

Chitosan based Axiostat Dental Dressing following Extraction in Cardiac Patients under Antiplatelet Therapy

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ABSTRACT

Hemostasis in cardiac patients following dental extraction under antiplatelet therapy is often challenging due to the risk of post extraction bleeding if it is not stopped or altered before extraction or risk of thromboembolism if they are stopped or altered before extraction. The various hemostatic measures that are traditionally being used in patients following dental extraction, Chitosan based dental dressing (AXIOSTAT) is a milestone, which is being increasingly used by many dental surgeons. 50 cardiac patients undergone single tooth extraction in dental clinic of the railway hospital without stopping or altering the antiplatelet therapy and AXIOSTAT dental dressing was placed in the extracted socket for Hemostasis. Patients were checked for the effectiveness of AXIOSTAT as a hemostatic measure in the study. All patients who underwent extraction under the protocol that we followed showed the **average hemostatic time in all the patients was 1.5 minutes.** None of the patients showed troublesome bleeding in this study. The Chitosan based AXIOSTAT dental dressing is a wonderful hemostatic agent that is routinely being used in many fields but due to lack of awareness among dental surgeons it is less used in dentistry. This study will certainly be one small step in this matter, but a thorough study is needed to check for the effectiveness of Chitosan based AXIOSTAT dental dressing in other surgical extraction and different oral surgery procedure.

KEYWORDS: Axiostat Dental Dressing, Antiplatelet Therapy, Extraction, Hemostasis

INTRODUCTION

The changes in lifestyle have resulted in lots of patients with cardiac complication who routinely takes either single or dual antiplatelet therapy. The protocol followed by Dental surgeons toward cardiac patient taking single or dual antiplatelet treatment reporting for tooth extraction is to either stop or alter their medication because of the fear of excessive and uncontrolled bleeding following tooth extraction. The continuation of antiplatelet medication results in risk of post extraction bleeding, but on stopping or altering the medication puts patients at increased risk of thromboembolic events such as cerebrovascular accidents and myocardial infarction. The study in 1994 showed that 2.3% of 1500 adults seeking dental treatment were on oral antiplatelet therapy. The Antiplatelet medication generally prescribed are low dose aspirin (75mg to 300mg), Clopidogrel and Dipyridamole. Combined use of aspirin and clopidogrel (dual antiplatelet) produces additive and possible synergistic effects as the two block complementary pathways in the platelet aggregation cascade. The use of this combination is increasing in patients with acute coronary syndrome, in ST- segment elevation, acute myocardial infarction and in patients who have had coronary artery stents.^{1,2}

Tooth extraction is a common procedure in dentistry. Hemostasis following tooth extraction is essential to prevent blood loss. Hemostasis in the healthy individual involves interaction between blood vessel wall, the blood platelet, the blood coagulation system, and the fibrinolytic system. Antiplatelet drugs are drugs that interfere with the platelet phase by decreasing platelet aggregation and interfere with the clot formation.

To minimized the risk of post extraction bleeding in patients taking antiplatelet medications, several protocols have been followed such as use of local antifibrinolytic therapy^{3,6} and various haemostatic agents, while some authors suggest that they can safely undergo outpatient dental extraction without changes in their regular therapeutic antiplatelet therapy or by use of fibrin glue post extraction to prevent the hemorrhagic complication.⁴ Each of the approaches has its own merit and demerit such as bleeding risk if antiplatelet therapy is allowed to continue or cost factor of fibrin glue used post extraction.

Chitosan is a high molecular copolymer with acetyl glucosamine and glucosamine radicals in its structural chain that when subjected to dissolution in diluted organic and inorganic acids, result in formation of viscid electrolytes. The presence of active groups in Chitosan

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molecules allow for easy chemical modifications and as a result of this Chitosan is being increasingly used in different fields. The role of Chitosan in the medical field is largely, due to its specific biologic features like biocompatibility, 100% natural, biodegradability, easily broken down to glucosamine, and antibacterial activity [1]. The main cause of haemostatic effect of Chitosan is that it can induce platelet adhesion, aggregation, and activation of intrinsic blood coagulants, and besides this Chitosan can control bleeding by sorption of plasma, and erythrocyte coagulation.

The wonderful action of Chitosan has led us to do a study with Chitosan based AXIOSTAT dental dressing

On 50 cardiac patients who were on either single or dual antiplatelet therapy reporting to the dental clinic of this railway hospital for dental extraction.

CASE REPORT

A total of 50 cardiac patients reporting to the dental clinic in this railway hospital for dental extraction were taken up for study purpose. All the patients were on either single or dual antiplatelet therapy. Patients taken for the study were subjected to single tooth extraction atraumatic extraction. Before extraction all patients underwent various investigations such as hemoglobin estimation, bleeding time, clotting, I.N.R, and platelet count. Patients allergic to sea food and with severe medical illness, who were not fit for extraction, were excluded from the study. Patient with IN.R less than 2.5 was taken for the study. A full medical history was taken and an I.O.P.A of the tooth was done to rule out any underlying periapical pathology. Patients taken for study were subjected to oral prophylaxis in order to minimize localized gingival inflammation around the tooth to be extracted. Antibiotic prophylaxis was given to all patients preoperatively. Local anesthesia, 2% lidocaine with 1:200000 adrenaline given, and tooth extraction was performed as atraumatic as possible, using forceps technique. Immediately following extraction, the socket was placed with Chitosan based AXIOSTAT dental dressing (1 X 1 cm) trimmed by scissor to fit into the socket with care that AXIOSTAT dental dressing fill the extracted socket to the level of

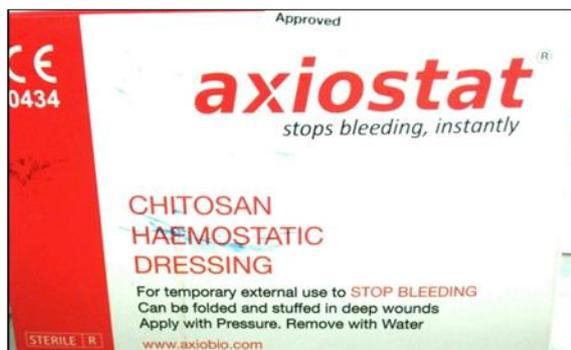


Fig 1: Chitosan Based Axiostat Dental Dressing

crestal gingiva. The dressing was gently placed using the dry instrument and digital manipulation if needed. The patient was given gauze pressure pack over the Axiostat



Fig 2: Sterile Axiostat Dental Dressing 1x1cm



Fig 3: Axiostat Dental Dressing Placed Immediately Post Extraction of the First Molar

dental dressing, and no suture was given post extraction. The patient was observed for 24 hours in this railway hospital for any intermediate or secondary hemorrhage. Next day patient was recalled for a checkup and AXIOSTAT dental dressing was removed with saline irrigation of the socket and patient recalled after one week for follow-up to check the healing of the extracted tooth socket.



Fig 4: Extracted First Molar Socket Healing Next Day after Removal of Axiostat Dental Dressing.

RESULTS

The protocol that we followed in this railway hospital showed no post extraction bleeding in any of the patients. The average time taken for the haemostatic action of the AXIOSTAT dental dressing was 1.5 minutes. The result that we obtained in this study suggests that there is no

need to stop or alter antiplatelet therapy for single tooth extraction. The AXIOSTAT dental dressing removal needs the patient to be recalled again next day which leads to slight inconvenience to the patient.

DISCUSSION

The risk of post extraction bleeding in cardiac patients taking antiplatelet medications is increased further if the extraction is done without stopping or altering the medications. The Chitosan based AXIOSTAT dental dressing is a great hemostatic agent and it also improve post extraction healing. The Chitosan is a versatile biopolymer, and the presence of active groups in its molecular structure allows it to be used in different fields such as biomedicine, agriculture, waste water management and fiber industries. Biodegradation of Chitosan leads to the formation of nontoxic oligosaccharides of various lengths. These oligosaccharides can be processed in metabolic pathways to be excreted.² Kale et al. in 2012 showed that Chitosan based dental dressing improved postoperative healing with minimal complication.

All patients in this study were treated without stopping or altering their antiplatelet therapy based on the evidence that benefit of preventing thromboembolism certainly outweighs the risk of bleeding due to single tooth extraction. 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[3]. The soft consistency of AXIOSTAT dental dressing results in its easily trimming and manipulation with digital pressure, in order to be placed in the extracted socket. The sterile AXIOSTAT dental dressing when placed post extraction in the extracted socket is a perfect pressure pack in the socket that we found in this study because of its frictional locking in the bony extracted socket.³

The AXIOSTAT dental dressing is manufactured from freeze dried Chitosan and molds to form a highly electropositive sponge-like material.⁴ The only important thing is that AXIOSTAT dental dressing requires active bleeding, thus the more bleeding takes place; the better AXIOSTAT dental dressing performs which is quite useful during dental extraction.³ Shen et al. observed the hemostatic effect of Chitosan on platelet adhesion and aggregation as well as the release of growth factors from platelets stimulated by Chitosan exposure. Malmquist et al. in 2008 also concluded that Chitosan based dental dressing proved to be clinically effective hemostatic

agent following oral surgery procedures. Maksym et al. in their review of various hemostatic agents gave the detailed mechanism of action of Chitosan as a hemostatic agent. Besides the hemostatic effect of Chitosan based AXIOSTAT dental dressing, another the added advantage of Chitosan molecule is its polycationic nature at acidic PH allow it to disrupt the membranes of gram-negative bacteria, giving it natural antimicrobial properties.^{5,7}

CONCLUSION

The results of the study that we conducted in this hospital suggest that Chitosan based AXIOSTAT dental dressing is quite effective as the hemostatic agent and is of great help in cardiac patients undergoing tooth extraction, since the use of Chitosan based AXIOSTAT dental dressing greatly minimizes the risk of thromboembolism by allowing the continuation of antiplatelet therapy. Further the antimicrobial property of the Chitosan based AXIOSTAT dental dressing and better post extraction healing can be used in other surgical extraction as well as in minor oral surgery. The cost factor and awareness of the product among dental surgeon are required.

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