Library Progress International *Print version ISSN 0970 1052*
Vol.44, No.2s, Jul-Dec 2024: P.1607-1617 *Online version ISSN 2320 317X*

Original Article *Available online at www.bpasjournals.com*

A Comparative Evaluation of Patient and Orthodontist Preferences and Attitude in Intraoral Photography Using a Novel Tongue Retractor as an Adjunct for Occlusal Photographic Mirror vs. Conventional Techniques for Capturing Mandibular Occlusal Photographs in Orthodontic Practice.

Dr. Narayan Kulkarni[1], Dr. Yashraj Kharade[2]

ABSTRACT:

Introduction: The use of digital dental photography (DDP), which facilitates patient communication, treatment planning, and documentation, has become essential to orthodontic treatments. On the other hand, difficulties result from procedural errors, which are frequently caused by device design, patient compliance, or practitioner technique. The purpose of this study is to compare the attitudes and preferences of orthodontists and patients about a new tongue retractor as an addition to intraoral photography techniques for mandibular occlusal photography.

Materials and Methods: 48 participants, ranging in age from 18 to 40, were recruited in the Department of Orthodontics and Dentofacial Orthopaedics at K. M. Shah Dental College & Hospital. The participants were subjected to digital dental photography in accordance with predetermined inclusion and exclusion criteria. Patients and orthodontists filled, questionnaires and visual analogue scales to assess preferences, attitudes, and discomfort levels.

Results: Patients favoured the new tongue retractor, noting less discomfort and nausea, while orthodontists praised it for its comfort, ease of usage, and decreased discomfort. Both orthodontists and patients preferred the innovative tongue retractor, according to statistical analysis, which also showed substantial variations in the amount of discomfort, time required for photography, and respiratory impairment between the two procedures.

Conclusion: Incorporating the innovative tongue retractor with intraoral imaging techniques in orthodontic treatment can increase patient and orthodontist's comfort and treatment quality. In orthodontics, putting patient convenience and ease first can result in better treatment outcomes.

KEYWORDS

Digital Dental Photography, Novel Tongue retractor, Occlusal Photograph

INTRODUCTION

Digital dental photography (DDP), which is becoming an essential aspect of orthodontic treatments, is exemplified by dentistry[1]. Clinicians can document important phases of treatment with DDP. At least four extraoral and five intraoral images are advised in the field of orthodontics, the intraoral photos should show the patient's whole dentition and occlusion. Errors might come from the equipment's faulty design, the patient, or the practitioner during the DDP procedure.

For the mandibular occlusal photograph, the occlusal mirror is inserted with the broader end so that mirror rests on distal aspects of last molars; it is then turned upward with the mouth wide open until it touches the incisal edges of upper incisors. Once the causes of the errors are identified, appropriate solutions can be implemented. Therefore, three aspects of the procedure should be investigated: the patient, the practitioner, and the equipment.

Orthodontists often encounter the obstruction caused by a patient's tongue during occlusal photography.
Traditionally, patients are asked to roll their tongue back behind the mirror, which hurts the patient and degrades the image quality. During mandibular occlusal photography, tongue hindrance and pain or discomfort are frequent issues. The ideal photographic approach presents challenges for patients with syndromic patients, patients with macroglossia, and individuals with limited dexterity.
The newly designed tongue retractor for occlusal photography will help with this problem. Its unique design holds the tongue comfortably and securely away from the photographic area, giving the clinician unmatched visibility and control during occlusal photography. The material used to make the retractor is 3D-printed polyester made of polyethylene terephthalate glycol (PET-G), which is made possible by the Fused Deposition Modelling (FDM) process, which is durable, chemically resistant, and formable.
The inventive tongue retractor weighs 13g and has a triangular shape with 18 mm height, 30 mm and 18 mm length of base and apex respectively, and 24 mm width. It has a Clip-On Design that can be attached on the posterior side of the mirror.
Therefore, this study aims to evaluate the preferences and attitudes of patients and orthodontist toward the intraoral photographic technique of mandibular occlusal photograph with a novel tongue retractor compared to the conventional photographic technique of mandibular occlusal for orthodontic patients.

MATERIALS AND METHODS

Study Design, Sample Design and sample Description

The study population consisted of 48 subjects (24 patients and 24 orthodontists) referring to Department of Orthodontics and Dentofacial Orthopaedics, K. M. Shah Dental College & Hospital, Sumandeep Vidyapeeth deemed to be University, Piparia, Waghodia, Vadodara, Gujarat. The age ranged from 18 to 40 years. The patients had no previous experience of digital Dental photography. The subjects and parents or legal representative were informed about the clinical procedures and of possible risks and benefits, a signed consent form was obtained for all patients. All the patients underwent Digital dental photographic procedure in order to obtain orthodontic photographic records. The inclusion and exclusion criteria are summarized in Table 1. The sample size was calculated using Openepi software (v3.0) at 95% confidence interval and 80% power in reference the study conducted by Alessandro Mangano et al.

Table 1. Inclusion and exclusion criteria.

INCLUSION CRITERIA	EXCLUSION CRITERIA
1. Participants aged between 18-40 years included	1.Participants not willing to be a part of the study
2. Participants with good oral health.	2.Participants having previous experience of intraoral photography.
3. Participants with good oral hygiene	3.Participants with history of orthodontic treatment.
4. Participants with mouth opening ranging from 40 to 60mm	4.Participants having tongue tie.
5. Participants knowing English language.	5.Participants having mouth breathing habit.
	6.Patent authors and applicant.

Methodology

The study commenced following the acquisition of ethical approval from SVIEC, with approval number SVIEC/ON/Dent/RP/Feb/24/36. Participants were chosen based on predefined inclusion and exclusion criteria. Detailed information about the study was provided to each participant during the treatment session. Both the participant and their parent and orthodontists received an information sheet. A signed, written informed consent form was obtained from both the participant and their parent and orthodontist.

Following oral prophylaxis, which included scaling and polishing, patient selection was carried out through a clinical examination adhering to the inclusion and exclusion criteria. The selection of participants for the study involved the following steps. During the initial appointment (T1), the orthodontist captured mandibular occlusal photographs of the selected participants using the conventional intraoral photographic technique. At the subsequent appointment after 2 hours (T2), mandibular occlusal photographs of the chosen participants were taken using the intraoral photographic technique, employing a novel tongue retractor as an adjunct to the occlusal photographic mirror.

Figure 1: Novel Tongue Retractor

Figure 2: Final assembly of intra oral occlusal photographic mirror with novel tongue retractor.

Intra oral Photographic technique with novel tongue retractor as an adjunct to occlusal photographic mirror:

The camera is set up with the following settings: Aperture: F/22, Shutter Speed: 1/200, ISO: 100, Lens: Manual Mode, Flash: Manual Mode, Magnification Ratio: 1:3. A novel tongue retractor is attached to the occlusal photographic mirror, and the entire assembly is inserted into the patient's mouth. and the photograph should be taken at a 90° angle to the plane of the mirror, ensuring that the last molar is visible. Additionally, a lip retractor is used to retract the lip.

Figure 3: Mandibular occlusal photograph captured with conventional technique.

Figure 4: Mandibular occlusal photograph captured with Intra oral Photographic technique with novel tongue retractor as an adjunct to occlusal photographic mirror

Intra oral Photographic technique (conventional method):
The camera is configured with the following settings: Aperture: F/22, Shutter Speed: 1/200, ISO: 100, Lens: Manual Mode, Flash: Manual Mode, Magnification Ratio: 1:3. To capture the shot, the patient is instructed to roll their tongue back. The occlusal photographic mirror is inserted into the patient's mouth, and the photograph should be taken at a 90° angle to the plane of the mirror, ensuring that the last molar is visible. Additionally, a lip retractor is used to retract the lip

Method to evaluate patient's and orthodontist's preference, attitude and discomfort about intraoral photographic technique for capturing mandibular occlusal photograph.
The patient's and orthodontist's preference about intra oral photographic technique for mandibular occlusal photograph is evaluated with the help of 7 item questionnaire and 8 item questionnaires respectively, which is validated from experts. ICC value was 0.954(excellent), indicating that rating for the different questions by different experts were very similar. And patient's and orthodontist's attitude and discomfort about intra oral photographic technique for mandibular occlusal photograph is evaluated with the help of visual analogue scale (VAS).
Table 2: The patient's and orthodontist's preference about intra oral photographic technique for mandibular occlusal photograph is evaluated with the help of 7 item questionnaire and 8 item questionnaires respectively, where Option A and B are as follows.

A. Conventional intra oral photographic technique for capturing mandibular occlusal photograph.
B. Novel tongue retractor as an adjunct to occlusal photographic mirror for capturing mandibular occlusal photograph.

Patient's preferences about intra oral photographic technique for Capturing mandibular occlusal photograph.	**Orthodontist's preferences about intra oral photographic technique for Capturing mandibular occlusal photograph.**
1. Which intra oral photographic technique do you prefer in the case of repeating the	1. Which intra oral photographic technique do you prefer in the case of

mandibular occlusal photography procedure?	repeating the mandibular occlusal photography procedure?
2. Which intra oral photographic technique is more comfortable from point of comparison of two intra oral photographic technique for capturing mandibular occlusal photograph?	2. Which intra oral photographic technique is more comfortable from point of comparison of two intra oral photographic technique for capturing mandibular occlusal photograph?
3. Which intra oral photographic technique do you suggest for someone in need of intraoral photographs for undergoing orthodontic treatment?	3. Which intra oral photographic technique do you suggest for a colleague in need of intraoral photographs for patients undergoing orthodontic treatment?
4. Which intra oral photographic technique do you prefer from point of time involved with intra oral photography procedure?	4. Which intra oral photographic technique do you prefer from point of time involved with intra oral photography procedure?
5. Which intra oral photographic technique do you prefer from point of the size of the tongue retractor used in your mouth during intra oral photographic technique for capturing mandibular occlusal photograph?	5. Which intra oral photographic technique do you prefer from point of the size of the tongue retractor used in your mouth during intra oral photographic technique for capturing mandibular occlusal photograph?
6. Which intra oral photographic technique do you prefer from point of having difficulty in breathing during intra oral photographic technique for capturing mandibular occlusal photograph?	6. Which intra oral photographic technique do you prefer from point of the feasibility during intra oral photographic technique for capturing mandibular occlusal photograph?
7. Which intra oral photographic technique do you prefer from point of having nausea during intra oral photography procedure for capturing mandibular occlusal photograph?	7. Which intra oral photographic technique do you prefer from point of having difficulty in placement of photographic assembly during intra oral photographic technique for capturing mandibular occlusal photograph?
	8. Which intra oral photographic technique do you prefer from point of having gagging reflex during intra oral photography procedure for capturing mandibular occlusal photograph?

Statistical Analysis

Statistical analysis was done with Statistical Package for Social Sciences (IBM SPSS Statistic for window, version 21.0. Armonk, NY: IBM Corp.) at 95% CI and 80% power to the study. Descriptive statistics was done in terms of Mean and Standard Deviation, Frequency and Percentage.

Chi square test was applied to check for statistically significant difference in the responses.

Unpaired t test was applied to compare parameters between two appliances.
Statistical significance was calculated at $p<0.05$ and $p<0.001$ was considered highly significant

RESULTS

Orthodontist's preferences about intra oral photographic technique for Capturing mandibular occlusal photograph.

Table 3: Orthodontist's preferences about intra oral photographic technique for Capturing mandibular occlusal photograph

		Frequency	Percent	
Q1	A	13	54.2	P<0.05
	B	11	45.8	
Q2	A	4	16.7	P<0.05
	B	20	83.3	
Q3	A	13	54.2	P<0.05
	B	11	45.8	
Q4	A	24	100.0	---
Q5	A	21	87.5	P<0.05
	B	3	12.5	
Q6	A	12	50.0	P<0.05
	B	12	50.0	
Q7	A	16	66.7	P<0.05
	B	8	33.3	
Q8	A	5	20.8	P<0.05
	B	19	79.2	

For Question No.1 regarding preference for repeating occlusal photography procedure majority of the orthodontists (54.2%) chose option A i.e. conventional intraoral photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)
For Question No.2 regarding comfortability for capturing occlusal photograph, majority of orthodontists (83.3%) chose option B i.e. novel tongue retractor as an adjunct to occlusal photographic mirror for capturing occlusal photograph. ($p<0.05$)
For Question No.3 regarding suggesting intraoral photographic technique to colleague most of the orthodontist (54.2%) chose option A i.e. conventional intraoral photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)
For Question No.4 regarding time required all the orthodontists 100% chose conventional intraoral photographic technique.
For Question No.5 regarding preference from point of size of tongue retractor, majority of the orthodontists (87.5%) chose option A i.e. conventional intraoral photographic technique. For Capturing mandibular occlusal photograph. ($p<0.05$)
For Question No.6 regarding feasibility, 50% orthodontist chose conventional and 50 % chose novel tongue retractor technique. For Capturing mandibular occlusal photograph. ($p<0.05$)
For Question No.7 regarding difficulty in placement of photographic assembly, most of the orthodontist chose option A i.e. conventional intraoral photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$).
For Question No.8 regarding gagging reflex, most of the orthodontist chose (79.2%) option B novel tongue retractor as an adjunct to occlusal photographic mirror for capturing occlusal photograph. ($p<0.05$).

Comparison of Attitude, acceptability, feelings and stress perceived by orthodontists between conventional intraoral photographic technique and novel tongue retractor as an adjunct to intraoral photographic technique.

Table 4: Comparison of Attitude, acceptability, feelings and stress perceived by orthodontists between conventional intraoral photographic technique and novel tongue retractor as an adjunct to intraoral photographic technique.

		N	Mean	Std. Deviation	t value	p value
Discomfort	Conventional intraoral photographic technique	24	5.5000	.83406	5.948	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.8333	1.09014		
Time Needed	Conventional intraoral photographic technique	24	6.3333	.86811	10.139	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.7500	.89685		
Gag reflex	Conventional intraoral photographic technique	24	5.1250	.67967	5.986	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.7500	.89685		
Discomfort during mouth opening	Conventional intraoral photographic technique	24	5.5000	.83406	2.571	0.013*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	4.8750	.85019		
TMJ discomfort	Conventional intraoral photographic technique	24	5.1250	.79741	4.685	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.8333	1.09014		
Breathing Impairment	Conventional intraoral photographic technique	24	5.2917	.85867	5.227	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.9583	.90790		

*Statistical significance at $p<0.05$

Mean score for discomfort was 5.50±0.83 for Conventional intraoral photographic technique and 3.83±1.09 for novel tongue retractor as an adjunct to intraoral photographic technique respectively. This difference was statistically highly significant. ($p<0.001$)

Time needed for Conventional intraoral photographic technique was 6.33±0.86 which was more than that for novel tongue retractor as an adjunct to intraoral photographic technique, for which it was 3.75±0.89. This difference in time was statistically highly significant. ($p<0.001$)

Mean gag reflex score for Conventional intraoral photographic technique was 5.12±0.67 and for novel tongue retractor as an adjunct to intraoral photographic technique was 3.75±0.89. This difference in time was statistically highly significant. ($p<0.001$)

Mean score for discomfort during mouth opening for Conventional intraoral photographic technique was 5.5±0.83 and for novel tongue retractor as an adjunct to intraoral photographic technique was 4.87±0.85. The difference in discomfort during mouth opening between both the technique was statistically significant. ($p<0.05$)
Mean TMJ discomfort score for Conventional intraoral photographic technique was 5.12±0.79 and 3.83±1.09 and for novel tongue retractor as an adjunct to intraoral photographic technique respectively. This difference was statistically highly significant. ($p<0.001$)
Mean score for breathing impairment was 5.29±0.85 for Conventional intraoral photographic technique and 3.95±0.90 for novel tongue retractor as an adjunct to intraoral photographic technique. This difference was statistically highly significant. ($p<0.001$)

Patient preferences about intra oral photographic technique for Capturing mandibular occlusal photograph

Table 5: Patient preferences about intra oral photographic technique for Capturing mandibular occlusal photograph.

		Frequency	**Percent**	
Q1	A	6	25.0	**P<0.05**
	B	18	75.0	
Q2	A	4	16.7	**P<0.05**
	B	20	83.3	
Q3	A	8	33.3	**P<0.05**
	B	16	66.7	
Q4	A	24	100.0	**---**
Q5	A	21	87.5	**P<0.05**
	B	3	12.5	
Q6	A	15	62.5	**P<0.05**
	B	9	37.5	
Q7	A	7	29.2	**P<0.05**
	B	17	70.8	
	Total	24	100.0	

For Question no.1 majority of the patients (75%) chose option B i.e. novel tongue retractor as an adjunct to occlusal photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)
For Question no.2 majority of the patients (83.3%) chose option B i.e. novel tongue retractor as an adjunct to occlusal photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)
For Question no.3 majority of the patients (66.7%) chose option B i.e. novel tongue retractor as an adjunct to occlusal photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)
For Question no.4 regarding time required all the patients 100% chose A i.e. conventional intraoral photographic technique.
For Question no.5 regarding preference from point of size of tongue retractor, majority of the patients (66.7%) chose option A i.e. conventional intraoral photographic technique. For Capturing mandibular occlusal photograph. ($p<0.05$)

For Question no.6 regarding difficulty in breathing during photograph, majority of the patients (62.5%) chose option A i.e. conventional intraoral photographic technique. For Capturing mandibular occlusal photograph. ($p<0.05$)
For Question no.7 regarding feeling of nausea during photograph, majority of the patients (70.8%) chose option B i.e. novel tongue retractor as an adjunct to occlusal photographic technique for Capturing mandibular occlusal photograph. ($p<0.05$)

Comparison of Attitude, acceptability, feelings and stress perceived by patients between conventional intraoral photographic technique and novel tongue retractor as an adjunct to intraoral photographic technique.

Table 6: Comparison of Attitude, acceptability, feelings and stress perceived by patients between conventional intraoral photographic technique and novel tongue retractor as an adjunct to intraoral photographic technique.

		N	Mean	Std. Deviation	t value	p value
Discomfort	Conventional intraoral photographic technique	24	6.3333	.86811	10.139	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.7500	.89685		
Time Needed	Conventional intraoral photographic technique	24	5.5000	.83406	5.948	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.8333	1.09014		
Nausea	Conventional intraoral photographic technique	24	6.5000	.97802	11.281	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.5417	.83297		
Discomfort during mouth opening	Conventional intraoral photographic technique	24	5.0833	.71728	0.918	0.364
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	4.8750	.85019		
TMJ discomfort	Conventional intraoral photographic technique	24	5.1250	.79741	0.177	0.860
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	5.0833	.82970		
Breathing Impairment	Conventional intraoral photographic technique	24	6.7917	.72106	11.972	<0.001*
	Novel tongue retractor as an adjunct to intraoral photographic technique	24	3.9583	.90790		

*Statistical significance at $p<0.05$

Mean score for discomfort was 6.33±0.86 for Conventional intraoral photographic technique and 3.75±0.89 for Novel tongue retractor as an adjunct to intraoral photographic technique respectively. This difference was statistically highly significant. ($p<0.001$)
Time needed for Conventional intraoral photographic technique was 5.5±0.83 which was more than that for Novel tongue retractor as an adjunct to intraoral photographic technique for which it was 3.83±1.09. This difference in time was statistically highly significant. ($p<0.001$)
Mean score for nausea for Conventional intraoral photographic technique was 6.5±0.97 and for Novel tongue retractor as an adjunct to intraoral photographic technique was 3.54±0.83. This difference in time was statistically highly significant. ($p<0.001$)
Mean score for discomfort during mouth opening for Conventional intraoral photographic technique was 5.08±0.82 and for Novel tongue retractor as an adjunct to intraoral photographic technique was 4.87±0.85. The difference in discomfort during mouth opening between both the technique was statistically significant. ($p<0.05$)
Mean TMJ discomfort score for Conventional intraoral photographic technique was 5.12±0.79 and 5.08±0.82 for Novel tongue retractor as an adjunct to intraoral photographic technique.
Mean score for breathing impairment was 6.79±0.72 for Conventional intraoral photographic technique and 3.95±0.90 for Novel tongue retractor as an adjunct to intraoral photographic technique. This difference was statistically highly significant. ($p<0.001$)

DISCUSSION

Orthodontists now have access to revolutionary technologies for patient communication, treatment planning, and documentation thanks to the advent of digital dental photography (DDP). In order to assess patient and orthodontist preferences and attitudes toward the intraoral photographic technique of mandibular occlusal photograph with a novel tongue retractor compared to the conventional photographic technique of mandibular occlusal for orthodontic patients, this study investigates the implementation of a novel tongue retractor as an adjunct to intraoral photographic techniques.
The findings reveal significant differences in preferences and attitudes between orthodontists and patients regarding the two techniques. Orthodontists generally showed a preference for the novel tongue retractor due to increased comfort, reduced discomfort, and ease of use and reduction in gag reflex. Conversely, patients tended to favour the novel technique as well, particularly noting reduced discomfort and nausea compared to conventional methods.
The statistical analysis underscores these preferences, showing highly significant differences in discomfort levels, time needed for photography, and breathing impairment between the two techniques. Orthodontists and patients both favoured the novel tongue retractor for mitigating these issues, emphasizing its potential to enhance patient experience and streamline clinical procedures.
These results align with previous studies that have highlighted the importance of patient comfort and satisfaction in orthodontic treatments. By addressing common challenges such as tongue hindrance and discomfort during intraoral photography, the novel tongue retractor offers a promising solution to improve overall patient experience and treatment outcomes.
However, it's important to acknowledge limitations such as the relatively small sample size and single-centre study design, which may affect the generalizability of the findings. Future research could explore larger and more diverse populations to validate these results further.

CONCLUSION

The study's conclusions, taken together, lend credence to the idea of using the innovative tongue retractor in conjunction with intraoral photography methods in orthodontic treatment. In the quickly changing field of orthodontics, practitioners can improve treatment outcomes and care quality by putting the convenience and ease of their patients first.

HUMAN AND ANIMAL RIGHTS

No human rights were violated in the present study.

CONSENT FOR PUBLICATION

Consent for publication was obtained by each patient, by the patients' parents and legal representatives.

CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise

ACKNOWLEDGEMENTS:

Declared none.

REFERENCES

1. Shetty OSK, Verma2* A, Madhur VK, editors. Clinical Photography in Orthodontics Sharath Kumar Shetty1 , Arushi Verma2*, Mahesh Kumar Y3 , Vijayananda K. Madhur.
2. Conventional Vs Digital Impressions: Acceptability, Treatment Comfort and Stress Among Young Orthodontic Patients Alessandro Mangano1,* , Matteo Beretta2 , Giuseppe Luongo3 , Carlo Mangano4 and Francesco Mangano5.
3. A Qualitative Analysis of Dental Photography in Orthodontics: The Patient's Perspective Muhsin Çifter.
4. THE GUIDELssINES FOR A PRACTICAL APPROACH Rafey Fahim, 1 Rachna Thakur.