

Managing acute jaw trauma in the emergency and urgent care clinics

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Abstract

Chronic pain conditions constitute the primary reason for seeking healthcare, the development of related disability and addiction, and the highest driver of healthcare costs. Chronic temporomandibular, jaw and orofacial pain after acute jaw sprain/strain can be prevented if prompt and appropriate treatment in an emergency or urgent care clinic is provided using a jaw sprain/strain clinical protocol immediately after onset to begin the healing and recovery process. If pain does persist beyond a few weeks, a delayed-recovery protocol can be helpful. The rationale and strategies for both are discussed.

Introduction to Clinical Problem

Chronic pain conditions, including temporomandibular disorders (TMD), constitute the primary reason for seeking treatment, the highest driver of healthcare costs, and resulting disability and opioid overuse [1-8]. Acute jaw sprain/strain from jaw trauma, such as whiplash, blow to the jaw, and chewing strain, are common problems seen in emergency rooms (ER) or urgent care (UC) clinic that can lead to chronic TMD, jaw pain, orofacial pain, headaches and neck pain, if prompt and appropriate treatment is not provided by ER staff [9-18]. Three cases illustrate the dilemma that acute jaw sprain/ strain can present to ER and UC clinics (**Table 1**).

In each case, clinicians need to know how to appropriately manage these acute jaw problems with a protocol that will rapidly resolve the symptoms while preventing chronic pain and prolonged limitation of jaw function. A speed-to-treat Joint and Muscle Sprain/Strain (JAMSS) Protocol is recommended immediately after onset of pain to improve the potential for healing, resolution and prevent delayed recovery [19-21]. A Delayed-Recovery Protocol is recommended when the pain does not resolve within the first few weeks due to the presence of risk factors for chronic pain [22-23]. In this protocol, integrating patient training with evidence-based treatments will minimize transition to chronic pain. This paper presents the clinical indications, protocols, rationale, and outcomes for these protocols.

Background

Studies have found that jaw trauma from car accidents, falls, blows to the jaw, sports injuries, dental extractions, and many other injuries can result in acute strain to the masticatory muscles or sprain to the temporomandibular joints. The occurrence of such trauma leads to the onset of associated pain in the jaw, head and neck, along with limitation of jaw function [9-18]. For example, in one study of 164 patients with temporomandibular disorders, trauma was the initiating factor in 50.6% of cases, with 61% of these cases coming from trauma and strain during dental treatment [10]. Among young adult patients, another study found that 23% of all the cases presenting with jaw pain in this age group recalled its onset after third-molar extractions [11-13]. Other scenarios of trauma to the jaw that may cause JAMSS include motor vehicle accidents, intubation during general anesthesia,

yawning, blow to the jaw, dental care, or sustained hard chewing [14-18]. In each of these situations, rapid resolution of the acute pain after the original injury should be the primary focus for the ER physicians to encourage quick healing and maintain the patient's jaw function, quality of life, and comfort.

According to the Institute of Medicine (2011), the goal of preventing chronic pain is one of the highest priorities for health care [1-3] and particularly in the ER and UC clinics because treating chronic pain conditions costs more than cancer, heart disease, dementia, and diabetes [4-9]. One of such conditions that can lead to the development of chronic pain is temporomandibular disorders, affecting over 25% of the general population. While chronic pain developed from acute injuries can be prevented with the adoption of prompt and evidenced-based protocols for acute jaw and TMJ problems, this does not always occur. Most individuals with jaw pain at one month continue to report pain 5 years later despite treatment, with many of them routinely taking systemic medications and undergoing other treatments to manage their pain [24-31]. The lack of long-term success for jaw pain is often due to neglecting appropriate early treatment to encourage immediate healing, as well as the presence of risk factors that can delay recovery. These early steps should include adequate treatment of the injury and active training of patients to reduce risk factors that perpetuate chronic pain [32-35]. Instead, clinicians in the ER and UC often rely on analgesic medications such as opioids that, on one side, do not address the underlying condition and, on the other, can lead to addiction and dependency [36-41]. When pain becomes chronic, peripheral and central sensitization occurs due to the neuroplasticity of the nervous system, along with recruitment of additional agonist muscles [42-45]. Local tissues become more tender and sensitive to mechanical stimulation. As the pain progresses towards a chronic state, additional signs of sensitization including allodynia (sensitivity to normal touch) and hyperalgesia (increased pain with normal stimulation) tend to appear [42-45]. Additionally, initial painful symptoms can

expand to new areas, now including headaches, earaches, neck pain, TMJ dysfunction such as clicking and locking, and negative impact on a personal level [46-50]. Since TMJ, oral and facial structures are essential to eating, communication, and hearing and strongly influence appearance, self-esteem, and personal expression, chronic pain in this region can deeply affect an individual's functioning, quality of life, emotional status, and their dental care [39-53]. The patients also become increasingly difficult to manage long-term.

Clinical Implications

When trauma leads to jaw sprain/strain and TMD, any ER or UC doctor should treat it promptly on the same day to prevent development of chronic pain and long-term consequences. **Table 1** illustrates three cases seen in the ER and the treatment that was provided. In each case, adequate treatment was not provided to the patient and the pain persisted until full rehabilitation treatment was needed to heal the persistent jaw injuries and chronic pain.

Prompt successful treatment is important to prevent delayed recovery and chronic pain. Pain specialists in orofacial pain often see patients with chronic pain conditions that have progressed unnecessarily for months, increasing the complexity of management. When these patients have been successfully treated at the first sign of acute pain with the protocols described in this paper, chronic pain and long-term complications may be avoided. Thus, there is a need for well-defined protocols for successful early management of acute jaw pain effectively.

The speed-to-treat protocol for JAMSS has been developed to effectively and promptly address new-onset jaw pain and reduce the risk of development of chronic pain, limitation of jaw function, and long-term consequences. Acute sprain/strains can occur to joints and muscles throughout the body. Based on their severity, they can be categorized in first degree (slight muscle or ligamentous tear with mild pain and functional limitation), second degree (partial muscle

Table 1. Description of three cases involving trauma to the jaw. The H.E.A.L.S. protocol can be used in ER and UC in similar clinical cases to prevent the progression to chronic jaw pain

Case	Description	Clinical findings	Diagnosis	Treatment and outcomes
Case 1	A 32 year old male patient presented with recent onset symptoms of acute jaw pain, earache, and temple headache that began after a dental procedure in the previous week. Previous treatment included over the counter analgesics	Decreased incisal range of motion (distance between upper and lower front teeth edge) of 36 mm; tenderness upon palpation of the masseter, temporalis muscles and TMJ on the right side	A diagnosis of acute jaw muscle strain was confirmed by clinical exam	In each of these cases, the patients were ultimately treated by an Orofacial Pain specialist and a physical therapist. Rehabilitation treatment included an intra-oral stabilization appliance, physical therapy, and jaw self-care using the H.E.A.L.S. protocol. Each patient recovered from their TMD injuries after treatment.
Case 2	A 45 year old female patient with severe jaw pain and limited mandibular range of motion was seen in the ER months after a car accident.	Decreased incisal range of motion of 22 mm; tenderness upon palpation of the left masseter muscles and TMJ	A diagnosis of acute masseter contracture was confirmed by clinical exam	
Case 3	A patient presented to the ER with acute jaw pain after being struck in the jaw by the door.	Decreased incisal range of motion of 28 mm; tenderness upon palpation in the right TMJ and right masseter; swelling was noted	A diagnosis of acute TMJ sprain was confirmed by clinical exam	

ER: Emergency room; TMJ: Temporomandibular Joint; UC: Urgent Care

or ligament tear with blood clot formation, moderate pain, and functional impairment), or third degree (total separation of the muscle or ligament with severe pain, loss of function and stability), as outlined in **Table 2** [54-59]. Signs and symptoms in each category include progressively increasing pain, tenderness, swelling, limited range of motion, and functional loss.

One treatment strategy to encourage rapid healing of sprain/strain injuries in first- and second- degree injuries is to use the H.E.A.L.S. protocol including Heat/cold/massage, Exercise,

Analgesia, Lifestyle change, and Stress/ Strain reduction (**Figure 1**) [59]. The treatment of a third-degree injury requires a RICE Protocol including Rest, Ice, Compression, and Elevation. Although the RICE protocol [61] has historically been used to treat all types of sprain/strain injuries, recent research suggests the H.E.A.L.S. protocol is more successful in first and second-degree injuries such as case 1 and 2 [54-59]. However, RICE protocol is still the treatment of choice in third-degree injuries such as case 3 (**Table 3**). Studies have demonstrated that H.E.A.L.S. protocol during the first week

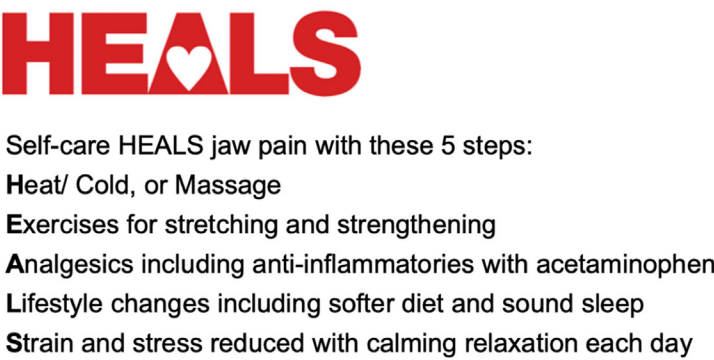


Figure 1. Speed-to-Treat JAMSS protocol for acute jaw sprain/strain using the H.E.A.L.S. strategy of movement, exercise, analgesia, and treatment.

Table 2. Comparison of different degrees of acute muscle sprain/strain.

	1 st degree	2 nd degree	3 rd degree
Injury	Slight muscle or ligamentous strain and subclinical fiber tearing	Partial muscle or ligament tear with blood clot formation and bruising	Total separation of the muscle or ligament with visible morphologic change
Pain	Mild	Moderate	Severe
Functional Limitation	Slight loss	Moderate loss	Severe loss

Table 3. Comparison of RICE versus H.E.A.L.S. protocols for acute muscle sprain/strain.

	H.E.A.L.S. protocol	RICE protocol
Type of injury	1 st and 2 nd degree	3 rd -degree
Characteristic	Mild to moderate tear or strain to muscle and/ or joints	Major tear of muscle and/or ligament
Pain level	Mild to moderate	Severe
Management	H.E.A.L.S.: Heat/cold/massage, Exercise, Analgesia, Lifestyle change, and Stress and Strain reduced	RICE: Rest, Ice, Compression, and Elevation
Timing	Same day	Weeks to month
Immune system response	Increased	Decreased
Blood flow to injured area	Increased	Decreased
Collagen formation in healing	Enhanced	Delayed
Speed to recovery and normal function	Rapid	Long term
Range of motion of muscles and joints	Quick return to normal	Compromised

after 1st or 2nd degree sprain/strain will encourage healing and return to normal function and activity levels compared to standard care [57-61]. This is especially true of jaw conditions due to the unique characteristics of the masticatory muscles and TMJ with regard to frequency of use of the jaw, the difficulty in resting the jaw, and its bilateral rotation and translation function [62-64].

Speed-to-Treat H.E.A.L.S. Protocol for JAMSS

To prevent chronic jaw pain, earaches, and temple headaches, and jaw dysfunction, a Speed- to-Treat JAMSS management strategy with the H.E.A.L.S. protocol is recommended as soon as possible and preferably on the same day by health professionals. By completing these steps, the potential for success in reducing pain and dysfunction at the acute stage can help prevent chronic pain [54-61]. Peripheral risk factors, such as oral parafunctional habits, muscle bracing, and overuse, continue to strain the jaw muscles and joints, resulting peripheral sensitization. Concomitantly, central risk factors, such as anxiety, depression, and sleep disturbance, act on the central nervous system in worsening pain perception, impairing pain modulation, and promoting the onset and maintenance of chronic pain. Restoration of normal function can be achieved with exercises that focus on stretching to restore normal range of motion. In addition, posture and relaxation exercises will reduce strain to the muscles and encourage healing [65-68]. Web-based training programs are also available for providing this training [69].

The H.E.A.L.S. protocol includes:

Heat, Cold and Massage: A first step involves applying heat or ice to sore muscles and joints. This will help improve healing, reduce the sensitivity of muscles and joints, and encourage healing. Trigger Point massage with a thumb, finger or massage device for a few minutes is also suggested to address the tender trigger points within tight muscle bands. These steps aim to reduce muscle tenderness, promote muscle relaxation, and reduce pain.

Exercise: Stretching, strengthening, and posture of jaw: This should be repeated 6 times per day for the first 2-4 weeks. For stretching, it is recommended to gently and gradually increase range of motion by placing two fingers between the front teeth for 10 seconds (**Figure 2**). After resting the jaw, this exercise should be repeated daily. With the ultimate goal of increasing range of motion, this exercise is thought to be progressive in that, when opening with two fingers is comfortable, the patient can increase to two knuckles, and then three fingers. Exercises recommended for strengthening include pushing the jaw to each side against resistance.

An important concept is to keep a balanced and relaxed posture. This refers to the position of the jaw, as well as the position of the face and body. For the jaw, it is important to keep the lips closed, with the teeth apart, the tongue up in the "n" position, while breathing through the nose. It is important to remember to sit upright, with



Figure 2. Jaw Exercises: Perform gentle jaw stretching and rotation exercises to achieve normal range of motion and function. These should be performed for 10 seconds 6 times per day. Stretching is performed by beginning with one to two fingers width between the front teeth, holding it to a count to 10, and then gradually progressing to 3 fingers stretch over the days ahead. Rotation is performed by slowly opening and closing the jaw (while keeping the tongue on the roof of your mouth where you say "n") and stopping when feel the condyle ("ball") of the joint(s) move forward against your fingers. Relaxation is performed by gentle massaging the masseter and temporalis muscles.

the lower back against the chair, the head up balanced over the neck, and shoulders relaxed. While standing, the chest should be kept up, the head up balanced over the neck, and the shoulders relaxed. The individual should be mindful of maintaining balanced relaxed postures during the day.

Analgesics: The use of anti-inflammatory and pain-reducing medications is encouraged as needed. Short-term use of over-the-counter ibuprofen, naproxen, acetaminophen, or aspirin (without caffeine) can reduce inflammation, joint, and muscle pain. A combination of ibuprofen and acetaminophen before bedtime can help relieve pain during sleep, which is fundamental for muscle recovery. Opioid medications should be avoided, for their well-known risk of increasing pain over time (opioid-related hyperalgesia).

Lifestyle changes: It is important to favor a pain-free softer diet to reduce strain on the jaw. Soft diet consists of well-cooked or soft protein foods, fruits, vegetables, eggs, smoothies, soups, and yogurt. Smoothies by using a blender to blend fruits and vegetables are recommended to protect the jaw until it heals. To privilege healing, sugar and simple carbohydrates should be avoided, as these macro-elements are known to cause inflammation. Gums should be avoided as well as tough chewy foods. Caffeine should be limited in its potential for leading to headaches and interfering with sleep.

During the healing process, sleep should be fostered with a regular pro-sleep routine. This includes, for example, encouraging a sound sleeping environment with a cool, quiet, and dark sleeping room, as well as reducing stimulating activities before bed (e.g.,

computer work, video, TV drama, and exercising). The bed should only be used for sleep.

Strain and Stress reduced: Jaw muscle tensing habits that put strain on the muscle and joints should be carefully avoided. Daytime oral parafunctional habits such as keeping the teeth together, except during eating, add significant strain to the jaw muscles and joints when protracted over time. Patients should be encouraged to avoid touching their upper and lower teeth together except during eating. Reminders such as stickers or timers can be helpful to change these habits. Here are list of oral habits to avoid;

- Teeth clenching and grinding (bruxism)
- Touching or resting the teeth together
- Biting cheeks, lips, or tongue
- Pushing the tongue against the teeth
- Hard chewy foods and biting objects like pens
- Tensing your jaw or pushing it forward or to the side
- Jaw strain from biting on musical instruments, snorkels, and scuba diving
- Opening mouth too wide too wide or too long

When jaw pain or oral habits are noticed, it is important to keep the teeth apart, the tongue up in “n” tongue position, with the jaw relaxed, lips closed, while breathing through the nose (**Figure 3**).

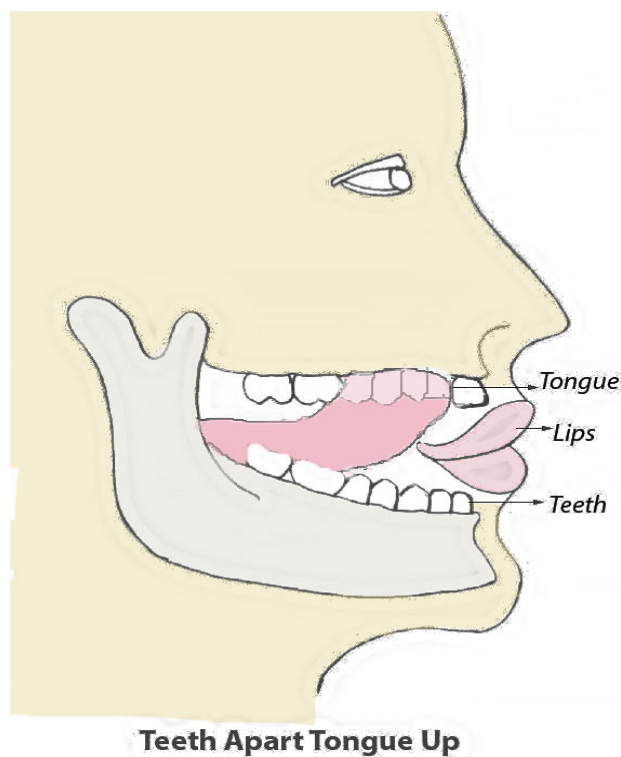


Figure 3. Tongue and Jaw Posture. Encourage return to normal movement with gentle use of the jaw during chewing, talking, and other activities while reducing parafunction such as clenching, jaw bracing, and hard chewing. Oral habits can be improved rapidly by replacing negative habits with the positive habit of keeping the teeth apart and tongue up (TATU) gently resting on the palate (e.g. during the “n” sound).

Reducing the risk of more injury to the jaw includes avoiding excessive prolonged opening with yawning, dental visits, singing, and biting hard foods, such as hard breads, tough steaks, candy and gum. It is recommended to chew on both sides alternatively. The use of a pain log can be helpful to review daily activities that aggravate the pain and modify these activities.

In addition, practicing calming stress reactions is suggested by taking a PAUSE to take a few deep breaths, quiet your mind, and practice relaxation. PAUSE means Pause to Assess, Understand, Start new, and Enjoy the moment. This helps reduce reactions to stressful life events and decrease tension in the jaw and oral habits such as clenching.

Occlusal jaw splints: The use of a protective immediate anterior bite splint can be placed on the same day at chair side to help protect the jaw and is similar to a protective elastic bandage for an ankle and wrist injury [70-72]. An immediate splint can be worn at night with the aim of reducing jaw closing muscle activity (e.g., jaw clenching or teeth grinding), inhibiting the maximum bite force, and encouraging healing of acute TMJ pain and related restricted jaw opening. The flat occlusal surface allows the mandible to freely move in various directions instead of closing into a specific dental relationship and encourages healing and normal function. The advantages compared to a traditional lab-based splint include; 1) immediate placement with no impression needed, 2) custom fit to each person's occlusal, range of motion, and orofacial features, 3) large enough to avoid aspiration or swallowing, and 4) temporary (2 to 4 weeks) to minimize occlusal changes.

Treating 3rd degree acute sprain using R.I.C.E protocol

Acute sprain/strains, characterized by the stretching or tearing of ligaments of the jaw and temporomandibular joint, are common injuries that can occur in various settings, including sports, motor vehicle accidents and blows to the jaw. The R.I.C.E protocol—Rest, Ice, Compression, and Elevation—has become a widely accepted first-aid approach to minimize swelling, alleviate pain, and promote healing in more severe acute sprain/strains.

Rest: Rest is a fundamental aspect of treating an acute sprain. By temporarily avoiding jaw activities such as chewing, clenching, musical instruments that aggravate the injury, patients allow damaged tissues to heal without further strain. The duration of rest will vary based on the severity of the sprain. For mild sprains, a couple of days of rest may suffice, while more severe cases could require several weeks.

Ice/cold: The application of ice is critical in the immediate aftermath of a 3rd degree sprain/strain. Ice can reduce swelling and numb sharp pain by constricting blood vessels and decreasing metabolic activity around the injury site. It is recommended that ice be applied to the jaw and face for 15-20 minutes every few hours in the first 48 hours following injury. However, care should be taken to avoid direct contact between ice and skin to prevent cold reactions. A barrier, such as a moist towel, can be used.

Compression: Compression involves using wraps, ice packs, or immediate application of jaw splints provide support and limit swelling. Compression helps stabilize the injured area and reduces the amount of swelling by limiting excess fluid accumulation. The application of compression should be maintained throughout the day, especially after activity.

Elevation rest: In jaw injuries, elevating the jaw, head and neck above the chest heart level helps reduce swelling by facilitating venous return and lymphatic drainage. Elevation should be maintained as much as possible in the first few days following the injury, particularly during sleep and rest periods [4].

The R.I.C.E method offers an effective initial treatment strategy for 3rd degree acute jaw sprains/ strains. Employing rest, ice, compression, and elevation serves to minimize pain and swelling and accelerates the recovery process. If needed, a referral to an orofacial pain specialist or other healthcare professionals for further evaluation and management as needed [73-76].

Conclusion

It is important that acute jaw sprain/strain is rapidly addressed to reduce the risk of development of a chronic pain state. One possible strategy is the adoption of a Speed-to-Treat JAMSS Protocol. If the pain does persist due to risk factors known to exacerbate chronic pain, a Delayed-Recovery JAMSS protocol can be implemented. In addition, referral to an orofacial pain specialist to provide a more comprehensive interdisciplinary rehabilitation treatment program may be necessary to improve pain at long-term.

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