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Dental Science

AN INDIGENOUS DEVICE FOR AUSCULTATION OF TEMPOROMANDIBULAR JOINT SOUNDS

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ABSTRACT Temporomandibular joint (TMJ) is a complex structure which is situated in base of the skull. It is made up of bones, cartilages, and various ligaments, muscular attachments. Diseases associated with this joint needs care full intervention. Diagnosis of TMJ diseases is a challenging aspect for a dentist. Patients suffering from TMJ diseases show a characteristic feature of joint sound or click sound. Diagnostic part involves examination and palpation of masticatory muscles and auscultation. Stethoscope is the widely used device of auscultation for detection of joint sounds. There are various commercial instruments like stethoscope, pressure algometers, sound/vibration detection devices, jaw tracking devices etc. for diagnosis of various TMJ disorders. However detection of joint sound alone will not be criteria for diagnosis. The studies conducted related to TMJ sounds cited that various range of sounds occurred in TMJ are reliable in diagnosing TMJ diseases. The sounds varied from excellent to poor. This article describes the fabrication of a simple modified stethoscope for auscultation of TMJ sounds using a new device called TMJ auscultator.

KEYWORDS : Temporomandibular Joint Disorders, TMJ Auscultation, TMJ Sounds

Introduction

The regular physical examination of the masticatory muscles and Temporomandibular joint (TMJ) involves thorough muscle palpation, palpation and auscultation for TMJ sounds, and measurement of mandibular range of motion. This assessment typically is performed by a trained examiner who uses palpation, a millimeter ruler and a stethoscope. However, clinicians sometimes use algometric devices, surface EMG recordings and joint sound-vibration detection amplification and electronic jaw tracking instruments to aid them in this diagnostic process.[1] According to several investigators, analysis of the acoustical signal can contribute to the differential diagnosis of TMJ pathology.[2]

The external auditory meatus (EAM) is the closest anatomically approachable structure to the TMJ, and the auditory canal has been shown to be more sensitive along with the surface of the skin when evaluating joint sounds.[3] Ogutcen-Toller M. (2003) did sound analysis of temporomandibular joint internal derangements with phonographic recordings. [4] We evaluated the fabrication of a simple instrument for auscultation of temporomandibular joint (TMJ) sounds from a stethoscope. Joint sound is one of the characteristic features of TMJ disorders for many patients.

Materials and methods

The Stethoscope: It consists of diaphragm chest piece with membrane, Y-tubing and ear pieces. The stiffer the membrane, the higher is its natural frequency of oscillation and the more efficient it is at higher frequencies. It also gives resonance to the bell and the resonance of the bell amplifies the joint sound. Reflected waves in the tubing may amplify sounds.

Procedure

Two stethoscopes were obtained (Microtone; M. R. surgical co. India) [Fig.1] and the two hollow 'T' junctions were fabricated with stainless steel tubes [Fig.2]. At one end of the two 'T' junctions were connected to ear piece tubes attached to 'Y' tubing of stethoscope. Ear plugs were attached to the second end of the 'T' junction, which will be inserted in patient's external auditory meatus [Fig.3]. The two diaphragms of stethoscopes were connected the projection of the 'T' junction. The diaphragms were connected in such way that they will be touching the skin over TMJ firmly without operator's support. The Y tubing of both stethoscopes were connected at both ends to form a single complete TMJ auscultator. [Fig.4]. The ear plugs are oriented into the patient's external auditory meatus with the diaphragms held against the skin over the TMJ.

Discussion

Internal derangements of the TMJ seem to be common in asymptomatic volunteers. A clinical suspicion of their presence might be suggested by joint noise, deviation on opening, and/or a history of locking. The etiology of internal derangement is presently unknown [5]. The point at which a jaw joint develops abnormal anatomy is also important. Muhl ZF et al [6] studied timing of temporomandibular joint sounds in orthodontic patients. The results of this investigation suggest that when audible joint noise appears, the joint may have been abnormal for some time. What is perceived as "clicking" is actually the result of disk deformity, or remodeling, which produces a mechanical interference to normal condylar movement. The importance of TMJ clicking is realized when its presence is associated with pain, and elimination requires a specific treatment. [7] Green et al [8] suggests that clicking does not progress to more serious dysfunction in two thirds of the patients surveyed. Brooke and Grainger's [9] followed up 94 patients with clicking TMJs not associated with pain and found per year would have pain. Yashida et al [10] studied TMJ vibration during opening and closing the mouth was measured by an accelerometer which has been accepted as a reliable method for measuring amplitudes of TMJ vibrations. Identification of individuals at risk or risk factors might be helpful to predict the individuals who may at a later date have pain and dysfunction.[11]

TMJ auscultator described in this article was designed in such way that the clicking sounds produced in TMJ can be captured from both external auditory meatus and skin over the TMJ. The sound wave from captured at two diaphragms of auscultator will be transferred to the operator's ear piece through vinyl tubing of the stethoscope. The TMJ auscultator was designed in such way that the right and left joint sounds can be heard separately. The sound wave from one side of earpiece and diaphragm can be blocked by rotating the 'T' tube. The complex structure of the TMJ auscultator helps to diagnose the various TMJ diseases associated with the disk derangements.[12]

Conclusion

Temporomandibular sound events are generally reliable and warrant their use in classifying and diagnosing patients with temporomandibular disorders. The various clicks occur during both vertical opening and closing appears to have a strong influence on the

production of temporomandibular sound events. Precise record keeping and careful risk management are essential. The TMJ auscultator invented and described here helps in diagnosis of the various TMJ diseases associated with clicking sounds.

Fig: 1. Microtone stethoscope

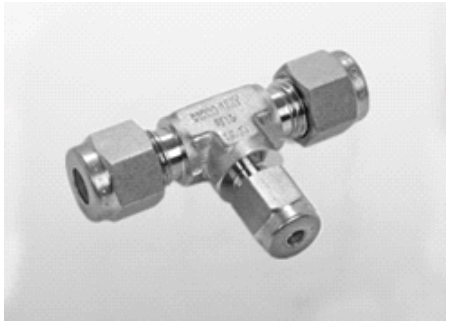

Fig: 2. Stainless steel 'T' junction tube

Fig: 3. The complex structure ear piece

Fig: 4. The TMJ auscultator

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