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EFFICACY OF DEXTROSE PROLOTHERAPY COMBINED WITH INTERMAXILLARY FIXATION IN THE TREATMENT OF TEMPOROMANDIBULAR JOINT HYPERMOBILITY

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ABSTRACT

Objective: This study was carried out to evaluate the efficacy of dextrose 25% injection prolotherapy with intermaxillary fixation in the treatment of temporomandibular joint hypermobility in a prospective randomized controlled clinical trial. **Subects and methods:** Twenty patients with TMJ hypermobility were randomly equally divided into two groups: Group A: Patients were treated with injection of dextrose 25% alone into the posterior periarticular tissues. Group B: patients were treated with dextrose 25% and IMF for 2 weeks. They were assessed for the maximum voluntary interincisal mouth opening MMO of the patients measured in millimeters and intensity of pain using a 10-point visual analogue scale VAS. The preoperative mean values were compared with postoperative mean values at 2 weeks, 1 month, 3, and 6 months. **Results:** Both groups revealed significant improvement in TMJ pain and significant reduction in MMO throughout follow up periods. By the end of the study, group B showed a statistically significantly reduction in mean MMO values than group A. **Conclusion:** Prolotherapy with dextrose 25% seems promising for the treatment of symptomatic TMJ hypermobility. It is a simple and safe technique devoid of significant side effects. A better result could be obtained if dextrose injection was combined with IMF for two weeks.

KEYWORDS: Temporomandibular joint, Maximum mouth opening, Intermaxillary fixation

INTRODUCTION

Hypermobility of TMJ refer to excessive abnormal movement of the condylar head anterior to the eminence on wide mouth opening that can be spontaneously reduced into the glenoid fossa (subluxation) or needs assistance of professionals for reduction (dislocation). Temporomandibular joint (TMJ) recurrent subluxation / dislocation may occur during ordinary activities such as yawning and laughing. Patients are usually distressed, as they are constantly in fear of dislocation [1, 2].

Various treatment techniques have been reported for treatment of TMJ hypermobility. Surgical approaches included capsular plication, lateral

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pterygoid myotomy, scarification of the temporalis tendon, condylectomy, reduction of the articular eminence (eminectomy), and augmentation the articular eminence (miniplates, implants). Conservative treatment approaches included intermaxillary fixation, intracapsular injection of sclerosing solutions such as alcohol, intramuscular injection of botulinum toxin, intra-articular injections of autologous blood, and prolotherapy [3-13].

Prolotherapy involves injecting dextrose solution into the region of the tendons or ligaments. It is hypothesized that it initiates a non-inflammatory or inflammatory process that deposits new additional fibers that will strengthen lax tendons or ligaments. Although different agents such as phenol-glucose-glycerin (P2G) and sodium morrhuate were used in prolotherapy, dextrose was the most common proliferant. It is considered to be an ideal proliferating agent because it is soluble in water, a normal constituent of blood chemistry, and can be injected in large quantities without complications [14, 15].

The work of Hegab[16] on the use of autologous blood injection (ABI) alone, intermaxillary fixation (IMF) alone, or both together for the treatment of TMJ dislocation has led us to plan to use dextrose prolotherapy with IMF. He found that the best clinical results were given by a combination of ABI and IMF. It is hypothesized that intermaxillary fixation as an adjunct to dextrose prolotherapy may have a positive result on TMJ dislocation.

SUBJECTS AND METHODS

This study was conducted on twenty patients with symptomatic TMJ hypermobility. Patients were selected from those attending outpatient clinic of Faculty of Dental Medicine, Cairo - Boys, Al-Azhar University, and Sayed Jalal University Hospital. Selection of patients were based on specific inclusion and exclusion criteria. Patients were included if they have painful subluxation or dislocation of temporomandibular joint, no history of previous TMJ surgery, and with no history of recent TMJ trauma. Patients were excluded if they have dystonia or drug induced hypermobility and if allergic to dextrose therapy.

Each patient was inspected to make sure that this patient fulfills the inclusion criteria of this study. The diagnosis of TMJ hypermobility was based on the patient's history and the clinical recognition of an excessive abnormal excursion of the condyle that slides over the articular eminence, catches briefly anterior to the eminence, and then returns to the fossa by self-reduction or medical assistance. Evaluation of TMJ pain, tenderness, and the number of dislocations over the last 3 months were recorded.

The maximum voluntary interincisal mouth opening (MMO) of the patients were measured in millimeters. The distance from the incisal edge of the upper incisor teeth to the incisal edge of the lower incisor teeth were measured using a digital caliper to the nearest mm. The intensity of pain was evaluated using a 10-point visual analogue scale VAS. In the VAS, the left most end represented no pain '0'. The right most end represents severe / worst pain '10'. Digital panoramic radiographs were taken on both TMJs in open and close position to demonstrate osseous abnormalities of the condyle and temporal eminence, condyle –articular eminence relation in opening and closing mouth position, and determination of the contemplated IMF screws sites.

Patients were randomly divided into 2 groups; Group A**:** received dextrose prolotherapy injection (control group), and Group B**:** received dextrose prolotherapy injection in addition to IMF for 2 weeks (study group). This study was approved by the ethical committee, Faculty of Dental Medicine, Al-Azhar University, Cairo, Boys. Patient consent was obtained after explaining the procedure and its possible complications.

This study was approved by the Research Ethics Committee of the Faculty of Dental Medicine, Al-Azhar University, Cairo, Boys (441/022019/142F).

Prolotherapy injection technique

The skin overlying the TMJ area was scrubbed with povidone iodine antiseptic solution. A line was drawn on the skin of the face from the tragus of the ear to the outer canthus of the eye. A point was marked on the drawn line just 10mm anterior to the tragus of the ear. Ten mm below this point, another point was marked on the skin. This point was utilized for local anesthesia and prolotherapy techniques. Anesthesia of the skin was achieved by infiltration technique with 2ml of 4% articaine injected into the posterior periarticular area**.**

In both groups, the modified prolotherapy technique proposed by Zhou [17] was utilized. A plastic syringe filled with 2 ml of dextrose 25 %was used, the needle (18 gauge) was directed to the surface of the condylar neck to deposit 0.5 ml; then it was advanced along the back of condyle and penetrated the posterior periarticular tissues to a depth of 25 mm, where 0.5 ml be deposited; then the needle was withdrawn 5mm as the final 1.0 ml be gradually injected **Fig (1.a).**

Intermaxillary fixation with IMF screws technique

In group B, four 12mm × 2mm titanium screws (Synthes company, Johnson and Johnson, Chicago, USA) and heavy elastics size ¼ inch were utilized for intermaxillary fixation. Four screws (2 maxillary and 2 mandibular) were directly inserted through the soft tissue at the junction of the free and attached mucosa between the canines and first premolars with careful attention paid to the location of the adjacent tooth roots. Two elastics were applied to attach the maxillary and mandibular screws and maintained for 2 weeks **Fig (1.b).**

Postoperative care

After completion of the prolotherapy, patients in group A were instructed to ingest only a soft diet for 2 weeks to decrease the effort of the TMJ and to avoid forcing the TMJ while yawning, chewing, and speaking. Patients in group B were instructed to limit their fluid intake at a time and to maintain good oral hygiene. They were learned how to cut or remove the elastics themselves in case of emergency (vomit or suffocation). Besides that, all patients were instructed to take paracetamol 500 mg tablet whenever needed as an analgesic in case of postoperative pain. The total allowed maximum dose of paracetamol for an adult is four 500 mg tablets in 24 hours. They were informed to wait at least 4 hours between doses.

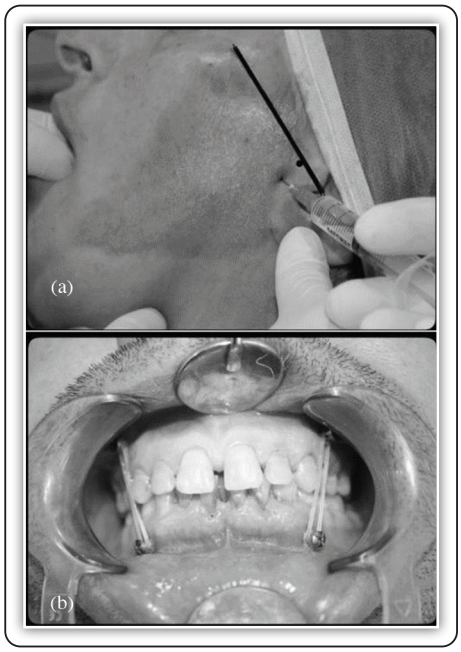

FIG (1) (a) clinical photograph showing dextrose injection. (b) showing IMF screws with elastics

Postoperative evaluation

The patients were asked to return for follow-up after 2 weeks, 1 month, 3 months and 6 months or whenever their TMJ recurrently dislocated. They were assessed for the maximum voluntary inter-incisal mouth opening and the intensity of pain.

Statistical Analysis

Data were collected, tabulated, and statistically analyzed using SPSS® Statistics Version 25 for Windows to detect whether significant differences existed between the means of the various studied groups

RESULTS

Twenty patients (6 male and 14 female) were included in the study. Their age ranged from 28 to 55 years with a mean age of 38.47 years. The prolotherapy technique was safe with no side effects. Some patients suffered transient facial palsy, this facial palsy was resolved 2 h post-operatively once the effect of articaine local anesthetic had been eliminated. Patients ligated with elastics IMF developed some discomfort during lip movement and speech. Although potential weight loss, because of IMF, was not considered as a factor for evaluation in this study, some patients complained of slight weight loss because of their restricted diet.

Maximum mouth opening

Table 1 shows the mean MMO of both groups along the different observation periods. There was a significant decrease of maximum mouth opening in both groups throughout the follow up periods. The inter group comparison revealed no statistically significant difference in mean MMO at 2 weeks and 1 month follow up periods. At 3 and 6 months, group B showed a statistically significant reduction in mean MMO than group A.

TABLE (1) Mean ± SD, t and P values of maximum mouth opening in both groups at different intervals.

Maximum mouth opening	Group A	Group B	T	P
Pre-operative	42.37± 3.14	43.64 ±3.45	0.789	0.442
2 Weak	23.88±3.29	22.98 ±3.89	0.511	0.617
1 Month	28.68±3.77	27.58 ±2.79	0.677	0.508
3 Months	34.91±5.10	30.71 ±1.58	2.355	0.033*
6 Months	36.0 ±0.76	32.11 ±1.69	6.233	<0.001*

t: Student t-test

p: p value for comparing between the studied groups

**: Statistically significant at p ≤ 0.05*

VAS

The intensity of preoperative and postoperative TMJ pain was recorded on a 10 cm visual analogue scale VAS. Both groups showed a statistically significant decrease in pain intensity throughout the different observation periods. As shown in table 2, the inter group comparison revealed no statistically significant difference in mean pain intensity at the different follow up periods.

TABLE (2) Mean ± SD, U and P values of VAS in both groups at different intervals

VAS	Group A	Group B	U	P
Pre-operative	8.75 ± 1.39	9.56 ± 0.88	24.00	0.277
2 Weeks	0.0 ± 0.0	0.0 ± 0.0	36.00	1.000
1 Month	1.0 ± 1.07	0.44 ± 0.88	26.00	0.370
3 Months	3.25 ± 2.43	2.78 ± 2.99	27.00	0.423
6 Months	2.75 ± 0.89	2.22 ± 0.44	24.00	0.277

U: Mann Whitney test.

p: p value for comparing between the studied groups

DISCUSSION

Temporomandibular joint (TMJ) hypermobility may lead to various types of discomfort including inability to close the mouth, preauricular pain and tenderness of the masticatory muscle [18]. In the literature, conservative treatment approaches included intermaxillary fixation, intra-articular injection of autologous blood, and prolotherapy[10,16].

Prolotherapy, which is also known as regenerative injection therapy and growth factor stimulation injection therapy, is an injection therapy used to strengthen and repair chronic ligament, joint, capsule, and tendinous injuries by stimulating proliferation of collagen at the fibro-osseous junctions to promote soft tissue repair and relieve pain [19]. Dextrose prolotherapy was used for stimulating inflammation because of its safe nature in comparison

with different proliferants such as phenol-glucose-glycerin and sodium morrhuate [10].

Results of the present study demonstrated significant decrease of maximum mouth opening in both groups throughout the follow up periods. This may be attributed to the action of dextrose therapy that initiates fibroblast proliferation, with production of stronger, thicker, and organized connective tissue that limit the hypermobility. Results of the present study agreed with Refai et al[19] who reported that the percentages of decrease in MMO were significantly greater in dextrose group than the placebo group. Moreover, these results were in agreement with Majumdar et al[20] who concluded that MMO decreased significantly between preoperative and 6 month postoperative. Zhou et al [17] in a series of 45 patients, reported a success rate of 91% after dextrose prolotherapy.

Ungor et al [10] conducted a retrospective study of 10 patients treated with dextrose 10% prolotherapy. They reported a decrease in MMO and stated that this decrease was not statistically significant. This is not coinciding with our result. This is because they have used a lower concentration of the dextrose (10%) than used in our study (25%). The dextrose 10% doesn't cause a histological inflammatory reaction, whereas dextrose injected in >10% solution is presumed to influx inflammatory cells and initiates the healing [15].

At 2 weeks and 1 month follow up periods, no statistically significant difference in mean MMO was found between group A and group B. At 3 and 6 months, group B showed a statistically significant reduction in mean MMO than group A. These results revealed that the combination of dextrose injection with IMF gave better result on hypermobility than dextrose injection alone. This may be due to the mandibular immobilization (IMF) for two weeks which aid in the development of mature fibrosis within the joint capsule. This could be affected positively on MMO measurements [16]. This agrees with Hegab [16] who used autologous blood injection alone ABI, intermaxillary fixation alone IMF, or both together for the treatment of TMJ dislocation. He found that the best clinical results were given by a combination of ABI and IMF.

In hypermobility, patient's pain is often caused by stretching the retrodiscal tissues while opening the mouth. The intensity of preoperative and postoperative TMJ pain was recorded on a 10 cm Visual analogue scale (VAS). Both groups showed a statistically significant decrease in pain intensity through all periods. The pain reduction in both groups might be attributed to the action of dextrose prolotherapy which promote tissue repair or growth, strengthen and repair damaged ligaments and helps stabilize the joint. On the other hand, IMF put the TMJ in rest for two weeks that help reduced the pain intensity. However, comparison between the 2 groups showed no statistically significant difference in pain intensity throughout the study intervals. This result is in accordance with Refai et al[19] and Alderman et al [21]. Similarly, Kilic et al[22] and Mustafa et al[23] reported statistically significant difference in pain reduction in both dextrose and placebo groups but no inter group difference.

CONCLUSION

The use of dextrose 25% prolotherapy technique significantly improved the symptomatic TMJ hypermobility. A better result could be obtained when dextrose 25% prolotherapy was combined with IMF for two weeks. However, continued research into combined IMF / prolotherapy's effectiveness in patient populations with large sample sizes and long-term follow-up is needed.

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