ABSTRACT
Aims: Training and teaching the students about the temporomandibular disorders (TMDs) and related sounds which can be used for its diagnosis is difficult for both teacher and students in terms of explanation and understanding. It is difficult for operator to explain about the condition of temporomandibular joint (TMJ) sounds in disease state and same way it is difficult to understand as patients. There is a need for a simple and handy device that can be used for teaching purpose in classrooms and institutional dental clinics and also for patients’ education and diagnosis. This paper presents a meek, easy to assemble, and economic electronic device to diagnose and record TMJ sounds. Temporomandibular joint (TMJ) disorders are very common in the current era due to stressful lifestyle and working environment. Some of them remain unnoticed and undiagnosed due to lack of patient motivation, education, and also due to lack of operators’ knowledge and skill to diagnose the same.

Students’ training and education also need reform and advancement in the field of TMDs. The paper explains about manufacturing of simple and handy device to diagnose and record TMJ sounds. The instrument can be used for teaching and training of students in teaching institutes and clinics. It can also be used for patient education purpose.

Keywords: Clicking, Temporomandibular disorders, Temporomandibular joint sound scout.


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INTRODUCTION
Temporomandibular disorder (TMD) is a multifactorial disorder that affects muscles of mastication, Temporomandibular joint (TMJ), and other associated structures. Temporomandibular disorder is also known as TMJ pain dysfunction syndrome, myofascial pain dysfunction syndrome, cranio mandibular dysfunction, and myofascial pain dysfunction.

The most important feature is pain, followed by restricted mandibular movements, and noises from the TMJs during jaw movement. Although, TMD is not life-threatening, it can affect quality of life. Usually people affected by TMD are between 20 and 40 years of age, and TMD is the second most frequent cause of orofacial pain after dental pain (i.e., toothache). Sounds from the TMJs are a symptom of dysfunction of these joints. Single sound from joint is described as a “click” or a “pop,” and when there are multiple, grating, irregular sounds they are termed as “crepitus” or “crepitation”. Each specific condition or disease in TMJ disorder has a unique characterization in terms of joint sound. Various instruments and devices were proposed for the detection of TMJ sounds.

Joint sounds have important role in diagnosing TMDs. Palpation and auscultations of TMJs are the two most common methods to diagnose the joint sounds. Pretreatment and posttreatment difference in frequency and intensity of joint sound can be of prognostic value in TMDs treatment. Auscultations can be done by extraauricular and intraauricular methods. Though joint sounds can be diagnosed with these conventional methods, they cannot be recorded and stored electronically as patient’s diagnostic record that can be used in future as and when required.

TECHNIQUE
The TMJ sound scout device is easy to fabricate and use. The device is made with condensing lavalier, a three-way wire, and a 3.5 mm audio jack.

Lavalier is an acoustic-to-electric transducer or sensor that converts sound into an electrical signal. Lavalier microphones are used in many applications, such as telephones, two-way radio conversations, motion picture production, public address systems for concert halls and public events, live and recorded audio engineering, megaphones, radio and television broadcasting, and in computers for recording voice, speech recognition, and
for nonacoustic purposes, such as ultrasonic checking or knock sensors.

Lavalier microphones are of three types based on their mechanism of producing electrical signals. The three types of lavalier microphones are electromagnetic induction (dynamic microphones), capacitance change (condenser microphones), and piezoelectricity (piezoelectric microphones).

Condensing-type lavalier was used in “TMJ sound scout device” (Fig. 1). The lavalier was connected to a 3.5 mm audio jack (Fig. 2) through a connecting wire. Electric soldering was done to connect wire with lavalier (Fig. 3). The line diagram of the device is presented in Figure 4. This device is used with any sound recording software which has feature of converting the sound into graphical representations.

Method to auscultate TMJ Sound using TMJ Sound Scout Device

The patient is asked to sit on dental chair without taking support of headrest. Connect the audio jack into insertion slot provided for the same on computer or laptop (Fig. 5). Run the software. Insert the lavalier end of the device into external auditory meatus of the patient (Fig. 6). Ask the patient to open the mouth up to maximum opening and close it till teeth are in centric occlusion. If there is TMJ sound present that will be sensed by highly sensitive lavalier microphone then the software will convert it into sound wave graphs (Fig. 7). The transformation of sound into visible graphical pattern is interesting and is most important part of the TMJ sound scout device. The quality of sound detected by device can be reheard and differentiated into pop or
crepitus. The sound sensed by the device can be stored in computer or laptop for future reference.

CONCLUSION

“The TMJ sound scout” device is very easy to fabricate and use. The practical of device is extended from students’ education for clinical examination. It is a very useful diagnostic tool for the detection of sounds in TMDs. This device gives more precise auscultation of joint sounds. This is easy to fabricate and must use device for every dentist for precise auscultation of TMJ joint. The TMJ sound scout device has highly sensitive lavalier microphone, which can sense different kinds of joint sounds. Its use with computer software gives quick visuals to appreciate the detected sound. The sound detected by the device can be stored in the laptop hard disk, mobile device, and other storage hardwares. The preoperative sound can be compared with postoperative joint sound.

This can be given to patients as their diagnosis records like radiographs.

CLINICAL SIGNIFICANCE

“The TMJ sound scout” device can be used for routine TMJ examination in dental clinics and dental institutions. Clinicians and students can easily fabricate it and confirm the presence or absence of the joint sounds during joint examination. The device can also be used for educational purposes in dental institutions. Students can easily understand the TMJ sounds and can differentiate among different types of joint sounds using this device. This device can be used for community-based research and/or field study purpose where full clinical setup is not available.

REFERENCES