Comparison of Efficacy and Safety of Infiltration Anesthesia and Inferior Alveolar Nerve Blockage for Posterior Mandibular Implant Insertion

Posterior Mandibulada İmplant Yerleştirilmesinde İnfiltrasyon Anestezisi ve İnferior Alveolar Sinir Bloğunun Etkinlik ve Güvenilirliğinin Karşılaştırılması

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ABSTRACT Objective: Implant insertion to posterior mandibular region is routinely performed with alveolaris inferior nerve blockage and this procedure includes the risk of mandibular nerve damage. For avoiding the nerve injury, infiltration anesthesia is considered as an alternative technique. This study is designed to evaluate the efficiency of infiltration anesthesia and inferior alveolar nerve (IAN) blockage in pain control, reliability of the injection technique, bleeding amount and relation with bone density and pain control for implant placement to posterior mandible. **Material and Methods:** Infiltration anesthesia or IAN blockage were randomly applied to 40 patients. Anesthetic solution deposition pain and implant insertion pain were evaluated by visual analog scale (VAS). The relation of implant insertion pain scores and bone density was evaluated statistically with Student's t test for both anesthesia techniques. **Results:** There was no statistically significant difference between the VAS scores of infiltration anesthesia and IAN blockage group during the implant placement and injection ($p > 0.05$). When pain is considered in neither injection technique, patients did not fell pain and alarm the surgeon. **Conclusion:** The present report suggests that although infiltration anesthesia was efficient for implant insertion to posterior mandible, it is not safer than IAN blockage when nerve damage is considered.

Key Words: Anesthesia, local; dental implants; mandibular nerve

ÖZET Amaç: Posterior mandibular bölgede implant yerleştirilmesi rutin olarak alveolaris inferior sinir bloğu ile yapılmaktadır ve bu uygulama mandibular sinir hasarı riskini taşımaktadır. Sinir hasarını önlemek için infiltrasyon anestezisi bir alternatif olarak düşünülmektedir. Bu çalışmada, posterior mandibulaya implant yerleştirilmesinde infiltrasyon anestezisinin ve inferior alveolar sinir bloğunun ağrı kontrolünü sağlamadaki etkinlikleri, sinir hasarı riski açısından güvenilirlikleri, operasyon sırasındaki kanama miktarı üzerine etkileri, kemik dansitesi ile anestezi etkinliği arasındaki ilişkinin değerlendirilmesi amaçlanmıştır. **Gereç ve Yöntemler:** İnfiltrasyon anestezisi veya alveolaris inferior sinir bloğu rastgele olacak şekilde 40 hastaya uygulanmıştır. Anestezik solüsyonun enjeksiyonu sırasında oluşan ağrı ve implant yerleştirilirken oluşan ağrı vizüel analog skala (VAS) ile değerlendirilmiştir. Her iki anestezi tekniğinde işlem sırasında hissedilen ağrı skorları ile kemiğin densitesi arasındaki ilişki Student's t testi ile istatistiksel olarak değerlendirilmiştir. **Bulgular:** Enjeksiyon ve implant yerleştirilmesi sırasındaki VAS skorları yönünden infiltrasyon anestezisi ve infeior alveolar sinir bloğu arasında istatistiksel olarak anlamlı bir farklılık bulunmamıştır. Her iki anestezi tekniğinde de sinire yaklaşılması halinde, hasta ağrı hissetmemiştir ve tepki vermemiştir ($p > 0.05$). **Sonuç:** Bu çalışmanın sonuçlarına göre infiltrasyon anestezisi posterior mandibulada implant yerleştirilmesinde etkili iken, sinir hasarı göz önünde bulundurulduğunda inferior alveolar sinir bloğundan daha güvenli değildir.

Anahtar Kelimeler: Anestezi, lokal; diş implantları; nervus mandibula

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Inferior alveolar nerve (IAN) blockage is routinely performed in dentistry and it provides ipsilateral anesthesia of teeth, alveolar bone, floor of the mouth, tongue and the some parts of the gingivae. Painless mandibular posterior implant insertion with IAN anesthesia is possible.

However it was reported that if implant insertion is performed with IAN anesthesia which provides deep proprioceptive blockage, in patients with insufficient alveolar bone height at mandibular posterior area the risk of mandibular canal damage increases.[1,2]

Heller and Shankland reported three major complications during the placement of posterior mandibular implants with IAN blockage: 1. prolonged soft tissue anesthesia which is uncomfortable for the patients; 2. the higher risk of intra-arterial injection; 3. damage of the inferior alveolar or mental nerves.[2]

Implant insertion as long as possible is necessary to provide the primary stability and long term successful results. Determination of vertical bone height before the surgery diminishes the risk of complications. Despite the technical developments in imaging, such as Cone Beam CT, there is still a risk of damage to the IAN during implant placement to the posterior mandible.

Infiltration anesthesia could be an alternative technique due to its shallow anesthetic properties which may allow the patient to give warn the physician if the drill or implant comes closer to the mandibular canal.

It is known that infiltration anesthesia has higher hemostatic properties than regional anesthesia and infiltration anesthesia provides better visibility during the surgery.[3,4]

Dense bone limits the diffusion of local anesthesia to the medullary bone and this may effect the pain control. It is thought that, IAN blockage provides deeper pain control than infiltration anesthesia in dense bone.[5]

This study is designed to evaluate the efficiency of infiltration anesthesia and IAN blockage in pain control, reliability of the injection technique, bleeding amount and relation with bone density and pain control for implant placement to posterior mandible.

MATERIAL AND METHODS

Forty ASA I or II patients (29 female, 11 male) who were edentulous at posterior mandible were included in this prospective and controlled study. Patients who needed additional surgery were excluded from the study. All patients signed an informed consent form before the procedure. The mean age of the patients was 51.97 (range 25 to 81).

A total dose of 2 cc articaine HCl solution (Ultracaine DS Forte, epinefrin HCI 0.012 mg/mL, Sanofi Aventis) was injected to each group.

In infiltration group 1.6 cc solution was deposited to buccal vestibule and 0.4 cc was deposited to the lingual area supraperiosteally. In IAN group following 1.4 cc local anesthetic solution deposition to lingula region, the syringe was pulled back 3mm and 0.3 cc solution was deposited for lingual nerve blockage and finally 0.3 cc anesthetic solution was deposited for regional buccal nerve anesthesia. Nine patients had bilateral implant placement and one of the two different anesthesia techniques was applied to each side of these patients. Following 4 minutes latency period 35 implants were inserted to 30 patients in infiltration group and 24 implants were inserted to 19 patients in IAN group. All implants were inserted 1.5-3 mm close to the mandibular canal. When additional local anesthesia was required for the operation, the procedure was considered as a failure. Implants which were inserted more than 3 mm away from the canal were excluded from the study.

Bone density was evaluated according to the tactile sensation during the drilling procedure. Proposed classification of jaw bone quality according to Lekholm and Zarb was used.[6] The amount of bleeding during the surgery was also clinically observed and noted.

Digital panoramic radiograph (Mediadent, 62 kV, 6.6 mA, 16s, 55.8 Gycm^2) was obtained intraoperatively with a metal indicator for accuracy of the calibration of the drilling procedure (Figure 1). Postoperative digital panoramic radiograph was also obtained to control the final location of the implant (Figure 2).

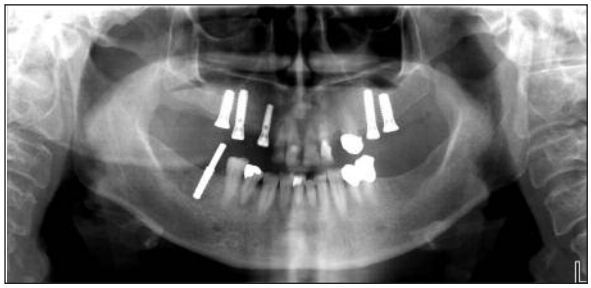

FIGURE 1: Panoramic radiograph with indicator to evaluate the distance between the mandibular canal and metallic indicator.

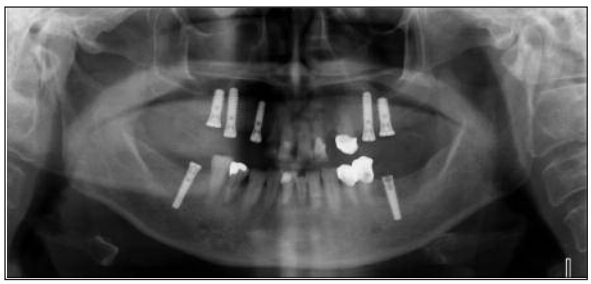

FIGURE 2: Final location of the implant.

The pain which occurred during the local anesthetic injection and implant placement were evaluated by Visual Analog Scale (VAS). Correlation of VAS scores of the two anesthesia techniques and bone density were evaluated by *Student's t* test.

RESULTS

Implant surgeries were completed by IAN blockage or infiltrative anesthesia in all patients other than one in infiltration group. This was accepted as a failure. The success rate of the infiltration anesthesia and alveolaris inferior blockage for posterior mandibular implant placement was 96.77% and 100% respectively.

There was no statistically significant difference between the VAS scores of infiltration anesthesia and IAN blockage group during anesthetic solution deposition and implant placement ($p > 0.05$) (Table 1).

When bilateral group (9 patients, 18 hemimandible) was considered there was no statistically significant difference between the VAS scores of two anesthesia techniques during implant placement and injection ($p > 0.05$) (Table 2).

The VAS scores increased according to the bone density in infiltration anesthesia group, but there was no meaningful correlation between the bone density and VAS scores of IAN group. There was no statistically significant difference between the two anesthesia groups when VAS scores of two groups were evaluated separately in D1, D2 and D3 bone ($p > 0.05$) (Table 3).

There were no complications noted during the surgeries and none of patients had nerve damage. The amount of bleeding observed was slightly higher in IAN blockage group than infiltration anesthesia group.

DISCUSSION

IAN blockage is the most commonly applied regional injection technique in dentistry and implant surgery. Although pain control with this technique is adequate, Del Castillo et al. reported that inferior alveolar or mental nerve damage is possible during implant insertion.[7]

TABLE 1: Table 1 shows the mean VAS scores of all 40 patients (59 hemimandible) for anesthesia deposition and implant placement.

	Aneshtesia pain	Operation pain
Infiltration anesthesia	0.55	0.76
Inf.alveolar nerve block	0.47	0.89

Mean VAS scores of all patients.

TABLE 2: Table 2 shows the mean VAS scores of bilateral group (9 patients, 18 hemimandible) for infiltration anesthesia side and IAN blockage side.

	Aneshtesia pain	Operation pain
Infiltration anesthesia	0.33	0.66
Inf.alveolar nerve block	0.22	1.22

Mean vas scores of bilateral group.

TABLE 3: Table 3 shows the mean VAS scores of 40 patients (59 hemimandible) in D1, D2 and D3 bone separately. (D4 bone have not seen in any patient).

Bone Density (Leckholm and Zarb)		D1	D2	D3	D4
Infiltration Anesthesia	Operation Pain	1,5	0,72	0,62	---
Inf.Alveolar NerveBlock	Operation Pain	0,6	0,9	1	---

Relationship between bone density-vas scores.

Two mm away implant insertion from the mandibular canal is considered a safe procedure for implant insertion and preoperative panoramic radiographs are valuable for determination of the safe distance from the canal.[8,9]

This present study compared the IAN and infiltration anesthesia techniques and showed that infiltration anesthesia is a reliable and effective technique for mandibular posterior implant insertion. This method was successful in 30 patients and failed in one patient (success rate %96.77).

When the VAS scores were compared there was no statistically significant difference between the two groups which means that infiltration anesthesia is not safer than IAN blockage when the risk of nerve damage during implant insertion is considered.

Nine patients had bilateral implant insertion with infiltration anesthesia or IAN. The VAS scores of these 9 patients were analyzed separately and these results were concomitant with the whole results.

Dense bone is considered a barrier for local anesthesia diffusion into the medullary bone. However, in this study the density of bone did not affect the efficiency of local anesthesia. Additionally, there was no statistically significant difference between the bleeding amount of two anesthesia techniques.

When we compared the IAN blockage and infiltration anesthesia techniques, we found that implant surgery with IAN blockage provides longer postoperative pain control.

If implants are inserted closer than 1.5 mm to the mandibular canal the patient may feel pain and warn the surgeon and VAS scores may induce, however this was not evaluated in this study due to damage risk of IAN.

Although painless tooth removal and endodontic treatment at posterior mandible by infiltration anesthesia is not possible,[10] implants may be inserted to this area without pain with the same anesthesia technique. This conflict has not been fully explained and could be related to periodontal and/or pulpal tissues surrounding the tooth and should be investigated more.

CONCLUSION

Although painless implant insertion to posterior mandible is possible with infiltration anesthesia, this anesthesia technique is not safer than inferior alveolar nerve blockage and the patients do not alarm the surgeon when implants come closer to the mandibular canal up to 1.5 mm.

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