# A nonsurgical endodontic treatment in open-apex and immature teeth affected by dens invaginatus

## Using a collagen membrane as an apical barrier

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## ABSTRACT

**Background.** The authors' objective in this case report is to demonstrate an effective nonsurgical endodontic treatment in open-apex teeth affected by dens invaginatus (DI) by using a collagen membrane as an apical barrier and using a mineral trioxide aggregate (MTA) apical plug.

**Case Descriptions.** The authors present two cases of DI with open apexes in maxillary lateral incisors. In the first case, an adolescent had bilateral Oehlers type II DI and extensive periradicular radiolucency, internal root resorption and a vestibular fistula in the left maxillary lateral incisor. In the second case, an adult had Oehlers type II DI and an incomplete apex in the left maxillary lateral incisor. For both patients, the clinician placed a collagen membrane through the apexes of the left maxillary incisors to provide a resorbable extraradicular barrier against which MTA cement could be packed. The clinician obturated the adolescent's right lateral incisor.

**Results.** In the adolescent, the vestibular sinus tract was closed after one week. At subsequent follow-up examinations, the periradicular regions were completely healed, and postoperative radiographs revealed good bone healing in the lateral incisors. The teeth were asymptomatic and healing was achieved without any need for further endodontic surgical intervention. In the adult patient, the tooth was symptom free after one week, and radiography performed six months after the procedure showed complete healing.

**Conclusions and Clinical Implications.** Despite complex anatomy and diagnoses of DI and open apexes, both patients successfully underwent nonsurgical endodontic treatment involving the use of a collagen membrane and an MTA apical plug. Using an extraradicular barrier clinically can help improve the adaptation of MTA in the apexes of open-apex teeth to achieve a complete seal.


**Key Words.** Dens invaginatus; endodontic therapy.
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Dens invaginatus (DI) is a developmental anomaly of teeth that results from an invagination of the enamel organ into the dental papilla before calcification.[1] Among the other names for this condition are "dens in dente," "invaginated odontome," "tooth inclusion" and "dentoid in dente."[2] The prevalence of DI ranges from 0.04 percent to 10 percent[3]; the maxillary lateral incisors are affected most commonly and the central incisors are affected less frequently.[4]

DI's clinical appearance varies considerably. In affected teeth, the morphology of the crowns can appear normal; however, teeth with DI also can have unusual features such as a greater labiolingual diameter or a cusp that is peg shaped, barrel shaped, conical or talon shaped. If these teeth have open root apexes, they present the clinician with an additional challenge in controlling the apical extent of the root filling and in restoring the apical portion of the tooth.[5]

The use of barrier membranes in endodontic surgery was advocated by Duggins and colleagues[6] for the management of root perforation, by Pecora and colleagues[7] for the management of large periapical lesions

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and by Rankow and Krasner[8] for endodontic surgery in general. The first commercially available barrier membrane was an expanded polytetrafluoroethylene periodontal membrane (Gore-Tex, W.L. Gore, Newark, Del.). Dahlin and colleagues[9,10] were the first to report applying the concept of guided tissue regeneration (GTR) to bone surgery; they created guided bone regeneration (GBR) with the use of a membrane and subsequently applied the technique to endodontic surgery. Many investigators have used collagen membrane for GTR and GBR but, to our knowledge, no investigators have published study findings involving the use of a membrane to create an apical barrier. Although a variety of absorbable barriers exist, collagen and calcium sulfate materials appear to be the best to use on the basis of supporting research, ease of handling and observed successful clinical results.[11] Collagen materials (for example, CollaCote, Zimmer Dental, Carlsbad, Calif.; Collastat, American Medical Products, Freehold, N.J.; Hemocollagene, Septodont, Maidstone, Kent, England; and Instat MCH, Ethicon Biosurgery, Somerville, N.J.) exhibit working properties that provide complete hemostasis,[12] support new tissue growth and absorb in one to 14 days when left in situ.[13] Calcium sulfate can serve as both a barrier and a hemostatic material. The clinician syringes the material through the tooth and into the osseous defect by using a microtube delivery system; it is absorbed in two to four weeks.[13] Calcium hydroxide and calcium triphosphate are other materials that can be used as a barrier against which to condense another material.

In this article, we present reports of the nonsurgical endodontic treatment of two maxillary lateral incisors that had Oehlers type II DI and open apexes, treatment involving the use of collagen membrane and a mineral trioxide aggregate (MTA) cement apical plug.

## CASE REPORTS

**Case 1.** A 15-year-old girl with a noncontributory medical and familial history received a referral from an esthetic dental clinician to the Department of Endodontics, School of Dentistry, Mashhad University of Medical Sciences, Mashhad, Islamic Republic of Iran, for evaluation and treatment of maxillary lateral incisors. The patient reported having experienced pain and swelling one month before the referral, but at the time of the examination she had no symptoms. Clinical examination revealed a sinus tract above tooth no. 7. The clinician (M.G.) placed a gutta-percha point to aid in tracing the sinus tract (Figure 1).

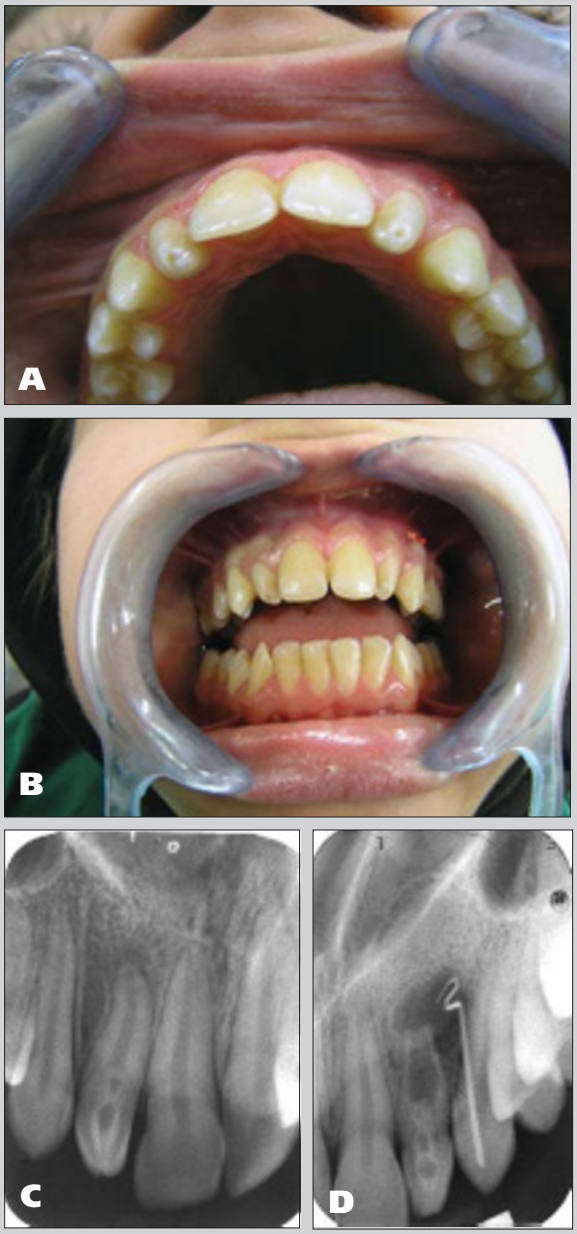


**Figure 1.** Case 1. Clinical (**A** and **B**) and radiographic (**C** and **D**) appearance of the invaginated right (**C**) and left (**D**) maxillary lateral incisors, showing the sinus tract on the left lateral incisor and peg-shaped crowns for both.

Teeth nos. 7 and 10 were slightly tender to percussion; there was no pain on palpation. Neither lateral incisor was responsive to the sensitivity test. Periapical radiographs revealed Oehlers type II DI in both teeth. The left maxil-

**ABBREVIATION KEY. DI:** Dens invaginatus. **GBR:** Guided bone regeneration. **GTR:** Guided tissue regeneration. **MTA:** Mineral trioxide aggregate.