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Original paper

Tertiary dentin deposition in the proximity of the cervical perforation aperture – A case study

BOGDAN DIMITRIU[1], ECATERINA IONESCU[1], IOANA SUCIU[1], DRAGOS EPISTATU[1], DANA BODNAR[1], MIHAELA CHIRILA[1], STEFAN MILICESCU[1], OANA AMZA[1], CATALINA MAGUREANU[1], RUXANDRA BARTOK[1], MARINA GIURGIU[1], ILEANA IONESCU[1]

[1] "Carol Davila" University of Medicine and Pharmacy, Faculty of Dental Medicine, Bucharest, Romania

Abstract

Dead tracts are dentin areas characterized by degenerated odontoblastic processes; may result from injury caused by caries, attrition, erosion, or cavity preparation. Odontoblasts can also form tertiary dentin, as a response to injury, in association with caries, trauma, or restorative procedures. Generally, this dentin is less organized than primary and secondary dentin and mostly localized to the site of injury. The reactive dentin formation that lays under caries, the pulp displays chronic inflammation and tertiary dentinogenesis takes place on the inner walls of the pulp space, in the region of the dentinal tubules associated with the base of the carious lesion. Higher-power photomicrograph of tertiary dentin shown in a primary dentin, first period of tertiary dentin formation, second period of tertiary dentin formation.

We initiated a case study regarding depositition of tertiary dentin in the close proximity of the cervical perforation hole on mesial root of the second maxillary molar. The repair material used (Biodentine, Septodont) was found placed under the tertiary dentin layer, rather than at the perforation place, mentioning the fact that the group of residents was not experienced with the management of the endodontic microscope and did not use a proper field.

We consider that we have identified dead tracts due to the fact that they were formed consequently carious lesions pathology, thereafter the tertiary dentin at the appearance of the coronal aspect was identified at the end of the dead tracts. The portion of the canal entrances were investigated both with analyzed filters (Crossed Polars) and with compensatory devices (retardation plates).

The present study identified tertiary dentine deposits in the coronary portion of the adjacent root canal entered in the perforation. At a thorough analysis of the coronal portions of the mesial root canal with compensating devices and analyzers filters, it was noticed a soft dentin blanket in which the dentinary tubules do not exist or are of very rare deposition.

Keywords Dead tracts, microscopy, root canal, perforation, tertiary dentin, micrometry.

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✉ *Corresponding author: ILEANA IONESCU, "Carol Davila" University of Medicine and Pharmacy, Faculty of Dental Medicine, Bucharest, Romania
Email: ileanaorto@yahoo.com

Introduction

Dead tract are dentin areas characterized by degenerated odontoblastic processes; may result from injury caused by caries, attrition, erosion, or cavity preparation. Odontoblasts can also form tertiary dentin, as a response to injury, in association with caries, trauma, or restorative procedures. Generally, this dentin is less organized than primary and secondary dentin and mostly localized to the site of injury. Morphologically, tertiary dentin has a variety of appearances, being referred to as reactive, reparative, irritation, or irregular dentin [1, 3, 5].

The reactive dentin formation that lays under caries, the pulp displays chronic inflammation and tertiary dentino-genesis takes place on the inner walls of the pulp space, in the region of the dentinal tubules associated with the base of the carious lesion. Higher-power photomicrograph of tertiary dentin shown in a primary dentin, first period of tertiary dentin formation, second period of tertiary dentin formation. It is interesting to note the progressive irregularities in tubule formation and changes in the morphology of the odontoblasts in that region.

Material and Methods

We initiated a case study regarding depositition of tertiary dentin in the close proximity of the cervical perforation hole on mesial root of the second maxillary molar.

The pacient analyzed was as an emergency in the department of Endodontics of Faculty of Dental Medicine, Bucharest with tooth 17 harboring multiple periapical pathology. The radiological evaluation revealed an a interradiculare perforation which we tried to repair by conventional endodontic treatment. However, the root canal obturation was not perfectly sealed, thus the periapical pathology evolved as the root cyst that required the extraction of the molar. The patient donated the tooth for microscopic study.

The repair material used (Biodentine, Septodont) was placed under the tertiary dentin layer, rather than at the perforation place. We consider that we have identified dead tracts due to the fact that they were formed consequently carious lesions pathology, thereafter the tertiary dentin at the appearance of the coronal aspect was identified at the end of the dead tracts.

As long as the tooth presented the perforation, the tertiary dentin was formed in the coronal portion of the root canal, resembling an area in the proximity of the perforation place, however the other root canals could not be investigated by thin microscopic sections, because they were too altered.

Results and Discussions

On the median line of the image (Figure 1A) from coronal part to the apical, a discrete contour of tertiary dentine is noticed in the neighborhood of the pulp chamber. The microscopic study detected that under the tertiary dentin layer of the extracted tooth, a semi-opaque dental material from the vestibular area of the pulp chamber was recorded. The tertiary dentine (Figure 1B) occurs as a set of heavely infiltrated canals; they extend from the enamel-dentin jonction from the occlusal part, towards the tertiary dentine, meaning that it is located to the former limit of the pulp chamber before the pathological process (perforation) occured. Figure 1B illustrates the appearance of tertiary dentin overdue that is located in the coronarysense at the enamel proximity. A close detail on structures dentin tertiary (Figure 1D) which is characterized through thinner dentin ducts of irregular trailing, of discontinue layout deposition to the limit of the tertiary dentin area with the rest dentin (the pulp chamber, respectively).

The dental material (Biodentine, Septodont) found under the tertiary dentin layer, was probably an excess which was placed coronary under the tertiary dentin zone, probably because of the incomplete escavation of the top of the pulp chamber. At the entrance of the mesiobuccal root canal of the second maxillary molar (Figure 1E) there is a loss of substance, probably a notch of about 1.05 mm with maximum depth, which corresponds to the approximate mesial zone where the perforation was made, however the perforation route was not captured in the section plane (but the notch – reffered to the substance loss was located slightly lateral to the perforation, thus being a testimony of the fact that there exists a loss of substance in this area).

The data recorded after micrometry investigation revealed that into the plan section (all are dimensions apparent) the depth of the lack of substance right at the perforation locus was 96-116 μm. We emphasize the fact that we could not image into the same section both the root canal and perforation path. We preferred taking the section so that be the root canal followed. Taking into account the fact that the very small fragments'dimension left after creating the first section was impossible to be obtained additional new sections for the perforation path. Therefore, we have in this section and implicitly, in the microscopic pictures just the entrance area into the perforation (PEA) which occurs, as shown, under the form of a dents (lack of substance) in the endodontic wall space, at the entrance into the the root canal (RC). The width of the root canal at the entrance (immediately apical to the defect suitable at the entry into the perforation) was 440-450 μm whereas the the maximum thickness of the tertiary dentine on the surface from interal and canal mesial -vestibular was 27 to 28.5 μm.

This does not mean that the maximum thickness of tertiary dentin was submitted into the terms of pathological into the root canal and initially had this value. Part of the dentine tertiary was obviously removed through mechanical treatment. Although we intended the section plan saddle to correspond to the root canal spindle, the canal being not perfectly straight, this correspondence cannot be assured fairly. Thereafter, it is possible that the maximum or thickness of the tertiary dentine remaining post-root canal preparation (post-mechanically treatment) not to be the one measured, but it could be affirmed that it has at least the measured value.

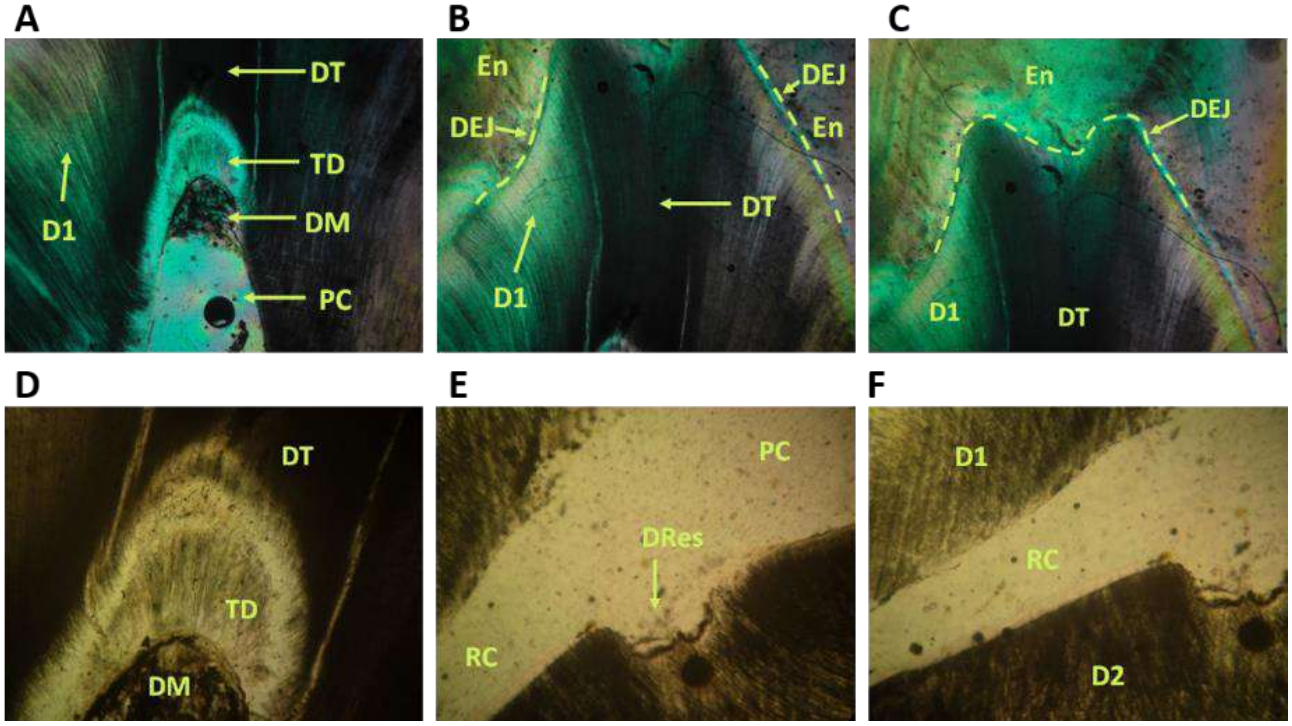

Figure 1. Microscopic analysis. A- DT – dead tract, TD – tertiary dentin, DM – dental material, PC – pulp chamber, D1 – dentin with low infiltrated dentinal tubules; **B-** DT – dead tract, D1 – dentin with low infiltrated dentinal tubules (high transparency dentin) En – enamel; DEJ – dentin-enamel junction; **C-** DT – dead tract; D1 – dentin with low infiltrated dentinal tubules; En – enamelDEJ – dentin-enamel junction; **D-** TD – tertiary dentin; DM – dental material, DT – dead tract; **E-** PC – pulp chamber, RC – root chanel, DRes – dentin resorbtion; **F-** D1 – high transparency dentin, D2 – low transparency dentin, RC – root channel.

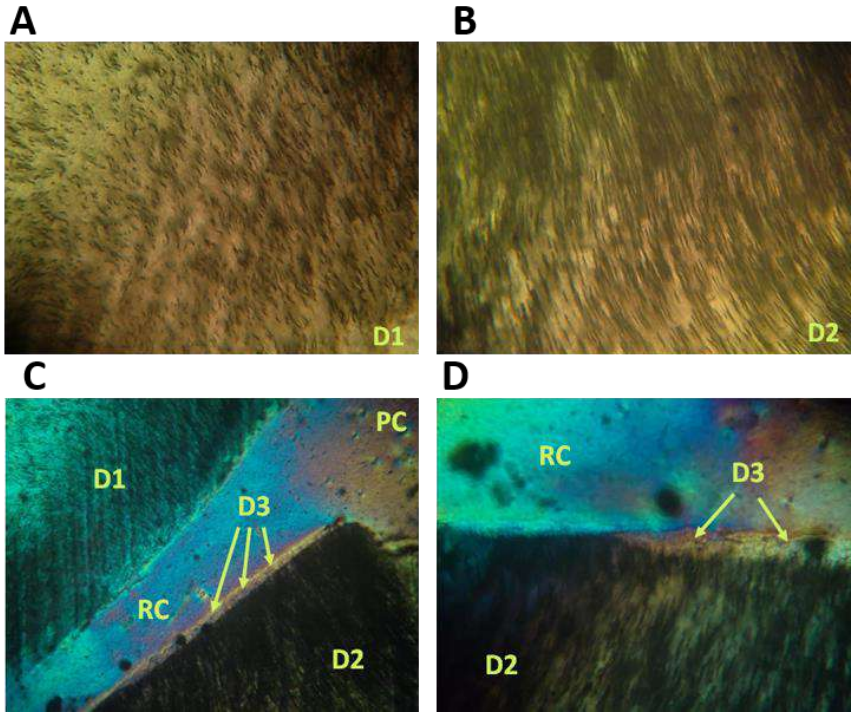

Figure 2. A- Detail image on high transparency dentin (D1). **B-** Detail image on low transparency dentin (D2), **C-** D1 – high transparency dentin, D2 – low transparency dentin, D3- tertiary dentin interphase, PC – pulp chamber, RC – root channel; **D-** D3 –tertiary dentin interphase, D2 – low transparency dentin, RC – root channel.

At the level of the coronal canal segment, with the notch that corresponds approximately to the input of the perforation (Figure 1F), it can be noted on both sides of the canal the presence of infiltrated canals, but the dentin transparency on one side and the other is different, therefore we interpreted this due to the fact that the route of the canals in those two areas was different. In the area that is marked D1, meaning the root canal wall from the distal portion, the canals are oriented to a larger angle relative to the plane sections i.e about 50-70 degrees, as there were snapped just short portions of the canal sections. The passing of the light microscopy fascicle was slighltly impeded (photo 2A). In the mesial portion of dentin from the mesial wall of root canal D2 (photo 1F) the degree of transparency is more reduced because the dentinal tubules have a trail about the plan sections so they were snapped on longer sections, thus the transition of the light beam microscope is prevented in this domain (photo 2B).

The tertiary dentine was emphasized in different colors of birefringence. These microscopic notifications, in the initial portion, the coronal part of the root canal, are contrary to the concept of the root canal classical dentin ducts path resemblence around main canal and it is assumed due to the fact that this route is radiary (photo 2C). If, in reality it would have been so, then it would have meant to saddle surprise the ducts both in the radial mesial wall, as in the distal one, which was not the case.

We studied the portion of the canal entrances to be studied both with analized filters (Crossed Polars) and with compensatory devices (retardation plates), this brought us in a position to emphasis a layer of peri- canalar dentin (a blanket of soft dentin) where the tubules presence does not exist, or are rare. This one blanket of dentin is present only towards mesial, however its thickness decreases to apical. Thereafter, we interpreted that this layer is also a dentin tertiary; interesting being the fact that it is found just on the mesial root canal wall and it arises the problem of absence of the dentine on the surface of the distal root canal. The absence of the tertiary pericanalare dentin layer could be put on instrumentation techniques, scraping it fully out on the distal wall. Going further towards apically, using higher power lens (photo 2D) we have noticed that the tertiary dentin blanket that is residual post instrumen-tation, presented gradual narrowing, so that at 1.5 mm from root canalentry it disappears completely (Figure 2 D). It is known that tertiary dentine forming typically in the pulp chamber through deposit at aggressions. In our case, the aggression comes from the coronary part (i.e. the carious lesion) and in this study it was found at the very end of the pulp chamber and “dead tracts”, but taking into account the fact that the perforatin was not identified but lately, at the reopening of the tooth using the endodontic microscope, there also existed a deposit of tertiary dentin, which was not located at the perforation place, rather than on the early portions of the root canal wall (Figure 2C).

Conclusions

The present study identified tertiary dentine deposits in the coronary portion of the adjacent root canal entered in the perforation. At a thorough analysis of the coronal portions of the mesial root canal with compensating devices and analyzers filters, it was noticed a soft dentin blanket in which the dentinary tubules do not exist or are of very rare deposition.

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In this article, all the authors have equal contributions as the first author.

Conflict of Interest

The authors have no conflict of interest to declare.

References

1. R.E. WALTON, M. TORABINEJAD. Principles and Practice of Endodontics. *Saunders,* 2002, 9-10.
2. L. TRONSTAD. Clinical Endodontics 3rd, Thieme Verlag 2009, 40-48.
3. WENNBERG A, HASSELGEN G, TRONSTAD L. Amet Hod for evaluation of initial Tissue response to biomaterials. *Acta odont scant,* 1978; 36; 67; 73.
4. NISSAN R, TROPE M, ZHANG CD, CHANCE B. Dual Wave - Lenght; spectrophotometriy as a diagnostic text of the pulp chamber contents, *Oral Surg, Oral Med, Oral Patol,* 1992; 74; 508-514.
5. TSATSAS BG, FRANK RM. Ultra structure of the dentinal tubular substances near the dentino enamel juction Calcif Tiss res, 1972; 9: 238-243.
6. Sturdevant’s Art and Science of Opperative Dentistry, Fifth Edition, Mosby-Elsevier, 2009.