LAMINA DURA: A DIAGNOSTIC LANDMARK

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INTRODUCTION

Lamina dura is a thin layer of dense bone that lines the normal socket. Radiographically it appears as a thin white radiopaque line around the roots of tooth and below the crest of alveolar bone. The classic literature describes the radiopaque socket LD as an image of a lining-reactive bundle bone responding to external forces applied to its surface by Sharpey’s fibers. The LD was also said to have a direct relationship with occlusal trauma. Richey and Orban, in 1953 thought the LD indicated changes in periodontal health. In 1963, Manson concluded that the LD was a radiographic artifact; a tangential bony radiopacity of no clinical significance and inconsistent with disease, trauma or health. In 1981, Greenstein et al. thought the LD was unrelated to the presence or absence of clinical inflammation. In 1994, Rams et al. said the crestal LD could be used in predicting periodontal health or disease activity. Socket and/or crestal lamina dura are also attributed to physiologic trabecular bone response to trauma or periodontal health, and are used as a potential diagnostic tool for such systemic diseases. Systemic conditions such as Pagets disease, Osteomalacia, Leukemia, Cushing syndrome, Hyperparathyroidism, Osteoporosis, Pyles disease and some Periapical pathosis have been associated with absence or decrease density of LD.

Anatomical Importance: Developmentally the lamina dura is an extension of lining of bony crypt that surrounds each tooth during development. Its mineralization component is similar to the trabeculae of cancellous bone in the area. The presence of an intact lamina dura around the apex of a tooth strongly suggests a vital pulp. The integrity of lamina dura is important in the evaluation of early periapical pathological process, periodontal diseases and other disorders in which lamina dura is lost. Absence of LD does not always indicate the presence of an apical pathology. Absence of LD may be because of thin cortical bone/ lining of the socket or overexposure of the film, which will make it less distinct. This tiny structure plays an important role in differentiating an odontogenic lesion from a non odontogenic lesion.

Radiographic Appearance: Its name lamina dura (hard layer) is derived from its radiographic appearance. This appearance is caused by the fact that X ray beam passes tangentially through many times the thickness of thin bony wall which results in its observed attenuation. This layer is continuous with the shadow of cortical bone at the alveolar crest.

Chevrons Sign: The appearance of lamina dura on radiograph may vary when the X ray beam is directed through a relatively long expance of the structure. The lamina dura appears radiopaque and well defined. However when the beam is directed more obliquely, lamina dura appears more diffuse and may not be discernible. In addition small variations and disruptions in the continuity of lamina dura may represent...
superimpositions of trabecular pattern and small nutrient canals passing from mandibular bone to periodontal ligament.

**Double Lamina Dura:** The image of double lamina dura is not uncommon if the mesial or distal surface of the root present to elevation in the path of x-ray beam. For eg. On the mesial surface of mandibular first molar roots, double lamina dura is seen.

**Normal Variations and Confusing Shadows**

1. Apex of maxillary canine (canine fossa)
2. Tooth rotation
3. Maxillary premolars before maturation
4. Projection over maxillary sinus
5. Tongue out of roof of mouth during panoramic
6. Projection over mandibular canal
7. Projection over mental foramen

**Accentuation of Lamina Dura**

1. Normal variant
2. Disease of skin: Scleroderma (systemic sclerosis)

**Common Pathological Conditions Affecting Lamina dura are as follows**

1. Idiopathic
2. Fibro-osseous disease (Hyperparathyroidism, Fibrous dysplasia, Paget’s disease of bone)
3. Metabolic disease (Osteoporosis, osteomalacia)
4. Blood disorders (Leukemia)
5. Sclerosing osteomyelitis
6. Periapical pathosis (periapical abscess, periapical granuloma, radiucy cyst)

**Uncommon Pathological Conditions Affecting Lamina dura are as follows**

1. Benign lesions of jaw like periapical cement osseous dysplasia, Traumatic bone cyst
2. Metastatic malignancy (especially breast), Langerhans cell Histocytosis, Tumors: Multiple myeloma, Burkitt’s lymphoma
3. Diseases of bone: Hypopara thyroidism
4. Metabolic diseases: Osteomalacia, Rickets (including vitamin D resistant form), Acromegaly, Hyperparathyroidism, Hypovitaminosis C, Hyperphosphatasia Cushing’s syndrome
5. Systemic disease: Renal tubular acidosis, Oxalosis
6. Disease of skin: Scleroderma (systemic sclerosis)
7. Disease of blood: Thalassemia
8. Other rare conditions like
   a. Fibrous histiocytoma
   b. Noma
   c. Removal of opposing tooth
   d. Sickle cell disease
   e. Post menopausal osteoporosis
   f. Anaemia
   g. Steroid medications

**Effects on Lamina Dura in Pregnancy:** As quoted on basis of study done by Marya et al in Rohtak region on pregnant females, it was concluded that loss of lamina dura was probably because of gestational hyperparathyroidism and mild resorption of the lamina dura may be a feature of normal pregnancy.

**Partial Loss of Lamina Dura in Benign Conditions**

1. Keratocystic odontogenic tumor
2. Lateral periodontal cyst
3. Simple bone cyst
4. Ameloblastoma
5. Periapical abscess
6. Periapical granuloma
7. Periapical cyst
8. Cushing syndrome
9. Root resorption
10. Traumatic bone cyst

**Partial Loss of Lamina Dura in Malignant Conditions**

1. Metastatic tumor
2. Fibrosarcoma
3. Multiple myeloma
4. Leukemia
5. Fibrous Dysplasia
6. Periapical cemental osseous dysplasia
7. Central giant cell granuloma
8. Burkitt’s lymphoma

**Complete Loss of Lamina Dura Seen In Following Conditions**

1. Hyperparathyroidism
2. Hypophasmatasias
3. Pagets disease
4. Renal osteodystrophy
5. Hypophasmatasias
6. Agranulocytosis
7. Hypochronic anaemia

**CONCLUSION**

The presence of crestal and radicular lamina dura is of significant diagnostic value. The presence of an intact lamina dura around the apex is a sign of vital pulp. However, the absence of its image around an apex on a radiograph may be normal. Hence, along with the integrity of LD the clinician must consider other signs and symptoms before proceeding for a diagnosis and treatment plan.

**References**


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