MDJ

Presurgical Evaluation of Impacted Mandibular Third Molar using Digital Fluoroscopy

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Abstract

Background: In order to evaluate the impacted mandibular third molar preparation there are many radiographic techniques used include conventional and digital techniques, the aim of the study is to establish the use of digital fluoroscopy in evaluation of impacted mandibular third molar.

Material and Method: - Digital fluoroscopy and conventional bisecting line angle techniques were done for 20 Iraqi adult males 20 -25 years with class one normal occlusion according to angle classification. Measurements were done according to classification system which includes angulations relation to the ramous, depth of impaction, nature of overlying tissue, root morphology, relation to second molar, and its relation to inferior dental canal.

Results: It was revealed that there are non significant differences in radiographic assessments of impacted mandibular third molar between digital fluoroscopy and conventional bisecting line angle technique for all classification systems of impacted mandibular third molar at $P \leq 0.01$.

Conclusion:-The value received from this study showed that digital fluoroscopy could be applied as a diagnostic tool in presurgical evaluation of impacted mandibular third molar.

Key words: third molar impaction digital fluoroscopy

Introduction

Digital fluoroscopy refer to multiple systems of image capture display storage and reconstruction that allows the incident x-rays to be displayed on a video monitor and then converts that real time (analogue) image display to electronic signals that can be quantified[(1)].

A video camera requires fewer x-ray interaction to produce a diagnostic image on a video monitor these developments will end the use of film processing thus eliminating one of the most common sources of errors and poor images[(2)].

A major advantage of this technique is the instaneous display of the radiographic image on a television screen. This means that the image may be evaluated for proper exposure and positioning factor while it is being obtained [(3)]. With digital fluoroscopy a significant reduction in radiation exposure by pulsed fluoroscopy improvement of image quality and machine feature [(4)].

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Materials and method

Data obtained from participating subjects regarding the age, sex, address, medical history, and drug intake were recorded in a specially prepared case sheet after clinical examination to check the fulfillment of following criteria of sample selection:

Full dentition with bilateral class 1 molar and canine relationships based on angle classification with normal overbite and over jet.

No history of previous extraction of third molar with no signs and symptoms of TMJ problems not to interfere with the accuracy of conventional intra oral technique.

Good medical history and no drug administration.

Accept participating in the study after discussing the idea and aim to each subject.

Digital fluoroscopy and conventional periapical bisecting line angle technique were done and the data recorded in the same case sheet. Unstandardized images of third molars for both techniques and incomplete shadow casting of the third molars which sometimes happened specially with conventional periapical technique were excluded.

1. Digital fluoroscopy: lateral oblique projection of the mandible was done according to Waehrmann and Manson – Hing (1977) [5]. The area wanted was viewed before exposure to avoid repetition and to zoom it electronically if it is not clear on small zoom [6].

Conventional periapical bisecting line angle technique: it was done for the impacted third molar using Kodak E – speed periapical dental x- ray film size 1.2, Trophy x- ray machine at 70kV, 8mA and 1, 25 sec exposure time. Radiographic examination of impacted third molar was recorded according to the following classifications:-

1. Angulations (winter's classification) [7]:-
   Class1: Vertical angulations
   Class 2: Mesioangular impaction
   Class 3: Horizontal angulations
   Class 4: Distoangular impaction
2. Relation to anterior border of ramus [8]:
   Class1: Crown is anterior to anterior border of ramus
   Class2: Half of the crown is covered by anterior portion of ramus
   Class3: Tooth completely embedded in ramus
3. Depth of impaction (Pell and Gregory classification) [9] :-
   Class A: Occlusal plane of impacted tooth is at same level of occlusion of second molar.
   Class B: Occlusal plane of impacted tooth between occlusal plane and cervical area of second molar
   Class C: Occlusal plane of impacted tooth below cervical area of second molar
4. Nature of overlying tissue [10]:-
   Soft tissue impaction
   Partial bony impaction
   Complete bony impaction
5. Root morphology:-
   Root length: when 1/3 – 2/3 of root is formed the impacted tooth is considered as incomplete root formation but when end of the root is formed it is considered as complete root formation. [11]
   Root width: If the mesiodistal width of the root of apical area is equal or not to that cervically. [12]
   Roots shape: Either fused single or separated. [7]
   Root curvature: Either straight or curved. [7]
   Third molar relation to second molar. [6]
   Third molar relation to inferior dental canal. [13]

Result and Discussion

All the data collected from the conventional periapical bisecting line angle technique and digital fluoroscopy show non significant differences when compared also agreement with previous studies shown below in addition to minimum exposure to X-radiation and better interpretation in digital fluoroscopy permit the application of digital fluoroscopy successfully in presurgical evaluation of impacted mandibular third molar

Analysis of data obtained by both DF and conventional bisecting line angle technique:-

1. Angulation:- Both techniques were showed that the most common impaction (9) cases (mean 0.45 SD 0.51) by digital fluoroscopy, (10) cases (mean 0.50 SD 0.51) by conventional is mesioangulation, this result is in agreement with Bishara and Andreasen (1983) [14] and Staggers et. al, (1992) [15] whose found that in 48,20% of all cases. While the horizontal angulations (class 3) less common (1) case (mean 0.05 SD 0.22) by digital fluoroscopy, (1) case (mean 0.05 SD 0.22) by conventional this in agreement with Richardson (1977) [16] show 5, 50% of his results. (Table1)
2. Relation of impacted third molar to anterior border of ramus (Pell & Gregory classification): class 1 is the most common (12) cases (mean 0.6 SD 0.50) by digital fluoroscopy, (12) cases by(mean 0.6 SD 0.50) conventional this in agreement with Forsberg(1988) [17] whose found it in 60.89% ,while class 3 is less common (2) cases (mean 0.1 SD 0.30) digital fluoroscopy ,(1) cases (mean 0.05 SD 0.22) by conventional as what revealed by Kim et. al, (2003) [18] which was 16.49%. (Table2)
3. Depth of impaction (Pell & Gregory classification) Class A is the most common (10) cases (mean 0.5 SD 0.51) by digital fluoroscopy, (10) cases (mean 0.5 SD 0.51) by conventional which is in agreement with Dachi and Howell (1961) [19] whose show 54.55% in their results. While class C is the least (4) cases (mean 0.2 SD 0.41) by digital fluoroscopy, (3) cases (mean 0.15 SD 0.36) by conventional this was confirmed by Grover and Lorton (1985) [20] whose found only 13.53%. (Table3)
4. Nature of overlying tissue: - Soft tissue overlying was the mostly shown, (12) (cases mean 0.6 SD 0.50) by digital fluoroscopy, (12) cases (mean 0.6 SD 0.50) by conventional which coincide with what was revealed by Bjork et. al, (1956) [21] and Bjork (1963) [22] . While complete bony overlying is the least (4) cases (mean 0.2 SD 0.41) by digital fluoroscopy, (3) cases (mean 0.15 SD 0.36) by conventional which is agreed with Alling and Alling (1993). [23] (Table4)
5. Root morphology (root length) Complete root formation is mostly seen in the images (18) cases (mean 0.9 SD0.3) by digital fluoroscopy, (16) cases (mean 0.8 SD 0.41) by conventional this result is compatible with results obtained by Silling (1973) [24] and Begg (1954) [25]. Incomplete root formation is less common (2) cases (mean 0.1 SD 0.30) digital fluoroscopy, (4) cases (mean 0.2 SD 0.41) by conventional came in harmony with Orton – Gibbs (2001) [26] result. (Table 5)
6. Root morphology (root width) Root width equal to mesiodistal cervical width of tooth is the most common (18) cases (mean 0.9 SD 0.22) by digital fluoroscopy, (17) cases (mean 0.1 SD 0.30) by conventional which is confirmed by Moffitt

(1998)[27] , root width not equal to mesiodistal width of tooth cervically is less (2) cases (mean 0.85 SD 0.41) by digital fluoroscopy (3) cases(mean 0.15 SD 0.36) by conventional as Richardson and Richardson (1993) [26] . (Table 6)

7. Root morphology (root shape) Single fused and conical is rare (5) cases (mean 0.25 SD 0.87) by digital fluoroscopy, (4) cases (mean 0.75 SD 0.31) by conventional this is agreed with Hattab et .al, (1995) [11]. Separated roots are the most common (15) cases (mean 0.75 SD 0.31) by digital fluoroscopy (16) cases (mean 0.8 SD 0.70) by conventional as what revealed by Cavanaugh (1985) [29]. (Table 7)
8. Root morphology (root curvature) Straight root is less common (5) cases (mean 0.25 SD 0.44) by digital fluoroscopy, (4) cases (mean 0.20 SD 0.41) by conventional like Orton - Gibbs (2001) (26). Curved root is mostly seen (15) cases (mean 0.75 SD 0.63) by digital fluoroscopy, (16) cases (mean 0.30 SD 0.50) by conventional which is agreed with Richardson and Richardson (1993) [28].(Table 8)
9. Relation of third molar to second molar:- Contact third molar to second molar is the most common (12) cases(mean 0.6 SD 0.69) by digital fluoroscopy, (11) cases (mean 0.55 SD 0.63) by conventional which was shown by Richardson (1992) [30]. No contact is less common (8) cases (mean 0.4 SD 0.99) by digital fluoroscopy, (9) cases (mean 0.45 SD 0.22) by conventional Alling and Alling (1993) [23] obtained similar results.(Table 9)
10. Relation of third molar to inferior alveolar canal Third molar mostly seen away from inferior alveolar canal (12) cases (mean 0.6 SD 0.69) by digital fluoroscopy, (10) cases(mean 0.5 SD 0.42) by conventional which is agreed with Richardson (1992) [30] approximately close to inferior alveolar canal was only in (8) cases (mean 0.4 SD 0.99) by digital fluoroscopy, (10) cases(mean 0.5 SD 0.42)by conventional these results agreed with Orton - Gibbs (2001) [26]. (Table10)

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Table 1: Angulations of mandibuler third molar

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Class1	6	3.0	0.47	7	0.35	0.48	0.33	N.S*
Class 2	9	0.45	0.51	10	0.50	0.51	0.37	N.S*
Class 3	1	0.05	0.22	1	0.05	0.22	0.5	N.S*
Class 4	4	0.2	0.41	2	0.10	0.30	0.19	N.S*

n = 20 * non significant difference at $p \leq 0.01$

Table 2: Relation of mandibuler third molar to the ramus

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Class1	12	0.6	0.50	12	0.6	0.50	0.5	N.S*
Class 2	6	0.3	0.47	7	0.35	0.48	0.37	N.S*
Class 3	2	0.1	0.30	1	0.05	0.22	0.29	N.S*

n = 20 * non significant difference at $p \leq 0.01$

Table3: Depth of impacted third molar

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Class A	10	0.5	0.51	10	0.5	0.51	0.5	N.S*
Class B	6	0.3	0.47	7	0.35	0.48	0.37	N.S*
Class C	4	0.2	0.41	3	0.15	0.36	0.34	N.S*

n = 20 * non significant difference at p≤ 0.01

Table4: Nature of overlying tissue

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Soft tissue impaction	12	0.6	0.50	12	0.6	0.50	0.5	N.S*
Partial bony impaction	4	0.2	0.41	5	0.25	0.44	0.35	N.S*
Complet impaction	4	0.2	0.41	3	0.15	0.36	0.34	N.S*

n = 20 * non significant difference at p≤ 0.01

Table5: Root morphology (root length)

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Complet root formation	18	0.9	0.30	16	0.8	0.41	0.19	N.S*
Incomplet root formation	2	0.1	0.30	4	0.2	0.41	0.19	N.S*

n = 20 * non significant difference at p≤ 0.01

Table6: Root morphology (root width)

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Root width =mesiodist al width of tooth cervically	18	0.9	0.22	17	0.85	0.41	0.47	N.S*
Not equal	2	0.1	0.30	3	0.15	0.36	0.32	N.S*

n = 20 * non significant difference at p≤ 0.01

Table7: Root morphology (root shape)

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Single fused conic root	5	0.25	0.87	4	0.2	0.61	0.41	N.S*
Separated root	15	0.75	0.31	16	0.8	0.70	0.47	N.S*

n = 20 * non significant difference at p≤ 0.01

Table8: Root morphology (root curvature)

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Straight	5	0.25	0.44	4	0.20	0.41	0.35	N.S*
Curved	15	0.75	0.36	16	0.80	0.50	0.39	N.S*

n = 20 * non significant difference at $p \leq 0.01$

Table9: Relation of impacted third molar to second molar

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Contact	12	0.6	0.69	11	0.55	0.63	0.46	N.S*
No contact	8	0.4	0.99	9	0.45	0.22	0.42	N.S*

n = 20 * non significant difference at $p \leq 0.01$

Table10: Relation of impacted third molar to inferior alveolar nerver

Variables	Digital fluoroscopy			Conventional bisecting technique			T-test	Significance
	No	Mean	SD	No	Mean	SD		
Close approximate	8	0.4	0.99	10	0. 5	0.42	0.39	N.S*
A way	12	0.6	0.69	10	0.5	0.42	0.42	N.S*

n = 20 * non significant difference at $p \leq 0.01$