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LINK BETWEEN ORAL AND SYSTEMIC DISEASES – INTERPRETATION OF LABORATORY INVESTIGATION REPORT

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ABSTRACT

There is ample evidence of a link between oral and systemic diseases. Dental procedures are associated with a finite risk to the patient. Medical risk assessment begins with identification of medical problems by taking medical history, physical examination, laboratory tests and medical consultation. Diabetes mellitus has adverse effects on entire body. Hepatobiliary diseases can produce mucocutaneous lesions. It is important to be familiar with various bleeding disorders and baseline hematological investigations before embarking on dental surgeries. The laboratory investigations often provide the missing link between oral and systemic diseases.

KEY WORDS; **Oral diseases , systemic diseases, link, Laboratory investigation**.

INTRODUCTION

The field of oral health research is ever changing. Systemic biology, better knowledge about individual organs will assist dentists in providing complete patient care. Periodontal disease may be the source of inflammation that has an impact on overall health.[1-4] Tobacco smoking ,stress, aging,obesity, oral hygiene are some of the common risk factors for the development of systemic diseases.[5] The purpose of this paper is to interpret the laboratory investigations to provide a link between oral health and systemic diseases.

Periodontitis and systemic diseases:

The link between the oral diseases and systemic diseases has been known for decades. Research is now providing ample evidence to support this. Recently link between periodontitis and systemic diseases like acute coronary syndrome, myocardial infarction has been under consideration.[6] Periodontitis is the source of inflammation.[7] According to American Heart Association and Center for Disease Control and Prevention, *hs-CRP(high risk-C reactive protein) test* is included as one of the important inflammatory markers. The *hs CRP* levels of 1, 1 – 3 and >3 mg/L are considered as low, moderate and high risk respectively. Inflammation may lead to insulin resistance and also type 2 diabetes.[8] The Prevalence of diabetes is increasing world wide.[9] Diabetes has adverse effects on entire body. The effects on oral health are periodontitis, gingivitis, xerostomia, candidiasis etc.[10] Many of these may manifest in undiagnosed diabetics. According to WHO criteria[11]- FBS(Fasting Blood Sugar) ≥ 126 mg/dl and PPBS(Post prandial Blood Sugar) >200 mg/dl can be considered as diabetes. The complications of diabetes are micro and macro vascular. The macro vascular complications are coronary artery disease and stroke. These are precipitated by dyslipidemia. Diabetes may lead to alteration in the lipid profile. The normal lipid profile includes total cholesterol <200 mg/dl, Triglycerides <150 md/dl , LDL_c <100mg/dl, HDL_c >40 mg/dl in females and >50 mg/dl in males.[12] Diabetic nephropathy, one of the micro vascular complications leads to renal failure. Blood urea and serum creatinine levels indicate the status of the kidney. Urine Albumin Excretion >200 ug/min is highly predictive of diabetic nephropathy, end stage renal disease and proliferative retinopathy.[13] Normal serum creatinine is 0.9 to 1.3 mg/dl. In acute renal failure creatinine levels may rise to 4 – 6 mg/dl & more than 10mg/dl indicates untreated chronic renal failure.[14] Glomerular Filtration Rate and serum electrolytes (Na^+, K^+, Cl^- , & HCO_3-) also reflect the status of kidney.

Liver dysfunction and oral health

Oral cavity may show evidence of liver dysfunction with presence of hemorrhagic changes, petechiae, haematoma, jaundiced mucosal tissues and gingival bleeding. These oral changes are associated with signs and symptoms of liver disease like nausea,vomiting,hemorrhagic tendency, ascites etc.[15] In such a case the altered liver function is assessed by bilirubin , which is a

pigment produced by degradation of heme. Normally total bilirubin is 0.3 to 1.2 mg/dl. If it exceeds 2mg/dl it manifests clinically as jaundice. Transaminases, SGPT(normal range 10 – 40 U/L), SGOT(normal range 8 - 20 U/L) are hepatocellular enzymes. SGPT is more liver specific. These enzymes are elevated in circulation if liver parenchyma is damaged. 20 – 50 fold elevations are seen in acute hepatitis. Alkaline phosphatase (ALP) displays considerable inter tissue and intra tissue heterogenicity. It has 5 iso-enzymes. But the predominant forms present in the serum are liver and bone varieties. Normal reference range of ALP in adults is 25 – 100 U/L. Two to three fold increased levels are seen in hepatobiliary diseases, bone diseases and in normal pregnancy (Placental iso enzyme). Serum albumin levels also reflect liver pathology.[16] Normal serum albumin range is 3.5 – 5 gm/dl.

Anemia whether clinically overt or not is a common condition encountered in clinical practice in India. It is useful not only to look for clinical evidence of anemia but also investigate for the presence of it. The anemia profile includes, Complete Blood count (Total count, differential count ,ESR) , decreased hemoglobin percentage(normal value 12 - 14 g%),decreased red blood cell indices like Mean Corpuscular Volume (MCV, Normal range 79 – 93.3 μm^3), Mean Corpuscular hemoglobin (MCH Normal range 26 – 31.9 pg/cell). Blood smear showing variation in RBC size and shape (microcytic / macrocytic). Most common type of anemia is due to iron deficiency. The special investigation for iron deficiency anemia along with the above mentioned are decreased serum iron (41 – 141 mg/dl), decreased serum ferrintin (Adult male 20 – 250 ng/ml & Females 10 – 120ng/ml) , increased Total Iron Binding Capacity(250 – 425 µg/dl). Megloblastic anemia can be assessed by estimation of serum vitamin B_{12} and folic acid.[17]

Bleeding Disorders and Investigations:

Dental procedures like extraction and periodontal surgery are among the most common invasive procedures. Post operative bleeding in most cases is self limiting. However a small and significant segment of population has an increased risk of bleeding due to inherited or acquired conditions like patients with haemostatic defects secondary to underlying disease or medication.

The human haemostatic system provides a natural balance between pro coagulant and anticoagulant forces. Pro coagulant forces include platelet adhesion, aggregation and fibrin clot formation. Anti coagulant forces include natural inhibitors of coagulation and fibrinolysis. Imbalance of haemostasis results in bleeding. The most commonly useful screening tests are Prothrombin time (PT), activated Partial Thromboplastin Time (aPTT) and platelet count.

Coagulation cascade consists of the following (Fig.1)

1. Extrinsic pathway – Tissue injury releases thromboplastin which activates factor VII. Factor VII in turn activates the common pathway. PT detects defects in extrinsic pathway and common pathway.

2. Intrinsic pathway - Acts via high molecular weight kininogen, protein kinase, factor XII, XI , IX, VIII to activate the common pathway. aPTT detects defects in intrinsic and common pathway.

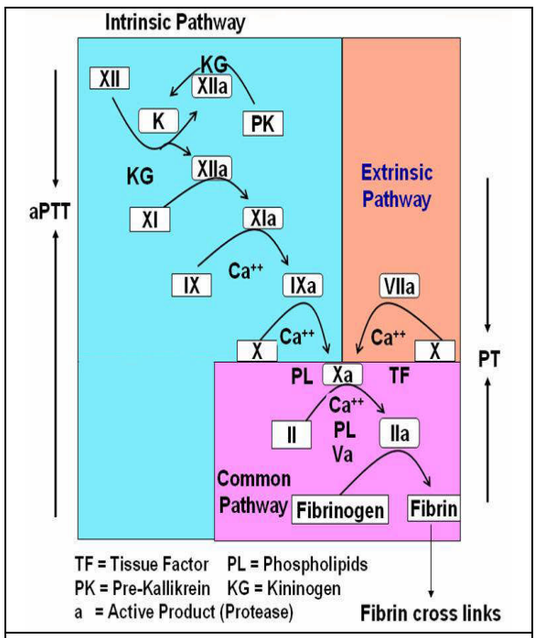

Fig.1.Coagulation mechanism

PT test requires a substance, thromboplastin. As the potency of thromboplastin is highly variable it is standardized by a mathematical process to derive INR(International Normalized Ratio). This INR is normally < 1.2. It is kept at 2 – 3 in patients who are on Oral anticoagulants like warfarin and Nicoumalone, patients with mechanical heart valves and irregular heart rate (atrial fibrillation) are often on oral antigcoagulants. Whenever dental procedures involving bleeding are done on such patients a physician or cardiologist should be consulted. PT(normal 11 – 15 sec) can also be prolonged in liver diseases due to decreased coagulation factors synthesis, in vitamin

K deficiency due to defective post translational modification of factors II , VII , IX , X.

Patients on parenteral anticoagulant (heparin) will have prolonged aPTT(normal 26.3 – 39.4 sec). aPTT should be brought to normal before performing dental procedures involving bleeding. Activated Partial Thromboplastin Time (aPTT) can also be prolonged in hereditary genetic disorders like hemophilia (factor VIII deficiency), Von Willibrand disease. Platelets bind to the injured endothelium and result in clot formation. Platelet deficiency (normal platelet count 1.5 – 4 lakhs/mm^3) results in bleeding. Hence major surgeries should be preceded by base line coagulation tests like platelet count, PT, aPTT. Moreover cardiac patients will often be on aspirin. Aspirin causes qualitative abnormalities of platelet function. Hence aspirin should be with held for 5 days before performing dental / invasive procedures involving bleeding.[18,19]

CONCLUSION:

Dentists play a vital role in patient assessment, education and can be a strong influence in health promotion in their clinical practice. It is important for them to be familiar with oral manifestation of various systemic disorders to ensure prompt diagnosis and early referral.

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