



EFFICACY OF CHITOSAN (AXIOSTAT) AS A HEMOSTASIS IN MINOR ORAL SURGERY

Dental Science

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ABSTRACT

Purpose: This study evaluated the efficacy of Chitosan (AxioStat) as a hemostatic in minor oral surgery. **Patients and Methods:** 50 patients underwent minor oral surgical procedures and haemostasis achieved with chitosan (AxioStat) and time taken for hemostasis was statistically evaluated. **Results:** This study involved 18 (36%) cardiac patients taking oral anticoagulants, 17 (34%) hypertensive patients and 15 (30%) diabetic patients. During minor oral surgical procedures hemostasis was achieved in mean time of 89.3 seconds with help of chitosan (AxioStat). **Conclusion:** The present study provides evidence that Chitosan (AxioStat) can be used as a clinically effective hemostatic dressing material that significantly shortens bleeding time following minor oral surgical procedures in medically compromised patients.

KEYWORDS

chitosan (AxioStat), postsurgical bleeding, haemostatic agent

INTRODUCTION

Bleeding is most common complication in oral and maxillofacial surgery. Bleeding from inaccessible parts of the oral cavity can cause distress, agony and discomfort to the patient and also distract the oral surgeon from operating field leading to frustration and consumption of more time. Bleeding can be due to variety of local or systemic factors. Predisposing factors include pre-existing local infections and presence of nutrition deficiency such as anaemia, hepatic insufficiency, hypertension, diabetes, traumatic procedures, and patient on anti-platelet medication. These factors can lead to significant bleeding during procedure and to stop this excessive bleeding haemostatic agents may be required.¹

In the past, haemostatic measures such as pressure packing, suturing of the wound and adrenaline were used. Sometimes the bleeding is from capillaries which cannot be controlled by mechanical mean, hence haemostatic agents would be of particular value in these procedures. Agents like microfibrillar collagen, gelatine sponge, fibrin glue, tranexamic acid, topical thrombin can be used, however they tend to cause infection and delayed wound healing.^{1,2,3}

Chitin is a relatively new product which is insoluble polysaccharide polymer of glucosamine that is purified and partially deacetylated to form soluble chitosan aqueous gel. Chitosan gel is then freeze dried in moulds to make a highly electropositive sponge-like material that is haemostatic and adapts well to oral surgical wounds. Chitosan is a food grade material which can be safely ingested, and its accidental inhalation risk is almost zero as it undergoes dissolution.⁴ Chitosan has a positive charge and attracts red blood cells (RBC) and platelets, which are negatively charged through ionic interaction thus a strong seal is formed at the wound site. This supportive primary seal allows the body to activate its coagulation pathway effectively, initially forming organised platelets.⁵

In this study we have tried to evaluate the efficacy of chitosan (AxioStat) as a haemostatic agent in 50 patients during minor oral surgical procedures.

Material and method

Study design : 50 patients who underwent minor oral surgical procedure were included in study without age or gender bias. Out of 50 patients 18 were cardiac patients taking oral anticoagulant, 17 were hypertensive and 15 were diabetic. They underwent minor oral surgical procedures under local anaesthesia with adrenaline in maxillary and mandibular arch. During procedure bleeding was encountered and site was packed with chitosan (AxioStat) dressing and

time taken for haemostasis was recorded. Postoperative analgesics were given only if required. Pre or post operative antibiotics were prescribed as and when required.

All patients had mean preoperative INR value of 1.34

Inclusion Criteria:

- Patients aged 18 years or older
- Patients undergoing minor oral surgical procedures with excessive bleeding tendency even if they are on oral anticoagulants/oral antiplatelet treatment

Exclusion Criteria:

- Pregnant, planning to get pregnant or lactating women.
- Allergy to seafoods and severe medical illness and not fit for extraction.
- Genetic bleeding disorders.

Result

Our study involved 50 patients 37 were males (74%) and 13 were females (26%) with age ranging from 19 to 76 years. 18 patients (36%) were cardiac patients taking oral anticoagulant, and 17 patients (34%) were hypertensive, 15 patients (30%) were diabetic. In this study, mean time of hemostasis was 89.3 seconds with range of 60-119 seconds. All patients had mean preoperative INR value of 1.34.

Table 1 (Sex Distribution)

Male	Female
37(74%)	13(26%)

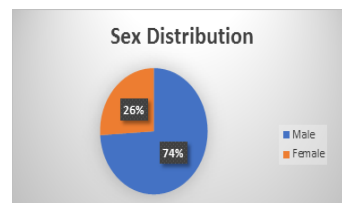
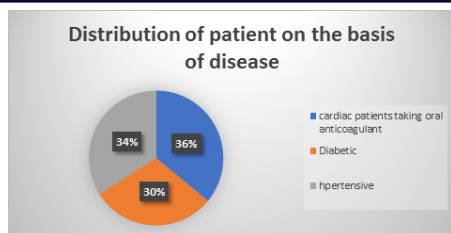
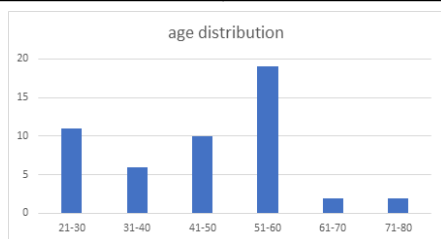


Table 2 (Distribution of patient on the basis of disease)

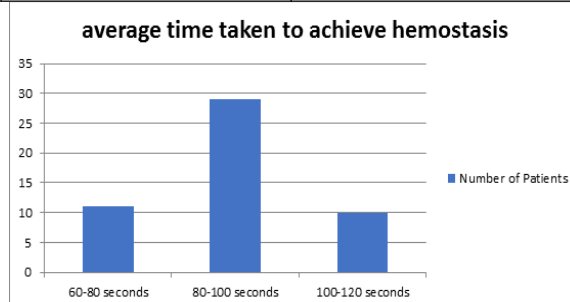
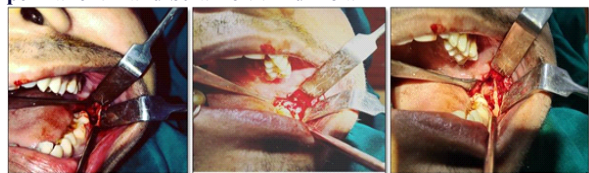
Disease	patients
cardiac patients taking oral anticoagulant	18(36%)
Hypertensive	17(34%)
Diabetic	15(30%)

**Table 3 (age distribution)**

Age (year)	patients
21-30	11(22%)
31-40	6(12%)
41-50	10(20%)
51-60	19(38%)
61-70	2(4%)
71-80	2(4%)

**Table 4 (average time taken to achieve hemostasis)**

Time (second)	Patient
60-80	11(22%)
80-100	29(58%)
100-120	10(20%)

**Figure 1: Axiostat placement after surgical removal of bilateral impacted permanent mandibular Canines****Figure 2: Axiostat placement after surgical removal of impacted permanent mandibular left third molar****Figure 3: Axiostat placement after enucleation of cystic lesion in left ramus of mandible region****DISCUSSION**

In this study, we paid attention on different minor oral surgical procedures like 22 (44%) surgical removal of third molar, 4(8%) surgical removal of canine, 16 (32%) multiple extraction, 4 (8%) cyst enucleation, 2 (4%) surgical canine exposure, 2 (4%) alveolar ridge reduction in which intraoperative bleeding control with axiostat was achieved. Haemostasis was achieved in mean time of 89.3 seconds with help of chitosan (Axiostat). None of this cases postoperative bleeding, infection was encountered.

The AXIOSTAT dental dressing is manufactured from freeze dried Chitosan and molds to form a highly electropositive sponge-like material.⁴

The self-adhesiveness nature of AXIOSTAT dental dressing is caused principally by the electrostatic attraction of negatively charged red blood cells to the key component positively charged Chitosan molecule of the AXIOSTAT dental dressing resulting in binding of red blood cells to the Chitosan molecule of AXIOSTAT dental dressing with the formation of dense, viscous mass that provides adhesion.¹

The soft consistency of AXIOSTAT dental dressing results in its easy trimming and manipulation with digital pressure, in order to be placed in the surgical site. The sterile AXIOSTAT dental dressing when placed in surgical site is a perfect pressure pack because of its frictional locking in the site.¹

Malmquist et al.⁶ found that chitosan dressing (HemCon Dental Dressing) is a clinically efficient hemostatic agent after oral surgery procedures, even in patients under oral anti-coagulant therapy.

Shen et al.⁷ observed the haemostatic effect of Chitosan on platelet adhesion and aggregation as well as the release of growth factors from platelets stimulated by Chitosan exposure. Cunha-Reis et al.⁸ showed cell adhesion consistent with the nature of the Chitosan.

Besides the haemostatic effect of Chitosan based AXIOSTAT dental dressing, another added advantage is its polycationic nature at acidic PH allows it to disrupt the membranes of gram-negative bacteria, giving it natural antimicrobial properties.^{9,10}

The ability of the chitosan dressing to form an effective seal preventing exposure to external environment and having an inherent bacteriostatic effect might be the two reasons for lowered wound infection. Similar observations were reported by other investigators such as Malmquist et al.⁶ and Kale et al.¹ Shen et al.⁷

Chitosan allows oral surgeons to continue anticoagulant regimens for surgical procedures and obviating the need for comprehensive management of INR status.¹¹⁻¹²

In this study, there was no alteration done in Oral anticoagulant regimen before procedure and haemostasis achieved with chitosan in accordance with Amer et al.¹³

CONCLUSION

The present study provides evidence that Chitosan (axiostat) can be used as a clinically effective haemostatic dressing material that significantly shortens bleeding time following minor oral surgical procedures in medically compromised patients.

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