



Research Article

LAMINA DURA: A DIAGNOSTIC LANDMARK

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ABSTRACT

Lamina Dura also known as hard layer, is a controversial debate on its significance and implication in various conditions; as some Dentists think that if there is complete or partial absence of LD then it is a diagnostic of pathoses like Pagets disease, Osteomalacia, Leukemia, Cushing syndrome, Hyperparathyroidism, Osteoporosis, Pyles disease and some periapical pathosis. While some suggest that the radiographic density increase of the LD indicates Occlusal traumatism, Osteopetrosis and Hypercementosis. So, keeping in view this article emphasized on significance of lamina dura in health and disease.

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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 health¹. 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 health². In 1981, Greenstein *et al* thought the LD was unrelated to the presence or absence of clinical inflammation^{3,4}. In 1994, Rams *et al.* said the crestal LD could be used in predicting periodontal health or disease activity⁵. 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 area¹. 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 lesion⁶.

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 crest⁷.

Chevrons Sign: The appearance of lamina dura on radiograph may vary when the X ray beam is directed through a relatively long expanse of the structure. The lamina dura appears radioopaque 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

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superimpositions of trabecular pattern and small nutrient canals passing from mandibular bone to periodontal ligament⁸.

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 seen⁷.

Normal Variations and Confusing Shadows⁷

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 Dura⁷

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

Common Pathological Conditions Affecting Lamina dura are as Follows⁹

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, radicular cyst)

Uncommon Pathological Conditions Affecting Lamina Dura are as follows⁹

1. Benign lesions of jaw like periapical cement osseous dysplasia, Traumatic bone cyst
2. Metastatic malignancy (especially breast), Langerhans cell Histiocytosis, Tumors: Multiple myeloma, Burkitt's lymphoma
3. Diseases of bone: Hypoparathyroidism
4. Metabolic diseases: Osteomalacia, Rickets (including vitamin D resistant form), Acromegaly, Hypervitaminosis D, 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. Sick cell disease
 - e. Post menopausal osteoporosis
 - f. Anaemia
 - g. Steroid medications

Effects on Lamina Dura in Pregnancy¹¹: 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 Conditions⁹

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 Conditions⁹

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 Conditions⁹⁻¹⁰

1. Hyperparathyroidism
2. Hypophosphatasia
3. Paget's disease
4. Renal osteodystrophy
5. Hypophosphatasia
6. Agranulocytosis
7. Hypochromic 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 sign and symptoms before proceeding for a diagnosis and treatment plan.

References

1. Massler M. The Lamina Dura in Roentgenographic Interpretation: Changes During Tooth Movement. *The Angle Orthodontist*. 1945; 15(1):3-17.
2. Berry HM Jr. The lore and the lure o' the lamina dura, *Radiology*. 1973; 109(3):525-8
3. Greenstein G, Polson A, Iker H., Meitner S. Associations between crestal lamina dura and periodontal status. *J Periodontol*. 1981; 52(7):362-6.
4. Kuhlencordt J, Kruse HP, Franke J. The diagnostic value of the alveolar lamina dura in generalised bone disease. *Rofo*. 1981; 134(4):401-7.
5. Rams TE, Listgarten MA, Slots J. Utility of radiographic crestal lamina dura for predicting periodontitis disease-activity. *J Clin Periodontol*. 1994; 21(9):571-6.
6. Kamla G Pilai, Normal Anatomical Landmarks Oral Maxillofacial Radiology; 1st Edition 2015, Jaypee Brothers Medical Publishers Pvt Ltd 156-57.
7. White SC, Pharaoh MJ. Normal Radiographic Anatomy Chapter 9. Oral Radiology Principle And Interpretation

- 5th Edition 2004. Mosby Elsevier Publishing House 168-169.
8. Tanwar R, Panwar R, Kaur G, Saharan R. Lamina Dura in Health and Disease. *Journal of Oral Sign.* 2012; 4(1):21-22.
9. Changes in Lamina Dura as a Manifestation of Systemic Diseases: Report of a case and Review of Literature. *Journal of Endodontics.* 1982; 8(10):467-70.
10. Graham W., Harley J., Alberico C., Absent Lamina Dura Associated With a Developmental Dentin Abnormality. *Arch Intern Med.* 1965; 116(6):837-841.
11. Marya RK, Chadha M, Rathee S, Dua. Effect of Pregnancy on the Lamina dura. *Gynecol Obstet Invest* 1988; 26:126-129.

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