference in papillary recession between the CTG and non-CTG groups.[15] The socket shield technique test group was also shown to reduce the risk of papillary recession 6 and 12 months after implant placement.[17]

Study Limitations

There are several limitations in this scoping review. The studies reviewed had follow-up periods ranging from 3 months to 8 years, showing only short-medium term results. Therefore, further studies with a more extended follow-up period are needed to determine the long-term outcome of the treatment.

Another limitation is the variable time of implant placement in the studies reviewed. Immediate implant loading in immediate, early, and delayed implant placement has different biomechanical characteristics.[4] More studies are needed with identical tooth loss conditions to obtain better results.

Moreover, the various types and materials of implants, abutments, and bone grafts can influence the result of the studies. Several types of implant and abutment materials are commonly used, such as titanium, zirconia, and others. In addition, the material of bone grafts also varies widely. These different materials have advantages and disadvantages that should be considered when determining an immediate implant loading treatment.[6,9] Further studies on more specific types of implant materials, abutments, and bone grafts are needed.

Lastly, contradictory results were found in this study. MBL-related studies point out that PES is not related to MBL.[13] While studies related to CTG point out that CTG helps protect the facial and interproximal bones, preventing excessive MBL and supporting high PES scores.[15] To obtain consistent results, further in-depth studies are needed to simultaneously assess these conflicting variables, such as MBL, CTG, and PES. Additional studies involving variables related to immediate implant loading in the esthetic zone, such as studies on the incidence of failure or differences in the results of immediate implant loading at different times of implant placement, may be performed.

CONCLUSION

Considering the weaknesses in this scoping review, several conclusions can be drawn. Firstly, treatment with immediate implant loading protocol is applicable in ideal clinical conditions (thick bone wall > 1 mm; thick gingival biotype) and is strongly recommended for areas with low aesthetic risk. The peri-implant tissue treated with the protocol of immediate loading of the implant in the short and medium term has obtained good results, especially in terms of aesthetics (PES and WES), papillary recession, and changes of the mucosal thickness. Regarding the use of guided tissue regeneration for immediate implant loading, it is recommended to use a mixture of autogenous bone graft and allograft covered with a resorbable collagen membrane for maximum aesthetic results. Short to medium-term treatment results with immediate implant loading resulted in a good increase in patient satisfaction and high patient preference. Lastly, there is no uniform knowledge among dentists about appropriate immediate implant loading.

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