

Effect of Long-term Corticosteroids on Dental Pulp

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Abstract

Corticosteroids are used in the treatment of chronic autoimmune diseases and many long-term illnesses. While these drugs may be considered essential for the patient's health, adverse reactions do occur. The incidence of adverse reactions depends upon the dose level and the duration of treatment. A pilot study was conducted on ten patients on long-term corticosteroids therapy. Pulpal obliteration was assessed by radiographic records. In most instances, pulpal changes to some degree were observed.

Keywords: Steroids, pulp obliteration.

INTRODUCTION

Calcification is a process in which tissue becomes hardened as a result of precipitates or larger deposits of insoluble salts of calcium (and magnesium) especially calcium carbonate and calcium phosphate. It can be of two types—Dystrophic type and Metastatic type.¹

Disorders that are related to parathyroid hormone activity and vitamin D results in metastatic calcification. These deposits are seen in arteries, kidneys, lungs and soft tissues.

Dystrophic calcification/pathologic calcification is characterized by deposition of calcium salts in dead or degenerating tissues with normal calcium metabolism and normal serum calcium levels as seen in tuberculosis necrosis, blood vessels in arteriosclerosis, scars and areas of fatty degeneration. In the oral cavity calcification is seen in gingiva, tongue, cheek and most common being in the pulp of teeth.

The body naturally produces a diverse group of hormones collectively known as steroids using cholesterol as a substrate, essential for metabolic control, regulation of water and electrolyte balance and regulation of body's response to stress. Corticosteroids are medicines designed to act in the same way as steroids, these are the drugs. Most widely used by virtue of their anti-inflammatory, antistress antiallergic and immunosuppressive action.

The various effects of cortisone on dental tissues includes the following: reduction in height of alveolar bone, it

becomes osteoporotic with decreased number of osteoblasts, reduction in amount of osteoid matrix and fibrous transformation of periodontal space.² It could lead to loss of supporting alveolar bone. Vascular changes in the pulp can be observed, major change being severe dilatation of the vessels.^{3,4}

The formation of dentin has been ascribed to medication with high doses of corticosteroids.⁵ Excessive formation of bone like substances and disorganized odontoblasts in pulp chamber is seen in histological sections.⁶ The width of the predentin zone could be approximately four times greater than in normal teeth and extensive formation of secondary dentin could be seen in some cases.⁷ Some studies have shown, fibrosis of the entire dentin in histological sections.⁸

STUDIES ON DENTAL PULP CHANGES

It has been found that prolonged treatment with this hormone leads to disorders affecting the electrolyte balance in the body, the dental literature contains a number of reports in which effects of cortisone on dental pulp have been studied.

In 1963, Anneroth et al⁶ reported the observation of pulp calcification in incisors of cortisone pretreated rats, in which he observed definite bone like tissues in the incisors. In 1989, Nasstrom and Peterson et al⁵ studied the effect of IV administration of corticosteroids on dentin formation in adult rat molars. In 1993, Nasstrom et al⁹ studied the effect on human teeth of renal transplantation, and found that pulp

space was markedly reduced. In 1996, Nasstrom reviewed the status of renal transplant patients on corticosteroids, observed that odontoblasts are affected at the early stage of corticosteroid treatment and calcification of the dental pulp occurs after several years.

The purpose of the present study is to investigate the correlation of long-term steroids and the presence of pulp calcification.

MATERIALS AND METHODS

An observational study was conducted by the department of Conservative Dentistry and Endodontics, VS Dental College and Hospital and ChanRe Institute of Rheumatology and Immunology.

AIMS AND OBJECTIVES

To detect the presence of calcification in patients on long-term corticosteroids.

Source of the Data

ChanRe Institute of Rheumatology and Immunology.

Inclusion Criteria

Patients on long-term corticosteroid therapy with the age group of 20 to 50 years.

Exclusion Criteria

Patients above 50 years of age keeping in mind the inclusion and exclusion criteria the subject selected for the study were on long-term steroid therapy due to rheumatoid arthritis.

The radiographic findings of this study group were compared with the control group (OPG, Fig. 1) (normal individuals in the age group of 20 to 50 years with no significant medical history).

FINDINGS

Clinical Findings

- During intraoral examination the patients had no subjective sense of pain or sensitivity.
- Patients with root stumps and grossly destructed teeth did not seek any dental treatment due to lack of pain.

Radiographic Findings

- Orthopantomograph radiograph (OPG, Figs 2 and 3) revealed the pulp spaces in all the teeth were obliterating in patients with corticosteroids administration (Fig. 4).

Name	Age/sex	Primary disease	Duration of medication	Observations (presence of pulp calcification)
Dilshad begaum	30/F	Rheumatoid arthritis	3 years	In molars
Manjula	40/F	Rheumatoid arthritis	2 years	In molars
Swathi Shegde	25/F	SLE	2 years	In first molars
Subbamma	49/F	Rheumatoid arthritis	3 years	In all teeth
Shruthi	26/F	Stills disease	2 years	In molars
Prathiba	23/F	Rheumatoid arthritis	3 years	In molars
Sheethal	32/F	Rheumatoid arthritis	21/2 years	In first molars
Shilpa	26/F	Rheumatoid arthritis	1 year	No changes



Fig. 1: OPG of patient 3: Radiograph of a healthy subject showing normal tooth morphology



Fig. 2: OPG of patient 1: Showing presence of pulp stones with 3 years of corticosteroid therapy



Fig. 3: OPG of patient 2: Showing obliteration of pulp canal with 7 years of corticosteroid therapy

Total no. of patients	10
Complete obliteration of the pulp canal	2
Denticles in all molars	3
Denticles in first molars	4
No changes in pulp	1

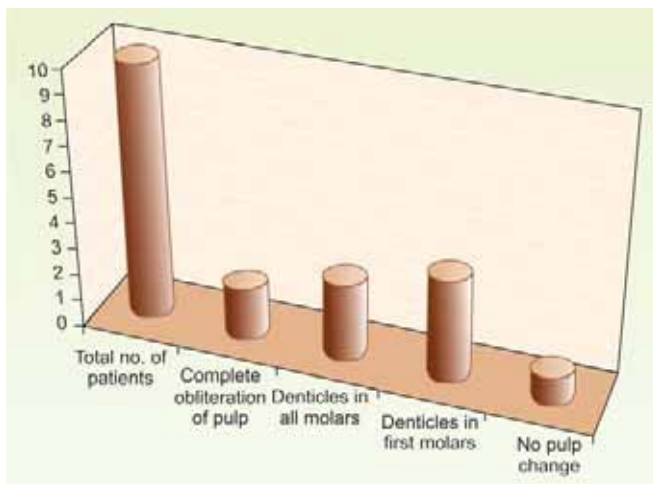


Fig. 4: Descriptive depiction of pulp changes observed in patients on long-term corticosteroids

- In patients on long-term steroid therapy pulp stones were observed in the molars and premolars.

DISCUSSION

Reasons for calcification due to steroids in the pulp can be due to Interference with enzymatic process which, in turn, could affect the normal histodifferentiation of the tooth.⁶ Long-term administration of corticosteroids does not inhibit normal formation of dentin layer, but results in necrosis of the superficial pulp layer which gets calcified.¹⁰ mature odontoblasts show a different reaction pattern to the altered hormone level and thus start forming new dentin.⁵ Long-

term administration of corticosteroids has complex actions which exerts great effect on odontoblasts. The mature odontoblast shows a different reaction pattern to the altered hormonal levels, but subsequent continuous dentin deposition is seen.¹¹ Young teeth might depress the dentin apposition rate to its lower limit.¹²

Specific effect of corticosteroid on dentin formation is initiating the formation of an excessive predentin layer,¹³ which is followed by complete mineralization of the predentin.⁹ however a widened predentin zone with an irregular mineralization front was observed under an electron probe X-ray microanalytical study of dentin minerals.¹⁴ Gradual narrowing of the dental pulp leads to deterioration of blood circulation resulting in poor nutritional state in the dental pulp cavity, growth factors cannot exhibit their function, odontoblast regeneration becomes impossible leading ultimately to repair by fibrous component alone.⁸

The effect an altered hormonal level due to steroid administration is very complex and very little of the mechanisms of reactions in the teeth are known.

CONCLUSION

The broad spectrum of effects that characterizes the adrenal cortical hormones, together with the fact that it has proved possible to isolate a number of these steroids has led to their great use in, medical therapy. Undesirable side effects are common in corticosteroid therapy and further studies are necessary to obtain a better understanding of the fundamental principles in hormone interaction and its influence on the pulp space.

From the radiographic observation a provisional inference that a correlation could exist between long-term use of corticosteroids and pulp obliteration. However, long-term multicentered studies needs to be done to corroborate the results of this observation.

REFERENCES

1. Harsh Mohan. Essential pathology for Dental students, Jaypee Brothers (3rd ed). 42-44.
2. Glickmann I, Stone IC, Chawla TN. Effect of cortisone acetate on the periodontal tissues of white mice. *J Dent Res* 1951;30:461.
3. Applebaum E, Seelig A. Histologic changes in jaws and teeth of rats following nephritis, adrenalectomy and cortisone treatment. *Oral Surg, Oral Med and Oral Path* 1955;8:881-91.
4. Goldsmith EP, Ross TA. Histochemical and histological study of the effects of cortisone on the lower incisors of fetal and post natal rats. *Acta Endocrine* 1956;22:23-25.
5. Nasstrom K, Petersson A, Konard P. Effect of intravenous administration of corticosteroids on dentine formation in adult rat molar. *Scand J Dent Res* 1989;97:301-06.

6. Anneroth G, Bloom G. Structural changes in the incisors of cortisone treated rats. *J Dent Res* 1966;45:229-35.
7. Nasstrom K, Forsberg B, Petersson A, Westesson PL. Narrowing of the dental pulp chamber in patients with renal diseases. *Oral Surg* 1985;59:242-46.
8. Yoshiho Chigono, et al. Dental pulp changes observed in patient on long-term corticosteroids. *Journal of Hard tissue biology* 2007;16(1):31-35.
9. Nasstrom K, Moller B, Petersson A. Effect on human teeth of renal transplantation: A postmortem study. *Scan J Dent Res* 1993;101:202-09.
10. Andrez Oberstiztyn, Jolanta Jedrzejczyk, Wieslawa Smiechowska. Application of Lyophilized dentin chips mixed with prednisolone and neomycin on infected rat incisor pulp. *J Dent Res* 1968;47(3):374-80.
11. Capik I, Ledecy V, Sevcik A. Effects of Flumetazone on exposed dental pulp of dogs. *ACTA VET BRNO* 2003;72: 279-83.
12. Peter C Ball. Lack of effect of excess glucocorticoid hormone on the rate of dentin deposition in rats. *J Dent Res* 1977;56(6):685-90.
13. Wysocki GP, Daley TD, Ulan RA. Pre-dentin changes in patients with chronic renal failure. *Oral Surg Oral Med and Oral Path* 1983;56:167-73.
14. Huuononen S, Larmas M. An electron probe X-ray microanalytical study of dentin minerals in sucrose fed or glucocorticoid medicated rats. *Calcif Tissue Int* 1999;65:223-25.