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Research Article

Does Articular Pressure Change Vital Signs During Temporomandibular Joint Arthrocentesis?

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Abstract

Objective: The objective of this study was to evaluate and compare vital signs, especially mean blood pressure and heart rate, in patients treated with two techniques of arthrocentesis of the temporomandibular joint.
Methods: Thirty patients received TMJ arthrocentesis with either two needle arthrocentesis (TNA) or single needle arthrocentesis (SNA). Heart rate and arterial pressure measurements were recorded at six different stages of the procedure and these values were compared between the two techniques.
Results: Heart rate and mean blood pressure recorded their peak values during needle insertion for both local anesthesia and arthrocentesis administration (P<0.05). Heart rate and mean blood pressure scores were significantly higher in the SNA group.
Conclusion: It is necessary to be more cautious in patients receiving SNA as blood pressure and heart rate may increase.

Keywords: arthrocentesis, temporomandibular joint, blood pressure, heart rate

Temporomandibular Eklem Artrosentezinde Eklem Basıncı Yaşamsal Bulguları Değiştirir mi?

Öz

Amaç: Bu çalışmanın amacı, iki farklı temporomandibular eklem (TME) artrosentez tekniği uygulanan hastaların ortalama arter basıncı ve kalp hızı gibi yaşamsal bulgularını karşılaştırmaktır.

Yöntemler: Otuz hastaya; çift iğne girişli artrosentez veya tek iğne girişli artrosentez yöntemleri ile TME artrosentezi uygulandı. Kalp hızı ve arteriyel basınç ölçümleri işlemin altı farklı aşamasında kaydedilerek bu değerler iki teknik arasında karşılaştırılmıştır.

Sonuçlar: Ortalama kan basıncı ve nabız; anestezi ve iğne girişi sırasında en yüksekti (P<0.05). Kalp hızı ve ortalama arter basıncı skorları tek iğne girişli artrosentez yapılan hasta grubunda istatistiksel olarak daha yüksekti. Tek iğne girişi ile artrosentez yapılan hastalarda kan basıncı ve kalp hızı artabileceğinden daha dikkatli olmak gerekir.

Anahtar Kelimeler: artrosentez, temporomandibular eklem, kan basıncı, nabız

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1. Introduction

Lysis and lavage of the Temporomandibular Joint(TMJ) were first applied using arthroscopy by Onishi [1]. In 1991, Nitzan first introduced the technique of TMJ arthrocentesis, which involves flushing the joint cavity by injector pressure with two needles inserted into the upper compartment of the joint [2]. This technique later became known as a double needle or two needle arthrocentesis (TNA) technique.

The joint irrigation procedure can be conducted either at a lower pressure using a suspended infusion bag or at a higher pressure with the use of a syringe [3].

Multiple adjustments have been recorded in the literature to address the challenges associated with the use of dual needles in the classical arthrocentesis technique. The single needle arthrocentesis technique was introduced by Guarda-Nardini in 2008 [4].

The single needle method includes flushing the upper joint compartment by allowing both the liquid inlet and outlet through the same cannula [5].

In SNA the fluid flow persists within the same cannula and lumen; therefore, arthrocentesis takes more time than TNA and SNA technique [6]. In addition, patients undergoing the SNA technique may find the arthrocentesis procedure more difficult to tolerate due to the higher intra-articular pressure compared to other techniques [7].

Several studies have compared the efficacy of TMJ arthrocentesis techniques [6,8,9] However, only one study has assessed patient comfort with these techniques about anxiety levels [10].

This study aimed to investigate patient HA and MBP values in the SNA technique compared to the TNA technique.

2. Material and Methods

This study received approval from the Erzincan Binali Yildirim University Clinical Research Ethics Committee. (2020/03-16). The study included 30 patients who were examined in Erzincan Oral and Dental Health Training and Research Hospital between 2019 and 2020 and diagnosed with disc displacement and underwent arthrocentesis with this diagnosis. Patients signed written informed consent before each procedure. This study included patients who were diagnosed according to the current diagnostic criteria and who also exhibited unilateral joint involvement, which was confirmed by magnetic resonance imaging (MRI) findings. All patients were adults, aged 18 years or older, and had been experiencing TMJ pain for a minimum of 6 months. Patients with systemic diseases affecting TMJ, previous TMJ surgical operations, and patients with incomplete clinical records were excluded from the study.

The patients were randomly allocated into two treatment groups based on the treatment they received. (SNA or TNA).

Arthrocentesis Techniques:

The TNA procedure used was described by Nitzan [2]. For this technique, a direct line was established from tragus to the lateral eye cantus, referred to as the Holmlund-Helsing line. The initial puncture point was designated as 20 mm in front and 10 mm below the tragus, while the second point was marked as 10 mm in front and 2 mm below the tragus. The superior joint compartment was washed up with 150 mL Lactated Ringer's fluid after preauricular local anesthesia infiltration. Two 21-gauge needles were used for irrigation, and upon completion of the procedure, following the removal of one of the needles, a 1 mL injection of hyaluronic acid was administered into the superior TMJ cavity via the remaining needle.

In the SNA technique, only a single needle entry point was used and both fluid entry and fluid exit were managed with the same cannula and lumen of a single 21-gauge needle as described by Guarda-Nardini et al. [4] The joint was irrigated with 150 mL RL solution. At the end of the procedure, 1 mL of hyaluronic acid was injected via needle.

Measurement Time Points:

MBP and HR of each patient were measured the operation (T0), during the needle insertion for local anesthesia (T1), during needle insertion(s) to the superior joint compartment (T2), during the arthrocentesis procedure at the fifth minute (T3) during the arthrocentesis procedure at the tenth minute (T4), and at the at the conclusion of the arthrocentesis procedure (T5).

Statistical Analysis:

Statistical analysis was carried out with IBM SPSS 22. The data were presented as mean ± standard deviation and median (minimum–maximum). The normality of variable distributions was assessed using the Kolmogorov-Smirnov test, and the Mann–Whitney U test was employed to compare values between the two groups due to the non-normal distribution of variables. Statistical significance was defined as a p-value less than 0.05.

3. Results and Discussion

There were no significant differences observed between the groups concerning age and sex. (Table 1). HR and MBP values were higher at all stages in the SNA group compared to the conventional arthrocentesis group. (Figure 1,Figure 2) however, there were no statistically significant differences between the two groups in all periods except at T4. (Table 2).

Table 1: Age and Sex Distribution of Patients in the Study

	SNA (n: 15)	TNA (n: 15)
Age (years)		
Mean ± SD	31.53 ± 10.76	27.33 ± 7.91
Median (min. – max.)	32 (17 – 53)	23 (19 – 42)
Sex		
Female	9/15 (60%)	10/15 (67%)
Male	6/15 (40%)	5/15 (33%)

SD: standard deviation; min: minimum; max: maximum

SNA: single needle Arthrocentesis, TNA: Two Needle Arthrocentesis

Table 2: Comparison of MBP and HR values according to process stages

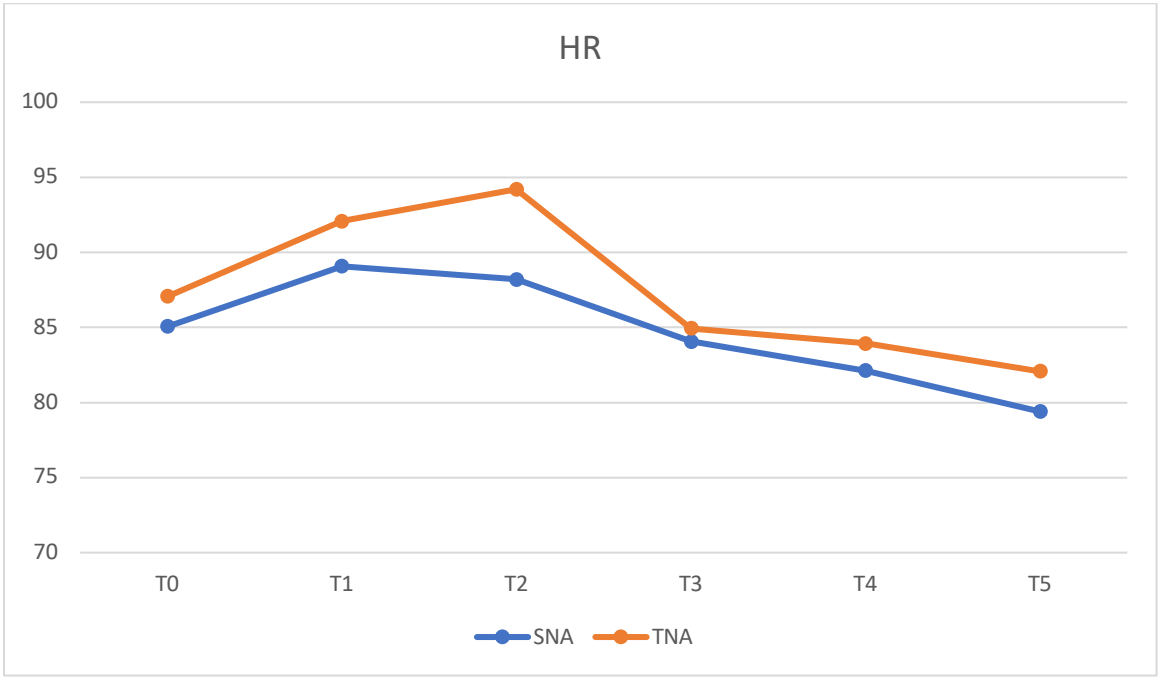
	HR			**MBP**		
	SNA	**TNA**	**P**	**SNA**	**TNA**	**P**
T0	85.07 ± 12.78	87.07 ± 14.11	0.870	94.13 ± 8.10	90.00 ± 11.56	0.285
T1	89.07 ± 13.26	92.07 ± 14.98	0.744	100.60 ± 7.94	94.13 ± 12.11	0.148
T2	88.20 ± 13.24	94.20 ± 15.21	0.389	98.27 ± 8.51	94.27 ± 11.69	0.250
T3	84.07 ± 12.78	84.93 ± 13.85	0.967	95.33 ± 8.07	87.80 ± 11.37	0.056
T4	82.13 ± 12.41	83.93 ± 13.70	0.902	97.00 ± 7.91	86.67 ± 11.10	0.013*
T5	79.40 ± 11.84	82.07 ± 13.24	0.775	90.53 ± 7,85	83.33 ± 10.73	0.067

SNA: single needle Arthrocentesis, TNA: Two Needle Arthrocentesis

HR: Heart Rate, MBP: The Mean Blood Pressure

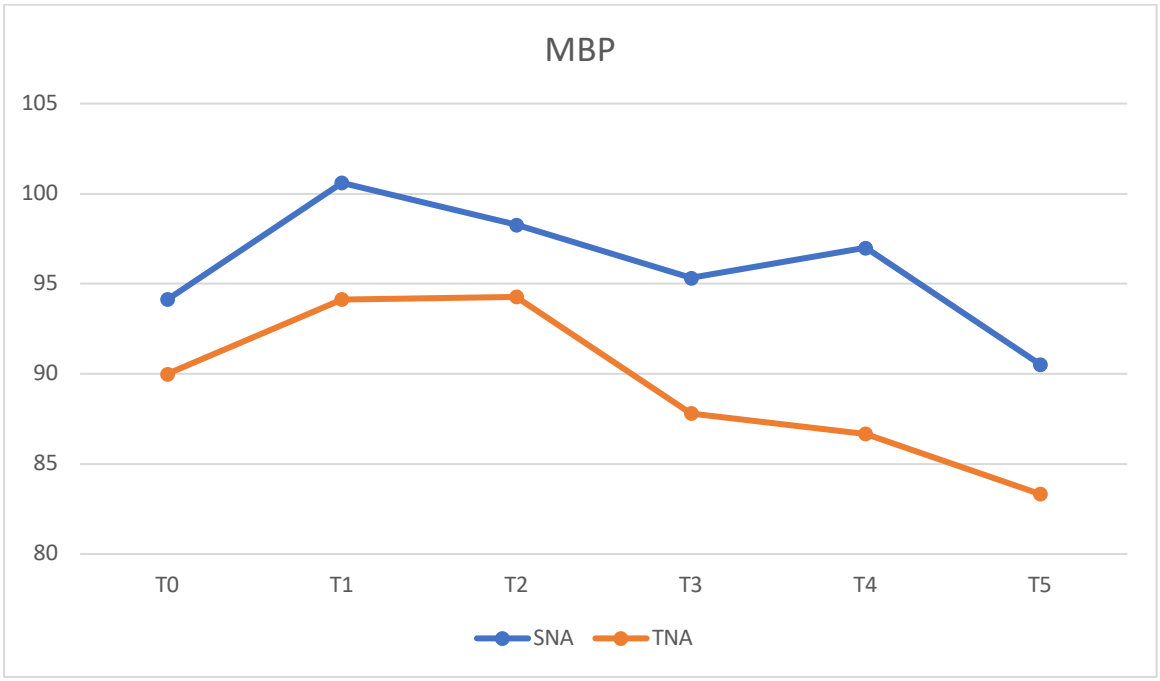
T0: Preoperative, T1: during the needle insertion for local anesthesia, T2: during needle insertion(s) to the superior joint compartment, T3: Fifth minute, T4: Tenth Minute, T5: At the conclusion of the arthrocentesis procedure

Figure 1: Change in HR Values According to Process Stage



SNA: Single Needle Arthrocentesis, TNA: Two Needle Arthrocentesis
HR: Heart Rate, MBP: Mean blood Pressure

Figure 2: Change in MBP Values According to Process Stages



SNA: single needle Arthrocentesis, TNA: two needle Arthrocentesis
HR: Heart Rate, MBP: Mean Blood Pressure

Discussion:

The effect of maxillofacial surgical interventions on heart rate and mean blood pressure values has been frequently presented in the literature [11]. Many publications have shown increases in these two values during surgical procedures performed under local anesthesia [12]. Changes in blood pressure and heart rate are often attributed to dental anxiety and fear [13,14]. Patients not only have a fear of dental surgical procedures but also develop anxiety about the needle used for local anesthesia administered before surgery [15]. In the arthrocentesis procedure, in addition to the needle used for local anesthesia, the procedure itself involves separate needle entries, which can further increase anxiety. With the increase in anxiety and fear, an increase in heart rate and average blood pressure is an expected outcome [16].

Various studies published to compare the effectiveness of SNA and TNA techniques [6,8,9,17–21]. Two of them additionally focused on the ease of procedure [6,8]. They studied the ease of procedure by using subjective feedback from the operator performing arthrocentesis. Only one study investigated the comfort of patients observing vital signs [10]. In the SNA technique, it was presumed that the intraarticular pressure would be greater than in the TNA technique because both the liquid inlet and outlet were managed through the same cannula [22]. The higher pressure can be useful in TMJs presenting intraarticular adhesions as in disc displacement without reduction cases. However, this higher pressure can be assumed more uncomfortable for patients. Additionally using the same cannula takes longer time in the SNA technique [21]. Longer operation time can be an irritating factor for patients and thus the HR and MBP values would be expected higher compared to the TNA technique. Taskesen et al. studied HR and MBP and the Stait-Trait Anxiety Inventory Scale (STAI-S) to compare patient comfort and anxiety levels in TNA and SNA techniques [10]. They revealed no statistically significant differences in HR and MBP values in any period between SNA and TNA groups although they expected the HR and MBP values would be higher in SNA than in TNA because of the higher intraarticular pressure. Unlike their study, we found the statistically significant difference only at point T4 marking the tenth minute of the procedure. The difference at this time point may be due to the pressure and this difference may be explained by the fact that the longer the duration of the procedure, the less the patient tolerates the pressure.

Limited sample size and retrospective study design are two major limitations of our study. However, using objective parameters such as HR and MBP values may be considered pro of the present study.

4. Conclusion

This study revealed that the SNA technique may reduce HR and MBP values therefore patient tolerability of the SNA may need to be considered in the SNA technique. Further studies using similar objective parameters in larger patient groups are needed

Ethics in Publishing

This study was approved by the Erzincan Binali Yildirim University Clinical Research Ethics Committee (2020/03-16)

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