Is It True, To Blindly Judge The Amount of Crowding In Orthodontic Treatment Planning?

Pratik Gandhi*, Deepa Gandhi**

* M.D.S. Orthodontist Senior Lecturer, **3rd Year Post Graduate Student, Atamargadh Dental college, Bhavnagar

Abstract: Objective: The orthodontic treatment planning change when blindly judge the amount of crowding and when orthodontist get true amount of crowding from orthodontic study model. Methods:100 orthodontists were asked to judge the amount of crowding on eight orthodontic study models by visualization and give the treatment of choice whether it will go for extraction, proximal stripping or expansion. For each model, the inter-canine width, inter-molar width and arch length were identical but the true crowding varied from 0.5 to 8.5mm. All orthodontist repeated the visualization exercise after 2 weeks to assess reliability and all the orthodontists were asked to repeat the treatment planning exercise on the same model but this time the value of true degree of crowding was provided. Result: All data were analyzed with significance predetermined at α-0.05.The result was showing that there was no statically significant difference in the repeat data. In results we couldn't find the statically significant difference in the reevaluated data. The extraction pattern was changed on 126 occasions when the true amount of crowding was known. In total, 800 treatment plans were included in the analysis (100 orthodontists scoring 8-models), in which the pattern of extraction was being changed in 14.6% of cases when the true amount of crowding was provided. Conclusions: Direct visualization may over judge the amount of crowding present and may affect the orthodontic treatment plan. When the true degree of crowding is known it can be lead to more consistent treatment planning with the decision to extract fewer teeth in the borderline cases.[Pratik GNJIRM 2017; 8(5):71-74]

Key Words: crowding, orthodontic, treatment

Author for correspondence: Pratik Gandhi, M.D.S. Orthodontist Senior Lecturer, Atamargadh Dental college, Bhavnagar, E-Mail: pratikgandhi555@yahoo.com M: 9033435984

Introduction: The orthodontic diagnosis and treatment planning is mainly dependent on accurate assessment of crowding. The ideal factors are the mesio-distal tooth width and arch length[1]. Apart from this the arch form, curve of spee and arch symmetry may fully or partially sometimes create space and therefore it affects the assessment of crowding to evaluate the above mentioned factors, a number of formal space analyses have been developed, among them the most acceptable space analysis is "ROYAL LONDON SPACE PLANNING [2,8]." Having a such kind of benefits of such analyses include consistency in treatment planning and as an aid for trainee orthodontists when assessing space requirements.

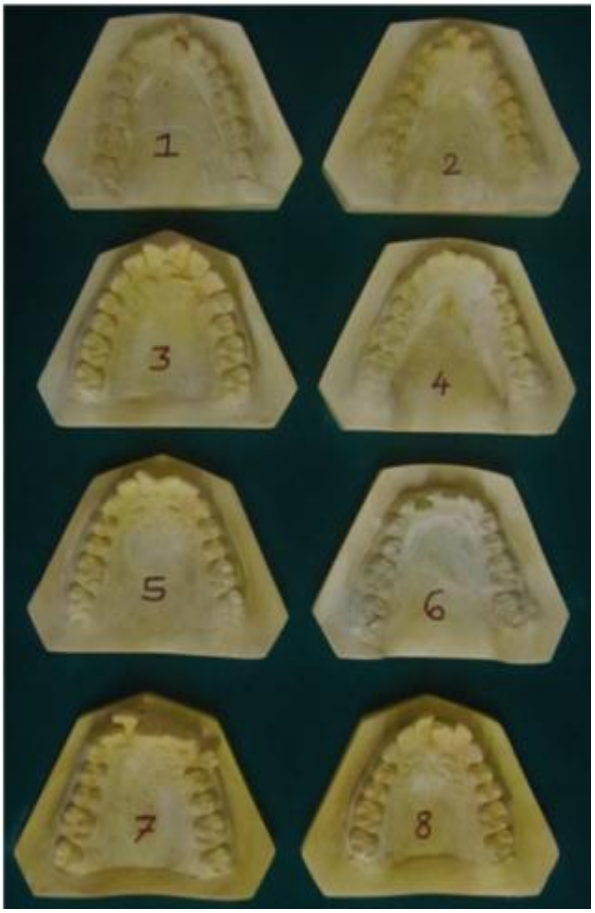
Previous study investigating the reliability and accuracy of clinician's estimates of crowding, looked at which were the most popular methods of determining the degree of crowding present [3,4]. Regardless of being offered instruments such as a caliper, ruler, brass wire or dividers to aid measurement "eye balling" or direct visualization was the only method employed by all 100 orthodontists taking part in this study. To estimate the crowding value and the suitable method for the relief of crowding on four – maxillary and 4 – mandibular arch stone models were done by all orthodontists. The size of tooth, arch shape and arch size were differing to each other. The priorityis the experience of the orthodontists did not depend on the efficiency of estimating the amount of crowding. Calculate the crowding differed by as much as 15mm for the same model between orthodontists over time. In most cases, the orthodontists change their opinion from non-extraction to extraction when they have got true value of crowding. In pre-molar selection criteria for extraction is also changed from 2nd pre-molar towards the 1st pre-molar. The aim of this study to rule out that if orthodontist has a true calculate value of degree of crowding then the treatment plan and diagnosis would be better or not?

Methods: All the patients have got the consent for this study under permission of an institutional review board (IRB). Eight orthodontic study cast, in which 4-maxillary and 4-mandibular stone casts were included in this study. Silicon impression material was used in eight different patients to fabricate the orthodontic study model. The crowding for the eight study models ranged from 0.2 to 8.4mm. In previous study they use acrylic teeth and are the malocclusions are created on typodont, in this way they have maintain the inter-canine and inter-molar width as well as arch length [5]. In previous study they have used "Ortho Insight 3D" scanner to check the mesio-distal width of the acrylic teeth but it can be argued that the measurements on the stone model scan would be a truer representation of the clinical situation, as it was more difficult to

assess the precise position of the individual contact points on such model due to tooth overlap[6, 7]. For this reason the crowding was measured directly on the stone models in this study.

To check the accuracy of clinician's estimates of the crowding and then to evaluate the effect of knowledge of the true crowding on their treatment planning, two separate questionnaires were used at two separate time intervals[13, 14]. The questionnaires were made in such a way that includes a preferred treatment options according to clinician's choice like non-extraction, expansion, interdental stripping and extraction. In questionnaire one, the degree of crowding was judge by clinician by visualization of study model without any help of ruler, divider, scale etc. And in second questionnaire the amount of degree of crowding was given prior to judge the treatment plan for given study model. The time interval between this two questionnary was less than 2 weeks, means second questionnaire has to be completed within two weeks after judging the first questionnaire.

Figure 1: The 4 – Maxillary and 4 – Mandibular study model with varied amount of crowding.



All eight study models were randomly arranged and given numbers on it. All orthodontist who has taken part in this study – in which 20 were higher hospital training, 15 were specialist orthodontic trainees, 15 were specialist orthodontic practioner and 40 were dentists with enhanced skilled in orthodontics. The sample size was calculated using G*power 3, and for a one sample t-test, significance = 0.05, power = 0.8 and a medium effect size = 0.5, the required sample size was 34 orthodontists.

Results: All data were analyzed with significance predetermined at α-0.05. The null hypothesis was that the treatment estimation was not reliable on any kind of study material of knowledge of the true crowding. The impedance for both the questionnaire, before and after knowledge of the true crowding have 1-1 matching of data and are correlated to each other. The results were listed in table-1. The result was showing that there was no statically significant difference in the repeat data.In results we couldn't find the statically significant difference in the reevaluated data. The extraction pattern was changed on 126 occasions when the true amount of crowding was known. In total, 800 treatment plans were included in the analysis (100 orthodontists scoring 8-models), in which the pattern of extraction was being changed in 14.6% of cases when the true amount of crowding was provided.

Table 1: summary of the analysis of repeat and the effect of true knowledge on the treatment decision; *p*> $\chi^2$is the exact probability associated with McNemar's test, or is the odds ratio and associated exact 95% confidence interval.

Measurement	Decision	*p*> χ^2	OR	95% CI
Repeat	Extraction	0.378	4.1	0.4-197.99
	Arch expansion	0.119	0.4	0.03-1.27
	Interdental stripping	1.023	1.0	0.30-2.67
Crowding	Extraction	0.017	3.1	1.22-8.38
	Arch expansion	0.781	1.2	0.63-2.06
	Interdental stripping	0.067	0.6	0.28-1.06

In table – 2, the complete distribution of choice of extraction was mentioned according to the orthodontist preference. In model no.3 and no.4 had the least amount crowding of just 0.5mm and 0.6mm

respectively. In no.2 model the amount crowding is highest 8.5mm, in this case the orthodontist change their statement when true amount of crowding was given in second questionnaire. When mild to moderate amount of crowding was present in model nos. - 1, 5, 6, 7, & 8 the orthodontists change their opinion from non-extraction, interdental stripping, and expansion to extraction.

Summary of the all statistics was mentioned in table – 3. In all cases, the mean calculated value of crowding was greater than the true value, 5 out of 88 models a one-sample *t*-test showed a statistically significant difference between true and estimated values.in general, when the value of crowding is increase than the mean estimated value also increase.

Table 2: Decision on extraction (XLA) without and with knowledge of true crowding

		True Crowding Known					
	Decision	**Non XLA**	**XLA 4/4**	**XLA 5/5**	**XLA -/1**	**XLA 2/2**	**XLA 2/-**
True crowding not known	Non XLA	190	4	5	0	0	0
	XLA 4/4	8	25	5	0	0	0
	XLA 5/5	8	6	24	0	0	0
	XLA -/1	0	2	1	3	0	0
	XLA 2/2	1	1	0	0	0	0
	XLA 2/-	3	0	0	0	0	2

Table 3: True, true crowding; n, sample size; EC, mean estimated crowding; SD/min/max/95%CI, standard deviation, minimum, maximum values, and 95% confidence interval; *P*(*t*), probability associated with the one-sample *t*-test

Model	True, mm	N	EC, mm	SD, mm	Min, mm	Max, mm	95% CI, mm	*P*(*t*)
1	3.8	100	4.8	1.5	3.0	10.0	4.2-5.5	0.01
2	8.5	100	8.4	2.4	5.0	15.0	7.7-9.4	0.98
3	0.5	100	0.3	0.6	0.0	3.0	0.1-0.8	0.54
4	0.6	100	0.4	0.8	0.0	3.0	0.3-0.8	0.12
5	1.3	100	2.2	1.4	0.5	7.0	1.8-2.8	0.01
6	2.2	100	3.8	1.7	2.0	7.0	3.3-4.5	0.01
7	4.5	100	6.8	2.3	4.0	14.0	6.0-7.7	0.01
8	1.1	100	2.3	1.3	0.5	5.0	1.9-2.9	0.01

Discussion: Blindly judge the amount of true crowding present in orthodontic study model by orthodontist may give negative response while doing orthodontic treatment planning. It is better to overcome the amount of true crowding present in study models with the help of ruler, scale divider etc [9]. in present study orthodontists change their statement from non-extraction to extraction when the amount of crowding increase and this is done by direct visualization. And when the true amount of crowding is given to all orthodontist they change their treatment plan extraction to non-extraction and gave preference for selection of 2nd Premolar instead of 1st Premolar for extraction pattern. Same kind of judgement alters in previous study also[10 - 12]. This kind of mistake in judging the proper treatment plan because over predict the amount of crowding by direct visualization. There were more number of changes in prediction of treatment plan was seen in model no.7 and it has 4.5mm of crowding. For this model 42 orthodontists were changed their statement when the true amount of crowding was provided. However, 18 orthodontists changed their statement from extraction to non-extraction, 6 from non-extraction to extraction and 18 changed their extraction pattern. In present study there was not any kind of differences found for arch expansion or interdental stripping approach. Because these kinds of treatment approaches were select wen the amount of crowding was very less. Interestingly, for model no.1 was 3.9mm when the crowding was calculated using visualization, 50% cases using an extraction approach and 50% non-extraction. When the true amount of crowding was provided, 30 orthodontists changed their treatment plan with 21 changing from extraction to non-extraction, 6 changing from non-extraction to extraction and 3

changing the extraction pattern from a mandibular incisor to 2 mandibular 1st Premolar. Intellectuality was mainly depends on orthodontist's skill and had a significant effect on the decision whether to extract or not in treatment planning when the true amount of crowding was known. Formal space analysis was requiring when the judgment of treatment planning was varied between the orthodontists this will make the perfect diagnosis for the orthodontic cases.

Conclusion: While judging the orthodontic treatment planning, by direct visualization was more likely to over predict the amount of true crowding. Clinician cannot blindly judge the orthodontic study model for treatment planning. For each case, clinician should do the formal space analysis is likely to assist with treatment planning. Orthodontist can make more reliable approach for treatment plan when they know the true amount of crowding present in study model. Treatment plan should not alter while mild crowding present. The treatment approach should remain same like non-extraction, expansion, proximal stripping in this situation.

References:

1. Baldridge, D.W.: Leveling the curve of spee: Its effect on mandibular arch length. The journal of practical orthodontics, 1969; 3:26-41.
2. Herren et al: Arch shape and space balance determined by arcogramme technique. Transactions of the European orthodontic society, 1973; 61-73.
3. Rudge et al: A computer program for the analysis of the studymodels. European journal of orthodontics, 1982; 4:269-273.
4. Bhatia et al: Operational performance of the travelling microscope in the measurement of dental casts. British journal of orthodontics, 1987; 14:147-153.
5. Harrish et al: Lower incisor space analysis: A contrast of methods. American journal of orthodontics and dentofacial orthopaedics, 1987; 92:375-380.
6. Richmond et al: Recording the dental cast in three dimensions. American journal of orthodontics and dentofacial orthopaedics, 1987; 92:199-206.
7. Schirmer et al: Manual and computer – aided space analysis: A comparative study. American journal of orthodontics and dentofacial orthopaedics, American journal of orthodontics and dentofacial orthopaedics, 112:676-680, 1997
8. Krischen, R.H., O'Higgins, E.A. and Lee, R.T.: The royal London space Planning: an integration of space analysis and treatment planning part I: Assessing the space required to meet treatment objectives. American journal of orthodontics and dentofacial orthopaedics, 2000; 118:448-455.
9. Krischen, R.H., O'Higgins, E.A. and Lee, R.T.: The royal London space Planning: an integration of space analysis and treatment planning part II: The effect of other treatment procedures on space. American journal of orthodontics and dentofacial orthopaedics, 2000; 118: 456-461.
10. Wallis et al: How good are we at estimating crowding and how does it affect our treatment decisions? European journal of orthodontics, 2013; 36:465-470.
11. Lin, L.I.K.: A note on the concordance correlation coefficient. Biometrics, 2000; 56:324-325.
12. Johal et al: Dental crowding: A comparison of three methods of assessment. European journal of orthodontics, 1997; 19:543-551.
13. Nijkamp et al: The influence of Cephalometrics on orthodontic treatment planning. European journal of orthodontics, 2008; 30:630-635.
14. Nywel Naish et al: Does a true knowledge of dental crowding affect orthodontic treatment decision? European journal of orthodontics, 2016; 38:66-70.

Conflict of interest: None
Funding: None
Cite this Article as: Pratik G, Deepa G. Is It True, To Blindly Judge The Amount of Crowding In Orthodontic Treatment Planning?. Natl J Integr Res Med 2017; 8(5):71-74