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Local Hemostatic Agents in Oral Surgery Bleeding Control

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ABSTRACT:

Oral surgery patients are at considerable risk from intraoperative and postoperative bleeding, which, if unchecked, could have serious negative outcomes. The dentist should be knowledgeable about the many hemostatic medications available and how to use them during various bleeding episodes. Both healthy and systemically compromised people can experience bleeding problems. The physician will be able to apply a particular method when they are appropriate if they have a thorough understanding of the various management techniques. Sadly, due to a lack of knowledge about the coagulation process, as well as the approaches and materials that are accessible, some of the most effective management techniques and preventive measures, are not used. This article's goal is to evaluate the research on the uses of several local hemostatic agents in the control of bleeding during oral surgery, as well as the mechanisms underlying these agents' actions and potential drawbacks. The discussion also includes innovative hemostatic substances like Quikclot and emCon dental dressing. Patients with inherited and acquired bleeding disorders, as well as those who are taking antithrombotic drugs for systemic illnesses, can benefit greatly from local hemostatic agents in reducing bleeding during oral surgical operations.

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Keywords: Oral surgery, local hemostatic drugs, and hemostasis.

INTRODUCTION:

Both the patient and the surgeon may find it difficult as bleeding occurs during and after surgery, and if it is not controlled, catastrophic repercussions may result. It can potentially jeopardise the procedure itself and visibility. When a vascular is cut or disrupted during surgery or due to trauma, bleeding typically results, which is typically successfully treated by exerting pressure. The source of the bleeding can come from either hard tissue (bone) or soft tissue (gums), and depending on the source of the vessel involved, it can be classified as arterial, venous, or capillary bleeding.) Identifying the source of the bleeding requires adequate retraction, good illumination, and thorough suctioning.) Electrocautery and suture ligatures are most frequently utilised in major oral and maxillofacial surgical operations to stop bleeding from tiny and major arteries. (However, topical hemostatic drugs may be required. when broad leaking is present, the use of pressure is ineffective, and the use of electrosurgical instruments could damage teeth or nerves.) It is very challenging to produce hemostasis using mechanical and thermal techniques in tissues with many and dispersed capillaries, parenchymal tissues, inflammatory or friable arteries, or bony surfaces. One of the most popular techniques for controlling intraoperative haemorrhage in such circumstances entails the application of a topical hemostatic drug. Local hemostatic agents prevent external bleeding by promoting or speeding up the body's natural clotting process via a variety of physical interactions with the blood or mechanical techniques. The clinician will be better able to comprehend how and when to use hemostatic drugs if they have a basic understanding of the coagulation process. The purpose of this article is to examine the research on local hemostatic medications used to control bleeding during oral surgery, including information on their mechanism of action, applications, and contraindications.

HEMOSTASIS:

Vasoconstriction, platelet plug formation, and secondary hemostasis coagulation are the three main processes. The first stage is an instantaneous constriction of wounded blood vessels brought on by vasoconstrictive paracrine produced by the endothelium, which causes a brief reduction in blood flow within the injured channel. The second stage involves the mechanical plugging of the defect by platelets adhering to the exposed collagen (platelet adhesion) and activating to release cytokines (serotonin, thromboxane A, and endothelin) in the vicinity of the lesion. Adenosine diphosphate, fibronectin, thrombospondin, fibrinogen, and platelet-derived growth factor are released platelet factors that help to form the platelet plug by activating additional platelets to adhere to one another through platelet aggregation. This furthers the constriction of the blood vessels. The third phase, also known as the coagulation cascade, is triggered by exposed collagen and tissue factor and results in the creation of fibrin polymer. The platelet plug that forms a clot is strengthened and stabilised by the fibrin protein fibre mesh. The intrinsic pathway and the extrinsic pathway are the two primary

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pathways that make up the clotting cascade, or secondary hemostasis. Collagen, which is exposed and binds Factor to start this cascade, is principally responsible for activating the intrinsic route. Tissue factor, which is made visible by tissue damage, stimulates the extrinsic pathway and, via factor activation, starts this process. Thrombin then transforms fibrinogen into fibrin and ultimately the final clot in this shared pathway where these two pathways merge [T].

HEMOSTATIC LOCAL AGENT:

A drug that encourages hemostasis, or the stopping of bleeding, is known as an "antihemorrhagic" hemostatic agent. The optimal hemostatic agent should be economical, safe for use inside the body, and efficient. Its metabolic breakdown products should also be harmless. The two types of local hemostatic agents are passive agents and aggressive agents [3]. Platelets can assemble in the presence of passive hemostatic substances to form a stable clot. The primary function of passive hemostatic agents is to cling to the bleeding site and create a physical, lattice-like matrix that activates the extrinsic clotting pathway and provides a surface for platelets to collect and form clots. Only patients with an intact coagulation cascade should utilise passive hemostats since they depend on the synthesis of fibrin to accomplish hemostasis. Because they are readily available, need no additional preparation or storage, and are very affordable, passive hemostats are frequently used as first-line medications. Actively bleeding wounds are not effectively treated by passive topical hemostatic agents because wet tissue does not adhere to them well, but heavier bleeding may make them more effective due to their greater capacity for absorption and the increased mass that their more fibrous/dense structures provide [3, 4]. It is advised to use the least amount of the agent necessary to achieve hemostasis and remove as much of the agent as possible once hemostasis has been achieved [5, 6]f not they can compress the surrounding structures (nerves, vessels, etc.) because they have the potential to expand many times their mass when they come into contact with fluids. Products that are passively hemostatic on the skin include gelatin, collagen, cellulose, and polysaccharide spheres. Active hemostatic substances are biologically active and directly contribute to the coagulation cascade that results in the formation of a clot. Thrombin and those products [5, 6] in which thrombin is coupled with a passive agent to produce an active product are examples of active agents. For patients using antiplatelet and/or anticoagulant medicines, thrombin is a beneficial option. In most circumstances, an active agent may be used with a passive agent to improve the total hemostasis, even if it is expensive and typically used with gelatin foam.) In general, most hemostatic agents are contraindicated in infected wounds. Two more types are flowable agents and sealants, which include cyanoacrylate, albumin and glutaraldehyde, polyethylene glycol (PEG) polymers, and fibrin sealants [5, 6].

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HEMOSTATIC PASSIVE AGENTS:

Items made with collagen

Hemostatic collagen products can be further subdivided into microfibrillar and absorbable collagen products and are made from either bovine tendon or bovine skin collagen. They are non-toxic and non-pyrogenic.

Collagen microfibrillar (Avitene)

It is a fibrous, water-insoluble partial hydrochloric salt made from pure bovine cutaneous collagen. They can be found in sheets, sponges, or loose fibrous forms. These goods shouldn't be resterilized; they are instantly usable and stored at room temperature. It draws platelets to the fibrous mass and encourages their aggregation into thrombi in the spaces between the fibres. This causes the release of clotting factors, the creation of a physiologic platelet plug, and platelet degranulation, which starts the clotting cascade. It must be applied dry directly to the site of bleeding without the addition of saline or thrombin and excess material to be removed. Thrombin is ineffective with this agent due to p(factors.) it is useful in the management of moderate to severe bleeding, i.e., capillary, venous, or small arterial bleeding. This product's drawbacks include the following: potentiation of wound infections and abscess formation [4, 6, 7] allergic reaction, adhesion formation, inflammation, foreign body reaction, and foreign body reaction. Due to fluid absorption and expansion, it must be avoided in any location where it may put pressure on nearby structures and is contraindicated in individuals with known allergies or sensitivities to materials of bovine origin [4,6,7]. For oral surgical operations, this type is typically less useful.

Collagen absorbable hemostat sponge (Helistat)

It is collagen made from pure, lyophilized, or freeze-dried bovine flexor tendon and comes in the form of sponge-like, soft, white, malleable, non-friable, cohesive structures. The items are very absorbent and can contain many times as much liquid as they weigh. Their indications include controlling leaking or bleeding from clean oral lesions as well as protecting open wounds. When applied, these products should be left in place for around - minutes to achieve hemostasis before being taken off, changed, or left in place. These goods are simpler to handle and use since they do not disperse like microfibrillar collagen hemostatic sponges do. T must be handled dry, and only the amount required for use must be extracted. Within days [8], all of these collagen molecules have entirely disappeared these substances alter the coagulation process in addition to mechanically preventing bleeding.) When collagen comes into contact with blood, platelets begin to clump together and adhere in vast numbers to the collagen fibrils. When the aggregated platelets degranulate, they release substances that help a clot form, like thromboxane [9]. The sponge also offers a three-dimensional "D" matrix that helps to fortify the blood clot.) It should not be used on individuals who have known allergies or sensitivities to substances derived from cows, or on wounds that are diseased or polluted

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[8]. The agents may promote bacterial growth and act as a nidus for abscess formation. Adhesion development, allergic reactions, foreign body reactions, and the development of subgalealseroma are all potential side effects. A buildup of blood serum behind the scalp is known as a subgalealseroma [10].

Products based on cellulose

Alpha-cellulose from plants is used to make oxidised regenerated cellulose, or Surgicel, which is sold as a high- or low-density, absorbent white knitted fabric. It is prepared as a costly meshwork of sterile fabric. The rate at which the body absorbs it varies on the amount utilised, the degree of blood saturation, and the tissue bed [4,6,7]. It provides an absorbable physical matrix for coagulation initiation and expands on contact with blood 7–10 times its own weight. Mechanical pressure is used to achieve hemostasis. It possesses acidic qualities due to a low pwhich may result in inflammation and necrosis. Due to p(factors, thrombin does not work with this agent. Due to a low p (factor) this is believed to be moderately bacteriostatic when compared to other hemostatic drugs. They must be applied dry without the addition of saline or thrombin and are used to reduce capillary, venous, and minor artery bleeding. Surgicel has been linked to transient sensory abnormalities, according to Loescher and Robinson [11]. In between 4 and 8 weeks, Surgicel will be absorbed. They should not to be used to: (1) restricted gaps due to swelling; (2) bony defects (fractures) as it may prevent bone regeneration; or (3) major artery haemorrhage control. Adverse responses consist of: (1) Fluid encapsulation and a foreign body reaction if the product is left in the wound (2) Vascular stenosis if cellulose is used to tightly wrap a vessel (3) Burning sensation when applied inunanesthetized nasal passages to avoid delayed healing, surgical granulomas, and neurological problems, excessive amounts of the material should ideally be eliminated. A brand-new topical hemostatic medication called ActCel and Gelitacel is made of sterilised and processed cellulose and is sold as Surgicel, which resembles a meshwork. When in contact with blood, it swells up to three or four times its original size and turns into gel. It entirely degrades within one to two weeks into glucose and water and has no detrimental effects on wound healing. ActCel is utilised in third molar sites and is meant to avoid dry sockets. ActCel's methods of action are diverse, increasing the coagulation process biochemically by promoting platelet aggregation and physically via 3D clot stabilisation. It is additionally employed in orthognathic and periodontal operations. ActCel plays a role in the modifying intrinsic route, and one study has shown that it binds to calcium ions [12], increasing calcium availability for the clotting cascade. It is hypoallergenic, does not include any chemical additives, thrombin, or collagen, and is suggested for the control of bleeding from open wounds and bodily cavities (such as the mouth, ears, nose, throat, and vagina). This material also has bacteriostatic qualities, which are particularly significant in polluted wounds or body cavities where it is difficult or impossible to maintain a sterile field [13]. Since Gelitacel resorbs in as little as 96 hours, it has a lower risk of encapsulation. It is a

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quick-acting, oxidised, resorbable cellulose hemostatic gauze of natural origin created from highest alpha-grade chosen cotton. Surgicel costs more than Gelitacel.

Items made with gelatin

One of the more frequently used substances for the treatment of mild bleeding is gelfoam. Purified hog skin gelatin is used to create the porous, flexible, absorbent gelfoam.) It is produced in the form of films, gelatin sponges (Gelfoam), or powder that is combined with water to create a paste. This product has the ability to expand to 200% of its initial volume and can absorb blood at a rate of around 40 times its weight.) It offers a clotting framework and successfully stops small vessel bleeding, but major artery bleeding may cause gelfoam to become dislodged. Gelfoam is particularly effective in controlling post-operative bleeding during dental extractions, and the inclusion of thrombin increases its efficacy. Gelfoam has very little tissue reactivity and liquefies in the oral cavity within a week, entirely absorbed within 4-6 weeks. Gelfoam can be used dry or moistened with saline or thrombin before placement. Gelatin is suitable for usage in irregular wounds because it conforms well to them. The use of absorbable gelatin sponges is not linked to Increased scarring, but surgeons frequently remove them to avoid nearby tissues being compressed by the swelling of the gelatin before the incision closes [14]. Hemostats made of collagen have been shown to produce poorer quality clots than those made of gelatine [15]. For patients with known allergies or sensitivities to porcine products, for the skin incision closure, in intravascular compartments due to the risk of embolization, in areas of infection or severe contamination due to the possibility of bacteria becoming embedded in the sponge and causing an abscess, or around nerves due to the possibility of swelling and nerve compression [4, 6, 7]. Other negative effects include fever, failure to absorb nutrients, encapsulation of fluid, hematoma, and localised infection [4, 6, 7], giant cell granuloma, excessive fibrosis, toxic shock syndrome, and foreign body reactions.

Hemospheres made of polysaccharides

It is offered in powder form with a bellows applicator and is a relatively new type of topical hemostatic medication made from vegetable starch with no human or animal components. By creating a hydrophilic effect, drying the blood, and concentrating its solid components, polysaccharide hemospheres are used to limit capillary, venous, and minor artery bleeding, consequently boosting barrier development. Since it contains sugars, diabetic people should consume it with caution.

AUTHENTIC HEMATOTIC AGENTS:

Thrombin

Topical thrombin preparations are either made utilising recombinant DNA technology or from human or bovine plasma (i.e., recombinant thrombin). A dry powder, solution for use with gelatin sponges, mixture with a gelatin matrix, or spray form of thrombin can all be

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applied topically.) It takes effect quickly (e.g., within 10 minutes). When taken with gelfoam, it converts fibrinogen to fibrin and is frequently used to treat moderate to severe bleeding. Because it can result in significant intravascular coagulation, which can be lethal, thrombin should never be administered intravenously or allowed to enter the bloodstream through wide, open blood arteries.

Local (flowablehemostatic agent)

Bovine-derived gelatin granules coated with human-derived thrombin make up the patented blend of two independent agents known as FloSeal matrix hemostatic sealant, which together produce a stable clot at the bleeding site. When gelatin granules are placed to a bleeding location, they expand by roughly 10–20% as blood hits them, creating a seal at the bleeding site. By turning fibrinogen into a fibrin polymer and activating the common pathway of the coagulation cascade, the product's thrombin creates a clot around the stable matrix. It returns to the body about 6 to 8 weeks, which is similar with how long it takes for a wound to heal normally. The substance can adapt to uneven wounds because to its flowability. It is effective on both hard and soft tissues and has been used as the first-line hemostatic agent in major oral surgical cases. It can be used in all surgical procedures (other than ophthalmic) as an adjunct to hemostasis when traditional procedures are ineffective. However, it carries the risk of transmitting infectious agents (viruses) and is not recommended for patients who are allergic to materials of bovine origin. The following side effects have been reported in association with flowablehemostatic agents: anaemia, arrhythmia, arterial thrombosis, atelectasis, atrial fibrillation, confusion, edoema, fever, haemorrhage, hypotension, infection, pleural effusion, respiratory distress, and right heart failure [6,14].

Sealants

The way sealants function is by creating a barrier that prevents the flow of the majority of liquids. The novel cyanoacrylate sealant, albumin with glutaraldehyde, PEG polymers, fibrin sealants, and fibrin sealants with fibrin are the four types of sealants used to manage surgical hemostasis. Fibrin sealant (tisseel) In addition to being a tissue adhesive and hemostatic agent, fibrin sealant has an effect on angiogenesis and wound healing whether it is natural or manufactured. In order to produce a fibrin clot at the surgical site, fibrin sealants often contain fibrinogen (Factor 1a), fibrin-stabilizing factor, thrombin (Factor 2a), and aprotinin 2. Using a syringe-like applicator, these materials can be applied, or they can be sprayed over a greater area with a gas-driven device. It is a tool that can be utilised in bone grafting surgeries, particularly sinus lift surgery. Fibrin sealants can be applied to both heparin-treated patients as well as people with coagulopathies who don't have enough fibrinogen to form a clot. Fibrin sealants prevent both local and diffuse bleeding, but not forceful bleeding. 71 patients who had undergone various oral and maxillofacial operations (dentoalveolar, aesthetic, and reconstructive) utilising Fibrin gel were included in a study by Davis and Sándor. One recurring oroantral fistula was among 70 patients' successful results at 6 months

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after surgery.) Patients with sensitivity to bovine proteins should not take it. By preventing revascularization at the surgical site, an extremely thick sealant layer may result in tissue necrosis. Blood thinners made from albumin (bioglue). Since they offer hemostatic and sealing qualities, tissue adhesives have been utilised extensively for many years. Its ability to leak through suture tracks is bioglue's biggest drawback.

MORE RECENT HEMOSTATIC AGENTS:

Products made using chitosan

Hyaluronic acid, chitin, and chitosan are a few of the N-acetyl glucosamine-containing polymers. For local hemostasis, chitosan has been found to be the most successful of them. Chitin from shrimp shells is converted into chitosan, a naturally occurring, biocompatible polymer with an electropositive charge. A highly viscous clot forms when negatively chargedred blood cells are drawn to this charge, sealing the wound and causing hemostasis. Chitosan improves hemostasis by interacting with cellular elements to create a cellular lattice that traps cells to create a synthetic clot. The creation of a clot happens independently of the intrinsic or extrinsic clotting pathways and is useful for patients using anticoagulant drugs. It is a new generation hemostatic agent that produces early hemostasis and enhances post-operative healing. Patients who are sensitive to shellfish do not experience any negative effects from them [1]. (emCon dental dressing) is a N-acetyl glucosamine polysaccharide, a chitosan-based item that comes in sponge shape, is both bacteriostatic and hemostatic, and adapts well to oral surgical wounds. According to a recent study, patients who utilised the (emCon dental dressing ((emCon Medical Technologies,)ncorporated) had hemostasis in less than one minute, which was considerably less time than the 9.5 minutes that the control group experienced on average. 32% of the sites treated with (emCon dental dressings healed noticeably faster than the control sites. A chitosan-based substance was discovered to have special bacteriostatic capabilities against Proteus mirabilis, Staphylococcus aureus, and Pseudomonas aeruginosa in another investigation. After a dacryocystorhinostomy, Dailey et al. compared the hemostatic effectiveness of a chitosan-based bandage to that of a collagen-based bandage. According to their findings, the chitosan bandage functioned better than the collagen one, with 12 of 14 post-operative bleeding occurrences being linked to the latter product.

Items made of poly-N-acetyl glucosamine

It is a kind of microalgal chitosan that has been more thoroughly acetylated and has demonstrated excellent effectiveness as a local hemostatic agent. It has been shown to be a hemostatic agent in genetically acquired, medically induced, and environmentally induced coagulopathy conditions. It concentrates red blood cells, clotting factors, and platelets at the site of bleeding and stimulates release of vasoconstrictors like thromboxane and endothelin. In numerous animal tests, they have outperformed other local hemostatic drugs. Although they have not yet received approval for dental usage, they appear to have a bright future.

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QuikClot (inorganic hemostat)

The main components of QuikClot are zeolites, which are porous aluminosilicate minerals frequently employed as adsorbents. Zeolites may contain a significant number of cations, including calcium, a cofactor in the coagulation cascade, due to their structural porosity. Hemostasis works by removing water from the blood, concentrating clotting components, activating platelets, and then accelerating the coagulation cascade's subsequent phases.

Significant heat is produced by this exothermic reaction, which could lead to further harm.) It is difficult to apply and maintain in place due to its granular texture. Rhee et al. conducted a survey that included in-person interviews with 103 different QuikClot users. Twenty of these incidents involved civilian trauma surgeons, 14 involved civilian first responders, and 69 involved US military personnel in Iraq. The survey identified 20 intracorporeal uses and 83 applications to exterior wounds combined. The researchers found that the product's intracorporeal use resulted in 3 burns, although overall hemostasis effectiveness was 92%. Pouring QuikClot into a wound, followed by a pressure dressing to achieve hemostasis, successfully controls external haemorrhage. There isn't yet a known application in oral surgery.

Strategies for hemostasis

Styptics

When used topically, styptics, such as aluminium solutions, close damaged blood arteries by compressing tissue.

Tanning agent

Tannic acid is a synthetic substance that, like the plant polyphenol tannin, inhibits mucous membrane bleeding by constricting the blood vessels.

Lissamine analogues

The acids tranexamic and epsilon-aminocaproic

Conexamic acid

Conexamic acid Plasminogen, the enzyme that activates plasmin, is competitively inhibited by 4.8% oral rinse, an antifibrinolytic substance that stabilises clots and promotes clot formation. Tranexamic acid non-competitively inhibits plasmin and stabilises clot formation because the primary function of plasmin in the body is clot destruction or fibrinolysis. Patients having minor oral procedures who have hereditary or acquired bleeding disorders can benefit from taking tranexamic acid orally. It can also be helpful for individuals who need oral surgery and are taking anticoagulant drugs as a preventative mouthwash. To control bleeding, it can be used before to, during, or after surgery. It is widely used as a mouthwash for hemostasis following surgery. Ramström et al. showed that using a 4.8% solution of

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tranexamic acid mouthwash postoperatively, 10 ml 4 times per day for 7 days, significantly reduced post-operative bleeding in the anticoagulated patient. When tranexamic acid is given intraoperatively, studies have not revealed a noticeably decreased ability to control haemorrhage (irrigation, soaked gauze). Additionally, tranexamic acid can be used intraoperatively to control bleeding. The total blood loss during maxillary surgery was dramatically decreased when a bolus of tranexamic acid was administered before to surgery, according to research by Choi et al. It is more effective than aminocaproic acid, has less negative side effects, and requires a lower dose to achieve hemostasis. 39 patients who continued to take anticoagulant medications during their minor oral surgery were evaluated by Sindet-Pedersen et al. to determine the hemostatic effects of tranexamic acid mouthwash. Before the wounds were sutured, 19 patients got 10 ml of a tranexamic acid solution with a 4.8% concentration, whereas the other 20 received a placebo solution. For seven days following surgery, mouth rinses were repeated four times each day. According to the researchers, just 1 patient in the tranexamic acid group experienced a bleeding event, compared to 8 patients who received a placebo who had 10 post-operative bleeding episodes. When Carter and Goss looked at anticoagulated patients who were given a 4.8% solution of tranexamic acid mouthwash for 2 days versus 5 days, they discovered that 82 of the 85 patients had no post-operative bleeding.

Although less effective than tranexamic acid as an antifibrinolytic drug, epsilon aminocaproic acid can be used in its place.

The features of the fractions recovered from the venom of "Bothropsjararaca" or "Bothropsatrox 2, 3" that have coagulative and antihemorrhagic effects are the basis for hemocoagulase (botroclot). Emocoagulase has two separate enzymatic activities that help blood coagulate, which shortens the time that blood clots and speeds up wound healing by encouraging the formation of capillaries in the wound space. One of them expedites the process of turning prothrombin into thrombin (an enzyme similar to thromboplastin), whilst the other results in the direct conversion of fibrinogen to fibrin monomer, which can then be transformed into a fibrin clot by thrombin (thrombin-like enzyme). An illness with a propensity for intravascular coagulation, venous and arterial thrombosis, are contraindications.) In a study by Majumder et al., it was discovered that using a topical hemocoagulase solution following minor oral surgery not only promotes faster hemostasis but also accelerates recovery.

Skeletal hemostats

Bone whey

Bone wax, commonly referred to as "bone bleeder" at the surgical site, is a sterile mixture of water-insoluble beeswax, paraffin, and isopropyl palmitate (a softening agent). It is packaged in individual foil envelopes and is useful when bleeding is from a visualised local vascular channel within bone. If not properly treated during surgery, this is a typical complication of

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mandibular third molar extractions and may contribute to post-operative bleeding. The wax is insoluble and therefore non-resorbable, it interferes with bone healing at the site of application, and it causes infection by reducing bacterial clearance in cancellous bone. The wax is flexible enough to be placed within a vascular channel and burnished, immediately tamponading the vascular source and achieving bone hemostasis. Where bone regeneration is anticipated (such as at a future implant location), caution should be utilised. When bone wax was utilised, surgical site infections happened in 6 of 42 instances (14%) and in 1 of 72 cases (1.4%), respectively, in a research that looked at infection rates after spine surgery. Bone wax has also been demonstrated to prolong and enhance inflammation , resulting in a foreign body giant cell reaction at the site of application.

Ostene

It is a synthetic bone hemostatic substance that was initially employed in cranial and spinal procedures. It is a bone wax-like preparation of water-soluble alkylene oxide copolymers. Within 48 hours, it becomes inactive and is unchangedly expelled from the body. It does not result in infection, inflammatory reactions, or interference with the osseous union, therefore it does not have the drawbacks of bone wax. In comparison to defects treated with bone wax, Wellisz et al. found that rabbit tibial cortical defects treated with ostene had much reduced rates of osteomyelitis and positive bone cultures. It is applied in a manner akin to bone wax and is between one and two millimetres thick. It costs more than bone wax.

CONCLUSION:

patients with inherited and acquired bleeding disorders, as well as those on antithrombotic drugs for systemic illnesses, can limit bleeding during oral surgical procedures by using local hemostatic agents.

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