Temporomandibular Joint Assessment in Relation to Serology and Disease Activity in Rheumatoid Arthritis Patients using Cone Beam Computed Tomography

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بسم الله الرحمن الرحيم

" يَرْفَعِ اللَّهُ الَّذِينَ أَمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ "

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Dedication

To the soul of my Mother

Who will live forever in my heart.

May ALLAH gather me with here in his paradise.

To my Father

Who is the candle that lights my life.

To my great brothers and sister

Wael, Ahmad and Noha

Who are always my supportive and best friends in this life.

To my beloved wife Sarah

Who is the rose of my life

To my great son and sweet daughters

The best gifts from ALLAH

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Abbreviation	Mean
2D	Two dimensional
3D	Three dimensional
ACCP	Anti-cyclic citrolinated peptides
CBCT	Cone Beam Computed Tomography
CRP	C-reactive protein
CT	Computed Tomography
DICOM	Direct information and communication in medicine
DJD	Degenerative Joint Disease
ESR	Erythrocyte sedimentation rate
ID	Internal Derangements
LPM	Lateral pterygoid muscle
MFPD	Myofacial Pain Disorder
MRI	Magnetic Resonance Imaging
OA	Osteoarthritis
RA	Rheumatoid arthritis
RF	Rheumatoid factor
TMD	Temporomandibular disorder
TMJ	Temporomandibular Joint
TPA	Temporal posterior attachment

Introduction

Rheumatoid arthritis (RA) is a chronic, systemic, inflammatory disorder of unknown etiology that primarily involves the joints but can also cause multiple extra-articular manifestations. RA is one of the most common autoimmune diseases, affecting 1–1.5% of the population worldwide. It is characterized by persistent synovitis, systemic inflammation, and autoantibodies (particularly to rheumatoid factor and citrullinated peptide). The hallmark feature of the disease is persistent polyarthritis (synovitis) that may affect many synovial joints.[(1)]

Inflammatory arthritis in RA is usually associated with an elevated erythrocyte sedimentation rate (ESR) and/or C-reactive protein (CRP) that correlates with disease activity. However, baseline ESR and CRP do not discriminate well between RA and non-RA, and do not predict persistent (erosive) disease.[(2)]

Rheumatoid factor (RF) is of high importance for the diagnosis of RA and the prediction of outcome. RF positivity is one of the seven ACR 1987 classification criteria for RA. The diagnostic value of the presence of RF has been studied for the classical latex fixation and Rose-Waaler agglutination assays, and also for the enzyme-linked immune-sorbent assays (ELISAs) for quantitative detection of RF iso-types IgG, IgA and IgM. IgM RF discriminates well between RA and non-RA conditions and predicts persistent disease.[(2)]

The discovery of artificial cyclic citrullinated peptides mimicking RA-specific epitopes paved the way for the development of readily available immunological tests. Anti-cyclic citrullinated peptides (ACCP) antibodies are as sensitive as, but more specific than, RF iso-types for diagnosing RA and can also be found in RF-negative RA patients.[(2)]

Most recent studies have clearly shown the excellent diagnostic performance regarding diagnostic sensitivity, and specificity of ACCP. However, reported diagnostic sensitivities and specificities ranged from 39% to 94% and 81% to 100%, respectively. [(2)]

Multiple studies confirmed the association of ACCP antibodies with radiographic progression in RA. ACCP occur in RA susceptible healthy individual's years prior to disease onset and can predict disease development. In contrast, the usefulness of ACCP for monitoring RA patients: particularly during treatment, as well as their relation to disease activity still remains a controversial issue.[(2)]

The "Disease Activity Score" (DAS) is a combined index that has been developed in Nijmegen in the eighties to measure the disease activity in patients with (RA). It has been extensively validated for its use in clinical trials in combination with the European League Against Rheumatism (EULAR) response criteria. Its easy use makes it also possible to collect valuable

information about the disease activity of any patient in daily clinical practice .[3]

Evaluation of response to a treatment can be made much easier and more objective using the DAS or DAS28 by assessing the number of swollen and tender joints and measuring the ESR. The DAS will then provide a number between 0 and 10, indicating how active the RA is at this moment.[4]

Joints affected include involvement of the hands, elbow, shoulder, upper cervical vertebrae (atlantoaxial articulation), knee, the ankle joint (tibial-talar articulation), and the hip.[5]

The temporomandibular joint (TMJ) is one of the least joints affected as it may be affected in about 10 % of RA cases. TMJ involvement is especially important in RA as these conditions may lead to severe disability.[6]

Conventional radiographic TMJ projections like transpharyngeal, transcranial, panoramic radiograph, conventional tomographic sections of TMJ may be adequate in a number of clinical situations. However, there are bony alterations that occur in these disorders like erosions, osteophytes, pneumatization of articular eminence that are difficult to be detected using conventional radiographs due to overlapping of the anatomic structures. This warrants the use of advanced imaging modalities like Magnetic Resonance Imaging (MRI), arthrography,

conventional Computed Tomography (CT) and Cone Beam Computed Tomography (CBCT).[7]

CBCT is an increment in the ever-expanding horizon of clinical CT technologies. The first prototype clinical CBCT scanner was used in 1982 at Mayo Clinic. The commercial CBCT scanners made their entry almost a decade after the initial adaptation for angiographic applications. Ever since several CBCT systems have evolved that have been extensively used in the field of medical clinical imaging.[7]

An important advantage of CBCT imaging of TMJ is that it allows accurate measurements of the volume and surface of the condyle. These measurements are extremely advantageous in clinical practice when treating patients with TMJ dysfunctions.[7]

None of the previous studies assessed the TMJs in RA patients in relation to RA serological studies or DAS. That's why we deemed it necessary to throw the light on the exact effect of disease activity and serological results on TMJs of RA patients.