

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

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## 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 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 72	17	Yes	No	60	Extractions due to gingival abscesses
Tsukiboshi <sup>8</sup>	71 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 61	3	Yes	Yes	N/A	N/A
Zerman and others <sup>9</sup>	51 61	N/A	N/A	N/A	N/A	N/A
Kawashima and Pineda <sup>10</sup>	71 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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## References

- Judd PL. Paediatric dental trauma: a hospital survey. *Ont Dent* 1985; 62(6):19-20,23.
- Borum MK, Andreasen JO. Sequelae of trauma to primary maxillary incisors. I. Complications in the primary dentition. *Endod Dent Traumatol* 1998; 14(1):31-44.
- Onetto JE, Flores MT, Garbarino ML. Dental trauma in children and adolescents in Valparaiso, Chile. *Endod Dent Traumatol* 1994; 10(5):223-7.
- Kinoshita S, Mitomi T, Taguchi Y, Noda T. Prognosis of replanted primary incisors after injuries. *Endod Dent Traumatol* 2000; 16(4):175-83.
- Andreasen JO, Andreasen FM, Bakland LK, Flores MT. Injuries to the primary dentition. In: Andreasen JO, Andreasen FM, Bakland LK, Flores MT, editors. *Traumatic dental injuries — a manual*. Copenhagen: Munksgaard; 1999. p. 44-7.
- Cameron A, Widmer R, Gregory P, Abbott P, Wong P, Heard F. Trauma management. In: Cameron A, Widmer R, editors. *Handbook of pediatric dentistry*. London: Mosby International; 1997. p. 95-141.

7. Roberts G, Longhurst P. Luxation injuries. In: Roberts G, Longhurst P, editors. *Oral and dental trauma in children and adolescents*. New York: Oxford University Press; 1996. p. 67-80.
8. Tsukiboshi M. Trauma to the primary dentition. In: Tsukiboshi M, editor. *Treatment Planning for Traumatized Teeth*. Carol Stream: Quintessence Publishing; 2000. p. 105-16.
9. Zerman N, Marcoli PA, Caprioglio D. Traumi ai denti decidui. In: Caprioglio D, Manna A, Paglia L, editors. *Manuale di Traumatologia Dento-alveolare*. Ciba Edizione; 1996. p. 209-34.
10. Kawashima Z, Pineda FR. Replanting avulsed primary teeth. *J Am Dent Assoc* 1992; 123(10):90-1, 94.
11. Mueller BH, Whitsett BD. Management of an avulsed deciduous incisor. Report of a case. *Oral Surg Oral Med Oral Pathol* 1978; 46(3):442-6.
12. Weisman MI. Replanting avulsed primary teeth [letter]. *J Am Dent Assoc* 1992; 123(12):10, 12.
13. Belanger G, Kluender RL. More about avulsed primary teeth [letter]. *J Am Dent Assoc* 1992; 123(12):12.
14. Killian CM. Reimplanted primary teeth [letter, comment]. *J Am Dent Assoc* 1993; 124(1):13-5.
15. Canadian Task Force on the Periodic Health Examination. The periodic health examination. *Can Med Assoc J* 1979; 121(9):1193-254.
16. Weiger R, Heuchert T. Management of an avulsed primary incisor. *Endod Dent Traumatol* 1999; 15(3):138-43.
17. Pefaur A. Reimplante de una pieza caduca despues de su avulsion traumatica [Reimplantation of a deciduous tooth after traumatic avulsion]. *Rev Fac Odontol Univ Chile* 1988; 6(1):20-4. Spanish.
18. Filippi A, Pohl Y, Kirschner H. Replantation of avulsed primary anterior teeth: treatment and limitations. *ASDC J Dent Child* 1997; 64:272-5.
19. Eisenberg MD. Reimplantation of a deciduous tooth. *Oral Surg Oral Med Oral Pathol* 1965; 19(5):588-90.
20. Crabb JJ, Crabb VP. Reimplantation of a primary central incisor: a case report. *Dent Pract Dent Rec* 1971; 21(10):353-4.
21. Ravn JJ. Sequelae of acute mechanical trauma in the primary dentition. A clinical study. *ASDC J Dent Child* 1968; 35(4):281-9.
22. Sakellariou PL. Replantation of infected deciduous teeth: a contribution to the problem of their preservation until normal shedding. Preliminary report. *Oral Surg Oral Med Oral Pathol* 1963; 16(6):645-53.
23. Judd PL, Casas MJ. Psychosocial perceptions of premature tooth loss in children. *Ont Dent* 1995 72(8):16-8, 20, 22-3.
24. Gable TO, Kummer AW, Lee L, Creaghead NA, Moore LJ. Premature loss of the maxillary primary incisors: effect on speech production. *ASDC J Dent Child* 1995; 62(3):173-9.
25. The etiology of orthodontic problems. In: Proffit WR, Fields HR, editors. *Contemporary orthodontics*. 2nd ed. Toronto: Mosby-Year Book Inc; 1993. p. 128-9.

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