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3D indexing in gastrointestinal disorders: exploring the unrevealed avenue

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Introduction

Bowel disorders don't discriminate. They affect people of all ages, gender and demographics. Bad digestion is the root of all evil. Gastrointestinal disorders basically involves various parts of gastrointestinal system be it small or large intestine. Among various GI disorders prevalence of inflammatory bowel diseases has increased remarkably probably due to increase consumption of junk food. Across asia there is remarkable increase in incidence and prevalence of IBD (particularly in East Asia).[1]Inflammatory bowel diseases (IBD), including Crohn's disease (CD) and ulcerative colitis (UC), are chronic inflammatory diseases with primary intestinal (large and small intestine) involvement. Although the exact underlying pathogenesis of IBD has not been clearly elucidated, it is postulated that dysregulated immunity is its basis. It is multifactorial disease in which immune system, genetics, and environmental factors all have a role. In India, UC/CD ratio is 8 : 1.IBD patients may exhibit a wide range of non-intestinal signs and symptoms known as extra intestinal manifestations (EIMs), with prevalence rates ranging from 6%-47%.[2]Approximately one third of IBD patients develop EIMs in the course of their disease involving joints, skin, eyes, oral cavity and the biliary tract .Patients with IBD may present with oral manifestations years before the appearance of intestinal disease and recognizing these patterns may assist physicians and other care givers in making a timely diagnosis of IBD while avoiding unnecessary workups.[3,4] Osteoporosis sometimes present as a initial sign of bowel

disease in otherwise asymptomatic patients, who then may be referred to a gastroenterologist for further evaluation and management. Osteoporosis occur due to malabsorption and maldigestion (celiac disease, postgastrectomy, short gut pancreatic insufficiency),Inflammatory bowel disease (IBD; Crohn's disease [CD] and ulcerative colitis) ,Chronic liver disease (cholestatic and hepatocellular disease ,Secondary to therapy for GI disease (liver and small bowel transplant, total parenteral nutrition, gastric bypass, or medications such as proton pump inhibitors [PPIs] in gastroesophageal reflux disease [GERD] patients).

For assessment of bony changes dual energy X ray absorptiometry is a gold standard test , however high cost and longer scanning time (10-15 mins) as well as inability to measure bone microarchitecture further high-resolution CT Scans are required for the detection of the etiology of osteoporosis. CBCT here offers a good opportunity to measure microarchitecture of bone at less radiation doses.[6] Considering the benefits of CBCT in mind we planned a study with the aim to assess the oral findings and correlate BMI (Body Mass Index) with various radio morphometric indices as a possible indicator of osteoporosis in Inflammatory Bowel Disease patients

Materials and methods

CBCT scans of 28 registered endoscopically proven cases of inflammatory bowel disease (Crohn's and ulcerative colitis) are taken from archives which serves the case group. CBCT scans of 28 age and gender matched controls were taken. Both cases and control group were telephone interviewed and subjects with history of anemia, diabetes mellitus, radiotherapy, alcohol consumption, corticosteroid medication, hyperthyroidism and smoking were excluded. Those subjects which fulfills the inclusion criteria were recalled and clinical history (previous episodes of apthous ulcers, rheumatic arthritis) and drug history were recorded. As (BMI; <22 kg/m^2) has been shown to be frequently associated with low bone mineral density (BMD) [5,BMI] for each subject was recorded. Various measurements were performed on CBCT scans by using modified Ledgerton's Classification .The antegonial index(AI) ,mental index(MI) ,panoramic mandibular index (PMI) and MCI values were measured in right and left mandible of patients with IBD and healthy controls on CBCT scans. MCI (mandibular cortical index) was also assessed and subjects are divided into three classes Class I the endosteal margin of cortex is even and sharp on both sides ,Class II the endosteal margin show semilunar defects or seem to form endosteal cortical residues on one or both sides , Class III the cortical layer forms heavy endosteal residues and is clearly porous.[7] Cervical vertebrae(C1 right ,left ,C2 and dens)were also assessed using innovative approach described by Imad Barngkgei et al as a marker of osteoporotic changes associated with inflammatory bowel disease.[8] The data were analyzed using SPSS statistical software version (17). Pearson's correlation coefficient test was done to assess correlation of body mass index with first Cervical Vertebrae right and left, second Cervical Vertebrae and dens in both cases and controls

Results

After thorough clinical examination of both cases and control group oral signs in form of apthous ulceration were seen in sixteen cases (figure 1) and four controls and cobblestone appearance of lower labial mucosa(figure 2) was also found in one out of twenty eight cases (TABLE 1).Joint pain present as in nineteen cases and five controls.(TABLE 2)

Pearson's correlation show significant correlation with body mass index with a Pearson's correlation 0.046 and 0.047 with respect to C1 left and dens respectively (Graph 1). Graph 2 and Graph 3 represent values of various

indices in both cases and controls which shows marked differences.

Discussion

Ulcerative colitis and Crohn's disease are the most common forms of inflammatory bowel disease (IBD), both of unknown aetiology.[1] These conditions are characterized by the chronic and recurrent inflammation of different parts of the gastrointestinal tract, but while in CD, chronic inflammation may affect any part of the gastrointestinal tract, in UC, mucosal inflammatory changes are confined to the colon.[2,9] IBD is currently on the increase, and it is important for the dental professional to be familiar with the condition as patients with IBD may present oral manifestations of the underlying disease.[10] Such manifestations of IBD may precede the onset of intestinal radiographic lesions by as much as a year, or even more.IBD is associated with various oral manifestations (Table 3) be it specific or non specific.[11,12]

The study also reveals various oral findings associated with inflammatory bowel disease depicting importance of thorough clinical examination. In past X rays "**The Naked Truth & the Shadow of Doubt"** by means of CBCT have been used for 3 D indexing in menopausal women and renal failure patients. F Caglyan et al have done a study with the aim to evaluate mandibular cortical indices, mandibular canal diameter, pulp chamber size ,pulp calcification ,lamina dura loss and soft tissue calcifications in the persons suffering from chronic renal failure and found a significant difference between MCI (mandibular cortical index) in study and control group where 26.7% of cases falls under class III of MCI.[7] According to Imad Barngkgei et al cervical vertebrae CBCT-derived RD values can also serve as an important tool for assessing status of osteoporosis with use of the associated CBCT-viewer program.[8] As osteoporosis sometimes present as a initial sign of bowel disease in otherwise asymptomatic patients, due to malabsorption and maldigestion (celiac disease, postgastrectomy, short gut pancreatic insufficiency) ,Inflammatory bowel disease (IBD; Crohn's disease [CD] and ulcerative colitis) ,Chronic liver disease (cholestatic and hepatocellular disease ,Secondary to therapy for GI disease (liver and small bowel transplant, total parenteral nutrition, gastric bypass, or medications such as proton pump inhibitors [PPIs] in gastroesophageal reflux disease [GERD] patients) can lead to various osteoporotic and bony changes in the jaws. So in order to explore the association between osteoporosis and gastrointestinal disease by virtue of usage of CBCT, present study was planned and various radiomorphometric indices were assessed. Study reveals significant differences for various radiomorphometric indices and CBCT derived radiodensity values between cases and controls , highlighting important role of CBCT in assessing bony changes.

So, by implementing the assessment of various radiomorphometric indices by using CBCT in daily routine osteoporotic risk group can be easily identified and patient can be directed for proper treatment.

Patients with IBD are at increased risk of developing dental caries and oral infections. The causes of the increased incidence are multiple, but they appear to be related to either the patient's altered immune status or to diet. It is also important to recognize the risk of adrenal gland suppression in patients receiving corticosteroids to manage their IBD. It may be necessary to augment the steroid regimen during some dental treatments, especially for anxious patients in whom preoperative, postoperative pain management is difficult or when a complicated or stressful procedure is anticipated. Oral inflammatory and granulomatous lesions associated with IBD may respond to topical steroid therapy but should not be used

indefinitely due to the risk of mucosal atrophy and systemic absorption.

Dental management of patients with IBD should include the following: 1) Frequent preventive and routine dental care to prevent destruction of hard and soft tissue. 2) Evaluation of hypothalamic/pituitary/adrenal cortical function to determine the patient's ability to undergo extensive dental procedures.3) Avoid prescribing non-steroidal anti-inflammatory drugs (NSAID), as they can trigger a flare-up. The use of paracetamol is recommended, although it can also adversely affect patients. 4) Early diagnosis and treatment of oral infections to enhance the gastroenterologist's ability to manage the IBD. Diagnosis (biopsy if necessary) and treatment of oral inflammatory, infectious, or granulomatous oral lesions Early diagnosis guide in proper treatment planning and avoid unnecessay complications.

Conclusion

With an attempt "To explore further and Treat better" oral diagnostician awareness of signs and symptoms appearing on CBCT of gastrointestinal disease can help in proper diagnosis, overall health and treatment of patient. CBCT can be used as a valuable diagnostic tool for evaluation of osseous findings, allows indices measurement in three dimensions without superimposition.

Recommendations: Larger sample size is required to ensure generalizability of results.

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site of involvement in patients with inflammatory bowel disease. Oral Dis. 2003;9:34-40.

Legend Tables and Figures

Table 1: Frequency and percentage of cases and controls showing presence of oral apthous ulcers and cobblestone appearance of oral mucosa.

	Cases		controls	
	Frequency	Percent	Frequency	Percent
Absent	11	39.3	24	85.71
Apthous ulcers	16	57.14	4	14.28
Cobblestone	1	3.5	0	0
total	17	100	28	100

Table 2:- Frequency and percentage of cases and controls with joint pain.

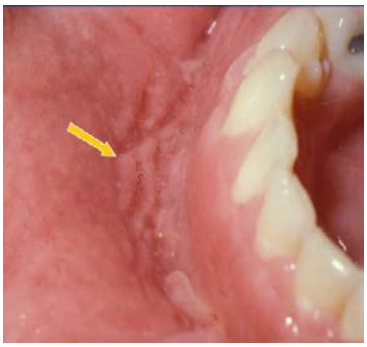
	Cases		Controls	
Joint pain	Frequency	Percent	Frequency	Percent
Absent	9	32.1	23	82.1
Present	19	67.9	5	17.9
Total	28	100.0	28	100.0

Table 3: Oral manifestations of IBD (Inflammatory Bowel Disease)

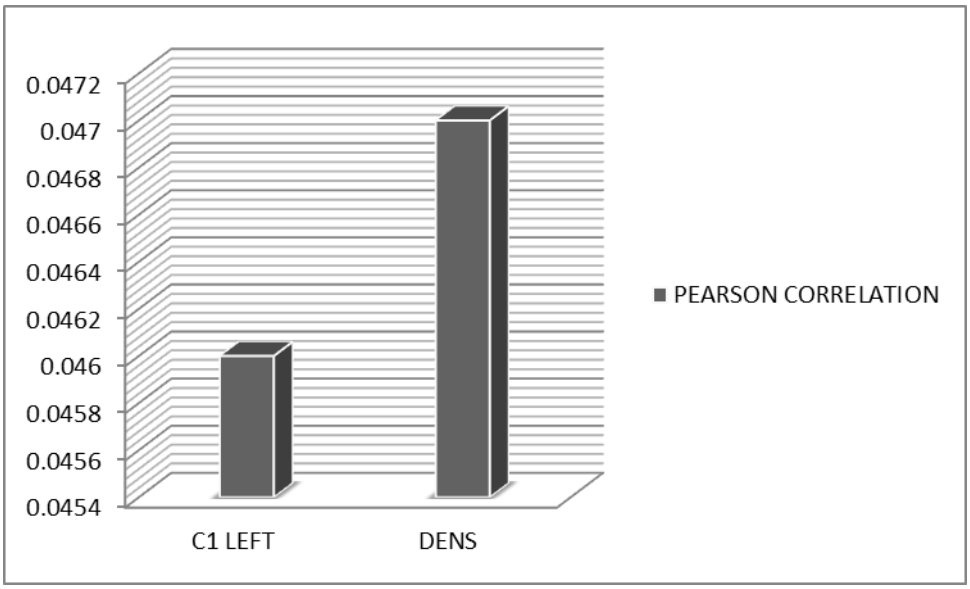
Oral lesions in IBD	
Specific	Orofacial granulomatosis Cobblestoning Mucosal tags Deep ,linear ulcers with hyperplastic folds Pyostomatitis vegetans
Nonspecific	Apthous ulcers Angular chelitis Labial/facial edema Gingivitis Gingival erythema/edema

Figure 1: Apthous ulcer on lower labial mucosa

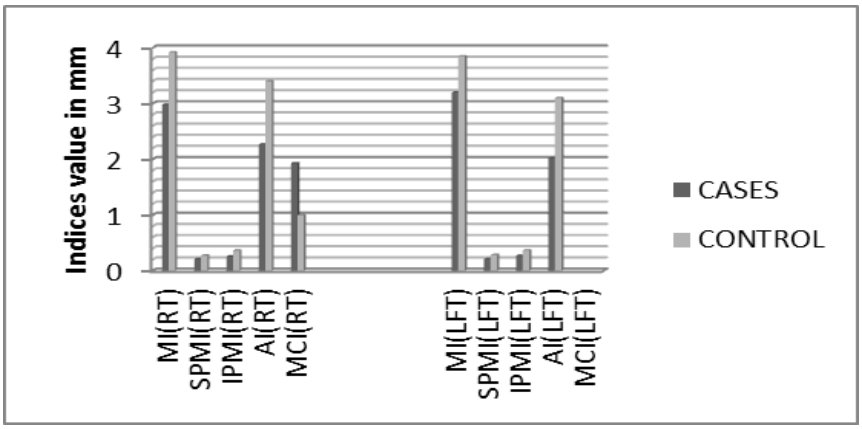
Figure 2: Cobblestone appearance on lower labial mucosa



Graph 1: Pearson's correlation of body mass index with respect to C1 left and dens respectively



Graph 2: Values of various indices MI (Mental Index) ,IPMI (Inferior Panoramic Mandibular Index) , SPMI (Superior Panoramic Mandibular Index) ,MCI (Mandibular Cortical Index) ,AI (Antegonial Index) in both cases and controls.



Graph 3: Values of radiodensity as recorded on first Cervical Vertebrae right and left , second Cervical Vertebrae and dens in both cases and controls using innovative approach described by Imad Barngkgei et al .