

Section 3
Modern Day Diagnostic Imaging Techniques

Chapter 5
Temporomandibular Joint
MRI and CT Imaging

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ABSTRACT

Computerized Tomography (CT) and Magnetic Resonance (MR) imaging of the Temporomandibular Joint are often not a routine part of a dental patient's pain and clinical evaluation. As a result, the most poorly understood region within the masticatory system is the Temporomandibular Joint foundation. Unfortunately, patient care and occlusal management are often compromised because of a lack of insight into the relationship between the anatomy of the Temporomandibular Joints and the occlusion. This chapter's four distinct sections review the key concepts about the temporomandibular joint foundation anatomical structures, detail structurally intact and structurally altered temporomandibular joint anatomy, clarify how structurally altered Temporomandibular Joints influence occlusal function, and classify the stages of temporomandibular joint structural degeneration. The concept of joint-based malocclusion is explored with numerous temporomandibular joint foundation anomalous software renderings, and sample CT and MR images, which together illustrate in detail how soft tissue and bony abnormalities in a structurally altered Temporomandibular Joint, can create distortions in the occlusion. This chapter further addresses the specific requirements a clinician must technically master to perform a comprehensive CT or MR examination, and then concludes with a unique clinical case that illustrates several mandibular growth-related joint-based malocclusion changes analyzed with MRI and CT imaging. The presented young patient was then treated with TM Joint disc repositioning surgery and Orthodontics to overcome his functional and esthetic challenges.

INTRODUCTION

The dental profession relies heavily upon diagnostic imaging in the evaluation of pathology of the dentition, the alveolar structures, and the cephalometric skeleton. However, most dentists do not understand the importance of computerized tomography (CT) and magnetic resonance (MR) imaging of Temporomandibular Joint structures. There are several reasons why the TMJ is not a part of the screening evaluation of most dentists. The dental profession frequently views "TMJ" or "TMD" as a pain condition,

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and as a result, the structural basis of the TM Joint foundation in the development of malocclusion and facial skeletal distortion is not appreciated (Schellhas, Piper, & Omlie, 1990).

Studies suggest that a clinical diagnosis of “absence of TMD” is associated with a high incidence of internal derangements, while the clinical variable of TMJ pain may have no effect on the prevalence of differing MR imaged TM Joint internal derangements. Further, clinical diagnostic criteria have been unreliable in predicting the MR imaged diagnosis of specific internal derangements (Emshoff et. al, 2002). Additionally, MR scans may be intimidating to dentists who are uncomfortable functioning in the medical arena, as dentists may not be oriented as to how and when to order these scans. Although CT is becoming more mainstream in the dental setting, dentists need guidance in knowing exactly how to generate and cut the CT, to maximize the diagnosis of the Temporomandibular Joint foundation. Therefore, the clinical value of careful scanning of joint structures oftentimes is not understood, because dentists still have questions as to what to do with the images and how to apply the findings to daily practice.

- **Both dentists and their patients must understand that the ultimate foundation for the dental occlusion is the Temporomandibular Joint itself, and it is this foundation that ultimately will determine whether occlusal management will remain predictable and stable.**

Medical radiologists also face difficulties in offering insight back to the dental profession about Temporomandibular Joint abnormalities. Medical doctors are not familiar with the clinical needs of the practicing dentist and therefore feel inadequate in their interpretation of the information contained in TMJ scans. Knowledge of normal TMJ anatomy, appearance on cross-sectional imaging, pathologic appearance, and therapeutic technique is important for a radiologist to assist in the diagnoses and ultimate management of patients with TMJ dysfunction (Pescavage-Thomas & Walker, 2014). Likewise, the vast amount of information that is present in MR and CT scans can be intimidating to dentists, whereby clinicians may fear missing a diagnosis beyond the TMJ. As a result, TMJ scans are either not generated or the diagnostic information is not utilized. Most importantly, the value of CT and MR images is not applied back to patient care. As is the case most often in medicine, specialists drive the need for diagnostic imaging in clinical management, such that the radiologist then learns to function in unison with the specialist. This chapter covers the essential skills for dental and medical professionals to be able to utilize TMJ imaging to better serve the needs of patients. This teamwork between specialists serves to enhance communication of findings for the benefit of the patient.

- **For CT and MR scans to enter the mainstream of dentistry, it is the responsibility of the twenty-first century dentist to know why scans are needed and how the diagnostic information in the scans is vital to their clinical practice. It is only logical that dentists own the responsibility for maximizing scan technology. This chapter is a starting point for dentists and radiologists to address their shortfalls.**

Four Sections are included:

1. **Section One** reviews the key concepts about the Temporomandibular Joint foundation that must be mastered in both CT and MR scan diagnosis. This starts with defining the normal anatomy of the TM Joint foundation. The focus of this section outlines the precise anatomical relationship between the disc and condylar head in the structurally intact TM Joint foundation.

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