BLEEDING DISORDERS & PERIODONTOLOGY

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CONTENTS:

- Introduction
- Blood supply to gingiva
- Physiology of normal hemostasis
- Classification of hemorrhage
- Factors causing gingival bleeding
  a) Local factors
  b) Systemic factors
- Indices for measuring gingival bleeding
- Bleeding on probing as risk indicator
Management of gingival bleeding

Conclusion

References
BLOOD SUPPLY TO GINGIVA

- Dentogingival plexus
- Subepithelial plexus with capillary loops
- Supraperiostial artery
- Intraseptal artery
- Complex network of periodontal ligament vessels
BASIC PHYSIOLOGY OF HEMOSTASIS

HEMOSTASIS

vascular phase
1. smooth cell
2. contraction

platelet phase
1. adhesion
2. activation
3. secretion
4. aggregation

coagulation phase
1. intrinsic
2. extrinsic

fibrinolytic phase
1. lysis
2. fibrinogen deactivation

Philip Vassilopoulous & Kent Palcanis Bleeding Disorders and Periodontology
2000.vol44.2007.211-223
CLASSIFICATION OF HEMORRHAGE

- Depending on the time lapse that the bleeding appears after injury:
  - Primary hemorrhage
  - Reactionary hemorrhage
  - Secondary hemorrhage

FACTORS CAUSING GINGIVAL BLEEDING

Local factors
1) Local irritants
2) Infections
3) Trauma
4) Iatrogenic

Systemic factors
1) Bleeding disorders
2) Vitamin deficiency
3) Endocrine disturbances
4) Platelet disorders
5) Leukemia
6) RBC disorders
7) Agranulocytosis
8) Drugs

**LOCAL FACTORS**

- Local factors include:
  - 1) Local irritants
  - 2) Trauma
  - 3) Iatrogenic

- 1) Local irritants: It includes:
  - A) plaque and calculus
B ) malposed teeth

C ) orthodontic appliance

D ) over hanging margins of restorations
3) **Trauma:**

- A) impingement of denture clasp of removable partial denture
- B) lacerations of gingiva during brushing
- C) gingival burns due to hot foods
4) **Iatrogenic**: during periodontal surgical procedures, or scaling and root planing improper instrument adaptation causes trauma to tissues.

- Spontaneous bleeding or bleeding on slight provocation can occur in acute necrotizing ulcerative gingivitis. In this condition, engorgement of blood vessels in the inflamed connective tissue are exposed by the ulcer of the necrotic surface epithelium.
SYSTEMIC FACTORS ASSOCIATED WITH BLEEDING

- Bleeding disorders: It includes
  1) Hemophilia A
  2) Hemophilia B
  3) Von willebrand’s disease

  1) **Hemophilia A**: It occurs due to deficiency of factor viii. It is transmitted as an x linked recessive fashion and characterised by abnormal prothrombin time.

  2) **Hemophilia B**: It occurs due to factor IX deficiency.

Shafer’s textbook of oral pathology – 6th edition
Von Willebrand’s disease is caused due to genetic deficiency of plasma glycoprotein called von willebrand factor.

This glycoprotein aids in the adhesion of platelets at the site of bleeding and also binds to factor VIII, acting as transport molecule.

In Hemophilia condition hemorrhage from many sites in the oral cavity is common. Without proper medication even a minor surgical procedure may result in death.
VITAMIN DEFICIENCY

It includes:

1) vitamin k deficiency or prothrombinemia
2) vitamin C deficiency

- 1) vitamin K deficiency or hypoprothrombinemia: Vitamin K is a fat soluble vitamin. It plays a role in the regulation of levels of factors VII, IX and X.
- Prothrombin levels below 35% will result in bleeding after brushing, however when level falls below 20% spontaneous gingival hemorrhage will occur.
**Vitamin C Deficiency**

- The interdental and marginal gingiva is bright red with a swollen, smooth shiny surface. In a fully developed scurvy, the gingiva becomes boggy, ulcerates, and bleeds.
- In chronic cases of scurvy hemorrhage occurs into the periodontal membrane occurs.

Shafer’s textbook of oral pathology – 6\textsuperscript{th} edition
ENDOCRINE DISTURBANCES

PUBERTY:

- Periodontal tissue may have an exaggerated response to local factors. A hyperplastic reaction of the gingiva may occur in areas where food debris, material alba, plaque, and calculus are deposited.

- The inflamed tissue becomes erythematous, lobulated, and retractable. Bleeding may occur easily with mechanical debridement of the tissues.

MENSES:

- Progesterone has been associated with increased permeability of microvasculature, altering the rate and pattern of collagen production in the gingiva.
- Gingival tissues have been reported to be more edematous during menses and erythematous before the onset of menses.
- No significant hematological laboratory finding are present except a slight reduced platelet count and slight increase in clotting time.
PREGNANCY:

- In 1877 Pinard recorded the first case of pregnancy gingivitis. It is characterized by erythema, edema, hyperplasia and increased bleeding.

- Kornman and Loesche found that during the second trimester, gingivitis and gingival bleeding increased without an increase in plaque levels. Increased vascular dilatation and increased proliferation of newly formed capillaries in gingival tissues.
ORAL CONTRACEPTIVES

Kalkwarf reported that the increased response caused by an altered microvasculature, increased gingival permeability and increase in prostaglandin E.

PLATELET DISORDERS:

Purpura is defined as purplish discoloration of the skin and mucous membrane due to spontaneous extravasation of blood.

One of the prominent manifestation of thrombocytopenic purpura is the severe gingival hemorrhage. There will be prolonged bleeding time.
LEUKEMIA:

- Leukemias are a group of malignant disorder of hematopoietic tissues which is characterized by an increase in the number of primitive white blood cells in the bone marrow.

- In adults, myeloblastic leukemia is more common, and in children, lymphoblastic leukemia is more common.

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A CLASSIFICATION OF LEUKAEMIA

<table>
<thead>
<tr>
<th>Acute</th>
<th>Chronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphoblastic</td>
<td>Lymphatic</td>
</tr>
<tr>
<td>Myeloid</td>
<td>Myeloid</td>
</tr>
</tbody>
</table>

Robbins and contran pathologic basis of disease – 7th edition
Gingival hemorrhage is a common finding in leukemic patients even in the absence of clinically detectable gingivitis.

Gingival bleeding can be an early sign of leukemia.

Gingival bleeding occurs due to thrombocytopenia that results from replacement of bone marrow cells by leukemic cells and also from inhibition of normal stem cell function by leukemic cells or their products.
APLASTIC ANEMIA:

- It is a bone marrow failure syndrome characterised by peripheral pancytopenia and general lack of bone marrow cavity.
- Clinical manifestations include anemia, leukopenia, thrombocytopenia.
- Oral manifestations include petechiae, purpuric spots, spontaneous gingival hemorrhage related to platelet deficiency.

Robbins and contran pathologic basis of disease – 7th edition
AGRANULOCYTOSIS:

- It is a disease involving white blood cells where there is decreased number of circulating granulocytes.
- The oral lesions constitute a ragged necrotic ulcers covered by a grey or even black membrane there is little or no apparent inflammatory cell infiltration around the periphery of the lesion. gingival bleeding is seen even with brushing.

Robbins and contran pathologic basis of disease – 7th edition
DRUGS:

- Anti platelet drugs are commonly used for the prevention of thrombo embolic diseases such as myocardial infarction, cerebral ischemia, and peripheral arterial insufficiency.

- Acetylsalicylic acid (ASPIRIN) is a frequently used anti platelet agent.

- Dosages include 325 mg, 81 mg (low dose). In INDIA it is available as 150 mg, 75 mg.

- Commercially available as ECOSPRIN.

The anti-aggregation mechanism of acetyl salicylic acid is the inhibition of thromboxane A2.

Other drugs include ticlopidine and clopidogrel.

Ticlopidine and clopidogrel mainly antagonize adenosine diphosphate receptors on platelets. (SAVI & HERBERT 2005)

Schrodi et al examined the effect of aspirin on bleeding on probing in patients with clinically healthy periodontium. Their result demonstrated that increased appearance of bleeding on probing in population that had 20% more bleeding sites.

Daniel Royzman et al demonstrated that aspirin intake of 81 mg (low dose), 325 mg (regular dose), of aspirin demonstrated a significant increase appearance of bleeding on probing.

Annabel Braganza et al demonstrated that ibuprofen increased intraoperative blood loss in patients up to two times of those who do not take ibuprofen.

Lawrence et al, observed intraoperative bleeding complications occurred only in those patients receiving NSAIDS and prolonged bleeding time.

A bleeding index can fulfill several purposes:

- Epidemiologists have used it as one measure of periodontal disease prevalence and also to estimate treatment needs and costs in a population.

- Researchers have used it as one way to measure effectiveness and anti-plaque, anti-gingivitis agents.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67; 555-561
To compare responses to various therapies (e.g. scaling and root planing versus periodontal surgery) and to correlate bleeding to disease activity.

Clinicians used it to screen patients for diagnosis and treatment plan to motivate patients to identify problem sites that require additional treatment.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J.Periodontol 1996; 67;555-561
INDICES FOR GINGIVAL BLEEDING

1) Sulcus bleeding index (SBI).

2) Gingival bleeding index.

3) Edwards bleeding index.

4) Papillary bleeding index.

5) Modified papillar bleeding index.

6) Gingival bleeding time index.

7) Eastman interdental bleeding index.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67;555-561
8) Papillary bleeding score (PBS)

9) Modified sulcus bleeding index.(mSBI)

10) Periodontal screening and recording.

1) **SULCUS BLEEDING INDEX** :

- The Sulcus Bleeding (SBI) is an index for assessment of gingival bleeding, developed by Muhlemann HR and Son S in 1971.

- This index system is a modification of the Papillary-Marginal Index (PMI) of Muhlemann and Mazor (1958).

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67;555-561
<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal appearing gingiva, No bleeding upon probing</td>
</tr>
<tr>
<td>1</td>
<td>No contour or contour changes, but bleeding on probing</td>
</tr>
<tr>
<td>2</td>
<td>Bleeding on probing, colour change, no edematous contour changes.</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding on probing, colour change, slight swelling of papillary and marginal gingiva.</td>
</tr>
<tr>
<td>4</td>
<td>Bleeding on probing, change in colour, obvious swelling of marginal and papillary gingiva.</td>
</tr>
<tr>
<td>Score</td>
<td>criteria</td>
</tr>
<tr>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>5</td>
<td>Bleeding on probing, spontaneous bleeding, change in colour, marked swelling with or without ulceration</td>
</tr>
</tbody>
</table>

2) GINGIVAL BLEEDING INDEX:

- Gentle probing of gingival crevice is done to estimate presence or absence of bleeding.
- If bleeding occurs after 10 seconds, a positive finding was recorded.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67:555-561
3) EDWARDS BLEEDING INDEX

Edwards proposed this bleeding index in 1975.

METHOD:

- Dental tape was wrapped around a proximal tooth surface in a bucco-lingual manner and inserted into the base of the crown.
- This procedure is repeated twice.
- If no bleeding occurs after 15 s, a score of 0 is recorded.
- If bleeding occurs, a score of 1 is given.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67:555-561
4) PAPILLARY BLEEDING INDEX

- The Papillary Bleeding Index (PBI) was introduced by Muhlemann H.R in 1977 as a modification of the Sulcus Bleeding Index (SBI) of Muhlemann.

- The PBI is based on bleeding following gentle probing of Interdental papilla

**METHOD:**

- A blunt periodontal probe is carefully inserted into the gingival sulcus at the base of the papilla on the mesial aspect, and then moved coronally to the papilla.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67;555-561
Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67:555-561
MODIFIED PAPILLARY BLEEDING INDEX

- This index was given by Barnett et al in 1980.
- It is a modification of Muhlemann PBI scoring system.

METHOD:

- It precisely defines the placement of probe at the mesial line angle of the tooth and gently sweeping the probe forward into the mesial papilla.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67;555-561
<table>
<thead>
<tr>
<th>SCORE</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No bleeding within 30sec of probing</td>
</tr>
<tr>
<td>1</td>
<td>Bleeding between 3 and 30 sec of probing</td>
</tr>
<tr>
<td>2</td>
<td>Bleeding within 2sec of probing</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding immediately upon probe placement</td>
</tr>
</tbody>
</table>
GINGIVAL BLEEDING TIME INDEX

It was given by Nowicki et al in 1981.

This was based on gingival bleeding time.

Index teeth include: maxillary right molar (16), left central incisor (21), left first bicuspid (24), mandibular left first molar (36), right central incisor (41) and right first bicuspid (44).

Gingiva is isolated with cotton rolls; the tissue was dried with a gentle stream of warm air for 5 seconds.

Probing is done using a Michigan ‘O’ probe in the sulcus of the six representative teeth until slight resistance was felt.

<table>
<thead>
<tr>
<th>score</th>
<th>criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no bleeding with in 15 seconds of probing</td>
</tr>
<tr>
<td>1</td>
<td>Bleeding with in 6-15 seconds of probing</td>
</tr>
<tr>
<td>2</td>
<td>Bleeding with in 11-15 seconds of probing</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding with in 2 seconds of probing</td>
</tr>
<tr>
<td>4</td>
<td>spontaneous bleeding</td>
</tr>
</tbody>
</table>
EASTMAN INTERDENTAL BLEEDING INDEX:

The Interdental Bleeding Index (IBI) was developed by Caton JG and Polson A in 1985.

Presence or absence of bleeding within 15 seconds is recorded.

Score 0 indicates absence of bleeding within 15 seconds.

Score 1 indicates presence of bleeding within 15 seconds.

Ernest Newbrun, Indices to Measure Gingival Bleeding; J. Periodontol 1996; 67;555-561
PAPILLARY BLEEDING SCORE:

It was given by Loesche in 1979.

<table>
<thead>
<tr>
<th>score</th>
<th>criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Healthy gingiva, no bleeding</td>
</tr>
<tr>
<td>1</td>
<td>Edematous red gingiva, no bleeding</td>
</tr>
<tr>
<td>2</td>
<td>Bleeding without flossing</td>
</tr>
<tr>
<td>3</td>
<td>Bleeding with flow along gingival margin</td>
</tr>
<tr>
<td>4</td>
<td>Copious bleeding</td>
</tr>
</tbody>
</table>

Ernest Newbrun, Indices to Measure Gingival Bleeding; J.Periodontol 1996; 67;555-561
MODIFIED SULCUS BLEEDING INDEX:

It was given by mombelli et.al in 1987.

<table>
<thead>
<tr>
<th>score</th>
<th>criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No bleeding on probing</td>
</tr>
<tr>
<td>1</td>
<td>Bleeding spot is visible</td>
</tr>
<tr>
<td>2</td>
<td>Blood forms a confluent red line at margins</td>
</tr>
<tr>
<td>3</td>
<td>Heavy or profuse bleeding</td>
</tr>
</tbody>
</table>

Ernest Newbrun, Indices to Measure Gingival Bleeding; J.Periodontol 1996; 67;555-561
### PERIODONTAL SCREENING AND RECORDING:

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Colored area of probe remains completely visible. No calculus or defective margin. No bleeding. Healthy gingiva</td>
</tr>
<tr>
<td>1</td>
<td>Colored area of probe remains completely visible. No calculus of defective margins. Bleeding after gentle probing</td>
</tr>
<tr>
<td>2</td>
<td>Colored area of probe remains completely visible. Supra or subgingival calculus, and / or defective margins.</td>
</tr>
<tr>
<td>3</td>
<td>Colored area of probe remains partly visible in the deepest probing depth of sextant</td>
</tr>
<tr>
<td>4</td>
<td>Colored area of probe completely disappears, indicating probing depth of greater than 5.5.mm</td>
</tr>
<tr>
<td>*</td>
<td>Symbol added to sextant score in presence of furcation, invasion mobility, mucogingival problems of recession of 3.5mm or Greater</td>
</tr>
</tbody>
</table>
SMOKING AND GINGIVAL BLEEDING:

As regarding with gingivitis and bleeding on probing with respect to smokers and non smokers, most of the investigators have found that smokers had less bleeding on provocation than non smokers.

The complete mechanism by which smoking suppresses gingival bleeding are not understood, it is well established that nicotine causes an acute vasoconstriction.

Thomas Dietrich, Jean–Pierre, Robert J. Glynn; The Effect of Cigarette Smoking on Gingival Bleeding; J Periodontol 2004; 75; 16-22
BLEEDING ON PROBING AS A RISK INDICATOR OR RISK MARKER FOR PERIODONTAL DISEASE

- Bleeding on probing is the best clinical indicator of gingival inflammation. Although this indicator does not serve as a predictor for loss of attachment.
- Lack of bleeding on probing does appear to serve as an excellent indicator of periodontal health.

MANAGEMENT OF GINGIVAL BLEEDING

- Diagnosis: Etiology of gingival bleeding must be determined through
  - History
  - Clinical Examination
  - Laboratory tests
- History:
  - Patients with history of bleeding problems caused by disease or drugs; should be managed so as to minimize risks.
• History of bleeding after previous surgery or trauma.
• Past and present drug history.
• History of bleeding among relatives.
• Medical history to rule out possible illness associated with bleeding problems.
• Any Topical or systemic drug administration.
• About Puberty and pregnancy
CLINICAL EXAMINATION

- It should detect the existence of ecchymoses, spider telangiectases, hemarthrosis, petechiae, hemorrhagic vesicles, purpuric spots.

- Local examination should include color, consistency, size of gingiva any enlargement and pocket depth.
LABORATORY INVESTIGATIONS

- The lab investigation help to detect any systemic involvement so as to minimize risk.

- They include Bleeding time, Clotting time, platelet count, prothrombin time.

- Normal values are
  - RBC count - 4.5 - 5.5 million /mm$^3$
  - WBC count - 5000 - 10,000 cells
  - Platelet count - 1.15 - 2.5 lakh cells
  - Bleeding time – 3 – 6 minutes
  - Clotting time – 5-10 minutes
  - Prothrombin time – 12 - 15 sec

Robbins and contran pathologic basis of disease – 7th edition
**BLEEDING TIME** : Bleeding time is the time interval from oozing of blood after a cut or injury till arrest of bleeding.

- Dukes method uses blotting paper to assess bleeding time.
- Normal duration is 3 - 6 minutes.
- It is prolonged in case of purpura.
CLOTTING TIME: Clotting time is the interval from oozing of blood after a cut or injury till the formation of clot.

- It is usually determined by capillary tube method.

- Its normal duration is 3-8 minutes.

- It is prolonged in hemophilia.
**PROTHROMBIN TIME**: It is the time taken by blood to clot after adding tissue thromboplastin to it.

- The normal duration is 12 - 15 seconds.
- It is prolonged in case of hemophilia and deficiency of factors V, VII, X.

**PARTIAL PROTHROMBIN TIME**:

- It is the time taken for the blood clot after adding phospholipids and calcium to it.
- The normal duration is 30 – 50 seconds.
MANAGEMENT OF GINGIVAL BLEEDING DUE TO LOCAL CAUSES

- If gingival bleeding is due to local irritants:
  a) Removal of plaque and calculus by scaling and root planing.
  b) Effective plaque control methods.
- Correction of malposed teeth by orthodontic appliances.

**MANAGEMENT OF GINGIVAL BLEEDING DUE TO SYSTEMIC DISEASES:**

- Management of gingival bleeding in haemophilic patients:
  - **In case of Hemophilia A:** The clinician should consult the patient's physician before dental treatment to determine the risk of bleeding and modifications required.
  - **To prevent surgical hemorrhage** factor VIII levels must be at least 30% are needed.
Parenteral administration of 1–deamino-8-d arginine vasopressin can be used to raise factor VIII concentrates 2-3 folds in patients with mild or moderate hemophilia.

Most moderate and severe hemophilias require infusion of factor VIII concentrates before surgery.

In Hemophilia B patients surgical therapy requires a factor IX level of 30% - 50% and usually achieves by administration of purified prothrombin complex concentrates.
MANAGEMENT OF GINGIVAL BLEEDING IN PATIENTS WITH PLATELET DISORDERS:

- Scaling and root planing is generally safe unless platelet count is less than 60,000 cells/mm³.
- No surgical procedures must be performed unless platelet count is >80,000/mm³.
- Surgery must be as traumatic as possible and local hemostatic measures should be applied.
MANAGEMENT OF GINGIVAL IN PATIENTS WITH LEUKEMIA:

- Physician must be consulted.
- Hematological laboratory values must be monitored.
- Administer antibiotic coverage for any periodontal treatment.
- Periodontal debridement should be performed and twice daily rinsing with 0.12 \% chlorhexidine gluconate is recommended.
- Oral ulcerations or mucositis are treated palliatively.
MANAGEMENT OF GINGIVAL BLEEDING IN ENDOCRINE DISTURBANCES:

PUBERTY: During puberty, education of parent is a part of successful periodontal therapy.

Preventive care includes vigorous program of oral hygiene.

Periodontal maintenance appointment may need to be more frequent when periodontal instability is noted.

MENSES:

Increased gingival bleeding and tenderness
associated with the menstrual cycle requires close periodontal monitoring.

- Periodontal maintenance should be titrated to the individual patient needs and if problematic 3-4 months interval must be recommended.

- **PREGNANCY**: Only non-emergency treatment like scaling, root planning, oral hygiene instruction, polishing should be done in I\textsuperscript{st} and III\textsuperscript{rd} trimester.

- Surgery contraindicated in I\textsuperscript{st} and III\textsuperscript{rd} trimester.
The international normalized ratio is a key component in the dental treatment of these patients.

When international normalized ratio (INR) is < 3.5 the anticoagulant regimen has to be adjusted.

Patients taking aspirin should discontinue the medication at least 3 days and upto 7 days before surgery.

Patients taking other drugs like NSAIDS must consult physician.
MANAGEMENT OF INTRAOPERATIVE BLEEDING

- The type of periodontal surgical procedure and potential for bleeding must be taken into consideration.
- Regional block must be avoided. Local infiltration with vasoconstrictor is desirable.
- Meticulous handling of soft tissues and conservative flap design, minimizing flap elevation must are key points.
- Primary closure of flap must be done by sutures.

At the end of surgery patient susceptible to bleeding are instructed to bite on gauze soaked with hemostatic agents for 30 mins.

VARIOUS TOPICAL HEMOSTATIC AGENTS ARE:

The role of gingival bleeding in assessing healing

- Proye et al., determined after one session of root planing and 3 weeks of oral hygiene the bleeding on probing was virtually eliminated.

- Vander velden found after resolution of clinically visual inflammation that many deep pockets demonstrated bleeding on probing this indicating additional therapy was necessary.

Gary Greenstein. The role of bleeding up on probing in the diagnosis of periodontal disease. A literature review; J Periodontol; 1984: 684-688
CONCLUSION

- Gingival bleeding reflects histological, clinical alterations associated with periodontal disease.
- Measurement of gingival bleeding tendency should be an integral part of all comprehensive oral examinations.
- In addition, it's a valuable criteria to detect and diagnose underlying systemic disturbances.
REFERENCES

- Essentials of preventive and community dentistry - soben peter
- Ernest Newbrun , Indices to Measure Gingival Bleeding; J.Periodontol 1996; 67;555-561.
Gary Greenstein, The role of bleeding up on probing in the diagnosis of periodontal disease. A literature review; J Periodontol; 1984: 684-688


Thomas Dietrich, Jean –Pierre, Robert J. Glynn; The Effect of Cigarette Smoking on Gingival Bleeding; J Periodontol 2004; 75; 16-22