

# Replantation of Avulsed Primary Incisors: A Risk–Benefit Assessment

• Erica L. Zamon, B.Sc. •  
• David J. Kenny, B.Sc., DDS, PhD •

## A b s t r a c t

*Parents of preschool children with avulsed primary incisors may request replantation. Although dental textbooks uniformly recommend that primary teeth not be replanted, some case reports advocate the procedure. This review of case reports identifies a number of pathological outcomes of replantation and provides information for clinicians and parents on the risks that may accompany replantation.*

**MeSH Key Words:** tooth replantation; tooth, deciduous/injuries; treatment outcome

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**E**pidemiological data clearly demonstrate that maxillary central and lateral incisors are the most frequently avulsed primary teeth, with an incidence of between 7 and 12%.<sup>1-4</sup> Consequently, dentists who treat a significant number of children under 4 years of age are likely to encounter a child with an avulsed maxillary incisor. The question of whether to replant these teeth has been a focus of debate and controversy in the dental literature. While editors of dental trauma textbooks uniformly caution against replantation of avulsed primary incisors, some case reports suggest replantation should be considered on an individual basis.<sup>5-11</sup> Authors who have encouraged replantation have evoked strong negative responses from their peers.<sup>10,12-14</sup> The purpose of this paper is to review the clinical evidence, risks and benefits of replanting primary incisors and to discuss the rationale for avulsion management.

### Evidence

The peer-reviewed dental literature that describes the outcomes for replanted primary incisors consists entirely of isolated case reports (Table 1). These reports provide limited and often incomplete information on the teeth involved, the extent of radiographic examinations, splint usage, extra-alveolar time of the avulsed tooth, and follow-up protocols. Consequently, all of the evidence for replantation is level III (non-experimental, descriptive and opinion).<sup>15</sup> The most useful case studies were those of Kinoshita and others,<sup>4</sup>

Weiger and Heuchert<sup>16</sup> and Pefaur.<sup>17</sup> The largest number of replanted primary incisors and most complete description of the outcome is in the report of individual cases by Kinoshita and others.<sup>4</sup> They describe long-term (> 1 year) outcomes for 8 replanted incisors (maxillary and mandibular). These incisors were all splinted following replantation. Dental pulps were left in all but one incisor despite ischemic periods in excess of 30 minutes. Four incisors were subsequently extracted due to abscess or pathological root resorption, 3 exfoliated physiologically and one was retained. One permanent incisor had an enamel defect. Three other authors reported discolouration or enamel defects on permanent incisors as well.<sup>8,11,16</sup>

Since no published guidelines for the management of avulsed primary incisors exist, there was no consistency in the management techniques described in the cited papers. In one case root resection and calcium hydroxide obturation were performed prior to replantation.<sup>18</sup> Other clinicians performed non-vital endodontic treatment using calcium hydroxide paste,<sup>4</sup> and in one case, a gutta percha point was used to fill the canal.<sup>19</sup> Splinting was accomplished either with a resin-only splint, a light wire and composite splint, or the tooth was held in place with a suture.<sup>4</sup> Some incisors were replanted without splinting.<sup>19-22</sup> In cases where antibiotics were used the regimen ranged from 3 days to one week.<sup>4,19</sup>

**Table 1 Case reports of replanted primary incisors**

| Author(s)                          | Tooth replanted in each patient | Follow-up months | Splinted | Root canal treatment | Extra-alveolar time (min.) | Outcomes  |
|------------------------------------|---------------------------------|------------------|----------|----------------------|----------------------------|---|
| Kinoshita and others <sup>4</sup>  | 71                              | 27               | Yes      | No                   | 30                         | Primary tooth still present                                     |
|                                    | 81<br>82                        | 60               | Yes      | No                   | 60                         | Exfoliated. Permanent incisor had enamel defect                 |
|                                    | 52                              | 36               | Yes      | Yes                  | 120                        | Exfoliated, normal  |
|                                    | 81                              | 2                | Yes      | No                   | N/A                        | Extraction due to abscess                                       |
|                                    | 72                              | 42               | Yes      | No                   | 30                         | Extraction due to root resorption                               |
|                                    | 71<br>72                        | 17               | Yes      | No                   | 60                         | Extractions due to gingival abscesses                           |
| Tsukiboshi <sup>8</sup>            | 71<br>81                        | 46               | Yes      | No                   | 15                         | Exfoliated. Permanent incisor had enamel defect                 |
| Weiger and Heuchert <sup>16</sup>  | 61                              | 24               | Yes      | Yes                  | 30                         | Extraction due to abscess. Permanent incisor had discolouration |
| Filippi and others <sup>18</sup>   | 51<br>61                        | 3                | Yes      | Yes                  | N/A                        | N/A   |
| Zerman and others <sup>9</sup>     | 51<br>61                        | N/A              | N/A      | N/A                  | N/A                        | N/A   |
| Kawashima and Pineda <sup>10</sup> | 71<br>81                        | N/A              | No       | No                   | 60                         | Exfoliated  |
| Pefaur <sup>17</sup>               | 62                              | 60               | No       | Yes                  | 60                         | Exfoliated  |
| Mueller and Whitsett <sup>11</sup> | 61                              | N/A              | Yes      | No                   | 1                          | Exfoliated. Permanent incisor had Turner's hypoplasia           |
| Crabb and Crabb <sup>20</sup>      | 51                              | 60               | No       | No                   | < 1                        | Exfoliated  |
| Ravn <sup>21</sup>                 | N/A                             | 8                | Yes      | No                   | N/A                        | Mobility and advanced resorption                                |
|                                    | N/A                             | 10               | Yes      | No                   | N/A                        | Mobility and advanced resorption                                |
|                                    | N/A                             | 12               | Yes      | No                   | N/A                        | Premature exfoliation   |
|                                    | N/A                             | 27               | Yes      | No                   | N/A                        | Extraction due to ankylosis                                     |
| Eisenberg <sup>19</sup>            | 62                              | 36               | No       | Yes                  | N/A                        | Exfoliated  |
| Sakellariou <sup>22</sup>          | 51                              | 48               | No       | No                   | < 1                        | Exfoliated  |

## Risks

When parents or clinicians elect to replant a primary incisor they commit the young child to additional treatment. Replantation may involve splinting and requires additional radiographs and local anesthetic to complete the procedure. Pulp treatment is virtually always required to prevent the development or progression of inflammatory root resorption. Pathological outcomes observed following primary incisor replantation included dental abscesses, root resorption, ankylosis, deflection of permanent incisors, and hypoplastic and morphological changes to permanent incisor crowns.<sup>4,8,11,16,21</sup> These outcomes require additional

procedures, extraction of the replanted primary incisor or restoration of the permanent incisor.

## Benefits

The main benefit of primary incisor replantation is maintenance of a normal anterior dentition. This may relieve parental guilt or concerns that a child's self-esteem and social acceptance will be compromised by premature loss of a maxillary incisor.<sup>23</sup> Evidence beyond the level of clinical opinion is not available to support concerns about self-esteem. Other benefits cited to justify replantation, such as prevention of articulation problems, impaired

mastication, space maintenance and prevention of tongue thrust, are weakly supported by clinical investigations and are largely anecdotal.<sup>24,25</sup>

## Discussion

Clinicians who are faced with parents urging them to replant avulsed primary incisors have only opinion and a few case reports on which to base their clinical decision. Furthermore, there is no consistency in case documentation or management and not a single protocol-based prospective outcome study of replantation of avulsed primary teeth. In the cases reviewed here, treatment methods varied significantly and there were deficiencies in the documentation of the uncontrollable variables (tooth involved, age of child, alveolar damage, extra-alveolar time and storage media). Also, in many cases clinical information such as follow-up time, extra-alveolar time and clinical outcomes was incomplete.<sup>9,18,19,21</sup>

A child who undergoes replantation will be subjected to extra radiographs, local anesthetic, the replantation procedure itself and perhaps splinting. The case reports in this review describe a number of pathological outcomes which would require further intervention. Premature extraction due to dental abscesses and root resorption as well as enamel hypoplasia of permanent incisors have been described by a number of authors.<sup>4,8,11,16,21</sup> Since the pulp was not removed from many of the replanted incisors some teeth subsequently abscessed. However, it is not known whether the enamel discolouration or hypoplasia of the permanent successor was produced by the accident or the abscess. The risk to the clinician is that the damaged permanent incisor may be attributed to the replantation procedure rather than the initial insult.

The benefits of replantation are based upon the pediatric principal of returning patients to their original functional state. Return to "normalcy" may improve some patients' self-esteem. Because parental urging for replantation appears rooted in guilt, the procedure may be requested as much to assuage parents' feelings as to protect the child from the possible repercussions of losing a tooth.

However, some authors suggest that failing to replant primary incisors will lead to occlusal, mastication or speech problems.<sup>4,18,19,22</sup> There is no evidence that occlusal problems, even tongue thrust acquired by the need to fill the gap during swallowing, have any long-term effects on the permanent dentition.<sup>25</sup> Premature loss of one or 2 primary incisors is common in children due to trauma and caries and has minimal effect on mastication. Articulatory speech problems may be more common in children with premature loss of multiple maxillary primary incisor(s). However, any effect would be diminished if only one or 2 incisors were missing and eruption of the permanent incisors would eliminate tooth-related effects on articulation.<sup>24</sup>

Case reports with long-term follow-ups provided the most useful outcome information (**Table 1**). We expect that the difficulty of sample acquisition and the controversy surrounding replantation of primary teeth will lead to continued publication of isolated case reports rather than protocol-based case series. When documentation reaches the level expected for reports of permanent tooth trauma, a 2-year follow-up with serial radiographic records and clinical examinations will be sufficient to demonstrate outcomes such as pulpal necrosis, ankylosis and root resorption. Publication of a protocol-based prospective outcome study of sufficient sample size to allow statistical analysis of outcome data would assist decision-making for clinicians and parents. This review of case reports identified a number of pathological outcomes that were either the direct result of replantation or could be attributed to the intervention. Parents who urge the dentist to replant an incisor should be informed of the additional procedures required and the pathosis described in the literature. Prospects for tooth survival and the incidence of pulpal necrosis, root resorption and ankylosis are unknown.

## Conclusion

It appears that the authors of textbooks are correct to discourage replantation of primary incisors based on the low level of evidence to support the procedure and on the risk-benefit assessment of the outcomes. Nevertheless, some authors of single case studies support and even recommend replantation. ♦

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*Ms. Zamon is a third-year dental student at the University of Toronto and was a summer research assistant in the department of dentistry, The Hospital for Sick Children.*

*Dr. Kenny is director of dental research and graduate studies, The Hospital for Sick Children, and professor of dentistry, University of Toronto.*

*Correspondence to : Dr. David J. Kenny, The Hospital for Sick Children, Dentistry, 555 University Ave., Toronto, ON M5G 1X8. E-mail: HSCDent@sickkids.on.ca*

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