

# Acupuncture in Temporomandibular Disorder Myofascial Pain Treatment: A Systematic Review

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**Aims:** To carry out a systematic review of clinical trials published up to 2015 to determine the effectiveness of acupuncture in treating myofascial pain in temporomandibular disorder (TMD) patients. **Methods:** The databases used were the Cochrane Library, PubMed, Scopus, and Web of Science; the dates of the articles surveyed ranged from 1990 to May 2015. The inclusion criteria were: (1) publications in English, Portuguese, or Spanish; (2) controlled clinical trials; (3) patients with TMD of muscular origin; and (4) studies that used acupuncture or laser acupuncture only for treatment. Reference lists of the included articles were hand searched. **Results:** A total of four randomized clinical trials using acupuncture (traditional, trigger point, and laser) for TMD treatment met the eligibility criteria and were included. Although the studies featured small sample sizes and short-term follow-up periods, acupuncture yielded results similar to those observed in groups treated with occlusal splints and were significantly superior than those obtained from placebo acupuncture-treated groups. **Conclusion:** Despite the weak scientific evidence supporting its efficacy, acupuncture treatment appears to relieve the signs and symptoms of pain in myofascial TMD. More controlled and randomized clinical trials with larger sample sizes are needed in this field of research to verify these initial findings. *J Oral Facial Pain Headache 2017;31:225–232. doi: 10.11607/ofph.1719*

**Keywords:** *acupuncture therapy, controlled clinical trial, myofascial pain, temporomandibular joint dysfunction disorders*

**T**emporomandibular disorders (TMD) are conditions clinically characterized by pain and dysfunction in the masticatory muscles, temporomandibular joints (TMJs), and adjacent structures.<sup>1,2</sup> TMD can originate in the muscles, joints, or both. Muscle disorders include myofascial pain, fibromyalgia, myospasms, and muscle contractions.<sup>3</sup> Of the conditions of muscular origin, the most common is myofascial pain.<sup>2</sup>

Epidemiologic studies have suggested that TMD is most prevalent in female adults aged between 20 and 40 years.<sup>4–6</sup> The etiology of TMD is multifaceted, and symptoms usually involve muscle pain, malocclusion, audible joint movement, and limited mouth opening, among others.<sup>3</sup> According to Stohler, between 90% and 95% of patients with TMD have facial pain of muscular origin with no identifiable structural causes.<sup>7</sup>

TMD treatment may vary from initial noninvasive therapeutic measures, such as occlusal splint therapy, occlusal adjustment, pharmacologic intervention, behavioral and self-care therapies, acupuncture therapy, and physical therapy (eg, ultrasound, mega-pulse shortwave therapy, diathermy, laser, hot and cold compress, transcutaneous electrical nerve stimulation, mobilization, massage, stretching, and exercise instructions), to more aggressive surgical treatments, such as arthrocentesis and arthroscopy. Conservative treatment continues to be the most effective approach in cases of TMD patients who present with symptoms of temporomandibular pain and dysfunction.<sup>8–14</sup>

In addition to these therapeutic methods for pain management, acupuncture can be used as an ancillary.<sup>15–17</sup> The technique may be an effective short-term therapy for pain in the masticatory muscles,<sup>15,18,19</sup> acute dental pain,<sup>20</sup> idiopathic headaches,<sup>21</sup> migraines,<sup>22</sup> tension headaches, and chronic daily headaches.<sup>23–25</sup>

**Table 1 The Jadad Scale<sup>27</sup>**

Criterion	Score	
	Yes	No
A: Was the study described as randomized?		
B: Was the study described as double blind?		
C: Was there a description of withdrawals and dropouts?		
D: The method of randomization was described in the paper, and that method was appropriate.		
E: The method of blinding was described, and it was appropriate.		

Scoring: Give 1 point for every yes and 0 points for every no.

However, it is unclear whether acupuncture is an effective treatment for TMD, particularly for TMJ and muscular pain. In view of the lack of scientific evidence, further studies featuring a high-quality, standardized method of treatment are needed to establish whether acupuncture presents therapeutic value in treating TMD.<sup>26</sup> Therefore, the aim of this study was to carry out a systematic review of clinical trials published up to the year 2015 to determine the effectiveness of acupuncture in treating myofascial pain in TMD patients.

## Materials and Methods

An electronic search was performed in the Cochrane Library, PubMed, Scopus, and Web of Science databases. The articles selected were published up to May 2015 in English, Portuguese, and Spanish. The search terms used were taken from MeSH (Medical Subject Headings), DeCS (Descriptors in Health Sciences), and txt word. The keywords used were: ((Acupuncture\* OR Acupuntura\*) AND ("temporomandibular joint" OR "articulación temporomandibular" OR "articulação temporomandibular" OR "temporomandibular joint dysfunctions" OR "disfunciones de la articulación temporomandibular" OR "Disfunção da articulação temporomandibular" OR "temporomandibular disorders" OR "trastornos temporomandibulares" OR "disordens temporomandibular" OR "temporomandibular joint disorder" OR "trastorno de la articulación temporomandibular" OR "disordem da articulação temporomandibular" OR TMD OR TTM OR DTM) AND ("randomized controlled trial" OR "Ensayo Clínico Controlado Aleatorio" OR "Ensaio Clínico Controlado Aleatório") AND ("controlled trial" OR "ensayo controlado" OR "ensaio clínico controlado") NOT (animals OR animales OR animais)).

Articles that repeated in the search were considered only once, and all titles and abstracts that met the inclusion or exclusion criteria were analyzed independently by three examiners (A.F., D.M., L.S.). Any

dispute concerning the screening process was resolved by discussion among the examiners. Articles selected after full reading of the text were then evaluated in terms of methodologic quality independently by the three examiners using the Jadad scale.<sup>27</sup> This method of evaluation rates studies by assigning them scores of 0 to 5. A clinical trial was considered to be of high quality when its Jadad score was  $\geq 3$  points and of low quality when its score was  $\leq 2$  points (Table 1).

The studies selected for this systematic review met the following inclusion criteria: (1) publications in English, Portuguese, and Spanish; (2) controlled clinical trials; (3) Patients diagnosed with TMD of muscular origin; (4) and used only acupuncture or laser acupuncture as a treatment. Studies were excluded if they did not report acupuncture as a treatment for myofascial TMD, evaluated other types of acupuncture, did not report on patients with myofascial TMD, featured study designs that were not clinical or clinically controlled trials, or used animals as test subjects. Studies on electro-acupuncture were excluded because the technique used electrical stimulation instead of relying on the physical insertion of a needle, and analyzing the actual effect of classical acupuncture in treating TMD via this method would be impossible.

The electronic search was supplemented by hand searching the reference lists of the included studies for relevant articles. Data were obtained from the selected articles and included the following parameters: authors, publication year, study design, sample size (number of participants, gender, and age), treatment groups, follow-up, and results of acupuncture for treating muscular TMD.

## Results

The electronic search identified 98 records and the manual search identified 2 records. A total of 17 articles were selected for full-text reading in accordance with the inclusion and exclusion criteria. Of these, 13 were excluded because they included patients with symptoms related to articular TMD as a criterion (Table 2).<sup>16,28-39</sup> Finally, four randomized controlled trials<sup>40-43</sup> that used acupuncture for TMD treatment met the eligibility criteria (Fig 1).<sup>44</sup> Table 3 presents an overview of the characteristics of these selected studies.

### Participants

According to the inclusion criteria of the four selected studies, the patients included in this review were patients diagnosed with TMD of muscular origin regardless of race, age, and gender and with symptoms of myofascial pain diagnosed at least 6 months prior.<sup>40-43</sup> The Research Diagnostic Criteria

**Table 2 Description of the Excluded Studies in This Systematic Review and Reasons for Their Exclusion**

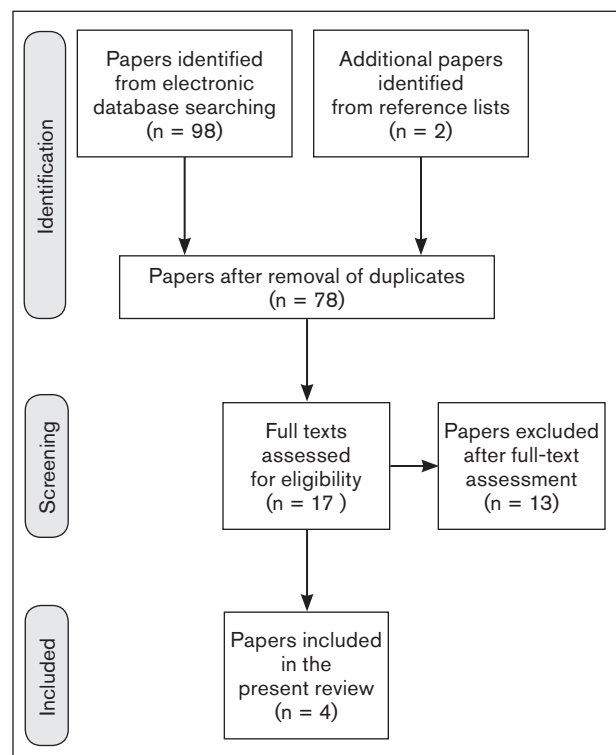
Database	Study	Title	Reason for exclusion
PubMed	Ferreira et al <sup>28</sup> 2013	Laser acupuncture in patients with temporomandibular dysfunction: A randomized controlled trial	Another treatment associated with acupuncture
	Vicente-Barrero et al <sup>29</sup> 2012	The efficacy of acupuncture and decompression splints in the treatment of temporomandibular joint pain-dysfunction syndrome	Inclusion criteria: Patients with limitation or deviation of audible movement
	Shen et al <sup>30</sup> 2009	Randomized clinical trial of acupuncture for myofascial pain of the jaw muscles	Inclusion criteria: Patients with jaw pain
	Simma et al <sup>31</sup> 2009	Immediate effects of microsystem acupuncture in patients with oromyofascial pain and craniomandibular disorders (CMD): A double-blind, placebo-controlled trial	Inclusion criteria: Patients with TMJ pain
	Schmid-Schwab et al <sup>32</sup> 2006	Oral acupuncture in the therapy of craniomandibular dysfunction syndrome—A randomized controlled trial	Inclusion criteria: Patients with TMJ pain and strain on craniomandibular muscles
	Shen and Goddard <sup>33</sup> 2007	The short-term effects of acupuncture on myofascial pain patients after clenching	Another treatment associated with acupuncture
	Elsharkawy and Ali <sup>34</sup> 1995	Evaluation of acupuncture and occlusal splint therapy in the treatment of temporomandibular joint disorders	Another treatment associated with acupuncture
	Raustia <sup>35</sup> 1986	Diagnosis and treatment of temporomandibular joint dysfunction	No evaluation of acupuncture as a treatment for TMD
Scopus	Simma-Kletschka et al <sup>36</sup> 2010	Microsystems acupuncture in craniomandibular pain syndromes—A randomised controlled trial [in Spanish]	Inclusion criteria: Pain in the craniomandibular system
	List et al <sup>37</sup> 1993	Pressure pain thresholds in patients with craniomandibular disorders before and after treatment with acupuncture and occlusal splint therapy: A controlled clinical study	Use of electrical stimulation in acupuncture
	List et al <sup>38</sup> 1992	Acupuncture and occlusal splint therapy in the treatment of craniomandibular disorders. Part I. A comparative study	Use of electrical stimulation in acupuncture
	List <sup>39</sup> 1992	Acupuncture in the treatment of patients with craniomandibular disorders. Comparative, longitudinal, and methodological studies.	Use of electrical stimulation in acupuncture
	List and Helkimo <sup>16</sup> 1992	Acupuncture and occlusal splint therapy in the treatment of craniomandibular disorders. II. A 1-year follow-up study.	Use of electrical stimulation in acupuncture

for Temporomandibular Disorders (RDC/TMD) was used in only one study<sup>41</sup>; in the other three, the diagnosis of muscular TMD was made clinically by observation of the movements and symptoms of the masticatory muscles. Among the included articles, the subjects were predominantly female with ages ranging from 19 years to 44 years. In total, 99 patients were analyzed.

### Intervention

Four randomized clinical trials published between 1991 and 2012 varied in the type of acupuncture used to treat muscular TMD. Two studies<sup>40,41</sup> used classical acupuncture as a treatment in the test group, one study<sup>43</sup> used trigger point acupuncture, and another study used laser acupuncture.<sup>42</sup> In terms of control groups, one study<sup>40</sup> used two comparison groups: one control group used occlusal splint therapy, and another group did not receive any treatment. The three other studies applied sham acupuncture (placebo)<sup>41,43</sup> and laser acupuncture (placebo)<sup>42</sup> to their control groups.

In Johansson et al,<sup>40</sup> acupuncture treatment involved insertion of sterile stainless steel needles (0.2 mm × 15 mm × 50 mm and 0.3 mm, Seirin, Sonesta AB) into the painful area (local point) and a

**Fig 1** PRISMA flowchart<sup>44</sup> showing the study selection process.

**Table 3 General Characteristics of the Studies Included in This Systematic Review**

Study	Study design	Sample (no. of participants, sex, age)	Treatment groups	Follow-up period	Measuring instrument
Johansson et al <sup>40</sup> 1991	Controlled and randomized clinical trial	45 subjects. Sex and age N/A	A: Acupuncture treatment B: Treatment with occlusal splint C: Control group	Patients were evaluated before and 3 months after treatment in Groups A and B. Group C was followed up after 2 months.	Linear measurement using the VAS, questionnaires subjective scoring (SDS), and range severity of clinical signs (CDS).
Smith et al <sup>41</sup> 2007	Controlled and randomized clinical trial	27 subjects. Mean age: 40.5 years.	Group 1: Acupuncture Group 2: Sham acupuncture	Follow-up 3 and 7 days after final treatment	Linear measurement using VAS
Katsoulis et al <sup>42</sup> 2010	Controlled prospective pilot study	11 subjects (10 females, 1 male). Mean age: 33 years.	Group 1: Laser acupuncture (not blinded) Group 2: Laser acupuncture (blinded) Group 3: Placebo (not blinded)	Evaluation before (week 0) and after treatment (week 16)	Linear measurement using VAS and a verbal scale to evaluate pain intensity
Itoh et al <sup>43</sup> 2012	Controlled and randomized clinical trial	16 subjects (5 females, 11 males). Ages: 19–24 years	Group 1: Trigger point acupuncture Group 2: Sham	Follow-up 10 weeks after first treatment.	Linear measurement using VAS and oral evaluation of MMO.

VAS = visual analog scale; MMO = maximum mouth opening.

strong reaction site (distal point; Hegu [LI-4]). Three to seven needles were used locally and distally and manipulated by manual stimulation, rotating, lifting, and thrusting. A total of six acupuncture treatment sessions were conducted, each session lasting 30 minutes, and three stimuli were used in each session until a sense of deep muscle pain, feelings of heaviness, and tingling in the surrounding area were achieved. The authors concluded that acupuncture is an alternative method to conventional treatment for individuals with stomatognathic craniomandibular disorders of muscular origin.

In the study by Smith et al,<sup>41</sup> each patient received six bilateral acupuncture sessions at the Xiaguan point (ST-7) for a period of 3 weeks. The needle was inserted 6–12 mm into the skin until it met resistance or caused pain and then held in place for 20 minutes. The needle was manually stimulated by touching for 10 seconds at 5-minute intervals. Upon withdrawal of the needle, pressure was immediately applied to the skin using a cotton swab for 10 seconds or until any bleeding ceased. All patients were evaluated for all possible outcomes 3 and 7 days after the last acupuncture session. The results of the study show that

the acupuncture procedure had a positive influence on the signs and symptoms of TMD.

Katsoulis et al<sup>42</sup> bilaterally used the Jiache (ST-6) and Quan Liao (SI-18) local points, in addition to the Houxi (SI-3) and Hegu (LI-4) distal points, based on traditional Chinese medicine guidelines and studies on acupuncture. These acupuncture points were simultaneously treated with a laser device (Laserneedle Medical, Ronbar AG), which automatically switched off after 15 minutes. This device allows for double-blind studies because patients are unable to sense when the laser needle is switched on. The radiation applied to the skin during treatment was 40–60 J with a wavelength of 690 nm. The maximum pain intensity over the previous 14 days was evaluated in each case and recorded at baseline (week 0) and 16 weeks after acupuncture treatment. Even though the results were inconclusive, the authors suggested that the laser needle may be a treatment option for patients with an interest in a noninvasive adjunctive therapy.

Itoh et al<sup>43</sup> used trigger point acupuncture, which requires palpation and the location of myofascial trigger points and bands of tight muscles, with attention given to a single muscle. The punctures of active

**Results**

**Conclusion**

Subjective symptoms: 90% of the subjects in Group A and 86% of those in Group B showed subjective improvement after treatment. Although no significant difference between Group A and Group B was observed, significant differences between Groups A and B with Group C were found.  
 Clinical Signs: Groups A and B showed statistically significant decreases in CDS ( $P = .01$ ) and number of chewing muscles sensitive to palpation ( $P = .05$ ) after 3 months. No statistically significant differences between Groups A and B were found.

Acupuncture treatment is an alternative method to conventional plate treatment. However, more longer-term studies are necessary to completely assess the effects of acupuncture treatment.

Both the real and simulation treatment groups showed improvements in average scores for functional impairment according to the VAS. However, only the results of the real acupuncture treatment group showed statistical significance ( $P = .003$ ). Significant improvements in pain intensity were also observed ( $P = .001$ ). In terms of pain distribution, the number of areas affected by pain was significantly reduced only in the real acupuncture group ( $P = .003$  left side of the face;  $P = .005$  right side face). The same results were obtained for maximum aperture ( $P = .020$ ) and pain-free opening ( $P < .001$ ).

Acupuncture exerted a positive influence on the signs and symptoms of TMJ. This study further demonstrated that the sham acupuncture device is a credible control method for trials involving facial acupuncture points.

Pain decreased by an average of 40 VAS points for 10 of 11 patients. Pain reduction of over 50% was reported by all four patients in Group 1 (verum open) and three of four patients in Group 3 (placebo blind). All of the patients in Group 2 (verum blind) reported pain reduction of below 50%. Verbal-scale evaluations showed pain reduction from moderate to very strong pains initially to moderate, light, and no pain after 3 months for all three groups.

Because of the low number of participants in this study, no clear conclusions could be drawn. Laser acupuncture may present a treatment option for patients with an interest in noninvasive methods.

After treatment, patients in Group 1 reported less pain intensity than those in Group 2. However, oral function (MMO) remained unchanged in both groups. Pain intensity decreased significantly between pretreatment and 5 weeks after trigger point therapy ( $P < .001$ ) and sham acupuncture ( $P < .05$ ). Group comparison using the area under the curve technique demonstrated a significant difference between groups ( $P = .0152$ ).

Compared with sham acupuncture therapy, trigger point acupuncture may be more effective for chronic temporomandibular joint myofascial pain.

myofascial trigger points are thought to be precise muscle locations and lead to a brief contraction of muscle fibers. Masticatory and cervical muscles were examined for myofascial trigger points with stainless steel disposable needles (0.2 mm × 50 mm, Shizuoka-shi, Seirin) inserted 5 mm and 15 mm into the skin, depths considered suitable for the target muscle, using the sparrow pecking technique to elicit a local twitch response. Once the local twitch response was obtained, the needle was maintained in place for 15 minutes. The results suggested that the analgesic effect of the trigger point acupuncture was better than the effects of the sham acupuncture.

During sham acupuncture treatment, which was used as a control treatment in two studies, the ends of the needles were manually cut and smoothed with sandpaper to prevent them from penetrating the skin. Then, the sparrow pecking technique was used, and the needles were removed.

Analysis of the methodologic quality of the four included studies revealed two studies<sup>41,43</sup> of good quality and two studies of weak quality<sup>40,42</sup> (Table 4). None of the reviewers disagreed during the analysis of the studies.

**Table 4 Representative Scores of Methodology of the Included Articles According to the Jadad Scale**

Study	A	B	C	D	E	Total points
Johansson et al <sup>40</sup> 1991	1	0	1	0	0	2
Smith et al <sup>41</sup> 2007	1	0	1	1	1	4
Katsoulis et al <sup>42</sup> 2010	0	0	1	1	0	2
Itoh et al <sup>43</sup> 2012	1	1	0	1	1	4

**Discussion**

The results of the systematic review and meta-analysis conducted by La Touche et al<sup>15</sup> showed that acupuncture used as a treatment for myofascial TMD produces statistically significant, short-term analgesic effects. The same study concluded that more



studies with larger sample sizes, longer-term evaluation, and of higher quality were needed to confirm the recommendation of acupuncture as a treatment for TMD pain.<sup>2</sup> Jung et al<sup>26</sup> also reported limited conclusions because of a low number of RCTs and studies with small sample sizes. In other words, there is little evidence available supporting the use of acupuncture as a treatment for TMD, especially for pain in the TMJ and masseter muscle.

This systematic review identified four studies testing the effects of acupuncture (traditional, trigger point, and laser) on myofascial TMD. Overall, acupuncture was found to be effective in relieving the signs and symptoms of myofascial pain in patients with temporomandibular dysfunction, suggesting it could be used as an alternative treatment in these cases.

Smith et al<sup>41</sup> compared acupuncture with a placebo and concluded that the former exerts a positive influence on the signs and symptoms of myofascial TMD pain. Additionally, acupuncture significantly improved functional impairment, pain intensity, areas affected by pain, inter-incisor gaps and lateral movements, TMD pain headaches, mouth-opening deviations, and audible joint movements. Similarly, in a previous study, Johansson et al<sup>43</sup> compared groups treated with acupuncture and occlusal splints and found that both treatments satisfactorily reduced the symptoms of pain of muscular origin. However, this study had a short follow-up period (ie, 3 months), and a longer follow-up time is required to completely assess the effects of acupuncture treatment. List and Helkimo<sup>16</sup> tested two groups also treated by acupuncture or occlusal splint therapy over a 12-month follow-up period and concluded that acupuncture is a suitable treatment for patients with primarily myogenic symptoms. However, this study was not included in the present analysis because of its use of stimulation by electrical current in some nonregional points, such as the hand (LI-4) and leg (ST-36), in addition to traditional acupuncture.

Traditional acupuncture may produce effects similar to those obtained by trigger point acupuncture in chronic myofascial pain, as well as better analgesic effects compared with sham acupuncture.<sup>41</sup> However, the effects of trigger point acupuncture on chronic myofascial pain remain unclear. A systematic review by Tough et al<sup>45</sup> revealed limited evidence supporting the use of acupuncture and dry needling of the trigger point to treat myofascial pain because the reviewed studies had small sample sizes and poor methodologic quality.

Katsoulis et al<sup>42</sup> were unable to reach a clear conclusion regarding the effectiveness of laser acupuncture for myofascial TMD because of the low number of study participants in their study. However, their

study suggested that acupuncture presents a possible treatment option for patients with an interest in noninvasive methods of treatment or adjunctive therapy. Ferreira et al<sup>28</sup> found that laser acupuncture was effective in achieving complete remission of symptoms and myofascial TMD pain after 3 months of treatment and produced better results than a placebo. Thus, laser acupuncture treatment may be considered a safe, noninvasive, and effective treatment, particularly because it helps relieve chronic pain associated with TMD and features no side effects. However, this study included patients with arthralgia in addition to myofascial pain and did not separate the group of patients with myofascial pain only. This omission reduces the utility of the results when applied to patients with myofascial TMD.

In terms of method of measurement, all of the studies included in the present systemic review used a visual analog scale (VAS). In general, the monitoring time was quite short, and the treatment periods in the studies were 16 weeks,<sup>43</sup> 3 months,<sup>42</sup> 5 weeks after treatment,<sup>41</sup> and 3 and 7 days after the final acupuncture session, which lasted an average of 3 weeks.<sup>40</sup>

The studies used in the present systematic review featured appropriately homogenous methodologies such that internal validity was achieved. However, the different sample sizes and diagnostic methods for temporomandibular dysfunction described in these studies could have affected their external validity; thus, the results described in this review should not be extrapolated to all myofascial TMD patients.

Differences among acupuncture methods (traditional, trigger point, laser, and electric), session application times, control groups, and sample sizes are difficult to standardize and could present a problem when conducting randomized clinical trials in this field.

## Conclusions

The studies included in this systematic review showed significant effects of acupuncture treatment in relieving the signs and symptoms of myofascial TMD pain. However, considering the quality of the studies analyzed in this review, the reliability of the evidence presented is limited; in particular, the low methodologic quality of two studies,<sup>40,42</sup> limited sample sizes, low availability of related studies in the literature, and methodologic differences among these articles are problems that must be addressed in future studies. These problems demonstrate the need for other controlled and randomized clinical trials and in this area of research prior to recommending acupuncture as an alternative treatment for myofascial TMD.

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