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Original Research

Assessment of bone grayscale values in patients with diabetes mellitus using CBCT

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ABSTRACT:
Background: Type 2 diabetes mellitus (T2DM) is a complex multifactorial disease affecting the length and quality of life. The present study was conducted to assess bone grayscale values in patients with diabetes mellitus. **Materials & Methods:** 56type II DM patients of both genders and equal number of age matched healthy control were enrolled. The diabetic status of the patient was determined in accordance with American Diabetes Mellitus Association. The CBCT scans of the patient was obtained. The cortical and cancellous bone quality was assessed in terms of Hounsfield Unit (HU) displayed by New Net Technologies (NNT) Software. **Results:** Out of 56 patients, males were 26 and females were 30. The mean cortical bone density in group I was 1283.2 HU and in group II was 1646.8 HU. The mean cancellous bone density in group I was 563.2 HU and in group II was 916.8 HU. The difference was significant ($P< 0.05$).**Conclusion:** Both cancellous and cortical bone density was lower in diabetes patients as compared to healthy subjects.
Key words: Cortical bone density, diabetes, Gray scale value

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a complex multifactorial disease affecting the length and quality of life of an affected individual. In the UK prevalence of diabetes is 3.66% or 2.3 million people diagnosed, consuming around 10% of total National Health Services resources annually.[1] Established macrovascular pathology is common at the time of diagnosis of T2DM, suggesting either latency in diagnosis and/or an atherogenic pre-diabetes state. It is estimated that, in 2006, some 194 million people worldwide, or 5.1% of the adult population, had diabetes.[2]T2DM is a progressive disorder accompanied by deterioration in β cell function and insulin resistance. Despite this, there is now clear evidence that tight control of blood glucose significantly reduces the risk of complications of diabetes.[3]

Bone quality and quantity during dental rehabilitation of patients in the anterior and posterior regions of jaws plays a key role in prognosis of the treatment. It is also associated with success and failure of implant treatment. Systemic diseases such as diabetes mellitus influence the bone quantity and quality of the jaws which is earlier well-documented in the literature.[4] The use of cone-beam computed tomography (CBCT) for bone density evaluation of these future implant sites in these patients may play an important role during their treatment planning. The stability of implants in these patients is also influenced by the site of placement of implant which may vary from the anterior or posterior maxillary and mandibular jaws.[5]The present study was conducted to assess bone grayscale values in patients with diabetes mellitus.

MATERIALS & METHODS

The present study comprised of 56type II DM patients of both genders. Equal number of age matched healthy control was also enrolled. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. Patients (DM) was kept in group I and control in group II. The diabetic status of the patient was determined in accordance with American Diabetes Mellitus Association where HbA1C values

determined the collective glycemic history of the preceding 3 months of the patient. The CBCT scans of the patient was obtained. The cortical and cancellous bone quality was assessed in terms of Hounsfield Unit (HU) displayed by New Net Technologies (NNT) Software. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 56		
Gender	**Males**	**Females**
Number	26	30

Table I shows that out of 56 patients, males were 26 and females were 30.

Table II Cortical bone density in both groups

Cortical bone density	Mean (HU)	P value
Group I	1283.2	0.05
Group II	1646.8	

Table II, graph I shows that mean cortical bone density in group I was 1283.2 HU and in group II was 1646.8 HU. The difference was significant (P< 0.05).

Graph I Cortical bone density in both groups

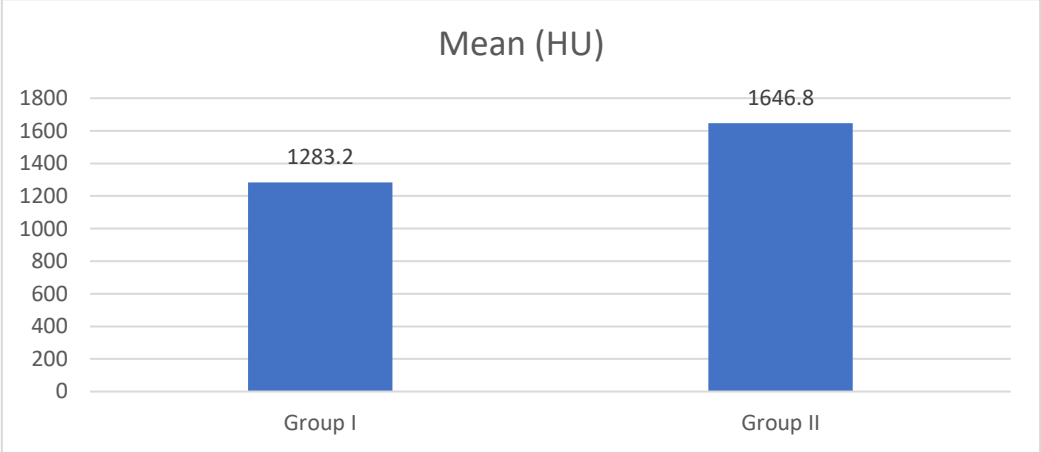
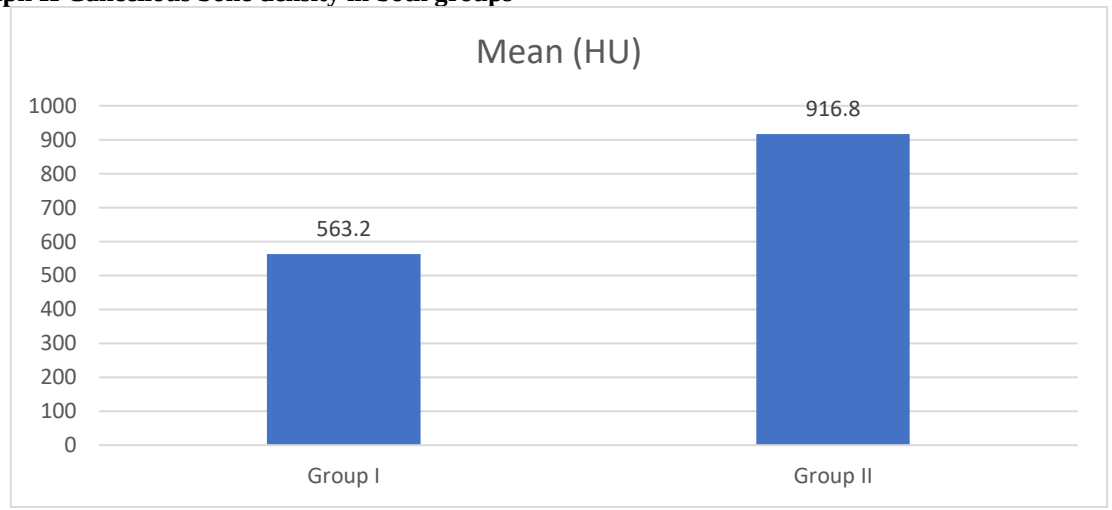


Table III Cancellous bone density in both groups

Cancellous bone density	Mean (HU)	P value
Group I	563.2	0.01
Group II	916.8	

Table III, graph II shows that mean cancellous bone density in group I was 563.2 HU and in group II was 916.8 HU. The difference was significant (P< 0.05).

Graph II Cancellous bone density in both groups



DISCUSSION

Cone-beam computed tomography (CBCT) in maxillofacial imaging is increasingly replacing MSCT for evaluating mineralized structures as CBCT images are of adequate quality with lower radiation dose.[6] HU is used to evaluate the quality of bone at implant placement area, to control grafts and to diagnose lesions, anatomic structures, etc. In addition, CBCT has reduced cost and limited volume scanning of structures. This may be because of scattered radiation and enhancing noise in reconstructed images.[7]The present study was conducted to assess bone grayscale values in patients with diabetes mellitus.

We found that out of 56 patients, males were 26 and females were 30. Shalu R et al[8]established the role of cone-beam computed tomography (CBCT) using grayscale values in determining bone density in different jaw sites and in comparing the values in healthy with diabetic patients.Bone densities in 322 possible implant sites in healthy and diabetic patients were evaluated using NewTomGiano CBCT machine. Cross-sections obtained were assessed for bone densities in terms of Hounsfield Unit on different sites using New Net Technologies software version 6.1.Age-wise cortical and cancellous bone densities were compared and no statistical significance was obtained. Gender-wise bone density was compared and significant results were found in males. Jaw-wise bone density was compared and was found to be significantly high in the mandible. The mean cortical bone density in control group was 1608.572 (±380.36), whereas in diabetic group was 1395.368 (±296.97), and the mean cancellous bone density in control was 906.918 (±185.40) and in diabetic was 559.868 (±128.16). Teeth wise in cortical bone significant values were found at premolar region (P = 0.046) and in cancellous bone significant values were found at canine and premolar region (P = 0.012) and highly significant values were found at molar region (P = 0.001).CBCT unveils a distinct pattern of cortical and cancellous bone density. A high degree of concordance between different regions of the mouth in cortical and cancellous bones was obtained in different study groups. CBCT could be used for bone density analysis.

The mean cortical bone density in group I was 1283.2 HU and in group II was 1646.8 HU. The mean cancellous bone density in group I was 563.2 HU and in group II was 916.8 HU. Nemtoi etal[9] found a significant inverse relationship between bone mineral density and HbA1c. The authors concluded that the bone mineral density of cortical and cancellous bone decreased with an increase in HbA1c values in diabetics. In another study by Nevins etal[10], it was observed that the bone-implant contact was significantly reduced for diabetic compared with control animals, but the quantity of bone formation was similar.

Cassetta et al[11] found higher values of thickness and density in males than females, with a statistically significant difference ($P \leq 0.05$). On the other hand, dissimilar results were found by Lee etal[12] who found in their study that even cancellous bone density is more in males than females.

CONCLUSION

Authors found that both cancellous and cortical bone density was lower in diabetes patients as compared to healthy subjects.

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