

Hemostatic effects of adrenaline and Ankaferd (blood stopper) during orthodontic attachment bonding

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Background/aim: Moisture prevention during the bonding of orthodontic attachments on impacted teeth is crucial for accomplishment. It was aimed to compare the hemostatic effects of adrenaline and Ankaferd Blood Stopper (ABS) during the surgical exposure of the impacted maxillary canine.

Materials and methods: The study consists of 20 patients, whose orthodontic treatments were outlined with the surgical exposure of maxillary impacted canine. Patients were divided into groups of 10; where each group was treated with one of the two medicines to control bleeding. Group A was treated with adrenaline, and group B was treated with Ankaferd Blood Stopper (ABS). The bleeding period was recorded as the time from the exposure of the crown until the inception of bonding.

Results: It was observed that both the bleeding period and the cumulative duration were significantly shorter in group B (the ABS group) than in group A (the adrenaline group) ($P < 0.05$), but no significant deviation in bonding times was recorded.

Conclusion: ABS is a good alternative hemostatic agent for the prevention of bleeding at the surgical exposure of impacted teeth without affecting the bonding.

Key words: Adrenaline, Ankaferd Blood Stopper, bleeding time, bonding time, impacted canine

1. Introduction

Prevention of moisture contamination is very important at any stage of the bonding procedure. In orthodontic practice, controlling moisture can easily be achieved during the bonding of orthodontic brackets to labial surfaces of erupted teeth. However, for impacted teeth, a surgical approach is required to bond an orthodontic attachment. During this surgical operation, providing moisture control is more crucial due to blood contamination. Studies showed that contamination of blood and/or saliva has a negative effect on bonding of orthodontic attachments (1–3).

Currently, there are several hemostatic agents that are generated from plants, animal products, and synthetic polymers designed for hemostasis (4–7).

Hemostatic agent used in this study is a herbal extract named Ankaferd Blood Stopper (ABS), which is a standard mixture of five different plants; *Thymus vulgaris*, *Glycyrrhiza glabra*, *Vitis vinifera*, *Alpinia officinarum*, and *Urtica dioica* (8–10). ABS represents its hemostatic action by the formation of an encapsulated protein network for vital physiological erythrocyte aggregation without

affecting the normal physiological individual coagulation systems (7,8,10–13). ABS is effectively used in medical and dental areas on patients who have primary and secondary hemorrhagic diathesis. Case series shows successful treatments on patients who have hemorrhagic diathesis (14,15).

Adrenaline, an adrenergic agent can be used locally on the bleeding gingiva and tooth pulp in the form of 1/1000 solution for the hemostasis. Adrenaline acts on α receptors on the mucosa membrane, so it stimulates these receptors and makes local vasoconstriction (16).

The aim of this study was to compare the hemostatic effects of ABS and adrenaline in terms of time consumption during bonding of orthodontic attachments to surgically exposed impacted canine teeth.

2. Materials and methods

2.1. Methods

This research project was approved by the Ethical Committee for Human Research, E14-376, Ankara

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Numune Training and Research Hospital, Ankara, Turkey. 20 patients (11 females, 9 males) who were referred to Hacettepe University, Department of Orthodontics due to the existence of impacted teeth were included in this study. Upon careful inspection and a complete diagnosis, orthodontic traction of impacted teeth following surgical exposure was planned. Patients' ages ranged from 14 to 17, with a mean of 15.75 years. None of the patients reported any bleeding disorders that would affect coagulation or a systemic disease that would cause contraindication for surgery.

Prior to surgery, patients were evaluated radiographically by means of orthopantomograms and occlusal radiographs (Figure 1). All of the canines were located at the palatal side. Patients underwent maxillary canine surgical exposure under local anesthesia with Articaine HCl (Maxicaine[®], VEM İlaç, İstanbul, Türkiye; containing epinephrine 1:200000). An incision was made to the midalveolar crest and sulcular incisions were applied from palatal side according to the location of impacted maxillary canine. A mucoperiosteal flap was then elevated palatally and osteotomy of the bone around the maxillary canines was performed. The decision of which hemostatic agent would be used for a particular patient was determined using a simple randomization technique. 10 small pieces of paper labeled with the initials, (ADR for adrenaline and ABS for the Ankaferd group) were inserted in 20 identical opaque envelopes. Right before each surgical intervention, one of the researchers (AZO) chose one of the envelopes, opened it and read the label aloud to determine which hemostatic agent would be used during the surgery. ABS/ADR was placed in surgery site until successful coagulation was achieved. The bleeding period was recorded as the time from the exposure of the crown until the inception of bonding. Surgery site was irrigated with sterile saline for removing ABS and ADR. Bonding procedure was performed according to the manufacturer's recommendation. The impacted tooth was etched with 37% phosphoric acid (Etching Gel, 3M Unitek, Monrovia, CA, USA) for 30 s. The tooth was then rinsed with water and dried. A coat uniform primer (Transbond XT primer, 3M Unitek) was applied. A gold chain was bonded to the tooth surface with Transbond XT adhesive (3M Unitek) and the adhesive was polymerized for 20 s. The recording for the bonding time was started with the application of acid gel and stopped after the light curing (Figure 2). The bleeding times and bonding times were recorded separately for each group. Following the bonding procedure, the area was irrigated, ligature wire was raised from vertical incision, and then the flap was sutured primarily. The surgical and orthodontic teams were the same for all patients.

Amoxicillin clavulonic acid (1 gr: 2 × 1), naproxen sodium (275 mg: 3 × 1) and chlorhexidine digluconate

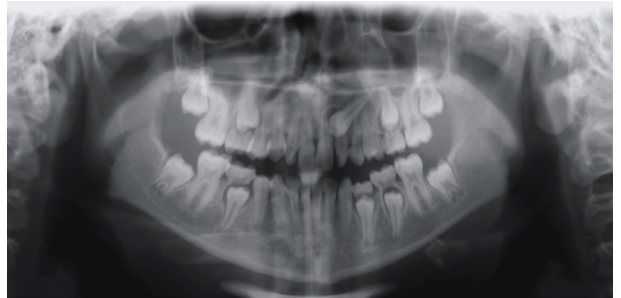


Figure 1. Patients were evaluated radiographically by means of orthopantomograms.

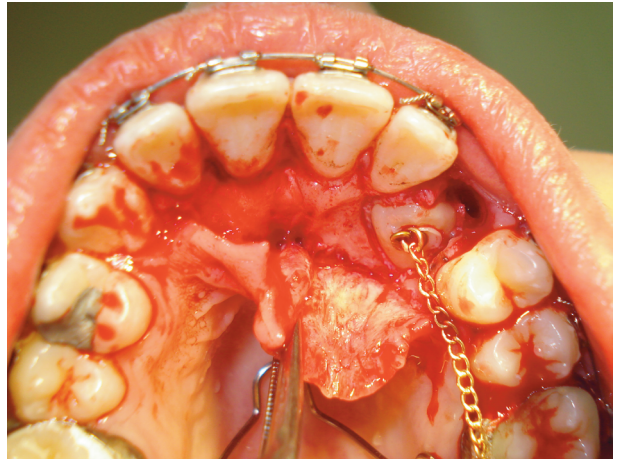


Figure 2. Gold chain was bonded to tooth surface after adrenaline or Ankaferd was applied for hemostasis.

benzylamine hydrochloride (15 mL: 3 × 1) were administered postoperatively. All of the patients were controlled one week later for suture removal. None of the brackets sheared off during treatment.

2.2. Statistical method

Normality of the data was tested using Shapiro–Wilk test. Distribution of bleeding time was found to be normal. However, due to the nonnormal distribution of the bonding time data nonparametric tests were used. Mann–Whitney U test was used to compare the bleeding time, bonding time, and total time between the adrenaline and ABS groups.

3. Results

Bleeding time, bonding time, and total time for each patient were evaluated statistically. According to the statistical values, there is no significant difference in bonding times but the bleeding times were shorter in the ABS group than in the adrenaline group. Consequently, the difference seen in bleeding time ($P < 0.01$) was reflected in

the total time ($P < 0.05$), which also showed a significant statistical difference between the ABS and the adrenaline groups; the ABS group presented shorter and the ADR group presented statistically significant longer total time (Figure 3).

4. Discussion

Current study evaluated the difference between ABS and Adrenaline in terms of bleeding times and bonding times during surgical exposure of impacted canines for orthodontic attachments. This study aimed to find an alternative agent for bonding procedure hemostasis.

Hemostasis is an important necessity for oral and maxillofacial surgical procedures (4,5). Various agents (oxidized cellulose, gelatin sponge, fibrin glue, bone wax, and tranexamic acid) and techniques (moist sponge application, pressure with clamp) are used to prevent intraoperative and postoperative hemorrhage (5,17). One of the most preferred methods to control bleeding during the surgical exposure of maxillary canines is the incorporation of adrenaline. In this study, ABS was compared with ADR. ABS was tested for topical hemostatic efficacy in animals with normal and defective hemostasis (18–20). ABS application can manage the physiological cell-based coagulation and prevent the bleeding in many clinicopathological situations (12,21–25). According to the literature, the adequate hemostatic pattern of ABS used on arterial tissues and used after tonsillectomy was observed in a range from 3.1 s to 3.19 min in earlier studies (26,27). Kandemir et al. used ABS for the hemostasis on abdominal aortas of rats and showed that ABS could be used successfully on hemostasis by measuring the bleeding times. Teker et al. observed that less bleeding time and less blood loss were seen when ABS was used for the hemostasis after tonsillectomy compared to the knot-tie technique (26,27). In the present study, the hemostatic pattern was recorded in a range of 22.1 s to 54.1 s for the ABS group. On the other hand, in adrenaline group the hemostasis pattern was seen in the range of 30 to 109 s, which was longer than in the ABS group.

Çakarer et al. showed that the mean of bleeding time in the ABS-treated dental extraction sockets was 56.2 s (28). Baykul et al. investigated the efficacy of the topical ABS application in 4 patients on hemorrhagic diathesis, following dental procedures under different conditions. Within 10 to 20 min, the hemostatic effect of ABS was seen in most of the patients after dental surgery (15).

In the literature, it was reported that the application of ABS decreased the inflammation and necrosis in a rabbit study (9). ABS also has positive effects on early soft tissue and bone healing (9,29). In the present study, the patients were not evaluated for the acceleration of tissue healing and there was no complication about healing in both

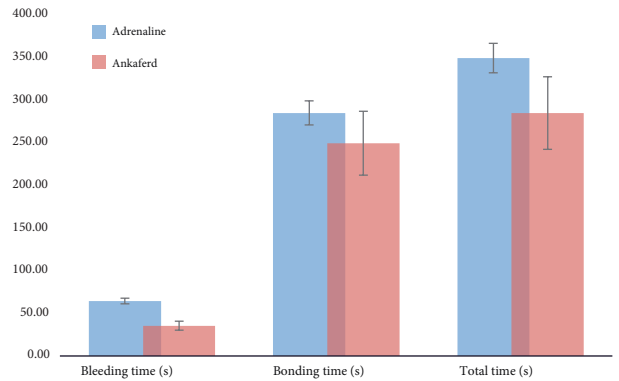


Figure 3. Comparison of bleeding time, bonding time, and total time between the adrenaline and Ankaferd groups. ($P = 0.002^*$ for bleeding time, $P = 0.677^{**}$ for bonding time, $P = 0.043^{***}$ for total time); $^*P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$.

groups but accelerated healing with ABS can be evaluated in further studies for better treatment models.

Kelles et al. compared ABS with adrenaline plus lidocaine and gelatin foam in the treatment of epistaxis in a rabbit model. ABS was found to be more effective than Adrenaline plus lidocaine and gelatin foam (30). Similar to this study, it can be seen that the bleeding time of the ABS group was significantly shorter than that of the adrenaline group. This can be an advantage in shortening the bleeding time and the total operation time.

Bonding failure due to humidity and contamination is a very common problem encountered while bonding attachments to impacted teeth. If bonding failure occurs during the orthodontic traction of impacted teeth, a secondary surgery will be necessary to bond a new attachment (31–33). In various studies, it was emphasized that shear bond strength can be lower if an orthodontic bracket is bonded directly to enamel surface that is contaminated with blood (31,32). In an in vitro study, Arslan et al. observed that ABS contamination reduced the bond strength of adhesives (33). In this study, no bonding failure was observed in any of the patients. Surgery site was irrigated with sterile saline before the bonding procedure. This may be the reason for zero debonding especially in the ABS group. In the present study, ABS and adrenaline were compared for bonding times. No significant difference was found between the ABS and adrenaline groups regarding bonding times.

Although all the operations were performed by the same surgeon and orthodontist to minimally affect the times of bleeding and bonding, distances from occlusal plane and positions of the impacted maxillary canines were not similar, and this can affect bleeding time because of the amount of osteotomy around the impacted teeth. This study is unique in that it compares ADR and ABS

over bleeding times in an in vivo study, which is a first in oral surgery. There are a few researches mentioning the effect of ABS on the shear bonding strength, yet there are no published data about the comparison of the bleeding time and bonding times of ABS and ADR. The clinical significance of ABS should be clarified in detail under in vivo conditions. This study is important for the literature as an in vivo study which offers an alternative hemostatic

agent to adrenaline that is routinely used for hemostasis during surgical exposure of impacted maxillary canines.

As a conclusion, the ABS group was more advantageous than the adrenaline group in terms of bleeding and cumulative time, yet no significant difference for the bonding time was recorded. Further studies can be done with increased number of patients and addition of impaction classification.

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