



Comparison of the learning of two notations: A pilot study

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Abstract

Introduction: MICAP is a new notation in which the teeth are indicated by letters (I-incisor, C-canine, P-premolar, M-molar) and numbers [1,2,3] which are written superscript and subscript on the relevant letters. FDI tooth notation is a two digit system where one digit shows quadrant and the second one shows the tooth of the quadrant. This study aimed to compare the short term retention of knowledge of two notation systems (FDI two digit system and MICAP notation) by lecture method.

Methods: Undergraduate students [N=80] of three schools participated in a cross-over study. Two theory-driven classroom based lectures on MICAP notation and FDI notation were delivered separately. Data were collected using eight randomly selected permanent teeth to be written in MICAP format and FDI format at pretest (before the lecture), post-test I (immediately after lecture) and post-test II (one week after the lecture). Analysis was done by SPSS version 20.0 using repeated measures ANCOVA and independent t-test.

Results: The results of pre-test and post-test I were similar for FDI education. Similar results were found between post-test I and post-test II for MICAP and FDI notations.

Conclusion: The study findings indicated that the two notations (FDI and MICAP) were equally mind cognitive. However, the sample size used in this study may not reflect the global scenario. Therefore, we suggest more studies to be performed for prospective adaptation of MICAP in dental curriculum.

Keywords: Lecture; Pre-test; Post-test; Tooth

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Introduction

A tooth notation is a key in making notes for oral diagnosis, treatment and communicating dental information with dental insurance companies, etc. It is also used in making referral for dental specialists and consultants.

MICAP, a new tooth notation, is based on the first letters of the names of teeth and numbers which denote the types of the relevant tooth class (1, 2). MICAP is the abbreviation of M-molar, I-incisor, C-canine, P-premolar. The letters (I, C,

P, M) represent all four tooth classes. The digits allocated for the tooth types are: central and lateral incisor (1, 2), canine (1), first and second premolar [1,2] and first, second, third molars [1,2,3] which are written as superscript and subscript along the respective tooth classes (I, C, P, M) to represent upper and lower teeth, respectively [1,2]. The new tooth notation 'MICAP' is able to identify all permanent upper and lower teeth using letters.

International Dental Federation (FDI) tooth notation is commonly used in dental practice in

many countries. FDI tooth notation is widely used by dentists to associate a specific tooth by two digits. One digit shows the quadrant and other (2nd) one indicates the tooth within the quadrant. This notation was developed by dr J Viotal and accepted by FDI office in 1971 and also known as ISO 3950 (3). This system is based on two digits which denote the quadrants and the relevant teeth of that quadrant which help to prevent errors when differentiating between the right and left sides and upper and lower arch teeth (4). Thus, the permanent teeth are identified by using two digits [11-18], [21-28], [31-38], [41-48] for the teeth located in the upper right, upper left, lower left and lower right quadrants, respectively.

Communication gap in dental practices is due to multiple tooth notations and is a major reason of malpractice in dentistry (5, 6). The current tooth notations designate the teeth using the same letter or number. The FDI notation system gives #13 to permanent upper right canine and the same tooth has two different tooth numbers in other systems. Such situation creates confusion and it is quite possible to make an error in the patients' dental problem. For example, in US, orthodontists and oral surgeons mostly use Palmer notation and Universal numbering system, respectively. In Palmer notation, used by orthodontists, the upper right first premolar is tooth #4 which is tooth #5 according to Universal numbering system for oral surgeons (7). Unclear notation, mixed dentition, and missing molar tooth are known risk factors for malpractice other than incorrect patient identification and involvement of several surgeons in one procedure.

To minimize the malpractice or improve the patient health care, efforts were made to make a global notation system. For this purpose, Palmer and FDI system were combined such as UL7 [27] for the maxillary left second molar (8). However, a great difficulty was seen for multiple teeth.

Keeping the increased demand for a tooth notation which offers the maximum clarity and compatibility with typing and computing requirements, MICAP system was developed and its theory and practical application were tested at small scale (9, 10). The format of MICAP #M¹² is for the upper left first and second molar which could be read 'at M, upper left 12 (one two - not twelve)'.

Teaching by lecture is a primary method in many medical and dental schools (11-13). Lecture base teaching provides an opportunity to learn conceptual information where information is spoken rather than reading because it provides a real human presence which makes it easier to focus attention (14). Traditional teaching like

delivering a lecture provides understanding of a complex topic. However, the effects of continuity of understanding of the contents differ according to the complexity of the topic. Few staff members and increased student numbers or large class size make a lecture the dominant teaching method (15). Despite the low retention of information by lecture method, expressiveness, clarity and repetition of contents are its major characteristics (16, 17).

Studies have shown that the new notation (MICAP) could identify deciduous and permanent teeth by dental health professionals (9, 10). However, there is no evidence showing that MICAP notation is easier than currently used notations. This study aimed to find which tooth notation (MICAP or FDI notation) was easier to learn when delivered in the form of lecture. Undergraduate dental, forensic and medical students participated in the study. Medical and forensic students were included because in clinical practice, they assess and manage dental patients, especially in emergency department, or make forensic reports (18, 19). Though they have little formal training in dental conditions, their baseline knowledge on FDI and MICAP notation was zero because no notation was taught to them. We hypothesized that FDI notation was easier than MICAP notation. The study was approved by ethics committee of Management and Science University-Malaysia. The written consents of the students were obtained before getting research data.

Methods

This was a cross-over study. A total of N=142 [dental (N=52), medical (N=60) and forensic (N=30)] students from dental section of Punjab medical college, Faisalabad, Pakistan, International medical school and school of forensic science of Management and Science University, Malaysia, respectively, participated as convenience subjects. The reason to choose three different locations was to control the bias on upcoming study lesson of MICAP notation and FDI notation which were not a part of the curriculum of medical and forensic programs. Only dental students get knowledge of FDI tooth notation as lecture form in the first year 'dental anatomy module' and they start practicing it from the 3rd year. To make homogenous participation, the second year (pre-clinical) students from the respective program were selected for this study.

Two theory-driven classroom based 45 minute lectures on MICAP notation and FDI notation with similar sequence of contents were delivered separately by a trained dental academician. The initial (pre-test) data were obtained before the lecture delivered on MICAP notation to dental

students. Fifteen minutes after the completion of the lecture, post-test I was given. After one week, post-test II was given using the same mock exam paper but without any intervention. The same procedure was repeated for FDI notation using the same study subjects after three months. However, the study participants were not informed about the next intervention (FDI) notation to control the bias. Similar procedures were repeated with medical and forensic science students. The three groups were not associated with each other because of different locations and MICAP and FDI were not part of medical and forensic curriculum except for dental program.

Mock exam questions papers of the study had eight randomly selected permanent teeth which were given in word form to be written in MICAP format as well as FDI format. The obtained papers were scrutinized before actual analysis. The papers of those students who didn't attend the first phase (MICAP lecture) were removed, but they responded the paper at post-test II. Similarly, those students who attended MICAP sessions but missed FDI intervention session either post-test I or post-test II were also removed. Thus, 28, 18 and 16 forms were removed from medical, dental and forensic program, respectively. Only those students who filled up six papers (pre-test, post-test I, post-test II x MICAP and FDI notation) were included. Thus, the total scrutinized forms

were (N=80) which came from dental (N=52-18=34), medical (N=60-28=32) and forensic (N=30-16=14).

To obtain the scores for knowledge, each selected permanent tooth response was given correct=1 or incorrect=0 for appropriate MICAP or FDI format. This way each subject had maximum score of 8 for one notation and 16 for two notations. Thus, all correct answers were summed up to get the total score.

Data were analyzed by repeated measures of ANCOVA and independent t-test using SPSS version 20.0; the statistical significance was set at 0.05. The within subject variable was the time effect, between subject variable was the program, and the covariate we controlled for was the age.

Results

Out of 142 students, 80 completed six sessions (three sessions per notation). At post-test I, knowledge improved up to 98.8% and 97.75% for 'Maxillary left first molar' written in MICAP and FDI format, respectively. At post-test II, the retention of knowledge of MICAP was up to 97.5% (Table 1).

Using repeated measures analysis of covariance (Table 2), it was found that dental students' knowledge on MICAP notation was significantly improved ($p < 0.001$) at pre-test and post-test I and maintained at follow up (post-test

Table 1: Comparison of the knowledge of MICAP notation at three levels by three health professional students (n=80)

Teeth to be converted into MICAP format	MICAP format	Pre-test		Post-test 1		Post-test 2	
		Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)
Mandibular right Canine	# ₁ C	12 (15.0)	68 (85.0)	76 (95.0)	4 (5.0)	77 (96.3)	3 (3.8)
Maxillary left lateral Incisor	#I ²	31 (38.8)	49 (61.3)	76 (95.0)	4 (5.0)	73 (91.3)	7 (8.8)
Mandibular right 2nd Molar	# ₂ M	66 (82.5)	14 (17.5)	78 (97.5)	2 (2.5)	78 (97.5)	2 (2.5)
Maxillary left first Premolar	#P ¹	16 (20.0)	64 (80.0)	79 (98.8)	1 (1.3)	75 (93.8)	5 (6.3)
Maxillary left first Molar	#M ¹	16 (20.0)	64 (80.0)	79 (98.8)	1 (1.3)	76 (95.0)	4 (5.0)
Mandibular right 2 nd Premolar	# ₂ P	15 (18.8)	65 (81.2)	79 (98.8)	1 (1.3)	78 (97.5)	2 (2.5)
Maxillary left 3 rd Molar	#M ³	16 (20.0)	64 (80.0)	78 (97.5)	2 (2.5)	77 (96.3)	3 (3.8)
Mandibular right central Incisor	# ₁ I	30 (37.5)	50 (62.5)	79 (98.7)	1 (1.3)	75 (93.7)	5 (6.3)

Table 2: Comparison of the knowledge of FDI notation at three levels by three health professional students (n=80)

Teeth to be converted into FDI format	FDI format	Pre-test		Post-test 1		Post-test 2	
		Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)	Correct n (%)	Incorrect n (%)
Mandibular right Canine	#43	34 (42.5)	46 (57.5)	77 (96.2)	3 (3.8)	76 (95.0)	4 (5.0)
Maxillary left lateral Incisor	#22	34 (42.5)	46 (57.5)	80 (100.0)	0 (0.0)	76 (95.0)	4 (5.0)
Mandibular right 2nd Molar	#47	33 (41.3)	47 (58.7)	79 (98.7)	1 (1.3)	76 (95.0)	4 (5.0)
Maxillary left first Premolar	#24	33 (41.3)	47 (58.7)	78 (97.5)	2 (2.5)	78 (97.5)	2 (2.5)
Maxillary left first Molar	#26	33 (41.3)	47 (58.7)	78 (97.5)	2 (2.5)	78 (97.5)	2 (2.5)
Mandibular right 2 nd Premolar	#45	34 (42.5)	46 (57.5)	78 (97.5)	2 (2.5)	76 (95.0)	4 (5.0)
Maxillary left 3 rd Molar	#28	34 (42.5)	46 (57.5)	77 (96.2)	3 (3.8)	78 (97.5)	2 (2.5)
Mandibular right central Incisor	#41	34 (42.5)	46 (57.5)	80 (100.0)	0 (0.0)	72 (90.0)	8 (10.0)

II) stage. Similarly, medical and forensic students learnt MICAP notation and retained knowledge of MICAP (post-test II) after one week (MD (95% CI) -7.38 (-8.00,-6.74), -7.50 (-8.31,-6.69), $p < 0.001$, respectively. However, there was no statistically significant difference ($p > 0.05$) between post-test I and post-test II among the three groups (Table 3). A significant difference in terms of FDI learning was found for medical and forensic students ($p < 0.001$) at pre-test and post-test II (Table 3).

Independent *t*-test was used to compare FDI and MICAP notation between program within subjects. It was found that knowledge of both notations was retained equally ($p > 0.05$). At baseline, the mean difference for MICAP and FDI notations was 1.49:0.42, 2.56 (MD: 95% CI); $p = 0.007$. Similarly, the formats of MICAP and FDI notation were retained almost equally at post-test II (Table 4).

Discussion

In literature, there is limited data available on comparison of tooth notation which seems to be relatively a new concept. Learning Pyramid (17) shows that the lecture provides less retention of information by learners. In this manner, there is no evidence what type of information either simple or complex is retained minimally. But

we found that by lecture, MICAP format was retained considerably quite high by students which gave strong evidence that MICAP format was easy to understand and could be retained as short term. The fact is that it is easier to remember more relevant concepts than less relevant concepts. Prior knowledge of the topic is better to be remembered by learners than the new concept learned in that area (20). This is what we observed with FDI notation for dental students. They had baseline knowledge of FDI notation almost a year back (when they were in the first year). It was also seen with new notation which is based on molar, incisor, canine and premolar terminology and such terminology is known to medical, dental and forensic students. They performed well for MICAP format as well. Medical and forensic students had zero baseline (pre-test) knowledge of MICAP as well FDI notation and later improved significantly at pre-test ($p < 0.05$). It has been shown that students that take both a pre-test and post-tests significantly score higher percentages (21).

In addition, our study focused on face to face learning in relation to understanding and retaining the concepts of the two different notations. It was found that all groups retained more information after a one week duration. This evidence was directly related to the study where

Table 3: Comparison of time effect on knowledge within subjects for the two program (MICAP and FDI notation)

Tooth notation	Comparison between groups	Dental (n=34)		Medical (n=32)		Forensic (n=14)	
		MD (95% CI)	p	MD (95% CI)	p	MD (95% CI)	p
MICAP	Pretest-Post I	-3.50 (-4.702, -2.298)	<0.001	-7.66 (-8.05, -7.26)	<0.001	-7.85 (-8.13,-7.51)	<0.001
	Pretest-Post II	-3.47 (-4.653, -2.288)	<0.001	-7.38 (-8.00, -6.74)	<0.001	-7.50 (-8.31,-7.51)	<0.001
	Posttest I-Posttest II	0.03 (-0.22, 0.28)	1	0.28 (-0.23, 0.79)	0.511	0.36 (-0.49, 1.21)	0.804
FDI	Pretest-Posttest I	-0.09 (-0.24, 0.07)	0.481	-7.69 (-8.18,-7.20)	<0.001	-7.79 (-8.10,-7.47)	<0.001
	Pretest-Posttest II	0.03 (-0.22, 0.33)	1	-7.59 (-8.07,-7.11)	<0.001	-7.07 (-8.09, 6.06)	<0.001
	Posttest I-Posttest II	0.12 (-0.11, 0.35)	0.620	0.09 (-0.54, 0.73)	1	0.71 (-0.34, 1.77)	0.257

*Repeated Measures ANCOVA analysis

Table 4: Comparison of mean knowledge of the subjects within program (FDI and MICAP)

Time	FDI X (sd) n=80	MICAP X (sd) n=80	Mean difference (95% CI)	t (df)	p
Pre-test	3.36 (3.94)	1.88 (2.82)	1.49 (0.42, 2.56)	2.74 (143)	0.007
Post-test 1	7.84 (0.72)	7.80 (0.62)	0.04 (-0.17, 0.24)	0.35 (158)	0.725
Post-test 2	7.63 (0.99)	7.62 (1.04)	0.01 (-0.30, 0.33)	0.08 (158)	0.938

*Independent t-test

researchers found the face to face method as the preferred format in terms of effectiveness and clarity of presentation when lecture method was compared with prerecorded explanation of power point slide methods (22).

Alphabets (I, C, P, M) are used for permanent teeth in MICAP notation. All tooth classes are identified by capital letters such as I-incisor, C-canine, P-premolar, M-molar. Alphabet letters such as 'In, Cn, Pm, Mm, and in, cn, pm, mm' were also suggested to identify the upper and lower teeth of the vertebrates (23). A great difficulty was observed 'in' used for lower incisor and 'in' used for text purpose. Referring to MICAP, tooth classes are identified by capital letter (I,C,P,M) while tooth types are shown by numbers [1,2,3] which are typed as superscript and subscript on relevant letters to indicate upper and lower teeth, respectively. For example, #M₁ is the format in MICAP to indicate the mandibular left first molar.

The medical terminology is common among dental, medical and forensic professionals. Therefore, using M-molar, I-incisor, C-Canine, P- premolar would enhance the communication among health professionals. Using a standard terminology by inter-professionals minimizes or more likely eliminates the errors related to miscommunication and ultimately it would improve healthcare services by inter-professionals. In our study, the lecturing method improved significantly the conceptual understanding of FDI as well as MICAP notation not only in the immediate follow up but also it was maintained later on. This effect has been reported by a study where children' oral health knowledge was significantly improved after lecture based education (24).

Study limitation and further study

One limitation of this study was not using two different teaching methods to find the learning effect on the two notations. Second, it lacked the comparison of Universal and Palmer notations with MICAP notation.

Future studies may be conducted by involving dental insurance companies for MICAP to be used as tool for medical and dental billing purposes.

Conclusion

Three groups (dental, medical and forensic) after one week of intervention were able to retain the MICAP and FDI format giving evidence that both notations were equally mind cognitive. However, the sample size used in this study may not reflect the global scenario. Therefore, we suggest more studies to be performed for

prospective adaptation of MICAP in dental curriculum.

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Conflict of Interest: None declared.

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