

Fruits and Vegetables: A Cost-effective Practical Solution in Periodontal Pre-Clinical Surgical Training for Postgraduate Students

Fouad H AL-Bayaty^{1*}, MFH Hidayat¹, Farha Ariffin¹, Erni Noor¹, Mahyunah Masud¹,
Muhammad Hilmi Bin Zainal Ariffin¹, Hafizul Izwan Mohd Zahari¹, Fara Azwin Adam¹

1. Centre for periodontology studies, Faculty of Dentistry, UiTM Campus Sg Buloh, Jalan Hospital, Sungai Buloh 47000, Selangor Darul Ehsan, Malaysia.

Abstract

The pre-clinical periodontal surgical techniques are an essential module in the postgraduate program in periodontology. Current methods used for practical purpose is costly and unsustainable.

This study aimed to evaluate the effectiveness of using fruits and vegetables as an alternative mode of practice exercise for a student to develop periodontal surgical skills and techniques before be done on the patient and to assess the suitability of certain types of fruits and vegetables for a specific pre-clinical periodontal procedure.

Eleven periodontology residents participated in this study. Lectures, video presentations, and demonstrations on suturing, flap access procedure, soft tissue grafting, and split-thickness incision techniques were given to the participants. A crossover study design was done whereby the participants were allocated randomly to practice techniques on banana peels, orange, and tomato. Specifically, suturing on banana peels; harvesting soft tissue graft on orange and split-thickness incision mimicking mucogingival surgery on tomato access flap. A Likert-style survey was distributed to participants before and after the exercise to evaluate their feedback of using banana, orange, and tomato as an alternative mode of practical exercise for the pre-surgical module.

Data was managed using IBM SPSS Statistics for Macintosh, Version 28.0.0.0 (190). Following training, practise harvesting FGG on orange skin ($p=0.015$) and participants confidence with materials when compared pre and post-test were significant ($p=0.007$).

Participants were very satisfied and gained excellent pre-clinical surgical practice exposure. The selected fruits were suitable for use as periodontal surgical procedures in preparation for the residents to attain the necessary skills before attending to their patients.

Clinical article (J Int Dent Med Res 2021; 14(4): 1498-1502)

Keywords: Pre-Clinical Surgical techniques, Fruits, Vegetables, Periodontology.

Received date: 05 October 2021

Accept date: 01 November 2021

Introduction

The postgraduate program in periodontology started in 2016 at the Faculty of Dentistry Universiti Teknologi MARA, Malaysia was the first doctorate program aimed at training periodontists in Malaysia. Its purpose is to enable graduates competent with advanced knowledge and skills in managing periodontal cases independently and to work in an interdisciplinary setting.¹⁻³

Psychomotor skills are an essential skill that is taught and develop in the course. Pre-clinical periodontal surgical techniques and skills are done on dental models so that the students are familiarized with the procedures before they can practice on their patients.⁴ This is to ensure that students can develop their hand-eye coordination and manual dexterity. Clinical periodontal surgical skill techniques include suturing techniques, periodontal access flap, soft tissue grafting, and placement of membranes.^{5,6}

Being an essential module in the postgraduate program in periodontology, the pre-clinical periodontal surgical techniques being taught presently uses typodont.

However, the materials can only be used once per practice and it is costly to replace for each coming student. Since the method is unsustainable and with limited funding, an

***Corresponding author:**

Professor Dr. Fouad Hussain Al-Bayaty,
Center for Periodontology Studies, Faculty of Dentistry,
University Teknologi MARA (UiTM), Jalan Hospital Sungai
Buloh, 47000 Selangor Darul Ehsan, Malaysia.
E-mail: fouad@uitm.edu.my

alternative cost-effective solution is needed. Fruits and vegetables are a sound practical solution for pre-clinical periodontal surgical techniques for training students. Selected fruits and vegetables have been identified for each specific preclinical periodontal surgical technique.^{7,8} The objectives of this study were to evaluate the effectiveness of using fruits and vegetables as an alternative material for the student to develop their periodontal surgical skill and techniques and assess the suitability of certain types of fruits and vegetables for a specific pre-clinical periodontal procedure.

Materials and methods

This study was headed by a senior lecturer (FHA) with the support of all the members of the Center of Periodontology Studies. Eleven residents (1 Male; 10 Female) from the Faculty of Dentistry-Centre of Periodontal Studies with age ranges from 32 to 36 years old volunteered to be in this study. Three types of fruits and vegetables were selected for participants to exercise. The banana was chosen specifically for participants to exercise basic incision, simple interrupted suturing, and membrane placement. The orange was used to exercise harvesting connective tissue and free gingival grafts and tomato were chosen for participants to exercise split-thickness incision. The practical sessions were held at the Spinel Dental Clinic. Before the practical exercise, participants were presented with lectures on suturing, access flap, soft tissue grafting, and split-thickness incision techniques including demonstration and video presentation.

A crossover study design was done with participants required to undergo pre-clinical periodontal surgical exercise on banana peels, orange, and tomato. They were randomized into three groups: group one (3 students) practicing suturing and guided tissue regeneration on banana peels; group two (4 students) practicing access flap, harvesting soft tissue graft on orange, and group three (4 students) practicing split-thickness incision mimicking mucogingival surgery on tomato.

The followings are the specific exercise perform on the fruits and vegetables:

Banana

The banana was prepared for suturing practice and membrane placement. Participants

would draw a line of 5 centimeters and make an incision with blade number 15 and then close the incision with several simple interrupted sutures with a 3-0 suture. Next, participants would draw one horizontal and two vertical lines to perform flap access. A Whatman filter paper no. 1 was inserted as a membrane to mimic the guided tissue regeneration (GTR) procedure (Figure 1).

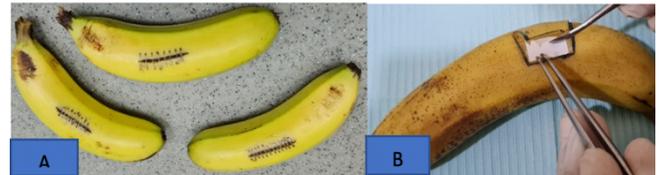


Figure 1. Shows the surgical technique practiced by the participant. A. Simple interrupted sutures on banana, B. Flap access with guided tissue regeneration.

Orange

The orange skin was used to mimic the epithelium, connective tissue, and bone of a patient's palate. An outline was made to represent the recipient site. A no. 15 blade was inserted at the edge of the incision. The mesial margin of the orange skin is raised from the underlying skin of the orange while the underlying orange pith is lifted with the side of the blade. The pith is slowly separated with a partial-thickness incision while the reflected skin margin is lifted with tissue pliers (Figure 2).



Figure 2. Shows the surgical technique practiced by the participant. Harvesting the orange pith which mimics the connective tissue on an orange.

Tomato

The tomato was used to practice split-thickness incision mimicking mucogingival surgery. Participants were asked to make one horizontal line on the tomato with a depth of penetration of up to 1 mm only. Next, with a sharp 15C blade, a split-thickness incision was made separating the 1mm of the cuticle from the underlying pericarp. The incision was gently made to avoid tearing the cuticle. The edge of the cuticle should be gently handled with a microsurgical tissue holder during the split-thickness incision (Figure 3). The edges of the tomato skins separated were then sutured.



Figure 3. Shows the surgical technique practiced by the participants for split-thickness incision mimicking mucogingival surgery on tomatoes.

Participants were given a Likert-style Survey (Table 1) to evaluate their attitude towards using banana, orange, and tomato as an alternative and cost-effective materials in the presurgical module before and after completion of the study.^{7,9}

Results

Descriptive analysis and IBM SPSS Statistics for Macintosh, Version 28.0.0.0 (190) were performed to analyze the student's responses before and after the study. A significant difference was found with pair 2, comparing the participant response before and after receiving the pre-clinical training utilizing oranges as a practice tool for practicing harvesting free gingival grafts with $p= 0.0015$. A significant difference was found with pair 6; comparing the participant response before and after receiving the pre-clinical training in assessing participant's confidence in using the practice material given, showing the pre-clinical training has improved the participant's confidence in using the materials provided with $p= 0.007$.

All the 11 residents participated in the suturing workshop; completed the survey before and after the workshop (response rate=100%). The mean age was 33.36 ± 3.44 years, with a range from 32 to 36 years. Ten participants were female and one male. Three students were in year 2, four students were in year 3, four students were in year 4. Students felt comfortable learning to suture and (GTR) with bananas and strongly agreed that practicing these surgical techniques using bananas was very useful (80%) compared to 50% before the workshop. 20% of the students believed that orange can be suitable for learning harvesting connective tissue, while 80% confirmed that their skills and abilities improved after practicing with orange and banana. Furthermore, 40 % were felled neutral and greed that tomatoes may be useful to perform the pre-clinical surgical practice. Results showed that 60% were strongly agreed that tomato was useful for split-thickness incision and can mimicking mucogingival surgery. Students have strongly agreed that cost was an important factor for acquiring skills in practicing different periodontal surgical procedures by using low-cost materials like vegetables and fruits. Before receiving practices, some respondents having a neutral response for all the questions (Q1: 20%, Q2: 40%, Q3: 40%, Q4: 30%, Q5:30%, Q6: 70%, Q7:20%, Q8: 40% and Q9: 20%). However, following the pre-clinical training course, a small number, of only 10% of respondents found Q6 & Q7 having a neutral response, and the remaining found that the pre-clinical training has been a useful course (Figure 4 and 5).

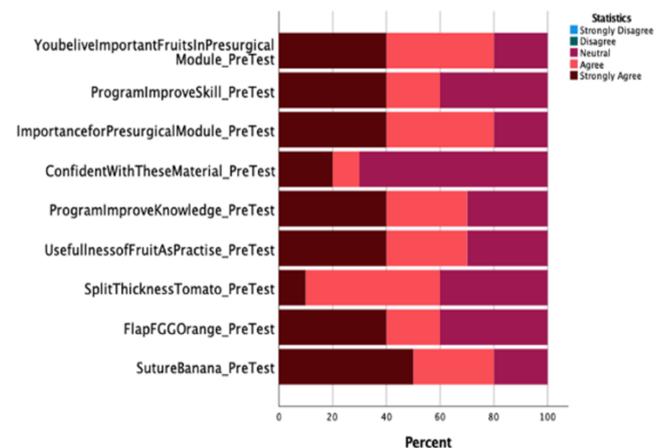


Figure 4. Percentage Pre-test.

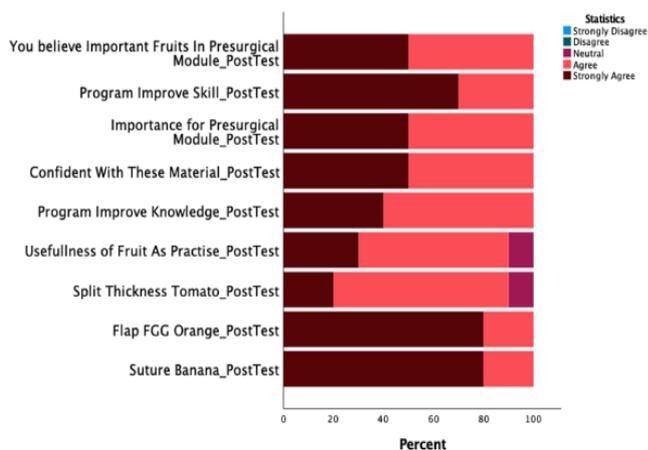


Figure 5. Percentage Post-test.

Discussion

The pre-clinical periodontal surgical techniques are an essential module in the postgraduate program in periodontology. Current materials used for practical purpose is costly and unsustainable. Successful education in surgical techniques requires students to practice materials that are accessible, affordable, realistic, and can simulate the oral tissue. Banana, orange, and tomato were suggested as alternative pre-clinical periodontal material for the student to practice. Surgical skill laboratories are becoming an important venue for the technical training of surgical residents globally. Over the last decade, much has been learned regarding the acquisition of surgical skills in this environment.¹⁰⁻¹²

Food items have been suggested as alternatives for suturing practice in resource-limited settings. Pig feet and chicken legs have classically been used¹³, however, the difficulty in preserving meat in warmer climates makes it impractical and wasteful.

To overcome these limitations, we have introduced banana, orange, and tomato as a low-cost, practical alternative for suturing, guided tissue regeneration (GTR), flap access, harvesting connective tissue, and mucogingival surgery practice. Suturing in periodontal surgery is considered essential for tissue apposition and repair, and as such is a critical skill for all resident students. To our knowledge, no earlier studies use these types of fruits and vegetables for pre-surgical training in periodontology.

Generally, several studies have investigated alternative suturing materials but not for periodontology. Kumaresan et al. combined a

polysiloxane “putty” impression with a synthetic foam sponge¹⁴ synthetic microfiber cloth was folded along the long axis of the wooden board, mimicking soft tissue.¹⁵ Orange fruit has also been suggested, fresh oranges were cut in half, and the pulp was replaced with vinyl putty and plaster⁷ and banana.¹⁶

Bananas offer a low-cost, feasible alternative. Results from our workshop showed 80% strongly agree that suturing, GTR, and flap access practice on bananas was very useful material in practicing pre-surgery in periodontology. Subjectively, bananas were well-received by students and considered to be an effective teaching model. It was successfully used to teach this technique during our workshop.

Tomato was the first time use in pre-surgical training specialty to practice the most sophisticated surgical procedures in periodontology such as split-thickness incision for root coverage. Very thin tomato skin can mimic the microsurgery procedure with a loupe in the oral cavity. 60% of the students strongly agreed and 40% agreed that it was is a very good material for training and practicing such type of surgical technique which needed excellent skills. The firm outer skin of the orange and fibrous consistency mimicked the tensile strength of keratinized human gingiva while the underlying skin provided soft resistance to harvesting soft tissue graft, simulating the attachment between the gingiva and soft connective tissue. 80% of the participant strongly agreed that orange was practical material for acquiring training and skill to harvesting soft tissue grafts. The different layers of the orange could be considered as a mirrored layer of the human keratinized gingiva.

A significant difference was found with pair 2, comparing the participant response before and after receiving the pre-clinical training utilizing oranges as a practice tool for practicing harvesting free gingival grafts with $p= 0.0015$. Meanwhile, a significant difference was found with pair 6; comparing the participant response before and after receiving the pre-clinical training in assessing participants confidence using the practice material given, showing the pre-clinical training has improved the participants' confidence provided with $p= 0.007$

The study is limited in generalizability since only 11 resident students from one dental school were included in this study. Finally, bananas, tomatoes, and oranges were low-cost,

effective, and useful materials for the training model, that, they can replicate human gingival tissue.

Conclusions

The availability of high-quality practise materials is crucial to the development of effective suturing and surgical skill. Suturing, GTR, flap access, connective tissue harvesting, and mucogingival surgery are all considered fundamental components of periodontal surgery surgical training. This model of utilising fruits such as banana, orange, and tomato in pre-clinical practise satisfies and exceeds the standards for effective practise, including acceptable modelling of primary approximation on human tissue and material reliability over several usage and can be useful materials to meet the pre-clinical periodontal surgical training module's objectives.

Acknowledgments

We would like to extend our deepest appreciation to the Faculty of Dentistry and the staff of the Centre for Periodontology studies, Faculty of Dentistry, UiTM Campus Sg Buloh for providing materials, and apparatus to be used for this workshop and research.

Declaration of Interest

The authors report no conflict of interest.

References

1. Dentino A, Lee S, Mailhot J, Hefti AF. Principles of periodontology. *Periodontol* 2000. 2013;61(1):16-53. doi:10.1111/j.1600-0757.2011.00397.x
2. Tomasi C, Leyland AH, Wennström JL. Factors influencing the outcome of non-surgical periodontal treatment: a multilevel approach. *J Clin Periodontol*. 2007;34(8):682-690. doi:10.1111/j.1600-051X.2007.01111.x
3. Basher SS, Saub R, Vaithilingam RD, et al. Impact of non-surgical periodontal therapy on OHRQoL in an obese population, a randomised control trial. *Health Qual Life Outcomes*. 2017;15(1):1-9. doi:10.1186/s12955-017-0793-7
4. Bayaty FHA-, Nik Mahmood N, Baharuddin I, Omar A. Journal of International Dental and Medical Research ISSN 1309-100X <http://www.iidmr.com> Tooth Mortality Fouad Hussain Al-Bayaty, and et al. *J Int Dent Med Res*. 2019;12(4):1511-1515.
5. Vann W, Shugars D, May K, Holland J. Acquisition of psychomotor skills in dentistry: a follow-up study. *J Dent Educ*. 1984;48(9):514-517. doi:10.1002/j.0022-0337.1984.48.9.tb01821.x

6. Masud, M.; Al-Bayaty, F. H.; Muhamed, N. A. H.; Alwi, A. S.; Takiyudin, Z.; Hidayat MFH. Gingival Recession and Dentine Hypersensitivity in Periodontal Patients: is It Affecting Their Oral Health-Related Quality of Life? *J Int Dent Med Res*. 2017;10(3):909-914.
7. Nicholson S. Laparoscopically assisted insertion of feeding jejunostomy. *Ann R Coll Surg Engl*. 2012;94:210-214. doi:10.1308/003588412X13171221589694
8. Kumaresan R, Pendayala S, Srinivasan B, Kondreddy K. A simplified suturing model for preclinical training. *Indian J Dent Res*. 2014;25(4):541-543. doi:10.4103/0970-9290.142577
9. Likert R. A technique for the measurement of attitudes. *Arch Psychol*. 1932;140:44-53.
10. Hamstra SJ, Dubrowski A. Effective training and assessment of surgical skills, and the correlates of performance. *Surg Innov*. 2005;12(1):71-77. doi:10.1177/155335060501200110
11. Grober ED, Hamstra SJ, Wanzel KR, et al. The educational impact of bench model fidelity on the acquisition of technical skill: The use of clinically relevant outcome measures. *Ann Surg*. 2004;240(2):374-381. doi:10.1097/01.sla.0000133346.07434.30
12. Seymour NE, Gallagher AG, Roman SA, et al. Virtual reality training improves operating room performance results of a randomized, double-blinded study. *Ann Surg*. 2002;236(4):458-464. doi:10.1097/00000658-200210000-00008
13. Khalil PN, Siebeck M, Mutschler W. The use of chicken legs for teaching wound closure skills. *Eur J Med Res*. 2009;14:459-460.
14. Kumaresan R, Karthikeyan P. An Inexpensive Suturing Training Model. *J Maxillofac Oral Surg*. 2014;13(4):609-611. doi:10.1007/s12663-013-0546-z
15. Weeks D, Kasdan ML, Wilhelmi BJ. An Inexpensive Suture Practice Board. *Eplasty*. 2015;15:e53. <http://www.ncbi.nlm.nih.gov/pubmed/26693271> <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4676034>.
16. Wong K, Bhama PK, d'Amour Mazimpaka J, Dusabimana R, Lee LN, Shaye DA. Banana fruit: An "appealing" alternative for practicing suture techniques in resource-limited settings. *Am J Otolaryngol - Head Neck Med Surg*. 2018;39(5):582-584. doi:10.1016/j.amjoto.2018.06.021