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Management of Haemorrhage in Oral Surgery

V.K.Vignesh
Final Year BDS Student

Dr.M.P.Santhosh Kumar *
Reader,Department Of Oral And Maxillofacial Surgery
Saveetha Dental College And Hospital
162, Poonamallee High Road,Velappanchavadi,Chennai
Tamilnadu 600077

Abstract

Bleeding during surgery is a serious clinical problem that can be very disconcerting to the patient and could have serious consequences. During the course of nearly all types of surgery, blood vessels will be disrupted, causing some bleeding. The dentist should be familiar with the general techniques of hemorrhage control for different types of bleeding episodes—small vessels, large vessels, oozing, drug-induced, or when an underlying coagulation defect is present. Bleeding complications can occur in healthy as well as systemically compromised patients. This article reviews the types of haemorrhage and various measures for their management. It also discusses the various haemostatic agents used in the management of bleeding episodes in oral surgery.

Keywords-Haemostatic agents, Haemorrhage, Dental surgery, Haemostasis

INTRODUCTION

Haemorrhage means the escape of blood from a blood vessel. Haemorrhage generally indicates extravasation of blood due to vessel rupture. Blood carries oxygen and nutrients to the tissues and is vital for body functions. Loss of blood due to any reason beyond a certain point is potentially life threatening and may lead to loss of life.

Types of haemorrhage

Depending on the type of blood vessel involved, haemorrhage can be arterial, venous or capillary.

Arterial Haemorrhage:

In arterial haemorrhage, there is bleeding from a ruptured artery. Arterial bleeding is pulsatile, brisk and bright red in colour.

Venous Haemorrhage:

Loss of blood from a vein is known as venous haemorrhage. Bleeding from veins is dark in colour and blood flows in an even stream. Due to lack of valves in veins of the facial region and extensive communication, there is relatively more flow from veins as compared to other parts of body.

Capillary Haemorrhage: Oozing from the capillaries is known as capillary haemorrhage. In capillary haemorrhage blood oozes from the area and no bleeding point can be made out.(1)

Depending on the duration of haemorrhage it can be classified as Primary, Reactionary/Intermediate Bleeding and Secondary Bleeding:

1. ***Primary bleeding:*** occurs at the time of injury. Haemostatic mechanisms in the body attempt to stop the bleeding by formation of clot.

2. ***Secondary bleeding:*** If the primary bleeding has stopped and wound starts to bleed again after 24 hours to several days, it is known as secondary bleeding. It may be due to: (a) dislodgement of clot (b) secondary trauma to the wound, (c) infection(the most common reason for secondary bleeding) (d) elevation of patient's blood pressure enough to overcome pressure external to blood vessels.

3. Intermediate bleeding/ Reactionary bleeding: Bleeding occurring within eight to 24hours after stoppage of primary bleeding is labelled as intermediate bleeding. Loose foreign body in the wound like calculus, broken bone piece, and pre-existing extensive granulation tissues in the extraction socket are the most common causes for the intermediate bleeding.(2)

Laboratory Tests for Screening

Majority of defects of haemostasis can be screened by four basic tests.

- Bleeding time
- Platelet count
- Prothrombin time
- Partial thromboplastin time

Bleeding Time (BT)

Bleeding time is a sensitive measure of platelet function. Usually there is linear relationship between platelet count and bleeding time. Patients with bleeding time more than 10 minutes have increased risk of bleeding. There are various methods of measuring bleeding time, e.g. Ivy, Duke and template.

Platelet Count

Normal platelet count is 1,50,000 to 4,50,000 per cubic millimetre of blood. When count becomes 50,000 to 1,00,000 there is mild prolongation of bleeding time, so that bleeding occurs after severe trauma, or surgery. Patients with platelet count below 20,000 have an appreciable incidence of spontaneous bleeding, which may be intracranial or any other internal bleeding. Minor oral surgical procedure can be safely done, if platelet count is above 80,000 to 1,00,000/cubic millimeter of blood, if not patient will need transfusion of platelet rich plasma.

ProthrombinTime (PT)

Prothrombin time screens the extrinsic limb of coagulation pathway (Factors V, VII and X) and factors I, II and V of

the common pathway. It is prolonged in patients, who are on warfarin anticoagulant therapy, vitamin K deficiency or deficiency of factor V, VII, X, prothrombin or fibrinogen. The results obtained from prothrombin time must be related to control value. Normal PT is usually 12-14 second. As a general guideline for dental procedures, INR [international normalized ratio which is patient's PT to control PT] should be 1.0 to 1.5.

PartialThromboplastinTime (PTT)

Partial thromboplastin time screens the intrinsic limb of coagulation pathway and tests for the adequacy of factors VIII, IX, X, XI, XII of intrinsic system and factors I, II, V of the common pathway. It is prolonged in haemophiliacs.(3,4,5)

Evaluating the patient before surgical procedure

Neck anatomy:

It is useful to divide the anatomical structures of the neck into five major functional groups, in order to facilitate and ensure a comprehensive assessment and surgical approach:

1. Airway - pharynx, larynx, trachea, lung.
2. Major blood vessels - carotid artery, innominate artery, aortic arch, jugular vein, subclavian vein
3. Gastrointestinal tract - pharynx, esophagus.
4. Nerves - spinal cord, brachial plexus, cranial nerves, peripheral nerves.
5. Bones - mandibular angles, styloid processes, cervical spine.

The platysma defines the border between the superficial and the deep structures of the neck. If a wound does not penetrate deep to the platysma, it is not classified as a significant penetrating neck wound. As transverse cervical veins running superficial to the platysma may bleed profusely when severed, they are easily controlled by direct pressure, and can be managed by a simple ligature. The sternocleidomastoid muscle divides the neck into the posterior triangle which contains the spine and muscles, and the anterior triangle which contains the vasculature, nerves, airway, esophagus and salivary glands.

When evaluating penetrating neck injuries, the neck is divided into three anatomic zones for purposes of initial assessment and management planning:

– Zone I: extends between the clavicle/suprasternal notch and the cricoid cartilage (including the thoracic inlet). Surgical access to this zone may require thoracotomy or sternotomy. Major arteries and veins, trachea and nerves, esophagus, lower thyroid and parathyroid glands and thymus are located in this zone.

– Zone II: lies between horizontal lines drawn at the level of the cricoid cartilage and the angle of the mandible. It contains the internal and external carotid arteries, jugular veins, pharynx, larynx, esophagus, recurrent laryngeal nerves, spinal cord, trachea, upper thyroid and parathyroid glands.

– Zone III: extends between the angle of the mandible and base of skull. It contains the extracranial carotid and vertebral arteries, jugular veins, cranial nerves IX–XII and sympathetic nerve trunk.(6)

Proper case history

A careful physical examination should note any adenopathy, splenomegaly, or hepatomegaly. Hepatic insufficiency should be assessed by seeking signs of jaundice, telangiectasias, gynaecomastia, testicular atrophy, or any other stigma of liver disease. Assessment of the skin and mucosal surface is mandatory. The sex of the patient, the age when abnormal bleeding was first noted, and the family history are of particular importance in evaluating the disorders of haemostasis, since most disorders of vessels and platelets are acquired, whereas most serious coagulation disorders are hereditary, and among these, over 90 per cent occur only in males. The absence of a family history of bleeding, however, does not exclude the presence of a hereditary coagulation disorder. The history remains the best single "screening" test for the presence of a hemorrhagic disorder, and the corollary to this statement is no less true. A history of surgery, major injury, or even multiple tooth extractions without abnormal bleeding is good evidence against the presence of a hereditary coagulation disorder.(7,8)

DRUGS & OTHER HAEMOSTATICS:

Drugs used for haemostatic therapy can be classified as:

I. Agents acting locally
II. Transfusional agents such as specific coagulation factors
III. Nontransfusional agents

I. Agents acting locally

These agents control oozing of blood from minute vessels but are not effective in controlling bleeding from large vessels.

Thrombin: Thrombin is obtained from bovine plasma. Thrombin therapy is restricted to local application in oozing of blood. Thrombin has also been used, mixed with plasma, to anchor the skin grafts in place. Assuming an otherwise normal clotting system, topical thrombin is often used clinically. If given intra- venously, thrombin causes extensive thrombosis and death. Topically applied thrombin operates as a haemostatic, particularly if the patient has a coagulation deficiency or is receiving oral anticoagulants, because all that is required for clotting is a normal supply of platelets, fibrinogen, and factor XIII in the plasma. Currently available thrombin, especially the bovine products, may be relatively crude preparations that still contain plasmin, a fibrinolytic agent. Antibodies may also be generated to the bovine thrombin or bovine factor V; the latter can cross-react with human factor V and lead to an acquired inhibition and bleeding.

Thromboplastin: Thromboplastin is a powder which is used for determination of prothrombin time and as a local haemostatic in surgery.

Flbrin: Fibrin obtained from human plasma is used in the dehydrated form as sheets from which segments of any desired size may be cut for use on bleeding surfaces. When used in combination with a thrombin solution, it also acts as a mechanical barrier and holds thrombin in position over the bleeding area.(6)

II Transfusional agents

Fibrinogen: Fibrinogen. a sterile fraction from human plasma, is used for restoring normal fibrinogen levels in haemorrhagic complications caused by acute afibrinogenemia. Fibrinogen & thrombin may be employed together for local haemostasis.

Antihaemophilic Globuiin (Ahg) : Antihaemophilic globulin or concentrate of factor VIII (AHG) is highly effective in the treatment of classical haemophilia-A. High potency human AHG is prepared from pooled, normal, human plasma; it is now prepared by recombinant DNA technique.

Coagulation Factors: Pure recombinant factor VIII, factor IX and factor VII are available. They are very expensive and may be associated with a greater risk of inducing inhibitor formation (IgG antibodies for VIII), thus reducing the efficacy of specific therapv.

Fresh Frozen Plasma: FFP is suitable for the treatment of most coagulation disorders, since it contains all the clotting factors. Concentrate of factor VIII (purified) and partially purified preparation containing factors II, VII, IX and X are also available for specific deficiencies.(7,8)

III. Non-transfusional agents

Vitamin K: Vitamin K comprises three distinct fat soluble, naphthoquinone compounds which participate in the biosynthesis of several clotting factors. Vitamin K is essential for the biosynthesis of 'active' prothrombin and factors VII, IX and X .

Aprotinin: It Is a polypeptide enzyme which inhibits serine protease and thus inhibits plasmin, kallikrein and trypsin activity. It inhibits fibrinolysis and reduces bleeding by 50% especially in surgeries.

Epsilon Amino Caproic Acid: It is a water soluble lysine analog which binds to the lysine binding sites reversibly on plasminogen and plasmin and inhibits binding of plasmin to fibrin. It is absorbed rapidly after oral administration.

DRESSINGS & OTHER MEASURES:

Bleeding caused by dentoalveolar surgery can most often be controlled by applying pressure with sterile cotton gauze. If this treatment is inadequate, the clinician must localize the source of bleeding as originating either within the soft tissues or within the bony structures.

Soft tissue bleeding may be controlled by haemostats, ligation, electrocautery, cryosurgery or application of microfibrillar collagen or collagen sheets (on broad bleeding surfaces). Microfibrillar collagen, made from purified bovine skin collagen, is used topically to arrest certain hemorrhagic conditions that do not respond to conventional methods of haemostasis. Collagen accelerates the aggregation of platelets and therefore may have limited effectiveness in patients with platelet disorders or hemophilia.

Bleeding from bony structures, especially from extraction sockets, can be controlled by a variety of means. If initial attempts to achieve haemostasis with sterile cotton gauze and pressure do not succeed, a collagen plug or gelatin sponge may be inserted within the bony crypt. The collagen plug, like microfibrillar collagen, serves to accelerate the aggregation of platelets as well as form a physical barrier. The gelatin sponge facilitates platelet disruption and can absorb 40 to 50 times its own weight in blood, both of which aid in blood coagulation. It is resorbed in 4 to 6 weeks.(9) Because it is gelatin, it must be applied dry; once moistened, it becomes difficult to handle. For this reason, many practitioners prefer the use of either denatured cellulose preparations or collagen sponge.

Ligation of Blood Vessels:

In the event of arterial bleeding from the soft tissues, the vessel should be grasped with a haemostat and ligated by tying it directly or indirectly by the use of a circumferential suture around the soft tissue. Palatal vessels are the most commonly severed arteries in the mouth. Sometimes compression of the vessel in this manner for a minimum of 5 to 10 minutes will in itself stop the haemorrhage. Attempts to locate and clamp this artery with a haemostat are generally unsuccessful. If these attempts fail, then the lingual artery or maxillary artery or main branch of the external carotid artery must be ligated.(10,11)

CONCLUSION

Control of bleeding is the most important integral part of any surgical treatment procedure. Proper prior evaluation of the patient & complete medical and family history are very much essential to overcome intra operative & post operative bleeding arising from undetected bleeding disorders.(12)

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