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Immediate Versus Conventional Loading of Two-Implant Overdenture with Magnetic Attachments: A 5-Year Follow-Up on Patient-Reported Outcomes

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Featured Application: Mandibular two-implant overdentures with magnetic attachment, utilizing an immediate loading protocol, could be deemed as a favorable treatment approach for edentulous patients. The immediate loading of implants yields comparable effects on the patient-reported outcomes compared to conventional loading.

Abstract: Comprehensive, long-term studies on patient-reported outcomes for two-implant overdentures with magnetic attachments using immediate or conventional loading methods are lacking. This study aimed to provide 5-year follow-up data comparing patient-reported outcomes for mandibular overdentures supported by two implants with magnetic attachments under immediate or conventional loading. Nineteen edentulous mandible patients were randomly assigned to immediate (IG) or conventional loading groups (CG). Two implants were placed with prostheses, loaded on the same day (immediate) or three months later (conventional). Participants completed questionnaires (oral health-related quality of life (OHRQoL), patient general satisfaction, and patient's denture assessment (PDA)) at baseline and yearly intervals for 5 years. Results showed no significant differences between IG and CG throughout the study. However, the within-group analysis revealed significant improvements in OHRQoL, patient satisfaction, and all PDA domains from the baseline to years 1–5. Regarding patient satisfaction, significant differences were observed between T1, T2, and T3 when compared with T0 of IG and T1-T0 of CG. Regarding PDA results of T4-T5, IG exhibited several significant differences compared to CG. In conclusion, this study suggests that two-implant overdentures with magnetic attachments, whether immediately or conventionally loaded, improve patient-reported outcomes. Immediate loading may have prolonged effects on the improvement of patient-reported outcomes.

Keywords: implant; overdenture; magnetic attachment; immediate loading; patient satisfaction; quality of life

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Citation: Bui, T.N.H.; Komagamine, Y.; Namano, S.; Miyayasu, A.; Sato, D.; Minakuchi, S.; Kanazawa, M. Immediate Versus Conventional Loading of Two-Implant Overdenture with Magnetic Attachments: A 5-Year Follow-Up on Patient-Reported Outcomes. *Appl. Sci.* **2023**, *13*, 11687. https://doi.org/10.3390/app132111687

Academic Editor: Alessandro Scala

Received: 14 September 2023
Revised: 21 October 2023
Accepted: 24 October 2023
Published: 25 October 2023

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1. Introduction

Two-implant-supported overdentures are suggested for edentulous mandibles, since conventional complete dentures have difficulty providing adequate retention, especially in cases of severe mandibular resorption [1,2].

Oral health-related quality of life (OHRQoL) is impacted by tooth loss, with the severity of impairment contingent on the distribution and location of the missing teeth [3]. Tooth loss leading to edentulism can result in orofacial structural changes and functional impairment, reducing chewing efficiency and subsequently increasing the risk of malnutrition [4]. For edentulous patients, oral rehabilitation appears pivotal and significantly improves their quality of life (QoL) [5]. The assessment of OHRQoL and patient satisfaction has historically been conducted using tools like the Oral Health Impact Profile (OHIP) and overall patient satisfaction metrics. Additionally, although OHIP is useful for evaluating OHRQoL, it may prove challenging to gauge improvements in cases where the baseline OHRQoL has not dramatically deteriorated. As a result, an alternative practical approach for assessing dentures has emerged: the patient's denture assessment (PDA) [6].

Owing to advancements in implant surface characteristics and efforts to overcome the physical and psychological challenges of the two-stage surgical protocol [7], immediate and early loading protocols for dental implants have been introduced and refined [8–11]. The strategy of immediate loading has piqued the interest of researchers and practitioners for decades, enjoying recognized clinical relevance [12]. Contrary to conventional loading, which entails attaching the prosthesis after a 3- to 6-month healing period, the immediate loading technique involves attaching the prosthesis on the same day as implant insertion [13]. As a one-stage surgical intervention, it curtails treatment time and cost, and facilitates clinical monitoring of implant stability during the osseointegration [8]. Concerning clinical outcomes, a literature review suggests there may be no substantial difference between the two loading protocols, immediate and conventional loading, in terms of peri-implant tissue indices and implant stability [14].

By shortening the rehabilitation process and expediting the restoration of oral function, the immediate loading protocol has the potential to enhance patient satisfaction [15] and overall quality of life [16–18]. However, only a limited number of studies have examined patient satisfaction in the context of implant therapy, let alone under settings of immediate loading versus conventional loading, and even fewer have considered longer observation periods, yielding conflicting outcomes. Komagamine et al., reported that immediately loaded two-unsplinted-implant-supported overdentures, retained by ball attachments, improved the oral health-related quality of life and self-assessment of dentures by the patients up to 5 years post-implant surgery; however, this was a pre-post test [19]. Similarly, a report by Patil et al. revealed that a mandibular single and two immediately loaded implant overdenture improved the OHRQoL among elderly edentulous Malaysian participants at both 1 month of immediate loading and 1 year of recall [20]. A literature review has highlighted the lack of significant differences in quality of life between immediate loading and conventional loading of mandibular overdentures [14].

To the best of our knowledge, no comprehensive investigations have yet been conducted regarding the long-term patient-reported outcomes of two-implant overdentures with magnetic attachments, specifically comparing immediately loaded versus conventionally loaded protocols. These evaluations would encompass changes in patient satisfaction, OHRQoL (using OHIP), and patient perceptions of the effects of denture treatment (using PDA). Hence, the objective of this study was to compare patient satisfaction and patient-reported outcomes concerning mandibular overdenture assisted by two immediately or conventionally loaded implants with magnetic attachments during the 5-year follow-up. The null hypothesis posited that no significant difference exists in patient-reported outcomes between immediately loaded and conventionally loaded 2-IOD with magnetic attachment.

2. Materials and Methods

2.1. Study Design and Eligibility Criteria

The Ethics Committee at the Faculty of Dentistry, Tokyo Medical and Dental University, reviewed and approved the study protocol (Number 693) for a long-term, randomized, unblinded clinical trial. Comprehensive information about the study, both written and

verbal, was provided to each participant, who then signed informed consent forms. The study's specifics and the preliminary outcomes (12-month patient satisfaction) have already been published [21]. This study adheres to the guidelines outlined in the 2010 Consolidated Standards of Reporting Trials (CONSORT) statement [22].

In brief, participants had to adhere to the following criteria to be involved: (1) complete edentulism in the mandible and any maxillary condition, (2) sufficient bone volume in the anterior mandible for the placement of two implants with a minimum dimension of 4.0 × 10.0 mm, (3) no requirement to bone augmentation, (4) willingness to wait at least four months for healing post-extraction, (5) good oral hygiene, and (6) possession of a sufficient command of written and spoken Japanese to respond to the questionnaires. Patients were not eligible if they had (1) uncontrolled systemic diseases that might compromise implant surgery; (2) experienced head and neck radiotherapy or chemotherapy; (3) a history of heavy smoking; (4) previously taken bisphosphonates.

A sample size of 10 participants per group was chosen for the preliminary investigation [21] and this 5-year follow-up report, as no previous studies had compared the patient-reported results of immediate and conventional loading protocols utilizing magnetic attachments. Initially, a total of 23 patients were recruited; however, 4 were omitted as they either refused to participate (n = 2) or did not meet inclusion criteria (n = 2). Hence, nineteen subjects were randomly allocated to one of the two treatment groups: the immediate loading group and the conventional loading group. The allocation was performed using the minimization method to assure pretreatment comparability of the groups about age, gender, and American College of Prosthodontists (ACP) classification [23]. During the first year of observation, one patient in the conventional loading group was lost before the follow-up due to implant failure.

2.2. Intervention

Prior to implant insertion, each patient either received new mandibular full dentures or had their pre-existing mandibular complete dentures relined to enhance the denture fitting. Subsequently, panoramic radiographs, computed tomography (CT) scans, preoperative planning, and surgical guide fabrications were performed. Two implants (Nobel Speedy Groovy RP 4 × 10–18 mm, Nobel Biocare, Gothenburg, Sweden) were placed in the interforaminal region of each patient using a flapless surgical technique, performed by the same experienced implantologist. Following this, the two groups underwent different treatment regimens.

Concerning the immediate group, keepers (Magfit, Aichi Steel Co., Aichi, Japan) with a diameter of 4.7 mm were attached to each implant with a torque of 25–30 Ncm. The keepers' height (3.0, 4.0, or 5.5 mm) was adequately chosen based on soft tissue thickness. Afterward, auto-polymerizing acrylic resin (Unifast III, GC, Tokyo, Japan) was used to embed the magnetic assembly (Magfit, Aichi Steel Co., Aichi, Japan) into the intaglio surface of the dentures. To reduce swelling following surgery and prevent the dentures from becoming ill-fitting, patients were told to wear their dentures continuously for 24 h. Participants were asked not to remove their dentures throughout the initial week except for denture cleaning and oral hygiene.

Regarding patients in the conventional group, two healing abutments were inserted. We then relieved the sides of the denture base surrounding the healing abutments to reduce contact between the denture and the abutments, thus avoiding the stress distribution on the implants. The healing abutments were replaced with keepers of a suitable height three months after the surgery. Magnetic assemblies were picked up similarly to how they were described for the immediate group.

2.3. Postoperative Care

Patients received prescriptions for analgesics (60 mg loxoprofen) and antibiotics (750 mg amoxicillin daily) for seven days. Additionally, they were instructed to rinse their mouths with a 0.2% benzethonium chloride solution three times daily for a duration of

two weeks. Starting one week after the surgery, they were advised to brush the individual implant attachments gently. No dietary restrictions were imposed on the participants.

2.4. Data Collection

All patients were requested to complete the questionnaires before implant insertion (baseline) and at 1, 2, 3, 4, and 5 years following the operation. A single evaluator performed all the clinical data collection at the Prosthodontics department of the Dental Hospital, TMDU.

OHIP—Consisting of 19 question items and mirroring the seven conceptual subdomains present in the English version, the validated Japanese version of the Oral Health Impact Profile for edentulous (OHIP-EDENT-J) [24] was employed to assess the oral health-related QoL of edentulous patients. These conceptual subdomains are as follows: "functional limitation", "pain", "psychological discomfort", "physical disability", "psychological disability", "social disability", and "handicap". Participants were questioned on how frequently they had gone through a particular incident in the preceding month for each question item. Responses were recorded on a 0–4 scale (0—never, 1—hardly ever, 2—occasionally, 3—fairly often, and 4—very often). As a result, the OHIP-EDENT-J summary score, the total of all 19 question item frequencies, could vary from 0 to 76, with higher values denoting a greater degree of OHRQoL impairment. A lower score indicates a better QoL. In accordance with the four-dimension concept, we analyzed the total score rather than each domain individually [21].

PDA—Patient's denture assessment (PDA) is a reliable and valid questionnaire for the self-assessment of complete dentures [6], gauged the multilateral effects of removable denture therapy on patient perceptions, consciousness, and sentiments towards their dentures. Unlike OHIP, this questionnaire places more emphasis on individual domains than on the overall result. Comprising 22 question items that fall under the six subscales ("function", "lower denture", "upper denture", "expectation", "esthetics and speech", and "importance"), each test item was measured using a 100 mm Visual Analog Scale (VAS), which was made up of a horizontal 100 mm line with endpoints that represented the worst-case scenario on the far left and the best-case scenario on the far right.

Patient Satisfaction—Patients evaluated their overall level of satisfaction with their dentures by responding to the question "How satisfied are you with your prosthesis?", using a 100 mm VAS, ranging from 0 (completely dissatisfied) to 100 (completely satisfied)"; therefore, greater satisfaction is indicated by a higher score.

2.5. Data Analysis

The Mann–Whitney U test was employed to analyze the median differences between the two loading groups. The Wilcoxon signed-rank test was performed to analyze the within-group data at baseline and yearly scores. Statistical software was used to conduct all statistical analyses (IBM SPSS Statistics 22, Chicago, IL, USA). The threshold for statistical significance for each test was set at $p < 0.05$.

3. Results

Figure 1 depicts the progression of participants throughout this randomized clinical trial, in which 23 edentulous volunteers were enlisted. Four participants were deemed ineligible due to failure to meet the stipulated requirements. Among these, one participant had uncontrolled diabetes, another was in poor health, and two were unable to accommodate treatment and follow-up appointments; therefore, they were omitted from the study. As a result, the final enrollment consisted of 19 participants, including 9 men and 10 women, with an average age of 68.4 years (range: 46–86 years). Table 1 provides a summary of the individual's baseline traits. Baseline (T0) scores of OHIP-EDENT-J, satisfaction, and PDA in both groups are listed in Table 2. Notably, age, gender, ACP classification, and baseline scores exhibited no significant differences between the two groups (non-paired *t*-test, chi-square test, and Man–Whitney U test). One conventional group participant, who

lost both implants a month after surgery, was not included. In contrast, in the immediate group, none of the implants were detached. Data from 10 and 8 participants, respectively, were examined in the immediate and conventional groups.

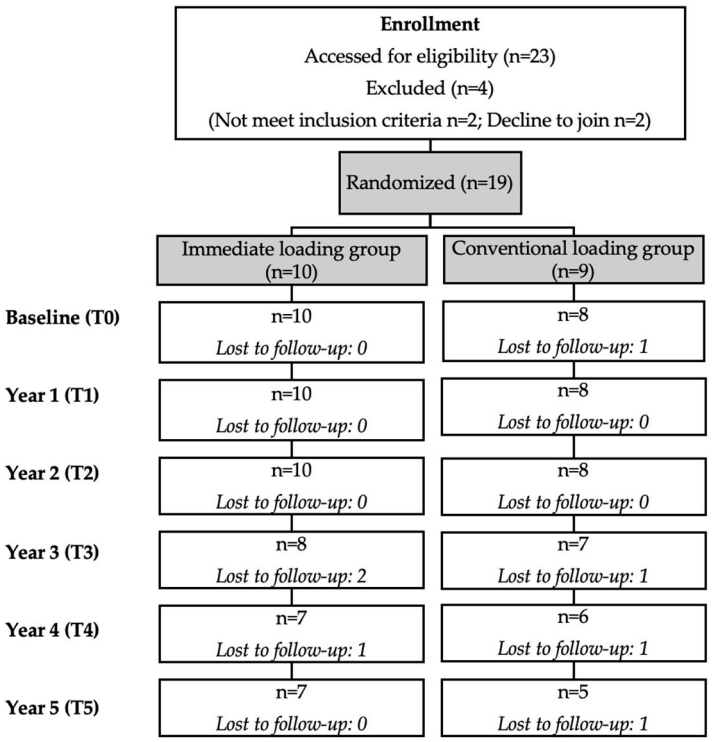


Figure 1. Participant flow during the study.

Table 1. Participants' baseline characteristics.

Characteristics	Total (n = 19)	Immediate Group (n = 10)	Conventional Group (n = 9)	p
Age, mean (SD) (years)	68.4 (9.9)	69.2 (10.6)	66.6 (9.1)	0.570
Gender (male/female)	9/10	6/4	3/6	0.250
ACP classification				0.890
I	4	2	2	
II	5	3	2	
III	7	4	3	
IV	3	1	2	

Table 2. Baseline (T0) scores of OHIP-EDENT-J, PDA, and satisfaction in both groups. (Immediate loading group (IG); conventional loading group (CG)).

	Immediate Group	Conventional Group	p
OHIP-EDENT-J	22 [13, 27]	20 [12, 25]	0.592
Patient satisfaction	72 [40, 82]	55 [50, 95]	1.000
PDA			
Function	321 [294, 350]	333 [234, 346]	0.859
Lower Denture	258 [226, 292]	311 [234, 334]	0.657
Upper Denture	226 [175, 256]	234 [194, 269]	0.534
Expectation	204 [156, 287]	194 [169, 262]	0.824
Esthetic and Speech	194 [127, 283]	141 [128, 255]	0.762
Importance	256 [175, 338]	286 [141, 290]	0.266

Note: Data are presented as median [first quartile, third quartile].

Median differences in OHIP-EDENT-J, patient satisfaction, and PDA between the baseline (T0) and each subsequent yearly evaluation, including year 1 (T1), year 2 (T2), year 3 (T3), year 4 (T4), and year 5 (T5), are detailed in Tables 3–5. No statistically significant differences were observed in OHIP-EDENT-J summary scores, general satisfaction, or the six PDA domains between the immediately and conventionally loaded groups over the study's duration.

Table 3. Median differences in OHIP-EDENT-J between baseline and each yearly evaluation period between groups (immediate loading group (IG); conventional loading group (CG)).

	Median Differences [95% Confidence Interval] of OHIP-EDENT-J				
	T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Immediate loading Group (IG)	−8 [−18, 1]	−2 [−14, 2]	−12 [−19, −4]	−6 [−21, −1]	−16 [−21, −4]
Conventional loading Group (CG)	−5 [−10, 0]	−5 [−9, −3]	−3 [−11, −2]	−7 [−12, 0]	−3 [−11, 1]
p	1.000	0.696	0.613	0.945	0.639

Note: Data are presented as median [first quartile, third quartile].

Table 4. Median differences in patient satisfaction scores between baseline and each yearly evaluation period between groups (immediate loading Group (IG); conventional loading group (CG)).

	Median Differences [95% Confidence Interval] of Satisfaction Scores				
	T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Immediate loading Group (IG)	19 [11, 48]	15 [4, 27]	23 [14, 39]	18 [1, 57]	23 [2, 42]
Conventional loading Group (CG)	58 [20, 86]	28 [3, 48]	13 [1, 44]	2 [−4, 42]	18 [−3, 40]
p	1.000	0.829	0.613	0.694	0.867

Note: Data are presented as median [first quartile, third quartile].

Table 5. Median differences in 6 domains of PDA scores between baseline and each yearly evaluation period between groups (immediate loading group (IG); conventional loading group (CG)).

		Median Differences [95% Confidence Interval] of OHIP-EDENT-J				
		T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Function	IG	41 [−2, 91]	48 [14, 81]	47 [29, 78]	57 [18, 92]	71 [32, 91]
	CG	58 [20, 86]	58 [22, 112]	60 [34, 139]	61 [33, 154]	66 [26, 123]
	p	0.633	0.573	0.536	0.463	0.955
Lower Denture	IG	77 [39, 113]	82 [27, 105]	91 [66, 107]	97 [56, 113]	108 [86, 117]
	CG	60 [28, 99]	81 [31, 101]	67 [40, 142]	81 [25, 132]	64 [9, 102]
	p	0.829	0.829	0.867	0.867	0.463
Upper Denture	IG	129 [63, 143]	114 [40, 140]	128 [92, 149]	154 [42, 177]	148 [107, 162]
	CG	103 [80, 177]	103 [74, 153]	125 [102, 160]	101 [42, 164]	76 [10, 164]
	p	1.000	0.696	0.867	0.694	0.613
Expectation	IG	125 [66, 169]	119 [32, 153]	145 [97, 161]	164 [46, 202]	156 [112, 183]
	CG	149 [88, 182]	133 [92, 159]	121 [109, 178]	100 [33, 134]	89 [17, 160]
	p	0.633	0.633	0.779	0.536	0.336
Esthetic and Speech	IG	139 [73, 186]	123 [46, 176]	156 [129, 170]	174 [34, 219]	169 [144, 189]
	CG	181 [108, 257]	144 [98, 237]	173 [114, 215]	98 [6, 165]	89 [4, 209]
	p	0.274	0.315	0.694	0.397	0.613
Importance	IG	83 [29, 155]	98 [27, 152]	133 [66, 176]	126 [−10, 205]	147 [70, 189]
	CG	156 [71, 221]	125 [60, 218]	125 [77, 192]	64 [32, 146]	52 [10, 173]
	p	0.315	0.315	1.000	0.613	0.463

Note: Data are presented as median [first quartile, third quartile].

However, within-group analyses yielded significant differences, as outlined in Tables 6–8. Pertaining to OHIP-EDENT-J, significant differences emerged between the baseline and each yearly evaluation period within each group. Specifically, significant differences were noted between T3-T0 for the immediate group and between T1, T2, and T3 when compared with T0 for the conventional group. For patient satisfaction, there were significant differences between T1, T2, and T3 when compared with T0 for the immediate group, as well as between T1-T0 for the conventional group. Interestingly, no significant differences were detected between year 4, year 5, and the baseline in the OHIP-EDENT-J score or patient satisfaction. Regarding median differences in the six domains of PDA scores for the initial three years (T1-T3), significant differences were observed between the baseline and each annual evaluation period in all domains of each of the two groups, with some exceptions. Notably, the Function domain of T2-T0 exhibited no significant difference in the immediate group. In year 4, significant differences were identified in the Function domain in the conventional group, along with the Maxillary Denture, Expectation, and Esthetic and Speech domains in the immediate group. In year 5, significant differences were apparent in the Function domain for the conventional group, while the immediate groups displayed significant differences in all six domains.

Table 6. *p*-value of median differences in six OHIP-EDENT-J scores between baseline and each yearly evaluation period within each group (immediate loading group (IG); conventional loading group (CG)).

	***p*-Value between Each Stage and T0 of PDA in Each Group**				
	T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Immediate loading Group (IG)	0.590	0.241	0.012 *	0.176	0.091
Conventional loading Group (CG)	0.046 *	0.035 *	0.017 *	0.173	0.279

*: there is a significant difference in scores between each stage and T0.

Table 7. *p*-value of median differences in patient satisfaction scores between baseline and each yearly evaluation period within each group (immediate loading group (IG); conventional loading group (CG)).

	***p*-Value between Each Stage and T0 of Satisfaction Scores in Each Group**				
	T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Immediate loading Group (IG)	0.007 *	0.017 *	0.012 *	0.069	0.123
Conventional loading Group (CG)	0.028 *	0.058	0.091	0.310	0.128

*: there is a significant difference in scores between each stage and T0.

Table 8. *p*-value of median differences in six domains of PDA scores between baseline and each yearly evaluation period within each group (immediate loading group (IG); conventional loading group (CG)).

		***p*-Value between Each Stage and T0 of PDA Scores in Each Group**				
		T1-T0	**T2-T0**	**T3-T0**	**T4-T0**	**T5-T0**
Function	IG	0.037 *	0.058	0.036 *	0.208	0.017 *
	CG	0.025 *	0.017 *	0.028 *	0.028 *	0.028 *
Mandibular Denture	IG	0.017 *	0.022 *	0.012 *	0.069	0.025 *
	CG	0.012 *	0.017 *	0.028 *	0.063	0.091
Maxillary Denture	IG	0.013 *	0.013 *	0.012 *	0.050 *	0.017 *
	CG	0.012 *	0.012 *	0.028 *	0.063	0.063
Expectation	IG	0.013 *	0.007 *	0.012 *	0.050 *	0.017 *
	CG	0.012 *	0.012 *	0.028 *	0.091	0.128
Esthetic and Speech	IG	0.013 *	0.007 *	0.012 *	0.050 *	0.017 *
	CG	0.012 *	0.017 *	0.028 *	0.091	0.091
Importance	IG	0.022 *	0.037 *	0.012 *	0.093	0.025 *
	CG	0.025 *	0.012 *	0.028 *	0.091	0.091

*: there is a significant difference in scores between each stage and T0.

4. Discussion

The objective of this study was to ascertain which loading approach yields superior patient satisfaction and overall oral health outcomes for individuals with two-implant overdentures. The results of this clinical trial suggested no significant differences in patient satisfaction and patient-reported outcomes between the conventional and immediately loaded implant-supported overdentures using magnetic attachments. Hence, the null hypotheses were accepted.

This result is in accordance with the study of Abou-Ayash S. et al., who reported that in single implant-retained overdentures, the loading strategy, including immediate and delayed loading, had no effect on OHRQoL. Furthermore, a single mandibular implant did not significantly improve OHRQoL when used to stabilize a complete denture [25]. A meta-analysis conducted by Schimmel et al. revealed a statistical inclination favoring conventional loading. Although all three loading methods demonstrated high survival rates, early and conventional loading protocols have received more comprehensive documentation compared to immediate loading, and they appear to result in fewer implant failures within the initial year [26]. In addition, these findings are consistent with a systematic review by Ribeiro et al., who found no statistically significant difference in satisfaction and quality of life between immediate and conventional loading, despite prosthetic complications and maintenance favoring the conventional loading group [27].

The study identified significant differences in OHIP-EDENT-J, patient satisfaction, and PDA scores between the baseline and yearly evaluations within each group. Regarding the OHIP-EDENT-J score and patient satisfaction within each group, significant differences were found in T1-T3 and the baseline; however, no significant difference was noted in T4, T5, and the baseline. De Bruyn et al. reported similar results, emphasizing that the most significant benefit of immediate loading, particularly during the initial stages of healing, is high patient satisfaction [28]. This could be attributed to the increased desire in patients to expedite the transition from implant placement to functional prosthesis, thereby offering rapid comfort and aesthetic benefits. Such expedited results may also offer economic advantages and decreased discomfort, especially during professional and social engagements [28]. Ideally, implant dentistry success should be measured by the overall implant-prosthetic complex's long-term result [29]. Multiple variables, including oral and dental conditions, personality and mental health, the aging process, and neuromuscular adaptation, may affect patients' appreciation of implant overdenture. Nevertheless, the existing scientific literature does not unequivocally support this assertion [30]. In addition, when it comes to the PDA results of T4-T5, the immediate loading group exhibited significant differences in several items compared to the conventional group. A recently published study

by Komagamine et al. similarly reported the long-term effects of the immediate loading protocol on improving several subscales of PDA scores [19]. Additionally, regarding patient satisfaction, significant differences were observed between T1, T2, and T3 when compared with T0 for the immediate group, while in the conventional group, the only significant difference was between T1-T0. This implies that immediate loading may have enduring positive effects on patient-reported outcomes.

The utilization of magnetic attachments as an attachment solution appears effective in mitigating stress within the peri-implant bone during an overdenture dislodgment [31]. Also, when the prosthesis is absent in the oral cavity, magnets are less conspicuous, smoother, and more comfortable. Patient preference for the magnet system is driven by considerations such as ease of cleaning, comfort, and the ability to speak and eat [32]. Previous studies using different types of attachments also reported no significant difference between immediate and conventional loading groups concerning patient-reported outcomes. For instance, Lang et al. analyzed the impact of QoL on implant overdenture patients using ball attachments and found no significant difference between the two groups when comparing answers to the pre-and post-treatment questionnaires [33]. Similarly, utilizing bar attachments, Alfadda reported that no differences were noted in any outcomes between the two groups [34]. Thus, mandibular two-implant overdentures with immediate loading using the magnetic attachment could be regarded as a successful treatment approach from a patient's standpoint.

The results of this study have to be interpreted in light of some limitations. Although the sample size aligns with earlier studies of similar objectives and techniques [19,21], a small sample size can lead to reduced statistical power. In this case, the statistical power was 69.4%, given that mean patient satisfaction scores were 89.9 and 80.5 for the immediate and conventional groups, respectively, at the 5-year follow-up, with standard deviations of 3.78 and 8.57. This potentially contributed to the lack of significance in changes between the two groups regarding patient satisfaction, OHIP summary, and domain scores, particularly for the 5-year follow-up. In addition, despite using the minimization method to ensure comparability of the groups pre-treatment, the differences in age, gender, and American College of Prosthodontists (ACP) classification might impact the study's outcomes. To comprehensively understand the long-term impact of immediate-loaded mandibular implant-supported overdentures on patient-reported outcomes, a randomized controlled trial with a larger size and more uniform maxillary denture condition is required.

5. Conclusions

Within the confines of this study's limitations, both loading approaches demonstrated satisfactory results. There was an improvement in patient-reported outcomes after receiving a two-implant overdenture with magnetic attachments, loaded by either immediate or conventional protocols. Immediate loading may have prolonged effects on enhancing patient-reported outcomes compared to conventional loading.

Author Contributions: Conceptualization, T.N.H.B., Y.K., S.M. and M.K.; methodology, Y.K. and M.K.; investigation, D.S., S.N., A.M. and T.N.H.B.; resources, M.K. and A.M.; data curation, T.N.H.B., S.N. and D.S.; writing—original draft preparation, T.N.H.B.; writing—review and editing, Y.K. and M.K.; supervision, M.K.; project administration, S.M.; funding acquisition, M.K. and Y.K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by JSPS KAKENHI, Grant Number 25462986.

Institutional Review Board Statement: The human study protocol was approved by The Ethics Committee at the Faculty of Dentistry, Tokyo Medical and Dental University (Number 693).

Informed Consent Statement: Written informed consent was obtained from the patients to publish this paper.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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