

Disturbed Root Development of Permanent Teeth after Radiotherapy

*Najmeh Anbiaee** Somayyeh Nemati *** Robab Anbiaee

*Department of Maxillofacial Radiology, Dental Research Center of Mashhad Dental School, Mashhad University of Medical Science, Mashhad, Iran.

** Department of Maxillofacial Radiology, Rasht University of Medical Science, Rasht, Iran. ***Department of Radiotherapy and Oncology, Beheshti University of Medical Science, Tehran, Iran.

Abstract

In this study, we have reported an uncommon sign in panoramic radiography of patient who had received ionizing radiation for rhabdomyosarcoma of the nasal fossa and the right ethmoid sinus, at fifteen years ago. The subsequent abnormal development of all maxillary permanent teeth is described and discussed as an uncommon effect of radiotherapy. Six months after referral to the department, the patient reported a painless swelling of the lower left side of mandible. Incisional biopsy confirmed the pleomorphic adenoma.

Key words: Complications; Radiotherapy; Root agenesis; Pleomorphic adenoma

Introduction

Due to tissue reactions to radiation, head and neck radiotherapy usually result in oral complications affecting the salivary glands, oral mucosa, bone, masticatory musculature, and dentition (1). Irradiation of teeth with therapeutic dosage during their development period severely retards their growth.

If irradiation occurs pre-calcification, it may destroy the tooth bud whereas post-calcification irradiation may contribute to malformations and seize growth (2). Also, deficient dental root development has been reported after the conventional radiotherapy (3).

The effects of radiation therapy on the jaws may cause defects in the permanent dentition as follows: retarded root development, dwarfed teeth, or failure to form one or more teeth, delayed eruption of the permanent teeth, hypodontia, root stunting, enamel defects, bony hypoplasia, facial asymmetry, trismus, root agenesis,

microdontia, excessive caries, premature closure of apices (2, 4-8).

If radiotherapy occurs during the development, it may complete calcification sooner and cause premature eruption. Irradiation of teeth may retard or prevent root formation; however, the eruptive mechanism is resistant to radiation (2).

There are not sufficient reports regarding the effects of radiotherapy on the root formation in childhood. Therefore, the present study was performed to demonstrate an uncommon case with no developed roots in all his permanent teeth in the maxilla after radiotherapy.

Case report

A 20-year-old male referred to our radiology department for periapical radiography examination. He suffered from discoloration of the maxillary right second incisor without any other symptoms. In this radiograph, the roots of the maxillary right first and second incisors and canine were not evident.

After the radiography, no root was observed at the maxillary canine and incisors and the internal resorption was revealed in the second incisor.

Reprints Requests: Dr. Najmeh Anbiaee

Dept of Maxillofacial Radiology
Mashhad Dental School, Vakilabad Blvd
Mashhad, Iran - 91735-984
Mobile: 00989153031510
Email: anbiaeen1@gmail.com

Figure 1. The panoramic view shows that all of the maxillary teeth are without roots but completely erupted



In the panoramic radiography all the maxillary permanent teeth were rootless and erupted completely. All the mandibular teeth erupted too and were completely intact with no impairment (Fig 1). None of the third molars were evident in the radiography of both jaws.

In the clinical examination, apart from the maxillary right second incisor which was mobile and discolored, all of the maxillary teeth were fixed and did not have any pathologic symptoms.

In his medical history, at the age of 5, he had suffered from rhabdomyosarcoma of the nasal fossa and the right ethmoid sinus.

Figure 2. Lateral cephalogram, shows normally presenting primary teeth at the time of radiotherapy.

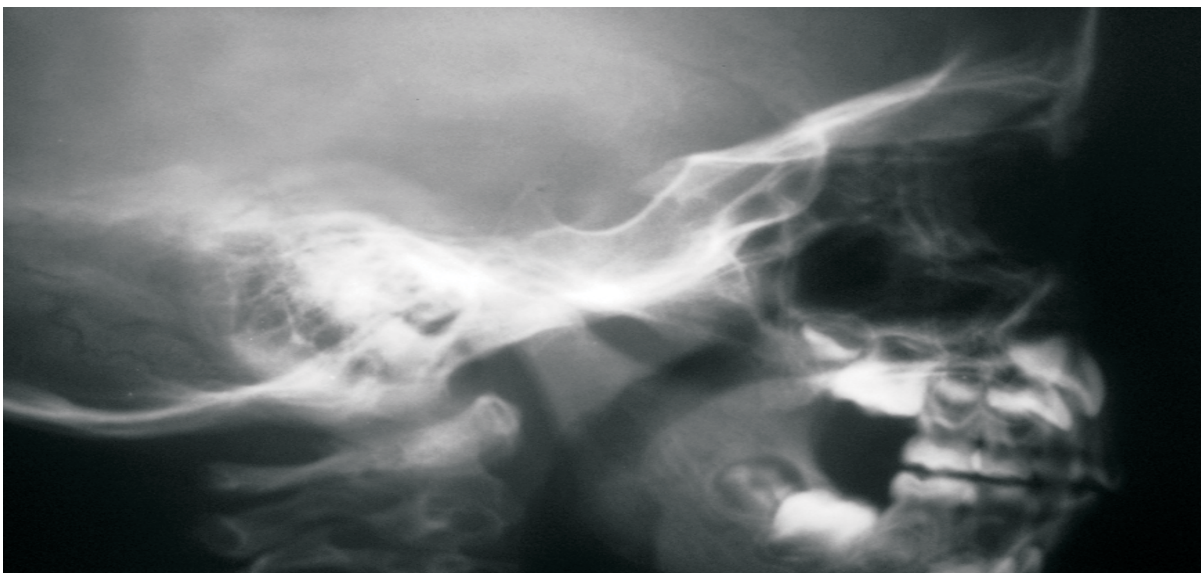


Figure 3. Posterior anterior skull view; note: the fullness of the ethmoid sinus because of the tumor.



At that time, he underwent external ethmoidectomy and then radiotherapy.

Total radiation dose was 4500 rad with cobalt in the fractional doses, in which 200 rad for 24 sessions administered during six months. The lateral cephalometry taken before radiotherapy revealed that the primary teeth were normally presented (Fig 2).

In the posterior-anterior skull view, fullness of the ethmoid sinus because of the tumor was evident (Fig 3).

Another interesting finding in this subject was submandibular gland pleomorphic adenoma which was diagnosed 6 months after referral to the department. The patient reported a painless swelling of the lower left side of mandible. Incisional biopsy confirmed the pleomorphic adenoma.

Discussion

Complications of the radiotherapy came as acute tissue reactions and late tissue reaction. Acute tissue reactions typically occur during treatment or a few months after and they generally resolve shortly after termination of the therapy. The late tissue reactions are defined in the literatures as occurring more than 90 days after the treatment (9).

Irradiation at the oral cavity may cause some side effects including xerostomia, stomatopyrrosis, dysgeusia, mucous ulcerations, osteoradionecrosis, and high caries activity; malformation of teeth due to radiation therapy during tooth development is a relatively uncommon complication (10).

Furthermore, hypodontia, root stunting, enamel hypoplasia, delayed eruption of tooth, mobility, and tooth loss are another side effects of radiotherapy (4, 11, 12).

Irradiated teeth with altered root formation still erupt (2). There are few reports regarding the effects of radiotherapy on children's dental structure.

Estiol C.L et al. observed the effects of radiotherapy on dentofacial development in 10 patients, who had the history of head and neck rhabdomyosarcoma. In their study, bony hypoplasia and disturbance in root formation were the most common findings (5).

In our patient, all the maxillary teeth erupted without root and he was asymptomatic.

Gabris et al. (10) also reported a case in which, very severe root deformities in all the maxillary teeth were revealed. All of the teeth in their study were mobile; however, in our case apart from one, the rest of the maxillary teeth were fixed.

Katalin et al. (13) reported childhood dental complications after radiotherapy of tumors in the nasal cavity. Similar to our case, they reported no or hardly developed roots of permanent teeth in the maxilla.

In the Most studies have shown the root stunting although a few of them presented root agenesis. Different symptoms may be related to the amount of total radiation dosage or to the manner of radiotherapy.

Our subject received 4500 rad (45 Gy) Cobalt in the fractional doses (200 rad for 24 sessions); however, in the other studies the patient doses were not reported. Though in a study by Herrmann T. et al. 8-25 Gy radiation dosage was delivered to the patient and no root agenesis were evident (11).

In contrast to this study that all of the maxillary teeth but one were fixed, in the other reports tooth mobility was a common side effect of the radiotherapy^{4,10}. This may be related to the healthy periodontium and absent of major dental caries.

The absent of third molars in both jaws, may be due to the natural missing of these teeth or possibly related to the side effects of radiation in the early stages of buds development.

It could be said that, the disturbed roots in this study were caused by the radiotherapy of patient at the age of 5. Also, the mechanism of eruption does not depend on the root existence and the radiation has not affected the eruptive mechanism and this finding is in agreement with references (2).

Regarding the fact that periodontal ligaments have an important role to play in tooth eruption, it may be assumed that radiation does not have any effects on the collagen ligaments (14).

All teeth in the mandible were intact and this finding might be related to the cobalt radiation therapy and the field of radiation.

Considering pleomorphic adenoma in this subject, it can be concluded that the patient is genetically susceptible to be affected by neoplasm. In addition, it probably was influenced by radiotherapy although this concept is not very well documented.

In conclusion, in the present case report, it could be assumed that radiotherapy has side effects on the root formation of all teeth in the children; however, it does not have any effects on the eruptive mechanism.

As all the mandibular teeth were intact and not influenced by radiation it could be concluded that the distance from radiation field is very important, or perhaps these teeth are less sensitive to radiation than the maxillary teeth.

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