COMPARISON OF SOFT AND HARD SPLINTS IN THE MANAGEMENT OF TEMPOROMANDIBULAR JOINT DYSFUCNTION

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Abstract

Objectives: *To evaluate the success rate of soft and hard splints in managing pain and restricted mouth opening in myofascial pain dysfunction (MPD) and internal derangement (ID) of the temporomandibular joint (TMJ).*

Materials & Methods: *A total of 50 patients diagnosed with myofascial pain dysfunction syndrome or signs of internal derangement were selected for this study. They were divided into two groups.*

Group A was treated with vacuum-formed splints (soft splint group) whereas group B was treated with acrylic resin splints (hard splint group). The total treatment period for both groups was four months.

Patients were recalled at 1, 2, 3 and 4-month intervals. Pain scores, recorded on a visual analogue scale (VAS) and the range of mouth opening was also recorded at regular intervals. Data were compared between groups and within groups. Pain scores of less than 2mm on the VAS and a mouth opening of more than 38 mm were parameters for sufficient treatment.

Results: *Difference in pain scores between the two groups were statistically significant at 1month (P=0.01) and three months (P=0.00). The difference of mouth opening using hard and soft splints was not statistically significant at all months (P≥0.29).*

Conclusion: *A soft splint is more effective in relieving the pain of TMD than a hard splint. There is no difference in two types of the splint in relieving restricted mouth opening.*

Key Words: *Soft occlusal splint, Hard occlusal splint, Myofascial Pain Dysfunction, Internal derangement, Temporomandibular Joint, Temporomandibular Disorder*

Introduction

The Temporomandibular joint (TMJ) is the joint between the lower jaw and the base of the skull. Temporomandibular disorders are a group of disorders which comprise a constellation of problems that affect the temporomandibular joint (TMJ), the associated muscles and related structures. According to a study conducted in Bergen, Norway, the prevalence of TMD was reported to be at 11.9% as per the Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) classification[1]. Common signs and symptoms of Temporomandibular Joint Dysfunction (TMD) are a pain, clicking, problems during chewing and limited or asymmetrical jaw movements that may affect the quality of life[2]. It is the most common cause of facial pain[3]. It can be managed through both invasive and non-invasive means. Conservative treatments include physical therapy, localized steam application, external muscle massage, occlusal adjustment, analgesia, psychotropic medication, splint therapy, alternative therapies such as acupuncture, ultrasound, soft laser, diathermy, and infrared radiation[4-7]. Invasive treatments include correction of the disk (meniscectomy), removal of the

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disk alone (meniscectomy) and removal of the disk followed replacement using with a Proplast-Teflon implant[8,9].

Prosthodontic and orthodontic appliances can be used for occlusal adjustments to reposition the mandible to centric occlusion[10]. Intraoral occlusal splints provide an even occlusal platform without altering the mandibular rest position or permanently altering the dental occlusion. There are some intraoral devices available which include the Michigan splint, modifications of a Hawley splint, and the anterior repositioning splint. Although occlusal splints are given routinely for TMDs, their role in relieving the signs and symptoms is still debatable[11].

Soft and hard splints are routinely used in clinical practice with the advantages and disadvantages of both types of appliances. For short term use, a generic soft splint can be given because of easier fabrication and the possibility of use with brackets and wires in place. The acceptance rate of a soft splint by patients is also higher because of better comfort[12]. Soft splints however, have been shown to be less effective in providing relief of symptoms in the long run[13]. Hard splints although less comfortable, are shown be more superior in relieving symptoms in problems that require the use of a splint for extended periods of time, especially in functional disorders of the masticatory symptoms[14]. They work to relieve symptoms by providing occlusal equilibrium, improving the vertical dimension, repositioning of the condyle, altering the afferent impulses to the central nervous system along with aiding cognitive awareness[15].

This study aimed to evaluate the success rate of soft and hard splints in managing pain and restricted mouth opening in myofascial pain dysfunction (MPD) and internal derangement (ID) of the TMJ. Similar success rate would allow the routine use of soft splints instead of hard splints because of more superior comfort levels provided by soft splints.

Materials and Methods

This clinical trial was conducted in the Department of Orthodontics and Prosthodontics at Khyber College of Dentistry, Peshawar, from August 2017 to April 2018. The trial was approved by the hospital ethical committee. An informed consent explaining the purpose, risks and benefits of the procedures involved were taken from the participants. A total of 50 patients were included among which 21 were males, and 29 were females. The following patients were included in the study; patients 22-50 years of age with myofascial pain duration of at least three months, patients having tenderness in muscles of mastication and neck, deviation of mandible on opening and those with a history of clicking, grating, disk displacement or lock-jaw.

Patients previously treated for TMD, those with occlusal disharmony, patients undergoing orthodontic treatment and occlusal correction, those with any form of systemic factors causing arthritis and patients seeking treatment from a psychiatrist for psychological disorders associated with pain in TMJ region were excluded from the study.

The patients were divided into two groups, A and B, consisting of 25 patients each. The mean age of the patients was 25 and 45 years in a group A and B, respectively. Group A was treated with a soft splint while group B was given a hard splint. The total treatment period for both groups was four months.

Maxillary arch impressions were taken with alginate to make master casts of the maxilla for both types of splints. Soft splints constructed from elastic rubber sheets with a thickness of 2 millimetres, using a vacuum former, ensuring close adaptation to the maxillary occlusion. Hard splints were fabricated from self-curing transparent acrylic resin with a thickness of 2–3 mm. Before trying the splints in the patient mouth for retention, they were disinfected with 2% glutaraldehyde.

The patients were instructed to wear the splint for four months. The time of use was increased progressively to reach 14 hours of use per day by the 7th day and 24 hours a day by the end of week 3. Removal of the splint was allowed only during eating and during hygiene procedures.

Patients were recalled at 1, 2, 3 and four-month intervals. Pain scores were recorded using a visual analogue scale (VAS). The range of mouth opening was also recorded at each follow-up visit. Pain scores and range of mouth opening were compared within and between groups. Pain scores of the VAS less than 2 and a mouth opening of greater than 38 mm were the parameters for sufficient treatment.

The collected data was analyzed using SPSS version 22.0. Percentages of frequencies were cal-

culated for categorical variables like type of splint. A t-test was applied for difference of pain scores and mouth opening scores between the two types of splints, keeping p <0.05 as significant.

Results

The study comprised of 50 patients who had been diagnosed with dysfunction of the temporomandibular joint. Data shows that collectively, both groups had a positive response to treatment. Pain and maximum jaw opening improved in all patients during all follow-up intervals. In our study 42% (n=21) of the subjects were male were, and 58% (n=29) were female. The mean age was 30.5±7.68 years which ranged from 20 to 49 years.

The difference in mouth opening at one month, two months, three months and four months between the participants using hard and soft splints was not statistically significant (P≥0.29). (Table 1)

All the pain scores in the soft splint group were lower than in the hard splint group. However, the difference of pain score at two months and four months between the participants using hard and soft splints was not statistically significant (P=0.11 and P=0.65, respectively). Furthermore, pain scores between the two groups were different at one and four months (P=0.01 and P=0.00, respectively). (Table 2)

Similarly, the difference in mouth opening achieved by both types of splints in both males and females at one month, two months, three months and four months it was not statistically significant (P≥0.40). (Table 3 and 4)

At the one-month follow-up visit, lower pain scores were reported for the soft splint group for both males and females, but only the males showed a statistically significant difference (P=0.02). At two months, lower pain scores were reported still for the soft splint group for both males and females, but both scores were statistically insignificant compared to the scores reported by the hard splint group. At the three month follow-up, statistically lower scores for the soft splint group were reported by females (P=0.00). Males, however, reported statistically significant lower pain scores in the hard splint group (P=0.00).

Fig: 1 Type of splints used stratified by gender

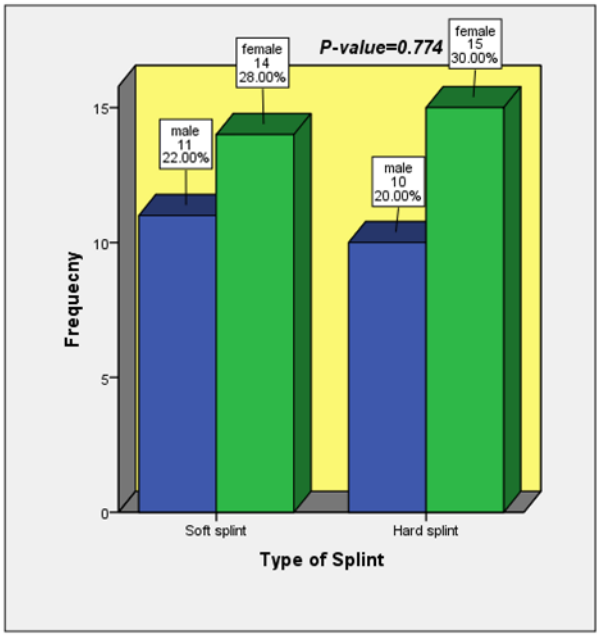

Table 1: Overall comparison of mouth opening in participants wearing soft versus hard splint

Type of Group		Mean	S.D	P. Value
Mouth opening at 1 month	Soft splint	28.84	9.07	0.772
	Hard splint	29.6	9.39	
Mouth opening at 2 months	Soft splint	69.96	193.66	0.315
	Hard splint	30.56	9.39	
Mouth opening at 3 months	Soft splint	72.52	193.07	0.302
	Hard splint	32.2	8.08	
Mouth opening at 4 months	Soft splint	74.28	192.72	0.296
	Hard splint	33.56	7.98	

**Independent sample T-test
** P Value ≤ 0.05

Table 2: Overall comparison of pain score in participants wearing soft versus hard splint

Type of Group		Mean	S.D	P. Value
Pain score at 1 month	Soft splint	6.68	1.03	0.005
	Hard splint	7.44	0.77	
Pain score at 2 months	Soft splint	5.56	0.87	0.107
	Hard splint	6.04	1.17	
Pain score at 3 months	Soft splint	2.56	0.96	0
	Hard splint	3.68	0.58	
Pain score at 4 months	Soft splint	0.56	0.68	0.646
	Hard splint	0.64	0.64	

*Independent sample T-test
** P Value ≤ 0.05

Table 3: Comparison of mouth opening in participants wearing soft versus hard splint in males

Type of Group		Mean	S.D	P. Value
Mouth opening at 1 month	Soft splint	28.64	9.36	0.87
	Hard splint	27.9	10.64	
Mouth opening at 2 months	Soft splint	30.91	6.11	0.76
	Hard splint	29.8	9.96	
Mouth opening at 3 months	Soft splint	33.91	4.61	0.49
	Hard splint	31.9	8.05	
Mouth opening at 4 months	Soft splint	35.55	5.41	0.4
	Hard splint	32.7	9.33	

*Independent sample T-test
** P Value ≤ 0.05

Table 4: Comparison of mouth opening in participants wearing soft versus hard splint in females

Type of Group		Mean	S.D	P. Value
Mouth opening at 1 month	Soft splint	29	9.19	0.61
	Hard splint	30.73	8.66	
Mouth opening at 2 months	Soft splint	100.64	258.66	0.31
	Hard splint	31.07	9.31	
Mouth opening at 3 months	Soft splint	102.86	257.98	0.3
	Hard splint	32.4	8.37	
Mouth opening at 4 months	Soft splint	104.71	257.45	0.3
	Hard splint	34.13	7.23	

*Independent sample T-test
** P Value ≤ 0.05

Table 5: Comparison of pain score in participants wearing soft versus hard splint in males

Type of Group		Mean	S.D	P. Value
Pain score at 1 month	Soft splint	6.86	1.1	0.02
	Hard splint	7.47	0.83	
Pain score at 2 months	Soft splint	5.71	0.91	0.09
	Hard splint	6.07	1.39	
Pain score at 3 months	Soft splint	3.64	0.74	0
	Hard splint	2.6	0.99	
Pain score at 4 months	Soft splint	0.64	0.63	0.12
	Hard splint	0.47	0.52	

*Independent sample T-test
** P Value ≤ 0.05

Table 6: Comparison of pain score in participants wearing soft versus hard splint in females

Type of Group		Mean	S.D	P. Value
Pain score at 1 month	Soft splint	6.86	1.1	0.10
	Hard splint	7.47	0.83	
Pain score at 2 months	Soft splint	5.71	0.91	0.43
	Hard splint	6.07	1.39	
Pain score at 3 months	Soft splint	2.6	0.99	0.00
	Hard splint	3.64	0.74	
Pain score at 4 months	Soft splint	0.74	0.52	0.42
	Hard splint	0.64	0.63	

*Independent sample T-test
** P Value ≤ 0.05

At four months, both males and females reported statistically insignificant lower pain scores in the hard splint group. (Table 5 and 6)

Discussion

The objective of this study was to determine the efficacy of soft and hard splint in the treatment of TMD. Our results show that soft splints were better at relieving pain than hard splints while both types of splints were equally effective in improving limited mouth opening.

Our sample size consisted predominantly of females. Reasons for this have attributed to behavioural, psychosocial, hormonal, and constitutional factors. The results of this study are corroborated by Bagis et al. who showed that females had TMD signs and symptoms more frequently than males in their study population.16

In the current study, the mean age was 30.5±7.68 years and the age range was from 20 to 49 years. Similarly, in a two-year study in Seattle, USA, the incidence of TMD symptoms in adults aged ≥18 years was greater in females compared to males, and it decreased in successively older age groups, although the youngest age category reported was 18 to 44 years.17 The mean age of the subjects in these studies represents an age where stress and depression are at peak levels which contributes towards temporomandibular pain and dysfunction.18

The present results showed that soft splint was effective controlling pain of TMD than the hard splint. The reason for this may be that it is more comfortable for the patients to wear than a hard splint. Seifeldin et al conducted a study on 50 patients who had been diagnosed with TMD in the form of reciprocal clicking of to assess for myofascial pain dysfunction (MPD) and internal derangement (ID) of the TMJ.19 The patients were assigned to two groups and were treated for 4 months with either a soft occlusal splint constructed from 2-mm-thick thermoplastic material (soft splint group) or a hard-occlusal splint fabricated from transparent acrylic resin (hard splint group). Six parameters of TMJ function (pain, visual analogue scores, tenderness of masticatory muscles, clicking, tenderness of the TMJ, and range of mouth opening) were measured before treatment and at 1, 2, 3 and four months. Their findings revealed that both types of occlusal splints improved TMJ symptoms in patients with MPD or ID of the TMJ. However, the soft occlusal splint group had lower pain scores after four months of use. These results are in contrast to our findings. Subjects reported improved TMJ function parameters with a soft splint after one month of use only. A possible reason for this may be better compliance of the participants with a soft splint attributed to genetic and ethnic factors. In our study, the two types of splints had no difference in improving mouth opening, i.e. both were equally effective, which was in agreement with various other studies.20, 21A possible reason for the difference between the efficacies of the soft and hard splints in pain control and improvement in function could be the difference in the time of use required to achieve better pain scores compared to improved mouth opening. Further studies are needed to investigate the reasons for the difference in improvement of pain and mouth-opening scores in both types of splints used in this study.

Conclusion

A soft splint is more effective in relieving the pain of TMD than a hard splint. There is no difference in the two types of the splint in relieving restricted mouth opening.

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