

A simple clinical innovation – The TMJ sound tracker

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Abstract

Temporomandibular joint is a hinge joint that connect our jaw to temporal bone of our skull, located anterior to the tragus of the ear. Disorders effecting tmj are called as temporomandibular disorders¹ They are a diverse, complex set of conditions that affect the temporomandibular joint and surrounding musculature. Symptoms include pain at rest or during function, limited range of motions and TMJ noises such as clicking, popping, and crepitus. In orthodontics we will come across a huge number of patients with TMJ disorders. So we need a simple and handy low expensive device to diagnose the sound produced by TMJ. This paper presents a simple easy device which can be used for tracking the TMJ sounds and which can be reproducible

Materials and method

Lavalier microphone, audio jack, android phone, plastic bottles, clay. Lavalier microphone is converted to earpiece and connected to the mobile to record tmj sounds

Results : we were able to record the clicking sounds and frequency produced by TMJ and which is reproducible.

Conclusion: This device can be used successfully used for diagnostic investigations

Keywords: Temporomandibular disorders, clicking, Temporomandibular joint

Introduction

Temporomandibular joint disorders(TMD) are heterogeneous group of pathologic condition affecting temporomandibular joint. They are characterized by facial jaw pain, clicking, crepitus, restricted mandibular movements and deviations. The most important feature is pain, followed by restricted mandibular movements, and noises from the TMJ during movement². Though this is not a life threatening disease it will effect the quality of life. It is considered as the most common cause of orofacial pain. Prevalence of TMD is reported from 10% to 76% percent with advancing age. Sounds that produced from TMJ are a due to dysfunction. single sound from joint is described as click or a pop and multiple irregular sounds are termed as crepitus. Each disorder in TMJ has a unique character in terms of sounds.

Different methods are available for the diagnosing TMD sounds, among those auscultation and palpitation were

common. Problem with these methods are they are not providing a diagnostic record, so that we can compare pretreatment and posttreatment sounds, which will helpful in prognostic values of TMD treatment. so our aim of the study is to develop a simple, cost effective device to record the TMJ sounds as a diagnostic record.

Technique

Materials include plastic bottle, rubber cap, sponge, modelling clay, lavalier microphone and a mobile application called android spectrum taken from play store. Lavalier microphone is a small microphone used for television, theatre and public speaking in order to allow for hand free operation. These miniature microphones are often supplied with a choice of push -on grilles of different length that provide gentle high frequency boost by forming a resonant cavity. A peak of approximately 6dB at 6-8KHZ is considered beneficial for compensating loss of clarity when chest mounted, as is a peak of a few decibels at 10-15KHZ when mounted in the hair above the forehead. This method of boosting high frequencies does not worsen noise performance, as electronic equalization would do. Lavalier microphone are of three different types, based on mechanism of producing electric signals. The three types of lavalier microphone are electromagnetic induction (dynamic microphones), capacitance change (condenser microphones), and piezoelectricity (piezoelectric microphones). Condenser microphone type is used in our study which is having a frequency response of 10-1800Hz and sensitivity of 54 dB³. We convert the microphone into an ear phone so that it can be placed inside the patients ear. Microphone is attached to the mouth of the plastic bottle, Plastic bottle is covered inside with modelling clay and sponge so that it will act as sound proof. Plastic bottle and the ear phone is connected in such a way that mouth of the bottle will cover the external ear completely and the ear piece will go

inside the ear. The lavalier was connected to a mobile application called android spectrum which can show the frequency of sound waves when TMJ clicks.

How tracker tracks?

Patient is asked to sit on a dental chair in relaxed posture. Audio jack is connected to the mobile application, lavalier ear phone is placed inside patient's ear and external ear is covered with mouth of bottle. Ask the patient to open the mouth to maximum opening and close in centric occlusion. When TMJ clicks the sound is tracked by the lavalier microphone and through audiojack, it is transferred to the mobile application. It will show in what frequency it clicks everytime. The quality of sound produced can be recorded and reproducible. Clinical trial done on 200 samples, individuals with clinking sound classified as symptomatic and individuals with no clinking classified as asymptomatic. Symptomatic patients showed highest frequency as 987 ± 6 , and lowest frequency of 203 ± 7 , asymptomatic patients showed a highest frequency of 18 ± 2 , and lowest as 56 ± 8 .

Fig .1



Fig:2

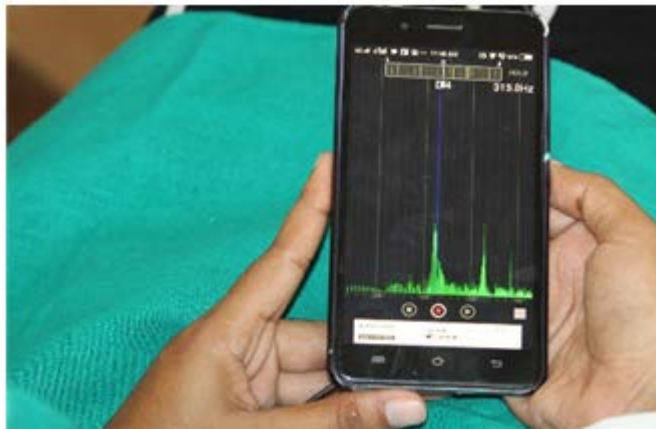


Fig. 3:



Fig:4



Conclusion

The TMJ sound tracker is very simple and easy to fabricate and cost effective device. This can be used as a simple chair side diagnostic tool for detection of TMJ sounds. This device consists of a highly sensitive lavalier

microphone, which can sense different types of joint sounds, which can be recorded and used for future analysis.

Clinical significance

- It can be used for routine diagnostic examination
- Educational purpose
- Field study purpose
- Diagnostic records

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