Original Research Article

Association between psychological distress and occlusion among temporomandibular disorder patients – a clinical study

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ABSTRACT

Background: *TMD is a multifactorial disorder significant research efforts have been invested in finding its etiologies and management to improve their quality of life.*

Objectives: *To evaluate and compare digital occlusal parameters, depression, anxiety and serum cortisol level between temporomandibular disorder patients and control group.*

Material and methods: *A sample size of 24 TMD patients and 24 apparently healthy age and sex matched controls were recruited in the study. The patients occlusion time and disclusion time was recorded using T-Scan III, the level of anxiety and depression was evaluated by using Hospital Anxiety and Depression scale questtionaire and serum cortisol was evaluated by collecting fasting blood sample, under aseptic conditions.*

Results: *The incidence of premature contacts (occlusal interferences), clusion time and disclusion time was significantly longer in TMD group than in control subjects. The anxiety and depression scores were statistically significant in TMD group compared to control group, but no statistically significant difference was observed in serum cortisol levels.*

Conclusion: *The present study demonstrated increase in the premature contacts i.e occlusal interferences were high with increase in clusion time, disclusion time, anxiety and depression scores in TMD group, where as no significant increase in serum cortisol levels was seen among TMD group even though their anxiety and depression levels were high. Hence, patients with temporomandibular disorders should always be evaluated for stress and anxiety along with the T- Scan evaluation of occlusal prematurities and correction of the same.*

Keywords: *TMD, HADS, T-Scan III, serum cortisol*

Introduction

Temporomandibular disorders is an all – inclusive term referring to a heterogeneous group of psycho physiologic disorders with the common characteristics of orofacial pain, masticatory dysfunction or both. [1] The multifactorial etiology of TMD is related to occlusal interferences, emotional tension and stress, teeth loss and postural deviation. [2,3,4,5,6] Two hypotheses, namely occlusal disharmony and psychological distress, have dominated the literature, but clear and convincing evidence for either being the primary etiology does not exist. [2] The prevalence of TMD signs and symptoms are high in general population. About 60-70% of the general population has at least one sign of a TMD, yet only around one in four people with signs is actually aware of symtoms of temporomandibular disorders. Only about 5-7% of people with one or more signs of TMD will actually seek treatment. [1,2,7,8,9] An etiological connection of TMD with psychological factors was proposed as early as 1980's. The relationship between psychological factors and TMD is multidirectional. The association between TMD and mental state is particularly important in patients suffering from stress and anxiety. One of

the predominant symptom and at the same time the main cause of the patients reporting for treatment due to TMD is a pain. [10] Pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Factors of nonspecific pain within TMD are usually classified as psychosocial, occupational and personal. All these factors encourages an acute pain episode, while mental suffering due to anxiety, adjustment disorder, depressive or irritable mood, fear of somatic illness, and persistent somatizations can incite a chronic form of pain. [9] Chronic tension is associated with an increase in parafunctional activity, which is considered to be one of the main TMD factors. Stress as well as anxiety, depression and personality traits exert an important influence on the increased frequency of parafunctional teeth contact. [11] Although there is a link between TMD pain and depression, there is still enormous ambiguity about its association in TMD.

Temporomandibular joint function has been the subject of considerable study for over a century and despite of extensive literature, the multifactorial etiology of temporomandibular dysfunction is even today an ambiguous issue. The present study aimed at evaluating the clear and convincing association of occlusal disharmony and psychological distress in temporomandibular disorder.

Material and Methods

The present study was conducted among the outpatients attending the Department of Oral medicine and Radiology, The Oxford dental college Hospital and Research Center, Bangalore. The study duration was from 2014 January to 2015 August**.** Patients diagnosed with signs and symptoms of temporomandibular disorders and patients without any medical illness aged between 18-50 years were included in the study. Patients with history of trauma to temporomandibular joint, congenital abnormalities related to temporomandibular joint, degenerative disease like rheumatic disease, undergoing orthodontic treatment, patients on cortisol treatment and bleeding disorders, and patients with hypertension were excluded from the study.

A detailed demographic data, dental and medical case history along with habits, occupation and history of anxiety were recorded from all the individuals, who visited the OPD and were enrolled into the study. All patients were selected according to the specific inclusion and exclusion criteria. The research proposal was reviewed and approved by the Ethical committee of the Oxford Dental College and Hospital, RGUHS University. An informed consent was obtained from all the patients after the explanation of the procedure to be performed. A thorough clinical examination was performed for all TMD patients (diagnosed based on RDC/TMD criteria,[12]) and apparently healthy subjects age and gender matched. Detailed TMJ, masticatory and neck muscle examination was performed. All the subjects were given self report questionnaire(HADS) for the evaluation of anxiety and depression, digital evaluation of occlusion was performed with Tek- Scan III and serum cortisol test for stress evaluation. Fasting blood sample was collected in the morning time between 8.30AM- 9AM under aseptic condition and centrifuged at 2500rpm/minute for serum cortisol. The cortisol level in the serum so collected was assessed by using Luminescent immunoassay.

The data was analyzed using SPSS [Statistical Package for Social Science] version 22, IBM. Descriptive Statistics was used for the age wise and gender wise frequency distribution of study participants in both the study groups and were expressed in terms of number and percentage. The mean and SD were estimated for various study parameters and difference were compared between the 2 study groups using Mann Whitney U test. The proportional distribution of anxiety & depression levels between the 2 study groups were estimated using Chi square test. The relationship between serum cortisol levels and the anxiety and depression levels were estimated using Pearson correlation test. The level of significance for various all the above inferential test is fixed at P<0.05.

Results

Anxiety among study group was assesed using HADS- a. Among 24 subjects of TMD group normal anxiety score in 13(54.2%), borderline score was seen in 7(29.2%) patients, whereas abnormal score in 4(16.7%) patients was noticed. Among 24 control group normal anxiety score was seen in 23(95.8%), borderline score in 1(4.2%), whereas abnormal score was not seen in control group. Statistically significant differences was observed between TMD group and control group (P<0.004) (Table 1).

Table 1: Analysis of association of anxiety among TMD and control group

Anxiety Levels	TMD Group		Control Group		x^2 Value	P-Value
	n	%	n	%		
Normal	13	54.2	23	95.8	11.278	0.004*
Borderline	7	29.2	1	4.2		
Abnormal	4	16.3	0	0		
Total	24	100	24	100		

Depression among study was assesed using HADS- d. Among 24 subjects of TMD group normal anxiety score was seen in 12(50%), borderline score in 10(41.7%) patients, whereas abnormal score in 2(8.3%) patients. Among 24 control group normal anxiety score was seen in 20(83.3%), borderline score in 4(16.7%), whereas abnormal score in none of the control group. Statistically significant differences was observed between study and control group (P<0.004) (Table 2).

T-Scan III was used for evaluation of posterior occlusal interferences between TMD group and control groups. In 24 subjects of TMD group occlusal interferences was observed in all TMD patients, whereas in control group it was

seen in 7(29.20) and absent in 17(70.80%). Statistically significant differences was observed between study and control groups (P<0.001) (Table 3). The mean clusion time was 1.55 seconds in TMD group and 0.48 in control group. The mean disclusion time was 3.15 seconds in TMD group and 0.16 in control group. The mean HADS-A was 7.88 in TMD group and 4.17 in control group. The mean HADS-D was 7.67 in TMD group and 5.00 in control group. The statistically significant differences was observed between TMD group and control group (P<0.001) for all these parameters. The mean serum cortisol level was 8.85 in TMD group and 8.82 in control group, with no significant difference between both groups (P>0.05) (Table 4).

Table 2: Analysis of assosciation of Depression among TMD and control group

Depression Levels	Study Group		Control Group		x^2 Value	P-Value
	n	%	N	%		
Normal	12	50	20	83.3	6.571	0.04*
Borderline	10	41.7	4	16.7		
Abnormal	2	8.3	0	0		
Total	24	100	24	100		

Table 3: Analysis of occlusal interferences using T-Scan III among TMD and control group

Occlusal Interference	TMD Group	Control Group	x^2 Value	P-Value
Present	24	7	26.322	<0.001*
	100%	29.20%		
Absent	0	17		
	0%	70.80%		

Comparison of T-scan finding, HADS-A, HADS-D and serum cortisol levels between 12(50%) joint disorders and 12(50%) muscle disorders in TMD group revealed, mean disclusion time was 4.07 seconds for joint disorder and 2.24 seconds for muscle disorder with statistically significant difference in disclusion time (P <0.005). The mean occlusion time was 1.53 in joint disorders and 1.57 in muscle disorders. The mean HADS-a was 8.25 in joint disorders and 7.50 in muscle disorders. The mean HADS-D was 7.67 in joint disorders and 7.67 in muscle disorders. The mean serum cortisol was 8.51 in joint disorders and 9.19 in muscle disorders. No significant difference was observed with respect to all

these parameters except in one parameter of disclusion time(P<0.005 Table 5).

Table 4: Analysis and comparison of clusion time, disclusion time, Anxiety, Depression and Serum cortisol levels among TMD and control group.

Parameter	Group	Mean±SD	P-Value
Disclusion time	TMD	3.15±1.76	<0.001*
	Control	0.69±0.19	
Clusion time	TMD	1.55±0.71	<0.001*
	Control	0.48±0.18	
HADS-a	TMD	7.88±3.15	<0.001*
	Control	4.17±1.69	
HADS-d	TMD	7.67±3.31	<0.001*
	Control	5.00±2.23	
Serum cortisol	TMD	8.85±3.75	0.91
	Control	8.82±2.63	

Table 5: Analysis and comparison of clusion time, disclusion time, Anxiety, Depression and Serum cortisol levels among muscle and joint disorders in TMD group.

Parameters	Disorder	N	Mean±SD	P-Value
Centric Disocclusion	Joint	12	4.07±1.73	0.005*
	Muscle	12	2.24±1.29	
Occlusion time	Joint	12	1.53±0.82	0.67
	Muscle	12	1.57±0.61	
HADS a	Joint	12	8.25±3.84	0.64
	Muscle	12	7.50±2.39	
HADS d	Joint	12	7.67±4.14	0.93
	Muscle	12	7.67±2.39	
S. Cortisol	Joint	12	8.51±4.47	0.58
	Muscle	12	9.19±3.02	

Discussion

Temporomandibular disorders is a collective term that includes a large spectrum of clinical problems of the joint and the muscles on the orofacial area; these dysfunctions are characterised by pain, sounds in the temporomandibular joint and irregular or limited function of the jaw.[5] Numbers of etiologic factors are contributed to the onset of TMD, but the

relative importance of individual etiological factors of TMD is controversial.[13,14] Significant research efforts have been attributed in finding its etiologies. Though occlusion is considered to play a bigger role in initiation of disorder, it is not being conclusively demonstrated. The influence of occlusion on the onset of TMD is contemplated and still a source of disagreement. The detailed, comprehensive study of these factors will help in advancing the knowledge on the possible existence of the association. Previously conventional methods of occlusal evaluation was made using articulating papers, impression wax, and shim stock foil. The main disadvantages of traditional methods are; they are two dimensional in nature and do not quantify the occlusal force. Studies have reported that no demonstrable relation seen between paper mark area and occlusal force. [15,16] Hence, digital analysis provides additional information on occlusal contact pattern, including the quantification of force, sequence of contact, and occlusal–disocclusal timing. [17]

Maness et al in the year 1987 reported the development of the prototype of a new computerized occlusal analysis device (T-Scan system; Sentek Crop, Boston, Mass). T-Scan has evolved as a very important diagnostic tool for evaluation of correct occlusal pattern and resulted in high quality treatment results which were not possible earlier. [18] Kersteine in 2001 was the first person to locate centric relation prematurity with simultaneous recording of sequence of resultant tooth contacts using computerized occlusal analysis system. According to him this method offers significant improvement in the precision of locating the first tooth contact.[18] Correct understanding of dynamic occlusion is very critical in differentiating between the normal and pathological occlusal parameters. Digital evaluation of the occlusion by T scan will provide additional information like clusion and disclusion time on functional occlusion. T scan analysis allows the clinician to evaluate the occlusal contacts quantitatively.

The first aim of this study is to determine digital evaluation of occlusion utilizing T-Scan III among TMD patients. The patients in the present study were considered with natural complete dentition and having Angle class I occlusion exhibiting signs and symptoms of TMD. Our study showed equal gender ratio with maximum numbers of patients belonged to the age group of 20 and 40 years which was in accordance with Edward etal study.[19] The present study demonstrated, the incidence of premature contacts (occlusal interferences) was higher and clusion time was significantly longer in TMD group than in control subjects (P<0.001). The findings of the study are in confirmation with other researchers like Cheng et al[20] and Haralur et al.[17]

Premature contacts can result in condyle displacement, which may potentially cause friction and increased intra-articular pressure on the TMJ. Both situations are injurious to the TMJ and contribute to changes of the structure of TMJ. If the capacity of the subject to modify the condition is exceeded, results in the disorders of the masticatory muscles and TMJ. To reduce the incidence of premature contacts, unconditioned contraction of masticatory muscle is seen. Hence, this altered mandibular position and the prolongation of the clusion time was seen in our study and similar findings were observed by Cheng et al.[20] However,

contradictory findings of increased prevalence of TMD among patients with fewer missing posterior teeth in more than one quadrant were noted by Wang et al using T-Scan III.[21]

The present study demonstrated the incidence of prolonged disclusion time which was high and statistically significant (P<0.001) in TMD group and was in accordance to Haralur SB et al. The prolonged disclusion time can lead to higher masticatory muscle activity and abnormal distribution of stresses in the disc resulltng in TMD symptoms. The compression of the mechanoreceptors of molar and premolar periodontal ligaments by prolonged excursive tooth contact, activate excess muscle contractions in the masticatory muscles. The longer time of the excursive interferences results in periodontal ligaments compression activating the masticatory muscles are activated to contract. This cycle repeats with every posterior tooth compression during both functional and Para functional mandibular movements and adds excessive muscle contractions. The additive constant and excessive masticatory muscle contractions results in lactic acid accumulation which often leads to the clinical appearance of muscular hyperactivity. This corroborates the findings of kerstein.[22]

TMD patients exhibit a variety of psychologic and behavioral characteristics, including somatization, stress, anxiety and depression. Various studies of anxiety and depression in chronic pain patients have established there is evidence of greater prevalence of anxiety and depression symptoms than in controls despite of different methodology used.[23] The second aim of the present study was to analyse the relationship of anxiety and depressive with signs and symptoms of TMD.

In the present study the level of anxiety and depression was self rated by HADS scale. The mean value of anxiety levels and depression were more in TMD group compared to control group (7.88, 4.17) and (7.67, 5.00) with statistical significance (P<0.001). These results showed that there is evidence of psychologic disturbances seen in TMD population compared to healthy patients and was in agreement with studies done by Wight et al. [24] An increased level of emotional stress can have influence on muscle function through increased muscle activity in resting phase (i.e. protective co contraction), bruxing activity or both. It can also activate the sympathetic nervous system leading to muscle pain. Activation of sympathetic nervous system is associated with psychophysical disorders that are related to TMDs.[24]

TMDs are frequently present in co-morbidity with anxiety and depression. HPA axis hyperactivity is seen during major depression with elevated cortisol levels. Cortisol, also known as a stress hormone, has been used as an indicator in stress evaluation studies. Due to paucity in the literature regarding serum cortisol level in TMD patients, the present study was designed to evaluate the serum cortisol level. However, there was no significant increase in serum cortisol levels were seen even though anxiety and depression were significant in TMD group compared to the control group. There is substantial literature that many investigations have failed to replicate this association due to inconsistent methodologies, time factor, and gender difference.[25] Psychological problems are more common in muscle

disorders compared to intracapsular disorders and cortisol secretion pattern of TMD patients is more activated at the end of the day.[26] These reasons could have been contributed to reduced levels of serum cortisol in TMD patients with higher levels of anxiety and depression. It is not confirmed by any other studies before.

All TMD patients have undergone selective grinding of the precluding teeth to shorten the clusion and disclusion time. For the patients with anxiety and depression counseling was done to relive their stress levels. Comparatively, reduction in clusion and disclusion time, anxiety and depression was observed. By one month follow – up, there was profound improvement with less intensity of pain were seen. In the present study evaluation of occlusion was done in centric relation using T-Scan III, future studies can be performed including left and right lateral excursions. In future, long–term studies with larger sample size of muscle and joint disorders of TMD patients should be considered.

Most of the times when a TMD patient approaches a general dental practitioner, due to lack of sufficient knowledge, they consider it as a single disorder and focusess on pain relief rather than addressing the underlying etiological factors. This can lead to chronicity of problem which will have a negative impact on quality of life. Oral physicians have an active role in recognising all direct and indirect contributing factors including psychological factors. Our study proved that HADS questionnaire can be a beneficial tool in determining the levels of anxiety and drepression as it is simple and easy to use.

Prosthodontists play a key role in managing parafunctional habits and occlusal disturbances. Evaluation of occlusion using T-Scan III is a less time consuming and simple procedure. The patient is asked to bite down on an ultrathin sensor, the results are computer analysed and displays the data immediately. The images obtained can be used to educate patient about occlusal interferences and their correction for relief of pain which is proved by our study. Physiotherapy helps in relieving pain, mobilising jaws and to restore function. Thus management of TMDs are challenging and need diagnostic and therapeutic intervention of a multidisciplinary team of health care providers which includes oral physicians, prosthodontists and physiotherapists. This study reinforces the importance of evaluation of psychologic stress using HADS and occlusion using T-Scan III as a useful tool in the management of TMDs.

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