Effectiveness Of Transcutaneous Electrical Nerve Stimulation (Tens) And Low-Level Laser Therapy (Llrt) On Post Operative Sequelae in Lower Third Molar Surgery -A Literature Review

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Abstract

Background. Spasticity is a factor that impairs the independent functional ability of stroke patients, and noninvasive methods such as electrical stimulation or taping have been reported to have antispastic effects. The purpose of this study was to investigate the effects of transcutaneous electrical nerve stimulation (TENS) combined with taping on spasticity, muscle strength, and gait ability in stroke patients.

Methods. From July to October 2020, 46 stroke patients with moderate spasticity in the plantar flexors participated and were randomly assigned to the TENS group () and the TENS+taping group (). All subjects performed a total of 30 sessions of functional training for 30 min/session, 5 days/week, for 6 weeks. For therapeutic exercise, sit-to-standing, indoor walking, and stair walking were performed for 10 min each. In addition, all participants in both groups received TENS stimulation around the peroneal nerve for 30 min before performing functional training. In the TENS+taping group, taping was additionally applied to the feet, ankles, and shin area after TENS, and the taping was replaced once a day. The composite spasticity score and handheld dynamometer measurements were used to assess the intensity of spasticity and muscle strength, respectively. Gait ability was measured using a 10 m walk test.

Results. The spasticity score and muscle strength were significantly improved in the TENS+taping group compared to those in the TENS group (). A significant improvement in gait speed was observed in the TENS+taping group relative to that in the TENS group ().

Conclusions. Thus, TENS combined with taping may be useful in improving spasticity, muscle strength, and gait ability in stroke patients. Based on these results, an additional application of taping could be used to enhance the antispastic effect of TENS or other electrical stimulation treatments in the clinic. A long-term follow-up study is needed to determine whether the spasticity relieving effect persists after taping is removed.

KeyWords: Effectiveness, Low, Level, Literature, Review.

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Introduction

Surgical removal of impacted mandibular third molar is the most commonly performed procedure in oral and maxillofacial surgery[1,2]Patients having tooth impaction are referred to an oral and maxillofacial surgeon for further management .The management involves interdisciplinary approach between orthodontists, dental surgeons and sometimes periodontists regarding management of impacted teeth [3]. The aim of the present article is to present the role of Low Level LASER therapy(LLRT) and Transcutaneous

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Electrical Nerve stimulation (TENS) in management of postoperative complications in third molar surgeries

Mead has defined an impacted tooth as "the tooth that is prevented from erupting into position because of malposition, lack of space, or other impediments"[4].

According to Peterson," impacted teeth are those teeth that fails to erupt into the dental arch within the expected time". [5] Farman in 2004 described that impacted teeth are those teeth that prevented from eruption due to a physical barrier within the path of eruption. [6]

According to Janakiraman et al, Impacted tooth is a tooth which is completely or partially unerupted and is positioned against another tooth, bone or soft tissue so that its further eruption is unlikely, describedaccording to its anatomic position[7]

Causes For Mandibular Third Molar Impactions

Many ideas have been presented to explain the high prevalence of mandibular third molar impaction. It has been proposed that the steady decline in the size of the human mandible/maxilla through time has resulted in smaller mandible/maxilla that can accommodate the corresponding molars, resulting in third molar impaction.[8].One theory suggest that insufficient development of the retromolar space leads to impaction of last erupted tooth.[9]The mandibular ramus grows by resorption at its anterior surface and deposition at its posterior surface, but any imbalance leads to lack of space for the mandibular third molars. [10]. The favorable route of eruption is critical in the mandibular third molar eruption. Impaction of mandibular third molars might occur as a result of a decrease in mandible angulation and an increase in mandibular plane angulation.[11]. Relationship between the root angulation and impaction angulated roots were studied by Yamaoka et al., shows that root angulation is more common in impacted mandibular third molars as compared to erupted mandibular third molars.[12]. It has also been discovered that the contemporary diet does not provide the appropriate effort in mastication, leading in a lack of jaw development stimulation and the modern man having impacted and unerupted teeth. Dietary habits, malposition of the tooth germ, hereditary factors, lack of sufficient eruption force for third molars, and the theory of phylogenetic regression of the jaw size - insufficient mesial movement of the dentition of modern humans due to a lack of interproximal attrition - are a few other important causes of third molar impactions. [13]

Pathological Changes Associated with Impacted Third Molars

The retained, unerupted mandibular third molars are associated with varied pathologies.

Dental caries

Dental caries may be present in impacted or partially erupted third molar or its adjacent second molar tooth. Nordenram et al suggest that .[14] dental caries accounts for 15% of third molar extractions. Few Research were conducted in prospective studies of occlusal caries in patients with asymptomatic third molars which reported and frequency of caries increase with an age and erupted third molars [15,16]

Pericoronitis and periodontitis

Studies have emphasized the association of pericoronitis and third molar impaction, which is still the main cause for removal of these teeth. The eruption process is also likely to cause minor gingivitis, where the symptoms may be similar to pericoronitis, and the lack of a good definition for this disease may lead researchers and clinicians to misclassify it. Still pericoronitis is undoubtedly the main problem faced by dentists when it comes to lower impacted third molars. [8,9]

Periodontitis has been found to affect 1% to 5% of the distal surface of the second molar. Periodontitis rises with age, regardless of the presence or absence of third molars, and so a greater frequency of periodontitis has been seen in older individuals in connection to impacted wisdom teeth. There has been no research linking periodontitis associated with impacted third molars to dental hygiene, which might be a complicating issue.[8,17]

Cysts and tumors associated with the tooth

Majority of Odontogenic cysts and tumors may be observed in patients with impacted third molars, like Odontogenic keratocyst, ameloblastoma, dentigerous cyst.[15]Histopathological examination of the accompanying soft tissue of asymptomatic impacted third molars may reveal cystic abnormalities, most typically in individuals over the age of 20. Stoelinga and Bronkhorst studied the occurrence, different presentations, and recurrence

of aggressive jaw cysts, as well as cyst malignant transformation.[18]

Root resorption

Studies have demonstrated that an untreated third molar can lead to the distal root of the second molar next to it resorbing. Additionally, several studies have shown a link between ageing and root resorption near the apex. These studies, which are retrospective in nature and were conducted in secondary care settings, do not, however, accurately reflect the prevalence of this issue in the general community.[9,19]

Other related pathologies

Cellulitis and osteomyelitis have been shown to develop at a 5% rate.[4,19]Occlusal interference, cheek biting, mastication difficulties, trismus, and temporomandibular joint disorders are also considered to be related to impacted third molars. These disorders and symptoms can induce misery and suffering, but their link to third molars is unclear due to a lack of supporting data in the literature.

2a(Iv)Classification

The Winter's classification for the impacted molar
Classification According to Winter G. B. Winter documented impaction types based on angulation—the inclination of the crown of an impacted third molar—concerning the angle formed between the long axes of the second and third lower molars.

1. Vertical impaction—the long axes of the second molar and the impacted third molar are parallel;
2. Mesioangular impaction—the long axes of the second molar and the impacted third molar are coincident docoronally
3. Distal-angular impaction—the long axes of the second molar and impacted third molar are convergent apically;
4. Horizontal impaction—the long axes of the second molar and impacted third molar are at right angles;
5. Buccolingual impaction—each tooth is oriented in a buccolingual direction;
6. Inverted impaction;

Classification by Pell and Gregory

Relation of the tooth to ramus of mandible and second molar
Class I: Sufficient amount of space for accommodation of the mesiodistal diameter of the crown of the third molar
Class II: The space between the ramus and distal side of second molar that is, less than the mesiodistal diameter of the third molar
Class III: All/most of the third molars is located within the ramus.[20]
Relative depth of the third molar in the bone
Position A: The highest portion of the tooth is on a level with/above the occlusal line
Position B: The highest portion of the tooth is below the occlusal plane, but above the cervical line of the second molar
Position C: The highest portion of the tooth below the cervical line of the second molar teeth in relation to the long axis of impacted second molar.

According to nature of overlying tissue

Soft tissue impaction
Partial bony impaction
Fully bony impaction.

War Lines

George Winter is said to have spent the most of his time researching the different situations and the simplest approach to remove impacted mandibular third teeth [21]. He proposed three imaginary lines that may be drawn on a typical intraoral radiograph to represent the tooth's angulation, depth in bone, and predicted difficulties in removal. These lines are known as Winter's lines, and they are color coded to assist debate. The first "white" line extends posteriorly over the third molar area and is drawn over the occlusal surfaces of the erupted mandibular molars. This line is utilized to determine the axial tilt of the impacted tooth since it is instantly visible.The second "amber" line runs from the distal surface of the bone to the third molar to the crest of the interdental septum between the first and second mandibular molars. It denotes the quantity of alveolar bone that surrounds the impacted tooth. The third, or "red," line is used to determine the depth of the impacted tooth within the mandible. It is a perpendicular lowered from the "amber" line to an imaginary elevator application point, which is commonly the cemento-enamel (CE) junction on the mesial surface of the impacted tooth (except in case of a disto-angular impaction where the point of elevation lies on the buccal aspect of the tooth)[22]

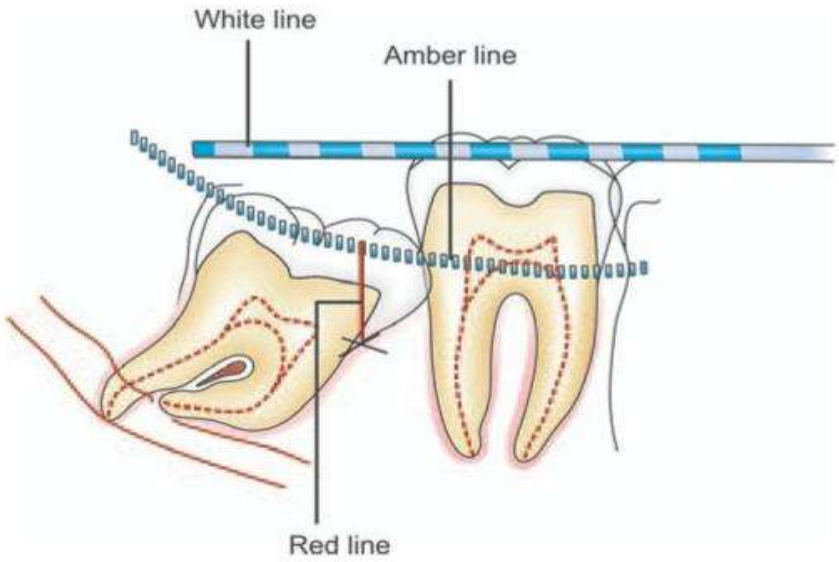

Figure 1: represents the WAR lines to represent the tooth's angulation, depth in bone, and predicted difficulties in removal of impacted third molar

Surgical extraction of impacted mandibular third molar and possible complications

For surgical removal of impacted mandibular third molars, there are two basic intraoral approaches: one through the sublingual area and the other buccally through the full mandibular thickness. Extraoral technique from the submandibular region is also available.[36-38]. Sublingual access necessitates the incision and elevation of a broad mucoperiosteal intrasulcular flap on the mandible's lingual side, in the molar and premolar areas. To reach the impacted tooth, the mylohyoid muscle attachment must be dissected. The buccal approach necessitates the elevation of a broad mucoperiosteal flap in the molar-premolar area. Under the apical region of the mandibular teeth, a thorough osteotomy is performed. However, there are several flap method variations, such as the envelope flap, two-sided flap, and comma shaped flap.[39]. In every case the third molar flap should provide adequate visualization of the surgical field.

After mucoperiosteal flap elevation excessive bone must be excised using 702/702 bur before third molar removal. In most cases there will be necessary to remove buccal and distal bone borders. In difficult cases the tooth should be sectioned with a fissure bur in a high-speed handpiece. The wound should be irrigated with a cool sterile physiologic saline solution. After tooth extraction using an elevator or forceps it is necessary to clean the operation area and to suture the wound without tension [40].

Multiple factors, including the operation, patient, and/or surgeon, impact the incidence and severity of adverse events associated with surgical procedures. There are two types of complications associated with mandibular third molar extraction: intraoperative and postoperative. [2]. Intraoperative complications are as follows: mandibular fracture, damage of adjacent teeth, tooth or tooth fragments displacement into soft tissues and bleeding. In cases if the excessive intraoral force was applied or/and part of bone was removed, risk of mandibular fracture or damage of adjacent teeth is increased [2,40]. Tooth or tooth fragments displacement into soft tissues can occur in case of wrong operation technique [41].

There is a lack of consensus among surgeons in the literature and in clinical practise concerning the postoperative reasons to reduce discomfort, edema, and trismus after surgical removal of impacted third molar, resulting in a variety of perioperative interventions ranging from premedication to alternative surgical procedures.[42-47]. 1% to 4% of patients are at risk of permanent injury [48]. Lingual nerve injury incidence was reported between 0.4% and 25%. Inferior alveolar nerve injury can cause paresthesia to complete numbness and/or pain [54] in the region of the skin of the mental area, the lower lip, mucous membranes, and the gingiva as far posteriorly as the second premolar [55]. Furthermore this commonly interferes with speech, eating, kissing, make-up application, shaving and drinking [56]. The injury

of the lingual nerve leads to numbness of the ipsilateral anterior two thirds of the tongue and taste disturbance [50].

Typical postoperative complications of lower third molar removal are pain, bleeding,swelling, bruising, trismus [57], dry socket, and surgical site infection [58].

Low Level Laser Therapy And Impaction

Mester et al[11]in 1971,concluded that low-level laser energy irradiation (LLEI) stimulates wound regeneration.From his work, laser therapy has been used for treating different syndromes and diseases, like dentin hypersensitivity,[12-16] temporomandibular joint disorders,[17-19] oral mucositis, [20,21] injury to the inferior alveolar nerve,[22]]and sagittal ramus osteotomy.[23].[24]

LLEI would also enhance the redox systems of the cells and increase adenosine triphosphate production, leading in the restoration of neuronal memories and the decrease of pain transmission. LLEI has also been demonstrated to increase collagen production by fibroblasts, blood circulation inside regenerated tissue, and mitotic activity in HeLa cells, as well as diminish immunological reactions.[26-28] The photochemical, photo electrical, and photo energetic biostimulations (primary biostimulation) and the effect on lymph vessels, with no adverse effects, also have claimed to be effects of LLEI.[29-32]Therefore, some researchers have claimed that LLEI lessens post-operative discomfort and edema and helps patients recover more quickly. The impact of LLEI on the most typical post-IMTM removal problems has also been investigated, with varying degrees of success. There is a lack of consensus among surgeons on the postoperative indications to reduce discomfort, edema, and trismus after IMTM surgical removal in the literature and in clinical practise, leading to a variety of perioperative treatments ranging from premedication to various surgical procedures.,[33-40] Because LLEI causes the lipid bilayers to adopt a more stable conformation and stabilizes the membranes of nerve cells, it has been found to have analgesic effects.

Tens And Impaction

Transcutaneous electrical nerve stimulation (TENS) and electro-acupuncture are examples of non-noxious stimulation that can produce analgesic benefits without creating adverse effects.(51) and is not subject to the first-pass effect. In addition to oral analgesics, electro-acupuncture(52,56) and TENS (47,48) have also been employed for pain relief because of these advantages.

These findings suggested that both because they showed that the combined stimuli had stronger analgesic effects than either non-noxious or noxious stimuli alone. TENS stimulate central processes, including descending pain-inhibitory pathways and endogenous opioids. There are numerous, unbiased accounts of TENS-related pain alleviation. (9,10-13,16-19),

Mechanism Of Action Of Tens

TENS is a non-pharmacological pain control method that employs surface electrodes placed on the skin to apply different frequency electrical currents to activate a complex neuronal network to reduce pain by activating descending inhibitory systems in the central nervous system to reduce hyperalgesia. This affordable, safe, and straightforward method can be used in conjunction with prescription drugs to relieve postoperative pain.(48,47).Previous reports show that TENS reduces pain through both peripheral and central mechanisms. TENS activates areas in the spinal cord and brainstem that use opioid, serotonin, and muscarinic receptors. Opioid and -2 noradrenergic receptors are implicated in TENS-induced analgesia at the site of application.(52).

Mechanism Of Action Of Low Level Laser Therapy

Through anti-inflammatory processes that suppress interleukin-6, monocyte chemotactic protein-1, interleukin-10, and tumor necrosis factor-a, LLLT generates cellular biostimulation, speeds tissue regeneration, improves wound healing, and lowers pain and swelling.2

But, because standardization of LLLT applications has not yet been established, clinical effects of LLLT might vary depending on each laser parameter (such as repeating sessions, application technique, application area, wavelength, irradiation period, and amount of energy).

Conclusion

To conclude, surgical removal of the third molar involves post operative pain, swelling and trismus. The steroids can be extremely beneficial, and have serious side effects. It's a good idea to understand

the benefits and risks of corticosteroids and replace them with TENS and LLRT which are cost effective and have no adverse effects.A well-designed clinical trial should be powered to find differences between LLLT and TENS in comparison with corticosteroids. A beneficial effect of LLLT and TENS ,detected, cost-effectiveness and minimal side effects. So, studies should be undertaken to determine whether it is advisable to use LLLT and TENS in patients undergoing surgical removal of impacted third molar

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