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Journal

"Flourish Your Stylus"

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Information to Authors

Chattagram International Dental College (CIDC) started its historical and memorable journey in the 2003 year. CIDC is the only Private Dental College in Chattogram which is smoothly running under the guidance of Chittagong University.

CIDC is approved by the Government of the Peoples Republic of Bangladesh and is recognised by the Bangladesh Medical and Dental Council (BMDC). CIDC is representing pioneer and exemplary academic and clinical oriented research institute of Bangladesh. About 65 Dental students completed their graduation from CIDC per annum.

Chattagram International Dental College commenced to publish a peer reviewed Journal from 1st January 2018. The journal intend to publish article of authors from any part of the globe, but has a special interest in publishing research articles of authors from Bangladesh and of relevance to developing countries. It interested in Editorial, Original (Research) articles, Special articles, Review articles, Short Communications, Case report and letters on new findings of Medical Science.

Chattagram International Dental College Journal is published in english, biannually eg. January and July with prior approval of Editorial board.

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Regarding references please follow the Vancouver style (Uniform requirements for manuscripts submitted to biomedical journals prepared by the International Committee of Medical Journal Editors (ICMJE guideline http://www.icmje.org).

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- All tables should be numbered using Roman numerals (I, II).
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Competing Interests

Chattagram International Dental College Journal requires authors to declare any competing financial or other interest in relation to their work. Where an author gives no competing interests, the listing will read the author (s) declare that they have no competing interests.

Editorial

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Basic Principles of Occlusion

Shahiqul Jabbar[1*]

Occlusion is one of the most debated topic in dentistry. It stands at the crossroads of almost all our clinical activities. Because an 'interference free occlusion' is essential for the maintenance of normal function and for predictable survival of any restoration. At the same time, occlusal problems in many forms continue to damage patient's teeth, making it the number one reason why restorations fracture and fail[1,2].

Dentists treat patients with a variety of occlusal approaches from the incredibly meticulous and precise gnathological approach with a fully adjustable articulator and cusp tripodation to a myofunctional approach all the way to the overly simplified and imprecise natural bite approach. Fortunately there are some basic physiological and mechanical principles that should apply to any of the case[3,4].

The 3 Basic Principles of Occlusion can apply to any occlusal philosophy. Nevertheless when the patient requires occlusal therapy or when there is a need to reconstruct a bite the most practical, anatomical, and physiological sound place to position the condyle is in the centric relation.

i) The first basic principle is bilateral and even occlusal contact. The masticatory muscles can generate huge forces, often several hundred pounds of force per square inch[5]. For this reason bilaterally even contacts throughout the dentition are mechanically sound, allowing proper load distribution and a stable occlusion. When a tooth interferes with full closure, it will trigger deflective interferences and cause any of the 7 signs and symptoms of occlusal disease such as hypersensitivity, abfractions, mobility, excessive wear or fractures, muscle or Temporomandibular (TM) pain[6,7,8]. Posterior teeth deflections may create an occlusal avoidance pattern leading to excessive anterior tooth wear. Also, in order to muscles function in coordination, teeth need to contact evenly. Occlusal interferences in centric position can trigger muscle or TMJ discomfort and that removing them will bring about improvement of the symptoms[9].

ii) The second basic principle is posterior teeth disclusion, or anterior and canine guidance. Anterior and canine guidance allows for the immediate disclusion of molars and premolars when making lateral or protrusive movements, such as in chewing. This immediate posterior disclusion provides some important mechanical benefits, masticatory muscles significantly decrease activity and the amount of force applied to the anterior guiding teeth is greatly decreased[10,11]. Williamson and Lundquist found that when posterior teeth touch, the muscles can function with full force[12]. On the other hand, when only anterior teeth touch, the forces decrease significantly. An additional mechanical benefit is that since the mandible works as a Class III lever, the further a tooth is from the fulcrum (TMJ) the less force is applied to it. When a patient lacks this mechanical benefit, during lateral movements, the posterior teeth grind over each other with full muscular force and it is typical to see these patients with severe signs and symptoms of occlusal disease.

iii) Finally the third basic principle of Occlusion is an unobstructed envelope of function[13]. During the chewing motion, the mandible does not only swing laterally, it swings forward (Protrusively) during the closure movement, returning back into the centric stop. This is called the Envelope of function. It varies from patient to patient but Lundeen and Gibbs found that the average was 0.37 mm[14]. The correct amount of overjet allows the space for this protrusive movement to occur without interference. When the overjet is insufficient or the lingual morphology of the anterior teeth is not concave enough, interference to the anterior path of closure will occur. The consequences of violating this principle while restoring anterior teeth

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are that patients may complain that their bite feels high or locked in. This often triggers parafunction activity. Also this interference in the path of closure may cause scraping of the anterior teeth, resulting in typical wear pattern, severe “thinning” of incisal edges or wear of the lingual surface of maxillary anterior teeth with wear of the facial of mandibular anterior teeth. It can also cause other problems, including mobility, chipping, and fracture of the teeth.

Conclusion

A clear vision for a healthy occlusal outcome is priceless and essential for occlusal therapy. This clear vision along with defined goals will allow the clinician to make clear decisions during diagnosis. It will also allow the professional to measure results at the end of treatment, as well as address the severe and rampant problem of occlusal disease.

In the quest for aesthetics function often takes a backseat. In the absence of an ‘inference free occlusion’ the aesthetic prosthesis itself is in jeopardy. In addition, such a prosthesis puts the health and well-being of the rest of the dentition its supporting structures, muscles and TMJs at risk of pathologic breakdown.

The 3 Basic Principles of Occlusion are clear, simple, scientifically sound principles. They are physiological and mechanical sound principles that allow the dentist to increase the quality and predictability of any dental procedure.

Disclosure

The author declared no competing interest.

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Original Article

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External Root Resorption in Postmenopausal Women with the Relation of Bone Mineral Density

Md. Abu Saeed Ibn Harun[1*] Mahabubul Islam Majumder[2] Foysal Sirazee[3]
Shakhauwat Tabrej[4] Tantri Sharma Pujan[5]

Abstract

Background: *The etiological factor of root resorption are complex either itphysiological or pathological. Factors are including the individuals biology, genetics and biomechanical factors. The root resorption due to clastic cell activity surrounding bone and hard tissue of tooth. There are imbalance of osteoclastic and osteoblastic activity during bone remodeling in postmenopausal women. The aim of the study was to evaluate the relation the External Root Resorption (ERR) with Bone Mineral Density (BMD) of postmenopausal osteoporosis.* ***Materials and methods:*** *126 postmenopausal women were included this study. Femoral neck and Lumber spine BMD of all women were evaluated by dual Energy X-ray absorptiometry (DEXA) scanfor diagnosis of Osteopenia and Osteoporosis. All panoramic radiograph were obtained at the time of DEXA scan. The changes of External Root Structure in panoramic radiograph were considered as external root resorption (ERR). The Lumber spine and Femoral neck Bone Mineral Density (BMD) in mg/cm^2 and the number of teeth involved in ERR were posted data sheet for analysis.* ***Results:*** *The result showed that Lumber and Femoral BMD in Osteopenic ,Osteoporosis and treated osteoporosis were statistically significantdifference in multiple comparison. The number of ERR involved teeth in Osteopenic, Osteoporosis and treated Osteoporosis were none significantin multiple comparison.The number of ERR were negative Pearson correlation value with Lumber BMD none significantly, Femoral BMD in significant.* ***Conclusion:*** *This study reveled that the relation of ERR with Lumber and Femoral BMD. Increase the numbers of ERR when Lumber and Femoral BMD decrease in postmenopausal women.*

Key words

Post-menopause; Dual energy X-ray absorptiometry; External root resorption; Bone mineral density.

Introduction

Resorption of tooth is the condition with either a physiologic or a pathologic process resulting in a loss of dentine, cementum and/or bone. External resorption of tooth initiated in the periodontium and initially affecting the external surface of the tooth[1]. External Root Resorption (ERR) in permanent teeth is an unexpected event for dentist and the etiology can be categorized as local or systemic except 'Idiopathic resorption of teeth'[2]. In addition,some case reported that virus-like Hepatitis B and Varicella Zoster has involved in ERR[3,4]. Moreover a potential link between systemic medication such as Bi-sphosphonate (BSP) with External Cervical resorption (ECR) but not clastic cell activating diseases like osteoporosis[5].

Osteoporosis is a medical disorder character by a generalizedlow bone mess and fragility with a consequent increase in fracture risk particularly of vertebrae, hip, and wrist[6]. It has been characterized asa pediatric disease with geriatric consequences[7].Achieving peak bone mess during youth is paramount, as was clearly demonstrated by an analysis of the relative influences on peak Bone Mineral Density (BMD) age-related bone loss and menopause on the development of osteoporosis[8]. The peak BMD may be the single most important feature in the development of osteoporosis[9].

Osteoporosis diagnosis and staging are based on the identification of different risk factors, the most important being low Bone Mineral Density (BMD) of the femoral neck or lumber spine[6]. WHO has been established four diagnostic levels of BMD:

i) The normal bone when t score is better than 1)
ii) Osteopenia when t score are between ≥1 and 2.5

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iii) Osteoporosis when t score is < - 2.5
iv) Established osteoporosis when non- traumatic fractures are includes and t score is < -2.5[10].

Furthermore,evidence suggested that there has the relation of periodontal disease, changes of alveolar bone and bone mess with osteoporotic and treated the osteoporotic patient[11-13]. The resorption of bone is mainly carried out by osteoclastand osteocytesbut other cells such as macrophages and monocytes also reported to have a bone resorbing capacity[14,15]. The resorptive process of the dental tissue seem to be similar to the boneresorption. But dentine resorptive cells are smaller than osteoclast, fewer in number[16]. Inflammatory root resorption are stimulated Bone Multicellular Units (BMU) where clastic cells gradually resorb the dentine surface free of cementoblast and odontoblast, but replacement resorption because of the death Malassez epithelium rest cells[17]. In animal study, the cementum defects were the presence of multi-nucleated cell, osteoclasts and cementicles that was associated with the over-expression of the Receptor Activator of the Nuclear Factor-KB Ligand (RANKL) a critical regulator of osteoclastogenisis[18].
Alveolar bone density has an effect the leading to a cascade of resorption of dental tissue in orthodontic tooth movement[19]. The mandibular alveolar bone mess reduced in osteopenic and osteoporosis postmenopausal women than healthy postmenopausal women. Changes in the alveolar bone mess in postmenopausal women's were strongly correlated with the BMD level of Skeletal Bone[11].The aim of the present study was to evaluated the relationship of Bone Mineral density (BMD) of postmenopausal women with External Root Resorption (ERR) involved teeth.

Materials and methods

Totally 126 postmenopausal womenwere included in this study with the complained of osteoporotic symptoms. Patients with suspected conditions affecting bone mineralization or receiving any drug without Bisphosphonate that affecting bone mineralization were excluded. All patients were evaluated by Dual Energy X-ray Absorptiometry (DEXA) in Lumber spine and Femoral neck for BMD, and dental radiograph such as Orthopantomography (OPG). Among 126 postmenopausal women 78 were osteoporotic, 22 osteopenic and 26 treated osteoporosis by Bisphophonate (Zoledronic acid 5mg/year i.v). Osteoporosis and Osteopenic were diagnosed by DEXA scans from Cumilla Medical College, Bangladesh. BMD at lumber spine and femoral neck were measured by DEXA scanner.Osteopenia when t score are between ≥1 and 2.5, Osteoporosis when t score is < -2.5.

All Panoramic radiographs are obtained at the time of the DEXA scan from Central Medical College and Hospital, Comilla.The bone mineralized density of included postmenopausal women were totally unknown during observation of orthopantomography. The changes of root structure in panoramic radiograph were considered as External root resorption, there are as follows.

Cervical Region of Teeth: Well defined to irregularly bordered mottled radiolucency and/orcloudy radiopaque

The Lateral Aspect of Tooth: Sharply defined radiolucency confined to the root surface and/or the rootreplace by ingrowth bone.

Resorption of apical region: Blunting of the root apex, the bone and lamina dura follow the resorbing root and exhibit a normal appearance around the shortened structure and/or The pulp canalabnormally widen at the apex.

The numbers of teeth which were involved the external resorption posted to data sheet with her Bone Mineralized Density (BMD) of Lumber spine and Femoral neck in mg/cm^2. A tooth which was prior root canal treated, history of trauma, a sign of root fracture, a sign of tooth wearing excluded from the count.

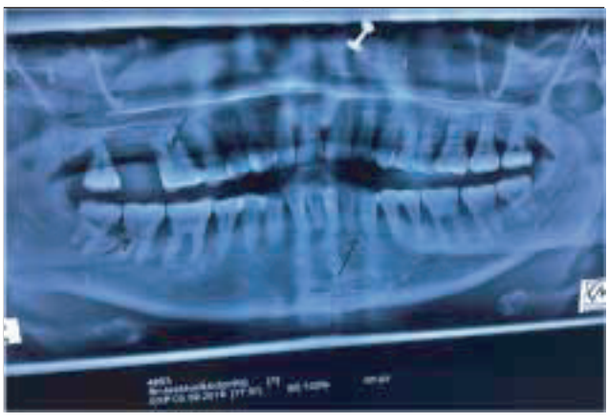

Figure 1 : External Root Resorption (black arrow) showed in Orthopantomography.

Statistical analysis was completed using SPSS version 21(IBM). Because all data were continuous in numbers (Lumber BMD, Femoral BMD, teeth numbers involved in ERR), one way anova analysis of variance followed by Tukey honest significanttest were performed to compare the difference of Lumber BMD, Femoral BMD, ERR in Osteopenic, Osteoporosis and treated osteoporotic postmenopausal women. Pearson correlation coefficient test was performed to find the relationship of ERR with Lumber BMD and Femoral BMD.

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Results

The descriptive statistical analysis ofage (Mean ± SD), Lumber BMD and Femoral BMD (Mean ± SD) in mg/cm^2, numbers of ERR involved teeth (Mean ± SD) are presented in table I. The mean age was 61.5 ± 9.81, 61.24 ± 6.29 and 63.57 ± 7.73in Osteopenic, Osteoporotic and Treated osteoporotic postmenopausal women respectively. The Lumber spine BMD and Femoral neck BMD for Osteopenic women was 0.985 ± 0.08 and 0.782 ± 0.06 and mean number of External Root Resorption involved teeth was 1.36 ± 1.59 in same group of postmenopausal women.In Osteoporotic postmenopausal women, the Lumber spine BMD, Femoral neckBMD and mean number of external root resorption involved teeth was 0.751 ± 0.13, 0.567± 0.11 and 1.64 ± 1.63 respectively. Lumber spine BMD, Femoral neck BMD and number of external root resorption involved teeth was 0.849 ± 0.13, 0.616 ± 0.14 and 1.69 ± 1.61 in treated osteoporosis postmenopausal women respectively.

Table I : The descriptive analysis of postmenopausal women.

	Osteopenia (n=22)	Osteoporotic (n=78)	Treated Osteoporotic (n=26)
Age	61.5±9.81	61.24±6.29	63.57±7.73
Lumber BMD (gm/cm^2)	0.985±0.08	0.751±0.13	0.849±0.13
Femoral BMD(gm/cm^2)	0.782±0.06	0.567±0.11	0.615±0.14
External Root Resorption Teeth number	1.36±1.59	1.64±1.63	1.69±1.61

The multiple comparison of Lumber spine BMD and Femoral neck BMD of Osteopenic, Osteoporotic and treated osteoporotic women are presented in Table II. The result showed that the Lumber BMD of Osteopenic postmenopausal women were significantly difference from Osteoporosis (p-value =0.0001, 95% CI 0.159–0.306) postmenopausal women and treated osteoporosis Postmenopausal women (p-value=0.001, 95% CI 0.047–0.222).The lumber BMD of Osteoporosis women were significantly difference from treated osteoporosis (p-value=0.003, 95% CI -0.222-0.047). The Femoral neck BMD of Osteopenic postmenopausal women were statistically strong significant from Osteoporosis (p-value=0.0001; 95% CI 0.150–0.279) and treated osteoporosis (p-value=0.0001, 95%CI 0.089 – 0.243) of postmenopausal women. But the Femoral BMD of Osteoporosis women were statistically non significant from treated osteoporotic (p-value=0.137, 95% CI -0.109-0.011) postmenopausal women.

Table II : Multiple comparisons of Lumber BMD (mg/cm^2) and Femoral BMD (mg/cm^2) in postmenopausal Osteopenic, Osteoporosis and Treated Osteoporosis women.

			p Value	95% CI (Low-Uper)
Lumber BMD (mg/cm^2)	Osteopenia (0.985± .08)	Osteoporosis (0.751± .13)	.0001	0.159-0.306
		Treated Osteoporosis (0.849 ± .13)	.001	0.047—0.222
	Osteoporosis (0.751± .13)	Osteopenia (0.985± .08)	0.0001	-0.306—-0.159
		Treated Osteoporosis (0.849 ±.13)	0.003	-0.166— -0.291
	Treated Osteoporosis (0.849 ± .13)	Osteopenia (0.985± .08)	0.001	-0.222—-0.047
		Osteoporosis (0.751± .13	0.003	0.029—0.166
Femoral BMD (mg/cm^2)	Osteopenia (0.782± .06)	Osteoporosis (0.567± .11)	0.0001	0.150—0.279
		Treated Osteoporosis (0.614 ± .14)	0.0001	0.089—0.243
	Osteoporosis (0.567± .11)	Osteopenia (0.782± .06)	0.0001	-0.279— -0.150
		Treated Osteoporosis (0.614± .14)	0.137	-0.109– 0.011
	Treated Osteoporosis (0.614 ± .14)	Osteopenia (0.985± .08)	0.0001	-0.243— -0.089
		Osteoporosis (0.567± .11)	0.137	-0.011— 0.109

The mean number of External Root Resorption (ERR) involved teeth of Osteopenic postmenopausal women were statistically none significant from Osteoporosis (p-value = 0.760, 95% CI -1.21-0.65) and treated osteoporosis (p-value = 0.765, 95% CI -1.45-0.79) postmenopausal women in table III. Statistically there were no significant difference of ERR involved teeth number in treated osteoporosisand Osteoporotic (p-value =0.989, 95% CI -0.92- 0.82) postmenopausal women.

Table III : Multiple comparisons of the ERR in post-menopausal Osteopenic, Osteoporosis and Treated Osteoporosis women.

	Multiple Comparisons	p value	95% confidence interval
Osteopenia (1.36 + 1.59)	Osteoporosis (1.64 ± 1.63)	0.760	-1.21— 0.65
	Treated Osteoporosis (1.69 ± 1.61)	0.765	-1.45—0.79
Osteoporosis (1.64 ± 1.63)	Osteopenia (1.36 ± 1.59)	0.760	-0.65— 1.21
	Treated Osteoporosis (1.69 ± 1.61)	0.989	-0.92— 0.82
Treated Osteoporosis (1.69 ± 1.61)	Osteopenia (1.36 ± 1.59)	0.765	-0.79— 1.45
	Osteoporosis (1.64 ± 1.63)	0.989	0.82—0.92

The pearson correlation coefficient value of Lumber BMD with Femoral BMD and ERR was 0.616 and -0.089. The lumber BMD was statistically significant with Femoral BMD (p-value = 0.0001) and non significant with ERR (p-value = 0.324) in table IV. The Pearson correlation coefficient value of ERR was -0.195 and p- value = 0.029 those was statistically significant.

Table IV : Correlation of bone mineral density of Lumber spine and Femoral neck with External root resorption.

	Lumber BMD	Femoral BMD	ERR
Lumber BMD.			
Pearson correlation Coefficient	1	0.616**	-0.089
Sig. (2-tailed)		0.0001	0.324
n	126	126	126
Femoral BMD.			
Pearson correlation coefficient	0.616**	1	-0.195
Sig. (2-tailed)			0.029
n	126	126	126
ERR.			
Pearson correlation coefficient	-0.089	-0.195*	1
Sig. (2-tailed)	0.324	0.029	
n	126	126	126

**Correlationis significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

Discussion

Bone is constantly being renewed by the balanced activities of osteoblastic bone formation and osteoclastic bone resorption termed as 'bone remodeling'. It is crucial for maintaining bone mess architecture, strength and normal bone homeostasis[20].Peak bone mess is achieved for both male and women by the mid-twenties. There after a gradual decline into old age occurs in men, acceleration of bone loss for several years after the menopause occurs in women[21]. It was clearly demonstrated by analysis of relative influence on peak Bone Mineral Density (BMD) on age related bone loss and menopause on the development of osteoporosis[22].In this presented study we found the lumber BMD and Femoral BMD were significant different from Osteopenic to Osteoporosis and treated Osteoporosis. But BMD of lumber spine and femoral neck in Osteoporotic to treated Osteoporotic postmenopausal women were non significant (p=0.137). The possible causes is all treated osteoporotic postmenopausal women had been started their treatment after osteoporosis developed.

The alveolar bone also join this renewed and remodeling event throughout the human life span[23]. In our another study showed that mandibular alveolar bone mess significantly more in normal postmenopausal women rather that the osteopenic and osteoporosis postmenopausal women[11]. Moreover, other studies also showed that increase the severity of the root resorption in induced osteoporotic group than control[24]. In our present studies, the number of ERR involved teeth were non significant in Osteopenic, Osteoporosis and treated Osteoporotic postmenopausal women. Although there was a case series found the relationof external cervical resorption with Bisphosphonate[25]. Interestingly, a systemic review suggested that surface application of Zoledronate and Alendronate reduces root resorption of replanted teeth in animal model[26]. The limitation of this presented study that Panoramic radiograph was used to evaluate ERR. Panoramic radiography was the least accurate in diagnosis of ERR compare to the CBCT[27]. We used Panoramic radiography for assessed all the teeth at a time in one film. Moreover, CBCT is not available in the city where study was conducted.

The root resorption of teeth involves interaction among inflammatory cells, resorbing cells and tooth hard tissue structures. The multinucleated giant resorptive cells referred to as clast cells named osteoclast, odontoclast, dentinoclast and cementoclast. The resorbing activity of clastic cells is related to expression of OPG/RANKL/RANK system by periodontal ligament cells. RANKL regulates odontoclast resorbing activity[28]. The cementum defects was also associated with an increased expression of the Receptor Activator of Nuclear factor-$_K$B Ligand (RANKL)[29].

The plasma RANKL was significantly higher in women with Osteoporosis in one study. In this samestudy showed the circulating levels of OPG and RANKL were inversely related to BMD and contribute to development of osteoporosis in postmenopausal women[30].

Moreover other studied demonstrated a positive linear correlation between initial concentration of RANKL in blood serum and degree of root resorption and the concentration of OPG in blood serum decreased significantly in case of sever root resorption[31]. In our study showed that negative Pearson correlation coefficient of ERR none significantly with femoral BMD (p-value=0.324, r= -0.195) and Lumber BMD in significantly (p-value=0.029, r=-0.089). The result demonstrated that increased the Lumber and Femoral BMD decreased the number of ERR. Because OPG and RANKL genetic polymorphism influence BMD in peri and postmenopausal women.

Conclusion

The results of this study help us to predict future trends on the diagnosis and management of ERR, especially for postmenopausal women. More study is required to established a solid knowledge base of Bone Mineral Density and its influence on ERR.

Disclosure

All the authors declared no competing interest.

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Original Article

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Mandibular Alveolar Bone Changes: Osteoporotic Fracture Risk Predictor in Dental Office

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Abstract

Background : *The purpose of the study was to explore the possibility of using mandibular trabecular pattern and mandibular alveolar bone mass on dental radiograph to identify fracture risk in post menopausal osteoporosis.* ***Materials and methods:*** *90 Postmenopausal women were included in this study with the complain of osteoporosis like symptoms. Patient with suspected conditions affecting bone mineralisation and edentates were excluded from this study. All patient were evaluated by Dual energy X-ray Absorptiometry (DXA) for Bone Mineral Density (BMD) TBS (Trabecular Bone Score) using TBS insight free software for GE-ProdogyadvanceBMD machine and digital dental radiographs for mandibular trabecular pattern and Mandibular Alveolar Bone Mass (MABM). All patients were divided into three groups according to mandibular trabecular pattern as group A (Sparse) group B (Alternative Sparse and Dense) and group C (Dense).* ***Results:*** *The results showed that TBS was lower in group A (1.273±0.108) than group B (1.296±0.103) and group C (1.301±0.09). MABM was also lower in group A (74.94±21.93) than group B(92.32±15.23) and group C (93.09±18.03) those was statistically significant ($p<0.05$).* ***Conclusion:*** *Mandibular trabecular pattern and MABM on dental radiograph is significantly effective as TBS and BMD for prediction of osteoporosis and fracture risk.*

Key words

Osteoporosis; Fracture; MABM; Mandibular Trabecular Pattern; TBS.

Introduction

Osteoporosis (OP) is conceptually defined as a systematic skeletal disease characterised by low bone mass and microarchitecture deterioration of bone tissue, with a consequent increase in bone fragility and susceptible to fracture[1]. Due to its prevalence worldwide, OP is a serious public health concern. Currently it is estimated that over 200 million people worldwide suffer from this disease[2]. 9 million new osteoporotic fracture expected annually worldwide[3,4]. In fact, an osteoporotic fracture estimated to occur in every 3 seconds[4]. Lifetime osteoporotic fracture risk is 40% in post menopausal women age over 50 years in USA[5]. Osteoporosis is also prevalent in men older the 50 years with 20% suffering an osteoporotic fracture during lifetime[6]. With the increased life expectancy and growing ageing population worldwide, these staggering number are projected to double over the next 40 to 50 years,as a result 6 million hip fracture excepted to occur worldwide by 2050[3].

Although Bone Mineral Density (BMD) measure by Duel energy X-Ray Absorbtiometry (DXA) is a major determinant by bone strength and fracture risk recommended by WHO, it is well known that over 50% of fracture occur in patient that are not classified as 'Osteoporosis'[7]. Rest of portion fracture risk factors should be considered for more evaluation.

Microarchitecture assessment of trabecular bone is one of the most promising candidate for fracture prediction[8-10]. Trabecular Bone Score (TBS) is a texture measurement that quantifies local variations in gray level distribution from DXA image[11,12]. TBS has a greater advantages over other bone microarchitecture measurement because physician can obtain information of both bone density and microarchitecture from one DXA scan. Though FRAX can predict fracture in OP, FRAX in Bangladeshi population is not still present.

The fellowing range for TBS value in postmenopausal women has been proposed: TBS 1.300 considered to be normal, TBS between 1.200 to 1.300 is considered to be changing with partially degraded microarchitecture and TBS ≤ 1.200 defined degraded

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microarchitecture with the three BMD categories, ie, normal bone mass, osteopenia and osteoporosis[13].
WHO has been established diagnostic levels of BMD:
i) The normal bone when t score is better than -1 (>833 mg/cm2)
ii) Osteopenia when t score are between ≥-1 and -2.5 (Between 833 and 648 mg/cm2)
iii) Osteoporosis when t score is <- 2.5 (lower than 648 mg/cm2)[14].

On the other hand, compact bone and trabecular bone both can be evaluated in dental radiograph. The intraoral and panoramic radiograph taken provide information about alveolar bone like Mandibular Alveolar Bone Mass (MABM) trabecular pattern of mandibular bone, inferior cortical index and cortical width. Many investigator have reported inferior cortical index and cortical thickness to be detected low bone mass even as a sign of increase fracture risk[15-17]. Many of studied has been shown that mandibular trabecular pattern is a reliable sign of bone mineral density in dentate middle aged subject[18;19]. The hypothesis of the present study was that the trabecular pattern may provide useful information about fracture risk. The objective of the prospective study was to explore the possibility of using mandibular trabecular pattern and MABM on dental radiograph to identify individuals with osteoporotic fracture risk compared with TBS.

Materials and methods

Totally 90 Postmenopausal women were included in this study with the complains of osteoporotic symptoms. Patient with comorbid ailments affecting bone mineralisation were excluded. Edentulous patient were also excluded from this study. All patients were evaluated by DXA for BMD and Trabecular Bone Score (TBS) were also calculates at the same time by using TBS insight free software (Medimaps Group) for GE-Prodogy advance BMD machine. Digital Dental Radiograph (RVG) were done for assessment of mandibular trabecular pattern and MABM calculations. All patient were divided into three groups according to mandibular trabecular pattern as Group –A (Sparse) Group-B (Sparse+ Dense) and Group-C (Dense).
Trabecular Bone Score (TBS) were divided into nine groups for prediction of osteoporotic fracture risk.Where in A1 (Normal BMD and TBS≥1.300) are low risk of osteoporotic fracture (≤4/1000 per year)and C3 (Osteoporotic and TBS <1.200) are highest risk of osteoporotic fracture (>20/1000 per year).Others group were A2 (Normal BMD and TBS >1.200 to 1.300) A3 (Normal BMD and TBS <1.200), B1(Osteopenia and TBS 1.300), B2(Osteopenia and TBS >1.200 to 1.300), B3 (Osteopenia and TBS <1.200) C1 (Osteoporosis and TBS ≥1.300) C2 (Osteoporosis and >1.200 to1.300).

Mandibular Trabecular Pattern

A digital radiograph (Gendex sensor, Vixwinsoftware, USA) of the premolar region was obtained using a standardized paralleling technique. All radiographs were done in same procedure. The overall trabecular pattern (Trabeculation) was assessed using a visual index proposed by Linda et al and modified by Jonasson et al[16-18]. Only dentate patient were included and the trabecular pattern was assessed avoiding areas with recently extracted teeth and bone around the fixed partial denture. With the help of these radiographs, the alveolar trabeculation was classified as either sparse (Group-A) alternating dense and sparse (Group-B) or dense (Group-C). When the trabecular pattern was evaluated as sparsethe criterion was large inter-trabecular spaces especially in premolar area (Figure: 1). When the trabecular pattern was evaluated as dense the entire radiographed area had an equal degree of trabeculation and the inter-trabecular spaces were small even under the roots (Figure: 2). When the trabecular pattern was assessed as alternating dense and sparsetrabeculations were normally denser cervically and sparser apically (Figure: 2). When it was difficult to classify the trabecular pattern, alternating dense and sparse was chosen.

Mandibular Alveolar Bone Mass

The MABM by the mean gray level values of the alveolar bone on the digital radiograph. The region of Interests (ROIs) were set on the apical radiograph of the individual on the 6 mm step of the reference radiograph with “rectangular tool” avoiding the lamina dura and the most crestal locations. No apical bone was included[16,18]. Then the Pixel intensity (PI) were measured from low level to high level (by assigning the value 0 to black 256 to white). Areas of bone loss represent as darker while areas of the bone gain or dense bone as lighter areas[16,18]. MABM were evaluated from the mean value of PI. This obtained data are presented as mean ± Standard Deviation (SD) and it was posted to the data sheet for statistical analysis.

Statistical Analysis

All collected data were posted in preformed data sheet according to good clinical practice. Calculation of mean and standard deviation were performed in Microsoft Excel version 1.24.1 August 2016. The data

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were analysed in Graphpad software (GraphPad Software Inc.USA). The statistical analysis of Baseline characteristics was done by one-away ANOVA test. The MABM and TBS of inter group was compared by unpaired t test.90%, 95% ,99% confident interval (CI) of MABM and TBS of inter group was calculated by the methods of EC filler (J.R. Statist.Soc,7,1-64).p- Value <0.05 are used for statistical significant.

Results

Baseline data on this study population are given in table I Mean age for group-A was 62.67, group-B was 59.27 and group-C was 61.59. Mean heights for group-A was 146.96, group-B was 149.72 and group-C was 148.74. Mean weight for group-A was 50.60, group-B was 52.36 and group-C was 54.15.Mean Lumber Spine (LS) 't' score for group-A was -3.02, group-B was -2.82 and group-C was -2.55.Mean Femoral Neck (FN) 't' score for group-A was -5.29, group-B was -3.26 and group-C was -2.56. All baseline data were statistically non significant (p>0.05).

Osteoporotic fracture risk predictor Trabecular Bone Score (TBS) in different mandibular trabecular pattern are given in table II. Trabecular Bone Score A1 (Fracture risk 4/1000/year) was found in 5 (9.80%) cases and 1 case for A2 (Fracture risk 4-5/1000/year) for group-C mandibular trabecular pattern. B1 (Fracture risk 5-7/1000/year) was found 5(17.86%) 2(18.18%) and 10(19.60%) cases in Group A, Group B and Group C respectively. B2 (Fracture risk 7-10/1000/year) was found in 4(14.28%) and 3(5.88%) cases for Group A and Group C. C1 (fracture risk 10-14/1000/year) was found in 5(17.86%) 3(27.27%) and 13(25.49%) for Group A, Group B and Group C respectively. C2 (Fracture risk 14-20/1000/year) was found in 8(28.57%) 5(45.45%) and 12(23.52%) cases for Group A, Group B and Group C respectively. C3 (Fracture risk >20/1000/year) was found in 6(21.43%) 1(9.09%) and 7(13.72%) for Group A, Group B and Group C respectively.

Mandibular Alveolar Bone Mass (MABM) and Trabecular Bone Score (TBS) of spine bone of inter group were compared in table III, table IV and table V. Mean MABM and TBS in group A was 74.94 and 1.273, but it was 92.32 and 1.296 in group B. The MABM was statistically significant (p<0.05) but TBS was statistically non significant(p>0.05) when compared between group A and group B. Mean MABM and TBS in group C was 93.09 and 1.301. The MABM was statistically significant (p<0.05) but TBS was non significant (p>0.05) when compared between group A and group C. The MABM and TBS of group B and group C was statistically non significant when both group were compared.

95% Confident Interval of MABM and TBS showed that all groups follow a Gaussian distribution and the measurement are not paired each other when they were compared (Table III, IV, V).

Table I : Based line characteristics of study population.

Variables	Gr-A(n=28)	Gr-B(n=11)	Gr-C(n=51)	p-Value
Age	61.67±13.53	59.27±7.72	61.59±10.16	0.805
Heights	146.96±5.28	149.72±6.02	148.74±6.98	0.369
Weight	50.60±8.54	52.36±8.16	54.15±10.28	0.287
LS t Score	-3.02±1.40	-2.82±1.06	-2.55±1.42	0.344
FN t Score	-5.29±11.39	-3.26±1.27	-2.56±1.27	0.201

Table II : Trabecular Bone Score(TBS) of spine in different Mandibular trabecular pattern.

TBS	Group- A (n=28)%	Group-B (n=11)%	Group-C (n=51)%
A1	00	00	5(9.80%)
A2	00	00	1(1.96%)
A3	00	00	00
B1	5(17.86%)	2(18.18%)	10(19.60%)
B2	4(14.28%)	00	3(5.88%)
B3	00	00	00
C1	5(17.86%)	3(27.27%)	13(25.49%)
C2	8(28.57%)	5(45.45%)	12(23.52%)
C3	6(21.43%)	1(9.09%)	7(13.72%)

Table III : Comparison of TBS and MABM in between Group-A and Gr-B.

	MABM	TBS
Group-A	74.94±21.93	1.273±.108
Group-B	92.32±15.23	1.296±0.103
95% CI	0.697 to 0.943	0.9271 to 1.0427
p-Value	0.0215	0.5483

Table IV : Comparison of TBS and MABM in between Group-A and Gr-C.

	MABM	TBS
Group-A	74.94±21.93	1.273±0.108
Group-C	93.09±18.03	1.301±0.09
95% CI	0.708 to 0.906	0.9423 to 1.0153
p-Value	0.0002	0.2220

Table V : Comparison of TBS and MABM in between Group-B and Group-C.

	MABM	TBS
Group-B	92.32±15.23	1.296±0.103
Group-C	93.09±18.03	1.301±0.09
95% CI	0.903 to 1.134	0.9542 to 1.0582
p-Value	.8957	.8711

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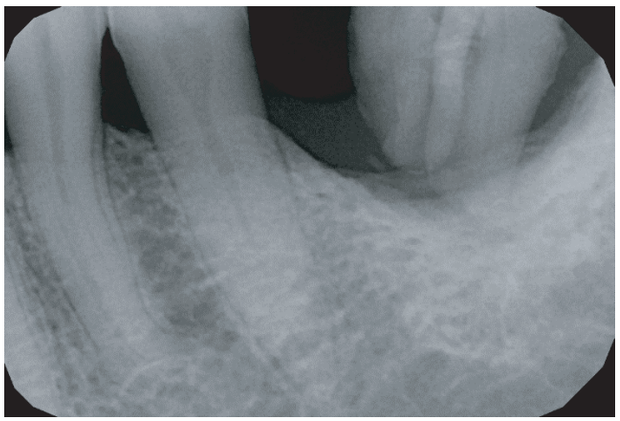

Figure 1 : Sparse Mandibular Trabecular Pattern.

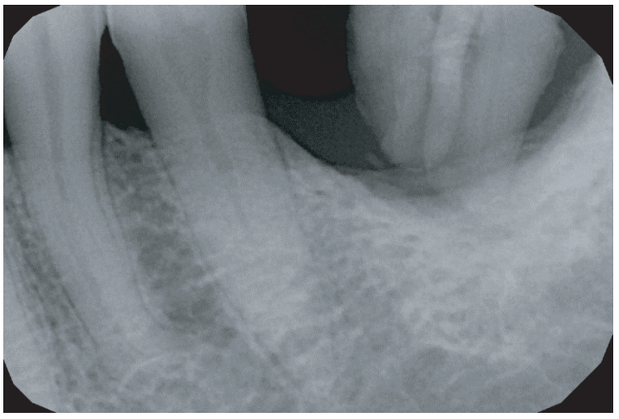

Figure 2 : Alternating Sparse and Dense Mandibular Trabecular Pattern.

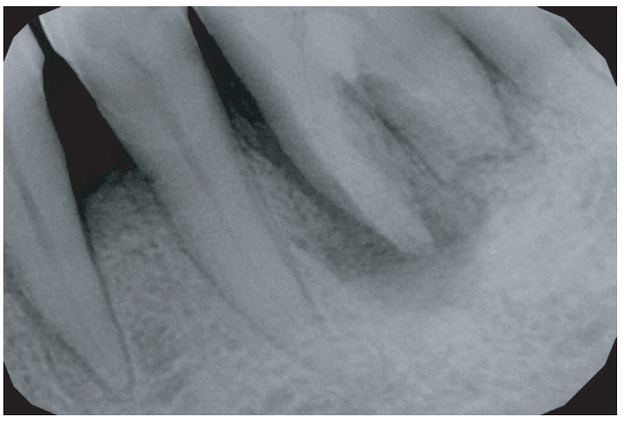

Figure 3 : Dense Mandibular Trabecular Patter.

Discussion

This study has shown as hypothesis that the trabecular pattern provided useful information about osteoporotic fracture risk. It was observed that lowest TBS (1.273) in sparse mandibular trabecular pattern then 1.296 in sparse and dense mandibular trabecular pattern. Highest TBS (1.301) was found in dense mandibular trabecular pattern in this study.

BMD, measured by DXA has been the reference standard for osteoporosis diagnosis in the absence of established fragility fracture[20]. BMD is one of the major determinants of bone strength and fracture risk[21] but there is considerable overlap in BMD values between individuals who develop fracture and those who do not[21]. Other factors influence bone strength and fracture risk, including the macrogeometry of cortical bone, the microarchitecture of trabecular bone, bone micro- damage, mineralisation and turnover[22,23].

TBS is a textural index that evaluates pixel gray-level variations in lumbar spine DXA image, providing an indirect index of trabecular microarchitecture[22]. Likewise MABM was calculated from pixel gray-level in ROI (Region of Interest) of mandibular alveolar bone. MABM of sparse mandibular trabecular pattern was significantly different from alternating sparse and dense mandibular trabecular pattern and only dense mandibular trabecular pattern[23]. The deficit in bone formation in cortical bone results in an increased number of lacunae and porosities and later on in thinner cortical plates, it leads to larger inter trabecular spaces and thinning of the trabeculae in cancellous bone[24,25,19]. When the cortex and trabeculae are thinner and the inter trabecular spaces of certain area (ROI) the mineral content is decreased, MABM of radiographed area also decreased.

Sparse mandibular trabecular pattern may be better at identifying individuals with fracture because resistance to fracture depends not only on the total amount of bone but also on the size and distribution of trabeculae[19].

In the group with sparse mandibular trabecular pattern, evaluated visually, 21.43% of patient was osteoporosis fracture risk coding group C3 (>20/1000/year). Whereas 13.72% for dense mandibular trabecular pattern. It wasfound that 48% of the individuals had suffered a previous fracture in the sparse mandibular trabecular pattern[26]. The same percentage (48%) of having the lowest bone texture were suffered bone fracture[26]. This present study are evaluated the prediction rather than occurrence.

The variation in Bone mass and trabecular pattern are marked between the incisor, premolar and molar region in single mandibule. Generally the incisor area has the smallest inter trabecular spaces and molar area has the largest. The location of premolar area has been proposed as a standard location, because it has the least individual variation of anatomy and muscle fibre insertion[27]. Therefore premolar area was used as ROI in this study, it seemed logical.

Sparse trabeculation was consistently noted under the fixed partial denture, whereas the trabecular pattern in some cases denser around abutment teeth than adjacent areas[26]. It is the result of genetically controlled growth and adaptive response to functional loading[27]. If the patient had pontics of fixed partial denture in premolar region, it was excluded from this study.

In elderly patients, some mandibles had kept a 'dense' trabeculation with very small inter trabecular spaces but the trabeculae appeared very thin and were no longer well mineralised. It was probable that age and medical condition had caused a considerable bone loss but the trabecular network was still intact. Although the size of inter trabecular spaces cannot be used for diagnosis of osteoporosis but large inter trabecular spaces in cervical alveolar dentate areas and low MABM, may be a serous warning sign for future fracture.

Assessing radiographic trabecular pattern and MABM in the alveolar process takes only a minute and the method should used with caution. Digital dental radiograph was used for avoiding shortcoming like processing procedure. The most serious shortcomings of this study is that the number of participants was limited. Future research efforts should examine large number population. All authors contributed equally in the whole process of the study as well as manuscript writing. We are grateful to Medimaps group for their free software to assess TBS.

Conclusion

In conclusion, Mandibular Trabecular Pattern and MABM on dental radiograph is good predictor osteoporotic fracture risk in comparison to TBS. Sparse Mandibular Trabecular Pattern with low MABM in dentate post menopausal osteoporotic patients is effective indicator of fracture risk. The findings of this study can conclude that dentist may play a useful role in prediction of osteoporotic fracture risk though a large scale study is necessary to establish the fact.

Disclosure

All the authors declared no competing interest.

Acknowledgment

Medimaps group- TBS insight free software was used in GE Healthcare Prodogy Advance version 16.00 BMD machine to determine the TBS in this study.

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Original Article

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Educational Intervention About the Knowledge of Necessity of Dental Check-Up During Pregnancy Among Selected Community in Dhaka City

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Abstract

Background : *An educational intervention study was carried out among the women of Kathal Bagan slum area of Dhaka city, from April to June 2009. The objective of the study was to plan, implement and evaluate the health educational intervention on the knowledge of necessity of dental check-up during pregnancy and assess the effectiveness of the programme.* ***Materials and methods :*** *The total sample size 60 respondents who were selected purposively. At first baseline survey was conducted to assess the level of knowledge of respondent.on the basis of baseline findings educational intervention programme was planned and organized, using group discussion as method and flash card, leaflet, model and picture was used as a media, post intervention data was collected with the same questionnaire to see the effect of health education intervention programme pre and post intervention data composed and analysis by SPSS.* ***Results :*** *30% respondents was in the age group of 21-25 years, 35% respondents were of primary level of education, 83% of respondents had no knowledge about the problems of teeth during pregnancy, 57 respondents had the knowledge about action that should be taken during pregnancy and 43 respondents acquired correct knowledge about dental treatment.* ***Conclusion :*** *The study shows that the knowledge was not adequate about the necessity of dental check-upbefore intervention but after educational intervention programme the knowledge level of women were found good.*

Key words

Dental check up; Pregnancy; Pregnancy gingivitis.

Introduction

Pregnancy is a critically important time for the highly specialized and development of the fetus.During this period of time a pregnant woman do everything to prevent exposure of the developing fetus to harmful substances and diseases. There are many things such as maternal substance abuse, high blood pressure, infection, inflammation, diabetes etc. that may cause complications of pregnancy as well as preterm delivery of Low Birth Weight (LBW) infants. Increasing certain of our body's chemicals associated with inflammation may play a role in early rupture of the amniotic sac. Gum disease is a common problem for a pregnant women during pregnancy. Hormone change can cause sensitive gums, pregnant women with gum disease are seven times more likely to have a premature birth or deliver a low birth weight baby. It is really important to know the knowledge about teeth and gum disease during pregnancy time for the birth of healthy child.

It is estimated that roughly 15% of the woman who deliver premature, microorganisms from gum infection have migrated to the amniotic fluid[1]. Starting in the second or third month of pregnancy approximately 50% of woman experience gum inflammation called pregnancy gingivitis. This is partly related to the increased amount of progesterone circulating throughout the body and can become a more serious problem if good oral hygiene is not maintained. During pregnancy, gum tissue is more sensitive to the plaque.When this happens, gums may appear red and puffy, and may bleeds more easily .Pregnancy gingivitis usually subsides after the child is born .The important things to remember that regardless of hormone levels, pregnancy gingivitis is caused by the expectant mothers immune response to the bacterial plaque that accumulates from poor oral hygiene. Regular dental check-up and good oral hygiene are the best

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ways to prevent oral infection and any potential risk to the developing fetus[2]. The mouth should not be isolated from the rest of the body, it is part of whole body system. Now the dentists and obstetricians recognize that there might be a link between inflammation in the body and premature birth. The goal is to eliminate all oral inflammation before and during pregnancy[3]. Researchers thought that inflammation of the gum may increase risk for complications for pregnancy. It is important that infection and inflammation may cause preterm delivery,asthma, lowIQ, cerebral palsy and poor motor skills.

Materials and methods

This interventional pre and post test study design was carried out in slum area of Kathal Bagan Dhanmondi under the district of Dhaka. A total of 60 pregnant women whose age 15- 45 years were selected for the study who were willing to give interview. The sample was collected by purposive sampling technique. A pretested structured questionnaires and check list were used for collection of data. Data were collected by direct interview of the respondent. Data analysis was done using SPSS (Version-16).

Intervention Approach

After baseline survey on analysis of the base line data, areas where educational intervention was needed were found out, Educational program was developed. Then lesson plan, flip chart and posters were prepared. The group members conducted the educational session by group approach. For intervention the group members visited all the households (Selected) and informed regarding intervention program on knowledge of Importance of dental checkup during pregnancy. The entire respondents were requested to be present at selected place to participate in the group education. The education intervention on importance of dental checkup was conducted on 1st May and 3rd May 2009 on different group. Flip chart and posters were used. After completion of the session feedback was taken from the respondents by asking questions.

Post intervention Evaluation

Postintervention evaluation was done on 15th and 17th May 2009 by using questionnaire. The researcher went house to house of the respondents for post intervention evaluation. The evaluation was done through person to person interview.

Results

The study was conducted among 60 women in a selected community. Date was collected from 60 respondents. The results are shown in the following tables.

Table I : Distribution of the respondents by their age (n=60).

Age	Frequency (n)	Percent (%)
<20 Years	8	13.3
21-25 Years	18	30.0
26-30 Years	11	18.3
31-35 Years	13	21.7
>35 Years	10	16.7
Total	60	100.0

Mean age is 28.88, SD= ±7.279

Table I shows that out of 60 respondents, majority 30% was in the age group of 21-25 years, 21.7% was in 31-35 years group. On other hand, 16.7% was above 35 years. And the rest by of 13. 3% were below 20 years.

Table II : Distribution of the respondents by their educational qualification (n=60).

Educational Qualification	Frequency (n)	Percent (%)
Illiterate	13	21.7
Only can sign	18	30.0
Primary	21	35.0
Secondary	7	11.7
Higher secondary	1	1.7
Total	60	100.0

Table II shows majority of the 35% respondents were of primary level of education, followed by 30% can only sign, 21.7% Illiterate,11.7% were secondary and 1.7% in higher secondary.

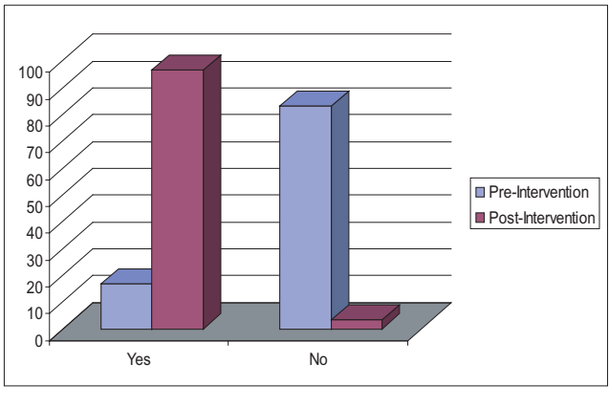

Figure 1 : Distribution of respondents about knowledge of problems of teeth and gum during Pregnancy.

Figure-1 shows that before intervention 83.3% had no knowledge about the problems of teeth and gum during pregnancy and after intervention most of the respondent 58(96.7%) acquired correct knowledge on the same.

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Table III : Distribution of the respondents by their Knowledge about action taken by pregnant women.

Action taken by pregnant women	Pre-Intervention		Post-Intervention	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
Doctors must be given idea about present pregnancy by the women	3	5.3	3	4
Treatment should be followed according to consulting of doctor	46	80.7	56	96
Don't know	8	14.0	0	0.0
Total	57	100.0	59	100.0

Table III shows that before intervention out of 60 respondent only 57 respondent had the knowledge about action that should be takenduring pregnancy according to the advice of doctor but after intervention 56 respondent i.e. 97% gave correct answer.

Table IV : Distribution of the respondents by their knowledge of about safe period for Dental treatment during pregnancy (n=60).

Safe period for Dental treatment	Pre-Intervention		Post-Intervention	
	Frequency (n)	Percent (%)	Frequency (n)	Percent (%)
First three months	1	50.0	17	28.3
Second three months	1	50.0	43	71.7
Total	2	100.0	60	100.0

Table IV shows that before intervention only 2 women out of 60 had knowledge of safe time of dental treatment during pregnancy. And after intervention 43 respondents 71.7% acquired correct knowledge about the safe time of dental treatment during pregnancy.

DISCUSSION

The purpose of this study was to assess the knowledge necessity of dental check up during pregnancy in a selected slum area of Dhaka city. It is a serious problem in Bangladesh. It is a medical and at the same time social problem. In this study research question was that the most of the women, especially slum women have inadequate knowledge about importance of dental checkup and health education intervention program can improve their knowledge. The current study showed that all of the slum women had no adequate knowledge about the importance of dental checkup. A health education intervention program could improve their knowledge and practice. 21.7% of the women were illiterate about the dental checkup in pregnancy so that they need the knowledge about dental problems. For this study a short educational intervention program (Lecture, poster, flash card, tooth model, photocopy, etc) were prepared which consisted of clear conception about it. Health education related dental disease in pregnancy was impared following a reselected lesson plan among the group of respondent. Group discussion was the method of intervention. An intervention test based on the answer of pre and post test questionnaire were done in order to assess the improvement of their knowledge through the imparted training than it was at the base line.

In this study Mean age was 28.88, SD= ±7.279, The out of 60 respondents, majority 30% was in the age group of 21-25 years, 21.7% was in 31-35 years group. On other hand, 16.7% was above 35 years. And the rest by of 13. 3% were below 20 years. Among the respondent majority of the 35% respondents were of primary level of education, followed by 30% can only sign, 21.7% Illiterate, 11.7% were secondary and 1.7%in higher secondary. Before intervention 83.3% had no knowledge about the problems of teeth and gum during pregnancy and after intervention most of the respondent 58(96.7%) acquired correct knowledge on the same. Before intervention out of 60 respondent only 57 respondent had the knowledge about action that should be taken during pregnancy according to the advice of doctor but after intervention 56 respondent ie 97% gave correct answer.

There is a study conducted by Orhun et al, Periodontitis by the year of 2005 state that, dental treatment should be receive when women is pregnant Good oral health care is vital during pregnancy. Continue with regular dental cleaning and check to avoid oral infections that can affect the fetus, such as gingivitis and periodontal disease[6-7]. So there is similarity of this study.Out of 60 respondents before intervention 83.3% had no knowledge on relation of problem of gum about the problem of teeth and gum during pregnancy and after intervention most of the respondent 58(96.7%) have acquired correct knowledge on the same. Dr. Dan Peterson in year of 2005 found that periodontal treatment significantly reduces the risk of having a pre-term birth or low birth weight infant, periodontal therapy reduced pre-term premature birth

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and low birth weight infant rates by 68% in women with pregnancy-associated delivery gingivitis. Mothers with gum disease have six times greater risk of delivering preterm, low-birth weight babies[8].

Pregnant women who receive treatment for their periodontal disease can reduce their risk of giving birth to a low birth-weight or pre- term baby. In a study of 400 pregnant women aged 18 to 35 with advanced periodontal disease, half of the subjects were given periodontal treatment before the end of the second trimester while the other half were treated after giving birth. Treatment included scaling and root planing, instruction in good oral hygiene habits and antimicrobial mouth rinse for daily use. Of the women who received treatment during pregnancy, 2 percent gave birth to either a low birth-weight or pre-term infant. By comparison, 10 percent of the women who received treatment after birth had either a low birth-weight or pre-term baby so there is similarity of this study[9,10] .

The information in our country where government is spending a large proportion of money in health sector, But there should not be any awareness about the pregnancy, dental check-up. And there should not be any other NGO or other private programme thatfor awareness about importance of dental checkup.

In these study data was collected by two times, one before intervention and other was after intervention. Before intervention there was poor knowledge about the dental check-up taking dental treatment before, during and after pregnancy. They only knew about the dental pain, and that for extraction of teeth. But they don't know about the necessity of dental treatment, safe drug may be taken in pregnancy, safe period.

They also don't know what type of paste is necessary for cleaning of mouth like fluoride tooth paste.

But after intervention they acquired good knowledge about the importance of dental checkup.

Conclusion

The study was conducted to assess and compare the improvement of knowledge of dental disease through an organized educational intervention programme. The aim of any intervention programme is that there should be some degree of change about knowledge, attitude and behavior. From the intervention programme knowledge of women (Slum area) were upgraded. Educational intervention programme can play an important role to increase the level of knowledge regarding importance of dental check-up during pregnancy.

Disclosure

All the authors declared no competing interest.

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Review Article

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Computer Aided Design / Computer Aided Manufacturing in Dentistry : A Review

Shahiqul Jabbar[1*] Farhana Sharmin[2] Shah Mohammad Shahadat Hossain[3] Md Kamrul Hasan[4]

Abstract

Computer Aided Design (CAD) / Computer Aided Manufacturing (CAM) in Dentistry describes an indirect restoration or prosthesis scanned by a scanner, designed by a software (CAD) and milled by a computer assisted milling machine (CAM). The Clinician or the Dental Laboratory Technician can fabricate restoration from several advanced dental materials, including ceramics, zirconia, metal, alloys, PMMA (Poly Methyl Meth Acrylate) and various composites.This review article provides an overview of the development of various CAD/CAM systems, operational components, methodologies and restorative materials commonly used.

Key words

CAD/CAM systems; Operational components; Fabrication techniques; Scanner; Restorative materials.

Introduction

The introduction of CAD/CAM system (Computer Aided Design / Computer Aided Manufacturing) in dentistry has revolutionized it's all specialities. This huge development has resulted in advancement in the fields of restorative dentistry, prosthodontics, implant dentistry, reconstructive surgery, as well as orthodontics. Digital intraoral scanners have got popularity over the last few years as many new systems have been introduced to the market. The advent of CAD/CAM brought with it the development of new metal free esthetic materials such as zirconia and high strength ceramics that can be milled chair side or in the dental laboratory. This system also enabled the dentists and laboratories to harness the power of computers to design and fabricate esthetic and durable restorations[1-3].

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Search Strategy

The google scholar detabase were quired for relevant articles to the topic of CAD / CAM in Dentistry. A literature Search was performed in PubMed using the search word "The use of CAD / CAM in dentistry". "Dental CAD / CAM systems" and "Recent advances in materials for all ceramic restorations". The search term following key words used in various combination : CAD / CAM systems; Scanner; Restorative materials.

Discussion

Evolution of CAD-CAM Systems

Computer-aided design and manufacturing were developed in the 1960s for the use in the aircraft and automotive industries[4]. Dr. Francosis Duret was the first person to develop CAD/CAM device, making crowns based on an optical impression of the abutment tooth and using a numerically controlled milling machine in 1971[4,5]. He produced the first CAD/CAM dental restoration in 1983[4]. Dr. Andersson developed the Procera Method of manufacturing high-precision dental crowns in 1983. Dr. Duret later developed the Sopha system in 1984[4,5]. Dr. Andersson was the first person to use CAD/CAM for composite veneered restorations[4,6]. In 1987, Mörmann and Brandestini discovered CEREC system, which was the first dental system to combine digital scanning with the milling unit[4,7,8]. The E4D Dentist system, which was introduced in 2008 permits same-day in–office restorations along with CEREC system[4].

Components

All CAD/CAM systems consist of three components:

i) Digitalization Tool or Scanner
ii) Software
iii) Production by Milling Machine.

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There are two different types of scanners:
a) Optical scanners b) Mechanical scanners.

Optical Scanners

The basis of this type of scanner is the collection of three-dimensional structures in a 'triangulation procedure'. Here, the source of light (eg. laser) and the receptor unit are in a definite angle in their relationship to one another. Through this angle the computer can calculate a three-dimensional data set from the image on the receptor unit. Examples: Lava Scan ST (3M ESPE, white light projections) and Straumann Es1 (Etkon, laser beam).

Mechanical scanner

In this scanner variant, the master cast is read mechanically line-by-line by means of a ruby ball and the three-dimensional structure is measured. This type of scanner is distinguished by a high scanning accuracy, whereby the diameter of the ruby ball is set to the smallest grinder in the milling system, with the result that all data collected by the system can also be milled. Example: Procera Scanner.

Drawbacks of Mechanical Scanner

i) The complicated mechanics

ii) The apparatus is very expensive

iii) Long processing times compared to optical systems.

Design software - Processing devices are distinguished by means of the number of milling axes:

- 3-axis devices
- 4-axis devices
- 5-axis devices.

3-axis milling devices: This type of milling device has degrees of movement in the three spatial directions. Thus, the mill path points are uniquely defined by the X -, Y - and Z -values. All 3-axis devices used in the dental area can also turn the component by 180° in the courseof processing the inside and the outside. Advantages -i) Short milling times and simplified control ii) Cost effective. Examples: InLab (Sirona) Lava (3M ESPE) Cercon brain (Degu Dent).

4-axis milling devices: In addition to the three spatial axes, the tension bridge for the component can also be turned infinitely variably. As a result it is possible to adjust bridge constructions with a large vertical height displacement into the usual mould dimensions and thus save material and milling time. Example: Zeno (Wieland-Imes).

5-axis milling devices: With a 5-axis milling device there is also, in addition to the three spatial dimensions and the rotatable tension bridge (4th axis) the possibility of rotating the milling spindle (5th axis). This enables the milling of complex geometries with subsections. Example: Everest Engine (KaVo)[2,9,10].

3Shape's Dental System: Is a unique combination of the most advanced 3D scanning technology and management software.

D700 scanner: This revolutionary scanner is optimized for impression scanning and is capable of scanning full dental gypsum models up to 40% faster and with greater details. The 3-axis allows the object to be tilted, rotated and translated so as to be scanned from any viewpoint, corresponding to a dental model.

Q700 scanner series: It provides a choice of 2 scanners - the Q700 with 1.3MP camera resolution and the Q740 with 5.0MP resolution. Both scanners are designed for productive quality control of small complex objects through excellent detail level, high scan speed and accuracy[11].

Different CAD-CAM systems

Cercon: It does not have a CAD component. In this system, a wax pattern (Coping and pontic) with a minimum thickness of 0.4 mm is made. The system scans the wax pattern and mills a zirconia bridge coping from presintered zirconia blanks. The coping is then sintered in the Cercon heat furnace (1,350 C) for 6 to 8 hours[3].

Everest: The Everest system consists of scan, engine and therm components. In the scanning unit, a reflection free gypsum cast is fixed to the turn table and scanned by a CCD camera in a 1:1 ratio with an accuracy of measurement of 20 µm. Its machining unit has 5-axis movement that is capable of producing detailed morphology and precise margins from a variety of materials. Examples: Leucitereinforced glass ceramics, partially and fully sintered zirconia and titanium[5].

Lava: This system uses yttria stabilized Tetragonal Zirconia Polycrystals (Y-TZP) which have greater fracture resistance than conventional ceramics. Lava system uses a laser optical system to digitize information. The Lava CAD software automatically finds the margin and suggests a pontic. The framework is designed to be 20% larger to compensate for sintering shrinkage[3,5].

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Procera: This system has combined pantographic reproduction with electrical discharge (Spark erosion) machining. It uses an innovative concept for generating its alumina and zirconia copings. First, a scanning stylus acquires 3D images of the master dies that are sent to the processing center via modem. The processing center then generates enlarged dies designed to compensate for the shrinkage of the ceramic material. Copings are manufactured by dry pressing high-purity alumina powder (> 99.9%) against the enlarged dies. These densely packed copings are then milled to the desired thickness. The Procera restorations have excellent clinical longevity and strength[5].

DCS precident: It is comprised of a Preciscan laser scanner and Precimill CAM multitool milling center. It can scan 14 dies simultaneously and mill up to 30 framework units in 1 fully automated operation[3]. Materials used: Porcelain, Glass Ceramic, In- Ceram, Dense Zirconia, metals, and Fiber- Reinforced Composites. This system is one of the few CAD/CAM systems that can mill titanium and fully dense sintered zirconia[5].

CICERO system: The computer integrated crown reconstruction was developed by CICERO Dental System B.V. (Hoorn, The Netherlands). The CICERO method for production of ceramic restorations uses official scanning, ceramic sintering, and computer assisted milling techniques to fabricate restorations with maximal static and dynamic occlusal contact relations. The system makes use of optical scanning, near net-shaped metal, ceramic sintering and computer-aided fabrication techniques[8].

CEREC system: The Computer Aided Design / Computer Aided Manufacture (CAD/CAM) CEREC (Computer-assisted ceramic reconstruction) system is used for electronically designing and milling restorations.

CEREC 1: In this, the ceramic block could be turned on the block carrier with a spindle and feed against the grinding wheel, which grinds the ceramic block to a new contour with a different distance from the axis at each feed step.

CEREC 2: The introduction of an additional cylinder diamond enables the grinding of partial and full crowns. It introduced the design of the occlusion in three modes: extrapolation, correlation and function. However, the design still was displayed two-dimensionally[7].

With CEREC 1 and CEREC 2, an optical scan of the prepared tooth is made with a Couple Charged Device (CCD) camera and a 3-dimensional digital image is generated on the monitor. The restoration is then designed and milled[7].

CEREC 3: This system skipped the wheel and introduced the two bur-system. The “step bur” reduced the diameter of the top one third of the cylindrical bur to a small diameter tip enabling high precision form grinding with reasonable bur life[7]. The most significant factor for three-dimensional scanning with the CEREC 3 intraoral camera is that tooth preparations for crowns and inlays have a unique characteristic: All points of interest can be seen from a single viewing line, representing the preparation and insertion axes, respectively[12].

CEREC in lab: Is a laboratory system in which working dies are laser-scanned and a digital image of the virtual model is displayed on a screen. After designing the coping or framework, the laboratory technician inserts the appropriate VITA In-Ceram block into the CEREC in Lab machine for milling. The technician then verifies the fit of the milled coping or framework[5].

E4D dentist system: Presently it is the only system besides CEREC that permits same day in-office restorations. This system includes a laser scanner (Intraoral digitizer) a design center and a milling unit. The scanner is placed near the target tooth and has 2 rubber feet that hold it to specific distance from the area being scanned. As each picture is taken, the software gradually creates a 3D image. The design system automatically detects the finish lines and marks them on the screen. As soon as the restoration is approved, the data are transmitted to either the in-house milling machine or a dental laboratory. The office milling machine will then manufacture the restoration from the chosen blocks of ceramic or composite[4].

The planmeca plan scan (Driven by E4D technologies) system: Is designed to be used in a similar manner to Sirona’s CEREC systems, as it can be used as a digital impression system, as well as a chair side design and milling system. The PlanScan system uses blue light with real time laser video-streaming technology to capture the dental data and is a powder-free system. The system captures both hard and soft intraoral tissues of various translucencies, dental restorations, as well as stone models and conventional impressions. Removable scanner tips, with built-in heated mirrors, allow no down time between patients as well as a high level of disinfection. The Planmeca Plan CAD Design Center includes scanning software, design software, a mouse and a laptop. The digital models can be used to design inlays, onlays, crowns, bridges and veneers.

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If needed, the scans can be sent to the laboratory for processing designing and manufacturing of the restoration, or the restorations can be milled chairside using PlanScan's dedicated PlanMill 40 milling machine.

Restorative Materials for CAD-CAM Processing (According to the Fabrication Method)

Pre-sintered[13]

Material	Company	Composition
Cercon	Dentsply	Partially stabilized zirconia
DC-Zirokon	DCS (Kelkheim, Germany)	Partially stabilized zirconia
Everest ZS-Blanks	Kavo	Partially stabilized zirconia
IPS e.max ZirCAD	Ivoclar vivadent	Partially stabilized zirconia
LAVA Frame	3M ESPE	Partially stabilized zirconia
Procera All Ceram	Nobel Biocare	Alumina
Procera All Zircon	Nobel Biocare	Partially stabilized zirconia
Vita YZ	Vita Zahnfabrik	Partially stabilized zirconia

Densely Sintered[13]

Material	Company	Composition
Denzir	Cad.esthetics	Partially stabilized zirconia
Degiceram L	Digident	Leucite-glass
Digizon	Digident	Partially stabilized zirconia
Everest G-Blanks	Kavo	Leucite-glass
Everest ZH-Blanks	Kavo	Partially stabilized zirconia
IPS e.max CAD	Ivoclar vivadent	Lithium disilicate-glass
ProCAD	Ivoclar vivadent	Leucite-glass
Vitablocs Mark II	Vita Zahnfabrik	Leucite-glass
Vitablocs TriLuxe	Vita Zahnfabrik	Leucite-glass
Zirkon	Cynovad	Partially stabilized zirconia

Glass Infiltrated[5,13]

Material	Company	Composition	Flexural strength (MPa)
In cerem Alumina	Vita Zahnfabrik	Glass-alumina	500
In cerem Spinell	Vita Zahnfabrik	Glass-alumina-spinel	350
In cerem Zirconia	Vita Zahnfabrik	Glass-alumina-PS zirconia	750

Stages in Fabrication of Prosthesis with CAD/CAM Technology

i) Computer surface digitization
ii) Computer-aided designing
iii) Computer assisted manufacturing
iv) Computer-aided esthetics
v) Computer-aided finishing.

The last two stages are more complex and are still being developed for inclusion in commercial systems.

Computer Surface Digitization

Scanning of prepared tooth is done either with LED based or Laser based scanners.

LED based scanner: A small hand held video camera with a 1cm wide lens (Scanner) when placed over the occlusal surface of the prepared tooth, emits infrared light which passes through an internal grid containing a series of parallel lines. The pattern of light and dark stripes which falls on the prepared tooth surface is reflected back to the scanning head and onto a photoreceptor, where its intensity is recorded as a measure of voltage and transmitted as digital data to the CAD unit.

Laser based scanner: A high speed laser takes digital scans of the preparation and proximal teeth to create an interactive 3D image. Rapid scan allows automatic capture of digital images at the operator's preferred speed to scan in the mouth or extra-orally on conventional impressions or models, all without powder. Newer laser based scanners can scan at subgingival level based on Optical Coherence Tomography (OCT).

At least 9 scans are required to produce the image. There are stabilizers present with the scanning device. If scanned image is correct it will appear in green color, if it is near correct it appears in yellow color but if scanned image does not meets the requirements software discards the image and shows it in red color[14].

Optical camera, LASER surface scanning device, three dimensional (3-D) scanning device (Digitizer) Photogrammetry, Computed Tomography (CT-Scan) Magnetic Resonance Imaging (MRI) 3-D ultrasonography etc. are some of the technologies used for computer surface digitization[15].

Computer-Aided Designing (CAD)

A three-dimensional image of the die is produced over the screen and can be rotated for observation from any angle[16]. Once the 3-D image is captured through any of the computer surface digitization techniques, 3-D image processing is done and the digitized data is entered in the computer. Finally, curve smoothening data reduction and blocking of undercuts can be done at this stage. Designing of the restoration is done using CAD software, which in turn sends commands to the CAM unit, for fabricating the restoration[15].

Computer Aided Manufacturing (CAM)

Third and the final stage is Computer-Aided Manufacturing (CAM). The CAM technologies can be divided in three groups according to the technique used:

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Subtractive technique from a solid block: In this stage the milling is done with computerized electrically driven diamond disks or burs which cut the restoration from ingots[15]. The CAM technique most commonly applied in manufacturing frameworks for single crowns and. The size of the material blocks available for the milling units limits the size of the FPDs[16].

Additive technique (by applying material on die): Here in this technique Alumina or Zirconia is dry pressed on the die and the temperature is raised to a temperature similar to the presintering state. At this stage, enlarged and porous coping is stable. Its outer surface are milled to the desired shape and coping, removed from die, and sintered into the furnace for firing to full sintering.

Solid free form fabrication: This category includes new technologies originating from the area of Rapid Prototyping (RP) which have been adapted to the needs of dental technology.

Rapid Prototyping Techniques

i) Stereolithography ii) Selective Laser Sintering (SLS) iii) 3-D Printing iv) Fused Deposition Modeling (FDM) v) Solid Ground Curing vi) Laminated Object Manufacturing (LOM)[10,16].

Stereolithography (Perfactory, Delta Med, Frieberg, Germany): It is the technique for creating 3 dimensional objects in which a computer controlled moving laser beam is used to build up the required structure layer by layer [10]. Occlusal splints and diagnostic templates for oral implantology can be produced with this technique[16]. herence tomography (OCT)[16].

Selective laser sintering: Starts by converting the CAD data in series of layer. These layers are transferred to the additive SLS machine which begins to lay the first layer of powder. As the laser scans the surface, the material is heated and fuse together. Once the single layer formation is completed, the powder bed is lowered and the next layer of powder is rolled out smooth and subjected to laser. Hence layer by layer formation of the object takes place[10].

3-D printing: In which after computer-aided designing, the machine is used to build (Print) a wax pattern of the restoration. Then this wax pattern is cast similar to normal lost-wax technique. Advancement has taken place in such a way that instead of wax, resin-type material is being used to fabricate patterns[10,15].

Advantages of CAD-CAM technology[10,16].

i) Applications of new materials : High strength ceramics that are expected to be the new materials for FPDs frameworks have been difficult to process using conventional dental laboratory technologies.

ii) Time effectiveness: less time required for both patient and clinician

iii) Reduced labor, material cost & increase productivity

iv) Quality control

v) A digital impression with patients comfort

vi) Latest innovation in CAD/CAM system allows occlusion to be viewed and developed in dynamic state

vii) Precisely produced restoration

viii) Data transfer & archiving is easy.

Disadvantages of CAD-CAM technology[10,16].

i) It requires greater learning curve.

ii) Capital costs of these systems is very high and rapid large scale production of good quality restoration is necessary to achieve financial viability

iii) Some CAD/CAM system relies on margin capture for digitization, thus making subgingival margin capture challenging

iv) In case of multiple unit bridges, it is difficult to get the passive fit and repair it to get accurate margin. Although in metal-ceramic restoration, soldering can be done to prevent the development of strain

v) In angled type long-extension bridge, when milled in one piece might lead to strain development

vi) Optical image acquisition seems to be a trend for the future, but at present, there is a huge limitation on capturing images for multiple elements prosthesis

vii) As CAD/CAM is ever advancing technology, upgrades and updates are often required

viii) Matching the patient's tooth shade to the blocks of materials used to fabricate the restorations can be a challenge to the dentist initially[15].

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Conclusion

CAD/CAM system has opened up new possibilities in the field of dentistry. The clinician can scan the preparation, can design the restoration using software and finally can mill the restoration chairside or send the digital files to the dental laboratory for production. CAD/CAM system selection needs careful consideration of the scanning device and software, its versatility and flexibility, accuracy, and ease-of-use. When it is planned to use a laboratory for fabrication of the restorations, it is also helpful to discuss with the laboratory technicians. Usinga scanning system that also automatically provides for shade matching and intraoral imaging at the same time as scanning the preparation, adjacent teeth and opposing arch saves time and further streamlines the process. Regardless of whatever system is used, accurate image selection is essential. Finally, research and evidence of effectiveness of CAD/CAM dentistry will help shape the future of all clinical dentistry.

Disclosure

All the authors declared no competing interest.

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Case Report

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Clinical Management of Horizontal Root Fracture in Permanent Teeth: 72 month Follow up

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Abstract

The purpose of the present case report was to evaluate the prognosis after the treatment of traumatic teeth. Traumatic dental injuries are for the most part unanticipated events that, if not managed appropriately for the patient. The goal of treatment for traumatically injured teeth is to return the teeth to acceptable function and appearance. Different types of treatment were performed in different traumatic condition within same patient. Mineral Trioxide Aggregate (MTA) was used as a sealer for maximum possibilities of regeneration. Results of treatment have been shown that there was no mobility of teeth and no pathological sign in radiograph and clinically upto 30 month. So the future has more promise for even more successful management of traumatic dental injuries.

Key words

Mineral trioxide aggregate; Horizontal root fracture; Stem cell; Regeneration.

Introduction

Traumatic dental injuries are for the most part unanticipated events that, if not managed appropriately for the patient. When teeth and their supporting structure are subjected to impact trauma, the resultant injury manifests either as a separation or a crushing injury or a combination of both. Fractures of root have been called intra alveolar root fracture, horizontal root fractures and transverse root fracture. They do not occur often and may be difficult to detect[1].

Understanding the extent and the severity of a traumatic injury, planning for the management of the patient and predicting the result is a likely outcome. The goal of treatment for traumatically injured teeth is to return to acceptable function and appearance.

Normal function requires repositioning of the teeth if they were displaced. Acceptable appearance requires repair of possible and proper position of periodontal soft tissue[2,3]. It is more lucky that we have lot of stem cells present in periodontal tissue and pulp, those are able to re-differentiation and converted into formative cells[4]. Mineral Trioxide Aggregate (MTA) was originally formulated to provide the physical properties,setting requirements, and characteristics necessary for an ideal repair and medicament materials[5,6]. Studies on MTA reveal that if not only exhibits goods sealing ability, excellent long term prognosis, relative ease manipulation and good biocompatibility but far ours regeneration as well[6]. The histological reactions at the fracture line are categorized into four types:-

i) Interposition of calcified tissue (Callus formation)
ii) Interposition of connective tissue, which is characterized by peripheral rounding of the fracture's ends
iii) Interposition of bone and connective tissue, radiographically characterized by the clear separation of the two fragments
iv) Interposition of granulation tissue, caused by an infected or necrotic pulp[1].

This case report presents maxillary both central incisor and left lateral incisor with different types of traumatic injuries, which could be preserved. Clinically diagnosis and fellow up result was made using digital radiograph (RVG). Splint in mobile crown and MTA for initiated regeneration were used.

Case Report

A 28 years old patient presented with an Orthopantomograph (OPG) after motor bike accident with complained of bleeding from mouth. He was admitted into hospitalized due to other injuries. Intra oral examination revealed mobility on maxillary left central incisor, complicated crown fracture in right central incisor and

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left lateral incisor. Treatment could not start due to restriction of physical movement for 1week. After one week clinical diagnosis was made using digital radiograph (RVG). In radiograph showed that horizontal root fracture in maxillary left central and lateral incisor. In left central incisor, fracture line was involved cervical portion of root just beneath the alveolar crest with mobility of crown in intra oral examination. In left lateral incisor, fracture line was involved in mid root level without any mobility. Both fragments of fracture root canal wall were symmetrical in left central incisor rather than left lateral incisor. Mobile portion of the crown was reduction and splinted with the adjacent teeth under local anesthesia. Entire pulp tissue was removed from right and left central incisor. Pulp from the coronal fracture fragments was removed.

All teeth were irrigated with normal saline and $Ca(OH)_2$ used as intracanal medicaments for 7 days. Root canals were instrumented with Pro-taper. Working length were measured by digital radiographed. After 7 days of $Ca(OH)_2$ placement, all were removed by normal saline irrigation solution. Root canals were dry with paper point. Obturations of the canals were done by selected gp and MTA as sealer. Excessive MTA should not be allowed on the fracture line of coronal fragments in left lateral incisor. Fellow up visit had been given in 3 month interval. After 8 month functional splint was removed and radiograph had taken. Clinically there was no mobility in the teeth, asymptomatic and no pathological sign in radiographed. Even after 30 month there were no pathological sign in radiograph and asymptomat:

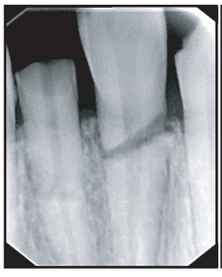

Figure 1 : Initial radiograph.

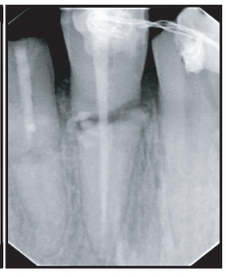

Figure 2 : Just after treatment

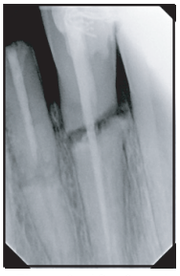

Figure 3 : After 3 weeks

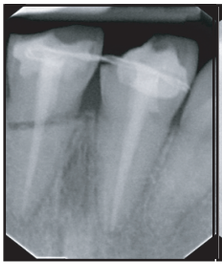

Figure 4 : After 8 month in both central incisor

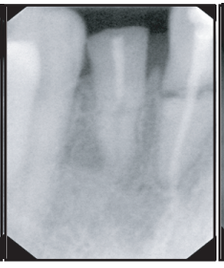

Figure 5 : After 8 month in left lateral. incisor

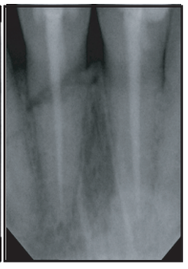

Figure 6 : After 30 month in both central incisor

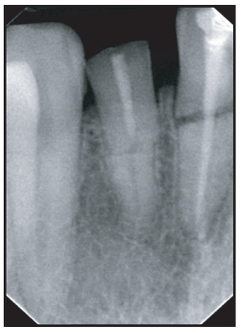

Figure 7 : After 30 months in left lateral incisor

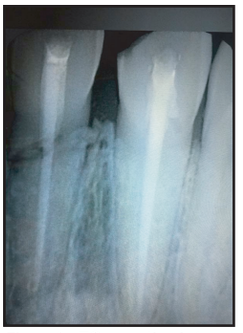

Figure 8 : 72 months later

Discussion

Compared to other dental traumas, root fracture are relatively uncommon. The frequency of root fractures in permanent teeth in only0.5% to 7%[1]. The prognosis of the teeth concerned is influenced by other factors, such as the patient age, stage of growth, mobility of the coronal fragment and diastasis of the fragments[1]. In a study with 208 root fracture, those located in the cervical third showed the worst prognosis.[7]However coronal root fracture of left central incisor was more challenged to successive result. But it has been good responses to treatment up to till.

The concept of early, prophylactic endodontic treatment practiced here in this cases differs from the treatment guideline published by International Association of Dental Traumatology (IADT).[8] The guideline recommends endodontic treatment only after pulpal necrosis, not as a prophylactic intervention. However, considering the patient in this study who were over 20 years old and a different approach was taken in this case.

Root- fractured teeth often possess a vital apical fragment, even when the coronal fragment should be endodontically treated. In this study, over- filled root canal filling material between the fragments did not lead to healing or lead to interposition of granulation tissue[9]. For this reason, root canal obturative materials were placed 1mm above the fracture line in left lateral incisor.

The use of root canal dressing with a $Ca(OH)_2$ between sessions was aimed to dissolved remaining pulpal debris, alkalinizing the environment and controlling periodontal bleeding. It was also preventing the granulation tissue formation like type iv healing reaction.

In the fallowing session, the root canal was obturated with MTA as a sealer and gp. MTA was used due to it is capable to activation of cementoblast and production of cementum[9]. It consistently allows for the overgrowth of cementum and also facilitates regeneration of the periodontal ligament.

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Conclusion

Dental traumatology has progressed in recent years to improve the understanding of the biological considerations involved in both diagnosis and treatment principles. Furthermore, improving the field of dental materials has been given the quality of treatment. As result th,e future has more promise for even more successful management of traumatic dental injuries.

Disclosure

All the authors declared no competing interest.

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