

# Comparative Observations of Effects of Articulation Training and Intraarticular Injection of Prednisolone Acetate on Temporomandibular Joint Synovitis

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**ABSTRACT Objective:** To investigate the clinical therapeutic efficacy of articulation training and prednisolone acetate intraarticular injection on temporomandibular joint (TMJ) synovitis. **Methods:** 120 patients, with regular dentition, without impacted molar, suffering from TMJ synovitis, were randomly divided into experimental and control groups, each group contained 60 patients. Patients in the experimental group were instructed to do articulation training. The repeated movement includes 3-4 cycles of oral movements, and the patients were required to do 3-4 times of articulation exercise each day. The cases in the control group received intraarticular injection of prednisolone acetate 0.0125g+0.5ml 2% lidocaine hydrochloride injection one time. The effects of two groups were detected and traced. **Results:** All patients in the experimental group were cured of the pain without recurrence, within 1-2 weeks of treatment, in the following 3-12 months. While 18 patients in the control group showed invalid 2 weeks after treatment, which meant the invalid rate was 30%, the invalid rate of the experimental group was significantly lower than that of the control group ( $P<0.001$ ); 21 patients in the control group showed invalid 3 months after treatment, which meant the invalid rate was 36.67%, the invalid rate of the experimental group was significantly lower than that of the control group ( $P<0.001$ ). **Conclusion:** Articulation training significantly surpassed intraarticular injection of prednisolone acetate in curing TMJ synovitis and relieving pains incurred by treatment.

**Key words:** Temporomandibular joint; Temporomandibular disorders; Synovitis; Therapy

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## Introduction

Patients suffering from temporomandibular joint, TMJ synovitis endure the pain in TMJ, which may become more excruciating with the functional movement, or the load and pressure of TMJ upward, backward become aggravated and the extent of debouchement may be limited. If the ipsilateral molar tooth were bited tightly, the acute pain occurred (or one even cannot clench the ipsilateral molar tooth) when there was intraarticular effusion. This kind of recurrent symptoms seriously impacts the physical and mental health of patients. Recently, intraarticular injection of prednisolone acetate or sodium hyaluronate has been used to cure TMJ synovitis, and its clinical effect was generally satisfying. However, prednisolone acetate may damage articular cartilage and the bone, for example, degenerate and inhibit the function of cartilage cells, as a result, it should not be overlaid<sup>[1,2]</sup>. Sodium hyaluronate is too expensive and cause injury for most patients, so it should not be overlaid, either. The authors treated TMJ synovitis with the methods of articulation training and intraarticular injection, then traced the treatment impression to the patients and observed the efficiency between the two therapeutic approaches.

## 1 Material and methods

### 1.1 Case selection

120 TMJ synovitis patients (71 females and 49 males, aged 23-40 years) attended in our clinic from June, 2007 to June, 2009 were selected in this study. All patients were with a disease history range of 5 days-6 months, and had no histories of face trauma, or histories of psychic and psychological diseases, or histories of migraine, or histories of rheumatism and rheumatoid arthritis. Clinic examination: the patients reported had regular dentition with neither articulation interference nor malocclusion abnormality nor impacted molars; The extent of debouchement was limited, but the type of debouchement was normal; There was pressing pain on the TMJ, and all cases could clench the ipsilateral molar tooth; push jaws experiment positive; X ray images of condylar process sclerotic appeared normal. Based on the histories and Diagnostic Criteria for Temporomandibular Joint Synovitis<sup>[3,4]</sup>, the patients in both groups were finally diagnosed as TMJ synovitis.

### 1.2 Groups

The 120 patients were divided into two groups, A and B, at random. The group A was the experimental group, while the group B was the control group.

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1.3 Material

Prednisolone Acetate Injection ( made by Zhejiang Xianju Pharmaceutical Co., Ltd) has a trade name of Xianju, whose specification was 5ml:0.125g. Disposable Sterile Syringe ( with needle, made by Shandong Weigao Group Medical Polymer Co., Ltd) has a specification of 5ml. Lidocaine Hydrochloride Injection(made by Shandong Hua Lu Pharmaceutical Co., Ltd) has a specification of 20ml:0.4g.

1.4 Methods

Patients in group A were performed with articulation training<sup>[5,6]</sup>. They were asked to sit up straightly and the heads (eyes) should be oriented so that the clinical Frankfort horizontal plane was parallel to the floor. In the protocol of exercise, interlace position of apex cuspid could be qualified with swallow first and held tightly for 10 seconds, followed by mandibular posture position for 10 seconds relaxation. Starting from the posture position, one cycle of oral movements consisted of 10 times of opening and closing the mouth, and the mental point was constantly kept in the median line while opening and closing the mouth with no touching, and the extent of debouchement was limited to 35-40mm. Gave a pause at the posture position before opening the mouth again. It should be emphasized that the repeated movement includes 3-4 cycles of oral movements, and the patients were required to do 3-4 times of articulation exercise each day for 12 months as one course of treatment.

Patients in group B received intraarticular injection of prednisolone acetate in the inferior vena, and the details were followed: The doctors routine disinfected maxillofacial and covered sterile sheet. Patients were injected prednisolone acetate 0.0125g+

0.5ml 2% lidocaine hydrochloride in the inferior vena one time, and it should be made sure that there is no blood if pumpback.

The authors traced the treatment impression to the patients and observed the efficiency between the two therapeutic approaches.

1.5 Evaluation criteria

The efficiency of the therapeutic approaches were evaluate according to the level of releasing the pain. The efficiency can be graded into 3 orders: excellent, improved and invalid. And the pain degree is quantized by VAS(visual analog scale) <sup>[7]</sup>.

Excellent: the pain disappear, VAS is"0", push jaws experiment negatie, and the extent and type of debouchement are normal.

Improved: the pain is reduced obviously, VAS is less than"2" or at least reduce 50%, push jaws experiment weak positive, and the extent and type of debouchement get improved.

Invalid: there is no obvious improve of original symptom, nor change of VAS.

1.6 Statistics

The authors got the total effective rate by adding the excellent rate and improved rate, and analysed the datas by SPSS17.0 statistics system chi-square test.

2 Results

All patients in group A were cured without recurrence, within regular extent and types of the debouchement in 1-7 days in the following 3-12 mouths. While patients in group B:after 2 weeks, excellent 22, improved 20, and invalid18; after 3 mouths, excellent 19, improved 19, and invalid 22. The total effective rate was got by adding the excellent rate and improved rate, and the results of therapy was shown in table1and table 2.

Table 1 The therapeutic result of experimental and control group ( after 2 weeks)

Groups	Cases	Excellent	Cases %	Improved	Cases %	Invalid	Cases %	Effective	Cases %	X <sup>2</sup>	p
A	60	60	100	0	0	0	0	60	100		
B	60	22	36.7	20	33.3	18	30	42	70		
	120									21.176	0.000

Table 2 The therapeutic result of experimental and control group(after 3 months)

Groups	Cases	Excellent	Cases %	Improved	Cases %	Invalid	Cases %	Effective	Cases %	X <sup>2</sup>	p
A	60	60	100	0	0	0	0	60	100		
B	60	19	31.67	19	31.67	22	36.67	38	63.33		
	120									26.939	0.000

By X<sup>2</sup> analysis, P<0.001, 2 weeks later, there were significant differences between the two groups, which indicated that the invalid rate of group A; P<0.001, 3months later, there were significant differences between the two groups, which indicated that the invalid rate of group A.

3 Discussion

TMJ synovitis is one of the commonest types of temporo-mandibular disorders, TMD, of which the pathogenesis is rather complicated. The typical clinical method currently used for treatin-

g TMJ synovitis is intraarticular injection of glucocorticoids, which can strongly nonspecificly inhibit inflammation caused by various reasons<sup>[8]</sup>. And its clinical effect is generally satisfying. Prednisolone acetate, one kind of glucocorticoids, is most often used for its many advantages, including: stably molecule structure, long half-life, long time staying in the articular, and little side effects. Unfortunately, prednisolone acetate causes a great deal of pain to the patients doing to the irritation, so it's usually injected with half lidocaine hydrochloride to ease the pain. However, glucocorticoids, of therapy dose, may lead to the drop of synovium, and suppress the synthesis of cartilage matrix, resulting in retrogression of articular cartilage<sup>[1]</sup>. If longterm used, it may damage articular cartilage and the bone, inducing irreversible degeneration of TMJ, as a result, it should not be overlaid. So in the short run(3months), it should be injected only once<sup>[9]</sup>.

In order to find more effective and conservative method to therapy TMJ synovitis, and to rise the cure rate, this study chose articulation training, and compared its therapeutic effect with that of intraarticular injection of prednisolone acetate.

Articulation training, focus on stomatognathic system, is a set of conservative method, which can therapy TMD and care TMJ. Stomatognathic system consist of TMJ, occlusion, masticatory muscles and related nerves and vessels, among which the anatomical structure and functional movement of TMJ are closely related with occlusion and masticatory muscles. Anatomically, TMJ is being rebuilt continuously throughout one's life, to adapt the changes of occlusion and masticatory muscles<sup>[10]</sup>; Functionally, the jaw movement should be presented by occlusion and TMJ. Consequently, occlusion and TMJ were regarded as a unity, in other words, occlusion is a special joint as an extension of TMJ, or TMJ is a special occlusion as an extension of the third molar<sup>[11]</sup>. At the same time, occlusion varies as the functional changes of stomatognathic system. This correlativity is a proof of unitarity of function and formation of stomatognathic system. And any aberration in any link will lead to anomaly of the whole system and TMD. Some studies have reported the aberration of muscle contraction mode in TMD patients<sup>[12]</sup>, whose postures appeared more obvious asymmetries than asymptomatic patients<sup>[13]</sup>.

By standard articulation training, patients regulate the coordination and symmetry of postures and muscular movement actively, keeping mandible movement smooth and coordinate, and further regulate the structure of TMJ, keeping the rebuilding of TMJ healthy. Meanwhile, normal occlusion can also regulate occlusal surface. Biting tightly in intercuspal position can stress the upper and lower molar uniformly, and increase the mechanical pressure of TMJ to speed up its rebuilding. The repeated movement included 3-4 cycles of oral movements, and the patients were required to do 3-4 times of articulation exercise each day for 12 months as one course of treatment, to help muscle and bone shape. Structural balance is the base of curing TMJ synovitis and of keeping TMJ healthy.

The most important two physiological location in articulation training are the intercuspal position and the gesture position of submaxilla, which can be improved by all patients with normal occlusion. In the intercuspal position, the submaxilla is in the centric position compared with the maxillae. Biting tightly in this position can help decentralize the intraarticular force, and adjust the relationship between anatomical structure and physiological function of TMJ<sup>[14]</sup>. Biting tightly in the intercuspal position can also make sure that bilateral lateromaxilla muscles contract isotonicly and isometricly and that the upper and lower molar can be stressed uniformly, leading to adjusting the relation of the muscular tension and contiguity of the molars. In the gesture position, not only the coordinated motion of lateromaxilla and katamaxilla muscles can be adjusted effectively, but also the local relationship between articular disc and acetabulum and condyle can be regulated, keeping the intraarticular pressure normal.

Scapino RP reported that the pressure of bilateral articulation mandibularis cavity was barotropic in the intercuspal position when one bites tightly, while the pressure was close to 0 in the gesture position of the submaxilla<sup>[15,16]</sup>. Opening the mouth from the gesture position, the negative pressure of articular cavity would increase gradually as the augmentation of the extent of the debouchment. And Hardy J found that the intraarticular pressure impacted the secretion of synovia and blood circulation and lymphocinesia<sup>[17]</sup>. It can be thought that standard articulation training can regulate the intraarticular pressure, and further regulate the secretion of synovia and blood circulation and lymphocinesia, speeding up the vanishing of inflammation, thus eliminate the pain. However, further researches on the mechanism are needed.

The results demonstrated that articulation training was significantly more effective than intraarticular injection of prednisolone acetate in treating TMJ synovitis. All 60 patients in the experimental group were cured within 1-2 weeks of articulation training, and no recurrence was found in the following 3-12 months. So the authors suppose that articulation training is able to cure the TMJ synovitis effectively in a certain range (the patients with normal occlusion can bite tightly).

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## 咬合运动与注射醋酸泼尼松龙治疗滑膜炎的疗效比较

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**摘要** 目的:比较咬合运动和关节下腔注射醋酸泼尼松龙治疗颞下颌关节滑膜炎的临床效果。方法:选择牙列完整、无第三磨牙阻生、符合颞下颌关节滑膜炎诊断标准的120例患者,随机分为实验组和对照组,每组60例。实验组行咬合运动,每次3-4个循环,每日3-4次,治疗周期为12个月;对照组给予醋酸泼尼松龙0.0125g+0.5ml 2%利多卡因关节下腔注射一次,比较两种方法的治疗效果。结果:实验组的60例患者均在治疗后1-2w疼痛消失,追踪3-12个月无复发。对照组的60例患者2个周后有18例无效,无效率为30%,两组比较其结果有显著性差异( $P<0.001$ )。3个月后有22例无效,无效率为36.67%,两组比较其结果有显著性差异( $P<0.001$ )。结论:咬合运动组的治疗效果显著高于醋酸泼尼松龙注射组,咬合运动能有效的治疗滑膜炎并减少患者的治疗痛苦。

**关键词** 颞下颌关节;颞下颌关节紊乱病;滑膜炎;治疗

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