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# Foreign Object Entrapment in Pulp Space of Primary and Permanent Teeth: A Systematic Review and A Series of Three Cases

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## Abstract

**Objectives:** To systematically review paediatric case reports documenting foreign body entrapment within the pulp space of primary and permanent teeth in children under 16 years of age and to supplement the review with three additional clinical cases.

**Methods:** A comprehensive search was performed in PubMed, Cochrane Library, and Google Scholar from database inception to April 2025. The review followed PRISMA 2020 guidelines and was registered in PROSPERO (CRD42024594531). Case reports and case series in English describing foreign objects lodged within the pulp chamber or root canal in children under 16 years were included. Data extraction and quality appraisal were conducted independently using the JBI and CARE guidelines.

**Results:** Thirty-one studies reporting 37 cases were included. Most patients were males (81%), and the mean age was 10.9 years. A total of 41 teeth were affected, including 14 primary (34.15%) and 27 permanent teeth (65.85%). Twenty different foreign objects were identified, with stapler pins being the most common. Management varied by dentition: extraction was more frequently performed in primary teeth, whereas conservative retrieval using endodontic files and tweezers was preferred in permanent teeth when feasible.

**Conclusions:** Foreign body entrapment in the pulp space is often associated with untreated caries and self-inserted objects for pain relief. Prompt clinical and radiographic assessment can facilitate early detection and prevent complications. Increased parental awareness and timely dental care are essential to prevent such behaviours.

**Keywords:** foreign object, foreign object retrieval, permanent tooth, primary tooth, pulp chamber

## Introduction

Dental caries is among the most prevalent diseases globally, affecting nearly 50% of children worldwide. It begins with minor surface roughness or subsurface demineralisation and gradually progresses to cavitation.<sup>(1)</sup> These open carious lesions can serve as sites for the insertion of various foreign objects like stapler pins<sup>(2)</sup>, pencil leads<sup>(3)</sup>, darning needles<sup>(4)</sup>, metal screws<sup>(5)</sup>, nails<sup>(6)</sup>, etc., potentially becoming focal points for infection and pain. Retrieving foreign objects from within the pulp chamber or root canal can be clinically challenging, yet it remains essential for successful treatment. The success of their removal is often influenced by the operator's expertise, patience, and experience, along with anatomical factors, and the accessibility of the root canal, as well as the foreign object's shape, size, and position.<sup>(7)</sup> Despite numerous reports, the overall understanding of the clinical presentations, diagnostic approaches, and treatment modalities associated with such cases remains fragmented. Therefore, this paper aims to systematically review paediatric cases reporting the entrapment of unusual foreign objects within the pulp space of primary and permanent teeth in children under 16 years of age, supplemented by three illustrative clinical case reports.

## Materials and Methods

### Research question (DDO framework)

Among paediatric patients with foreign objects inserted into the pulp space of primary or permanent teeth (Domain), how do variations in the type and location of the foreign object (Determinant) influence the clinical presentation, diagnostic approach, and treatment outcomes (Outcome).

### Protocol and registration

This review followed the guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to ensure a structured and transparent methodology. The review protocol was registered at PROSPERO under the unique number CRD42024594531. This review was conducted and reported in accordance with the PRISMA 2020 guidelines.

### Eligibility criteria

The review included full-text case reports and case series published in English that documented the pres-

ence of foreign bodies within the pulp space of children below 16 years of age. Studies were excluded if they were abstracts, duplicates, editorials, commentaries, retrospective, or comparative in nature, or if they described foreign objects located in the peri-radicular or peri-apical regions.

### Information sources and search strategy

The databases searched included MEDLINE via PubMed, Cochrane, and Google Scholar. The electronic search strategy was developed using a combination of Medical Subject Headings (MeSH) terms and relevant keywords from seminal publications. The search terms included: "foreign object", "foreign body", "pulp space", "pulp chamber", "root canal space", "masochistic habit", "self-injurious habit", "self-inflicting habit", "children", and "child". Boolean operators (AND, OR) were applied to combine these terms appropriately. The search was limited to studies published in English, involving human subjects, and restricted to case reports and case series.

### Selection process

All records retrieved through the search strategy were imported into the Rayyan software for reference management and removal of duplicates. Title and abstract screening, as well as full-text eligibility assessment, were conducted independently and in duplicate by two reviewers (DS and AG). Any disagreements at either stage were resolved through discussion and consensus, and when necessary, by consulting a third reviewer (NS). Data extraction from the included studies was also performed independently by the two reviewers using a standardised, pre-piloted data extraction form, and consistency was verified through cross-checking and consensus before synthesis.

### Data items

Type of study, country, demographic data, clinical characteristics; type of foreign object, dentition involved and management were collected.

### Risk of bias assessment

The methodological quality of the included case reports and case series was evaluated using the Joanna Briggs Institute (JBI) critical appraisal checklists for Case Reports and Case Series and the CARE (CAse REport) guidelines. Two reviewers (DS and AG) independently

assessed each study across the respective checklist items, focusing on the clarity of patient demographics, intervention details, clinical outcomes, and follow-up data. Any discrepancies in scoring were resolved through discussion and consensus, and where required, by the third reviewer (NS). The overall risk of bias for each study was cate-

gorised as low, moderate, or high based on the proportion of criteria fulfilled. This approach ensured consistency and transparency in the evaluation of the included literature. The detailed results of this quality appraisal are presented in Table 1.<sup>(2,5-34)</sup>

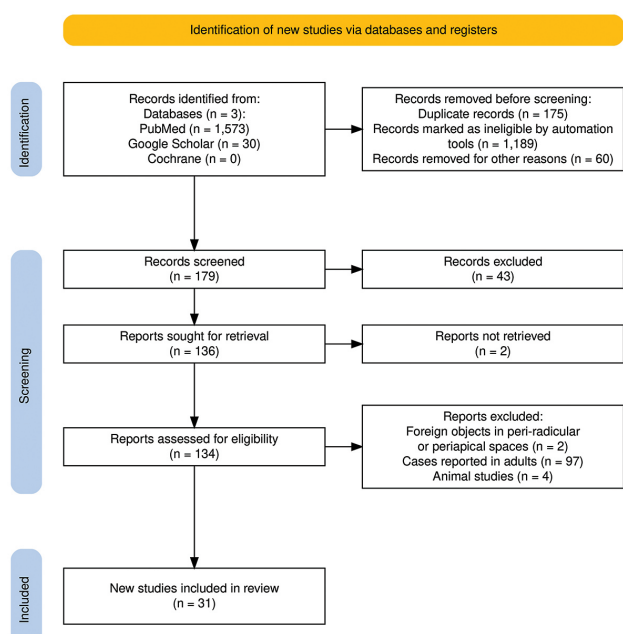
**Table 1:** Risk of bias assessment of included studies (Based on JBI Critical Appraisal Checklist for Case Reports and Case Series).

| Author (Year)                                        | Type of Study | Clear Patient Description | Diagnostic Methods Clearly Reported | Intervention/Treatment Clearly Described | Outcome Adequately Reported | Follow-up Adequate | Overall Risk of Bias |
|------------------------------------------------------|---------------|---------------------------|-------------------------------------|------------------------------------------|-----------------------------|--------------------|----------------------|
| Holla G, <i>et al.</i> , <sup>(8)</sup> (2010)       | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Lehl G, <i>et al.</i> , <sup>(9)</sup> (2010)        | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Nagaveni N, <i>et al.</i> , <sup>(10)</sup> (2012)   | Case series   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Dhull K, <i>et al.</i> , <sup>(11)</sup> (2013)      | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Pereira T, <i>et al.</i> , <sup>(12)</sup> (2013)    | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Mahesh R, <i>et al.</i> , <sup>(13)</sup> (2014)     | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Kanumuri P, <i>et al.</i> , <sup>(14)</sup> (2016)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Sharmin DD, <i>et al.</i> , <sup>(15)</sup> (2017)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Lakhani B, <i>et al.</i> , <sup>(16)</sup> (2019)    | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Chandran N, <i>et al.</i> , <sup>(17)</sup> (2020)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Subbareddy V, <i>et al.</i> , <sup>(18)</sup> (1990) | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Prabhakar A, <i>et al.</i> , <sup>(5)</sup> (1998)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Rao A, <i>et al.</i> , <sup>(19)</sup> (1999)        | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Nadkarni U, <i>et al.</i> , <sup>(20)</sup> (2002)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| McAuliffe N, <i>et al.</i> , <sup>(2)</sup> (2005)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Ozsezer E, <i>et al.</i> , <sup>(21)</sup> (2006)    | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Prabhakar A, <i>et al.</i> , <sup>(22)</sup> (2008)  | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Aduri R, <i>et al.</i> , <sup>(23)</sup> (2009)      | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Gadgil R, <i>et al.</i> , <sup>(24)</sup> (2009)     | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Kataoka S, <i>et al.</i> , <sup>(25)</sup> (2010)    | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Pinky C, <i>et al.</i> , <sup>(6)</sup> (2011)       | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Khan S, <i>et al.</i> , <sup>(7)</sup> (2011)        | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Rangeeth B, <i>et al.</i> , <sup>(26)</sup> (2011)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Chand K, <i>et al.</i> , <sup>(27)</sup> (2013)      | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Ramugade M, <i>et al.</i> , <sup>(28)</sup> (2014)   | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Kumar D, <i>et al.</i> , <sup>(29)</sup> (2016)      | Case series   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Rathore K, <i>et al.</i> , <sup>(30)</sup> (2017)    | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Ashqar N, <i>et al.</i> , <sup>(31)</sup> (2019)     | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Rawat G, <i>et al.</i> , <sup>(32)</sup> (2023)      | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Chourasia HR, <i>et al.</i> , <sup>(33)</sup> (2023) | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |
| Ahemd M, <i>et al.</i> , <sup>(34)</sup> (2025)      | Case report   | Yes                       | Yes                                 | Yes                                      | Yes                         | No                 | Low                  |

Summary: All included case reports and case series adequately described the patient demographics, clinical presentation, diagnostic approach, intervention, and outcomes. However, follow-up data were inconsistently reported. According to the JBI criteria, the overall risk of bias across studies was low.

### Literature search

Electronic searches identified a total of 1,603 records across the databases (PubMed=1,573, Google Scholar=30, Cochrane=0). After removing 175 duplicate records, 1,428 records remained. Of these, 1,189 were automatically excluded by database filters and automation tools, and 60 were removed for other reasons (e.g., non-relevant document type). The remaining 179 records were screened by title and abstract, after which 43 were excluded. A total of 134 full-text articles were assessed for eligibility. Following the exclusion of studies conducted in adults (n=97), animal studies (n=4), and reports describing foreign objects in peri-radicular or periapical regions (n=2), 31 studies met the inclusion criteria and were included in the qualitative synthesis (Figure 1).



**Figure 1:** Literature search Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

### Study characteristics

A total of 31 studies met the inclusion criteria, comprising individual case reports and a few case series describing foreign body lodgement within the pulp space of primary and permanent teeth. The studies were published between 1990 and 2025, reflecting more than three decades of clinical documentation. Overall, 37 cases were identified, with a marked male predominance (30 males, 81%; 7 females, 19%). The age of the affected children ranged from 5 to 16 years, with a mean age of

approximately 10.9 years, indicating a higher incidence among older school-age children. A total of 41 teeth were involved across the 37 cases, including 14 primary teeth (34.15%) and 27 permanent teeth (65.85%).

Foreign body insertion was more frequently reported in permanent teeth (n=27, 65.85%) than in primary teeth (n=14, 34.15%), most often involving the maxillary central incisors, consistent with their anterior location and accessibility. Across the reports, a total of 20 distinct types of foreign objects were identified, with stapler pins, metal wires, sewing needles, and ball-pen refills being the most frequently encountered (Graph 1). Most of these objects were self-inserted, typically driven by curiosity or self-inflicting oral habits.

Regarding management, nonsurgical retrieval methods were predominantly employed, including the use of H-files, K-files, barbed broaches, and tweezers under radiographic guidance. In cases where the object could not be dislodged or where associated pathology was present, tooth extraction was performed. The various retrieval methods employed are illustrated in Graph 2. The detailed assessment of methodological quality is summarised in Table 2.<sup>(2,5-34)</sup>

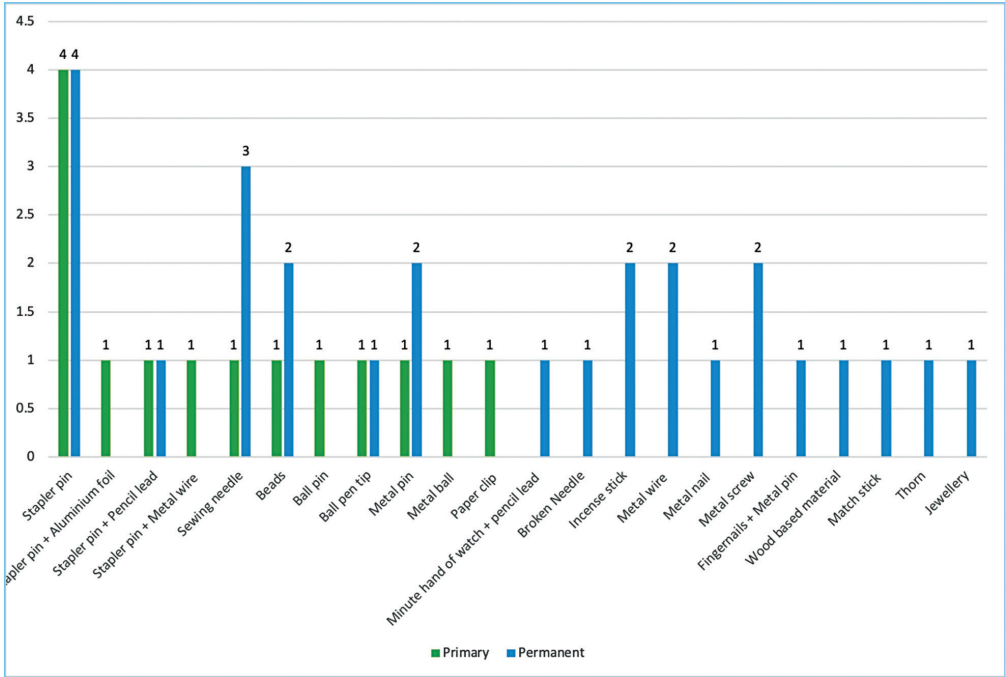
### Case series

The cases were reported to the Department of Paediatric and Preventive Dentistry, SRM Dental College, Ramapuram, Chennai, between June 2024 and September 2024.

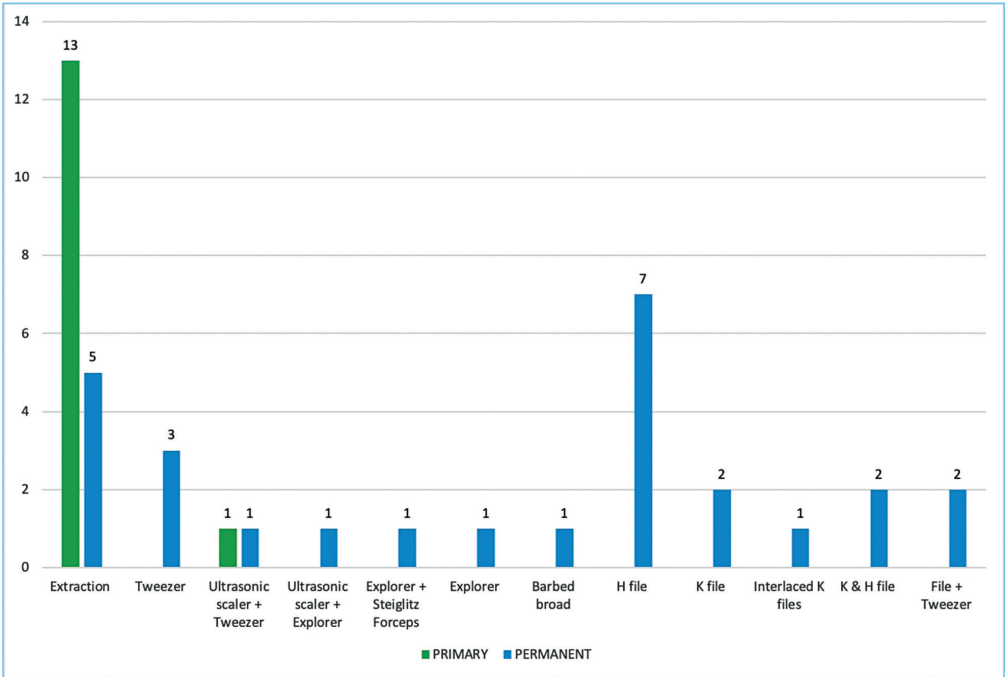
### Case report 1

A 7-year-old boy reported with a chief complaint of pain in the upper right front tooth for the past 2 weeks. The pain was spontaneous in onset, continuous, sharp, aggravated on mastication and had no relieving factor. The child was medically healthy, with no pre-existing systemic conditions or special healthcare needs.

On clinical examination, dental caries in 53, 51 and 61 was elicited (Figure 2a). An intraoral periapical radiograph (IOPA) in #53 revealed a round radio-opacity measuring about 1mm in diameter in the coronal third of the root canal (Figure 2b). To confirm its position, another radiograph was taken using the SLOB technique (Figure 2c). On further examination, the child gave a history of inserting a pencil and a safety pin into the carious lesion to remove food particles and relieve pain. The treatment



Graph 1: Different types of foreign objects found in the pulp space of primary and permanent dentition.



Graph 2: Retrieval methods used to remove the foreign object from pulp space.

**Table 2:** Summary of reported foreign objects in the tooth and their management.

| Authors                                      | Year | Journal                                                             | Indexing       | Type of study | Foreign Object                         | Age | Sex    | Clinical characteristics                   | Treatment                         |
|----------------------------------------------|------|---------------------------------------------------------------------|----------------|---------------|----------------------------------------|-----|--------|--------------------------------------------|-----------------------------------|
| <b>Foreign object in primary teeth</b>       |      |                                                                     |                |               |                                        |     |        |                                            |                                   |
| Holla G <i>et al.</i> , <sup>(8)</sup>       | 2010 | Journal of Contemporary Clinical Dentistry                          | PubMed         | Case report   | Stapler pins and aluminum foil         | 10y | Female | #53                                        | Extraction                        |
|                                              |      |                                                                     |                | Case report   | Sewing needles                         | 5y  | Male   | #51                                        | Extraction                        |
| Lehl G <i>et al.</i> , <sup>(9)</sup>        | 2010 | Journal of Indian Society of Pedodontics and Preventive Dentistry   | PubMed         | Case report   | Paper clip                             | 6y  | Male   | #55 ,within the canal                      | Extraction                        |
| Nagaveni N. <i>et al.</i> , <sup>(10)</sup>  | 2012 | Journal of Cranio-Maxillary Diseases                                | Google Scholar | Case series   | Stapler pin                            | 6y  | Male   | #85pulp chamber and root canal             | Extraction                        |
|                                              |      |                                                                     |                |               | Glass bead                             | 12y | Female | #84 ;pulp chamber                          | Extraction                        |
|                                              |      |                                                                     |                |               | Stapler pin                            | 9y  | Male   | #64 pulp chamber                           | Extraction                        |
| Dhull K <i>et al.</i> , <sup>(11)</sup>      | 2013 | International Journal of Clinical Pediatric Dentistry               | PubMed         | Case report   | Ball pin                               | 8y  | Female | #85                                        | Ultrasonic scaler tip and tweezer |
| Pereira T <i>et al.</i> , <sup>(12)</sup>    | 2013 | International Journal of Pediatric Dentistry                        | PubMed         | Case report   | Ball pen refill tip                    | 7y  | Male   | #54 pulp chamber and root canal            | Extraction                        |
| Mahesh R. <i>et al.</i> , <sup>(13)</sup>    | 2014 | Ethiopian Journal of Health Sciences                                | PubMed         | Case report   | Stapler pin                            | 5y  | Male   | #51 within the root canal                  | Extraction                        |
| Kanumuri P <i>et al.</i> , <sup>(14)</sup>   | 2016 | British Medical Journal                                             | PubMed         | Case report   | Metal wires and stapler pins           | 10y | Male   | #75                                        | Extraction                        |
| Sharmin DD <i>et al.</i> , <sup>(15)</sup>   | 2017 | Symbiosis                                                           | Google Scholar | Case report   | Stapler pins, Microtip pencil lead     | 12y | Female | #54 and #55                                | Extraction                        |
| Lakhani B <i>et al.</i> , <sup>(16)</sup>    | 2019 | International Journal of Clinical Pediatric Dentistry               | Google Scholar | Case report   | Metal ball                             | 8y  | Male   | #75                                        | Extraction                        |
| Chandran N <i>et al.</i> , <sup>(17)</sup>   | 2020 | Indian Journal of Medical Research                                  | Google Scholar | Case report   | Stapler pin                            | 6y  | Male   | #64                                        | Extraction                        |
| <b>Foreign object in permanent teeth</b>     |      |                                                                     |                |               |                                        |     |        |                                            |                                   |
| Subbareddy V <i>et al.</i> , <sup>(18)</sup> | 1990 | Oral surgery, Oral Medicine, Oral Pathology, Oral Radiology Journal | PubMed         | Case report   | Beads                                  | 12y | Female | #11 and #21, within the root canal         | Tweezer                           |
| Prabhakar A <i>et al.</i> , <sup>(5)</sup>   | 1998 | Journal of Indian Society of Pedodontics and Preventive Dentistry   | PubMed         | Case report   | Metal screw                            | 13y | Male   | #36, pulp chamber                          | Extraction                        |
| Rao A <i>et al.</i> , <sup>(19)</sup>        | 1999 | Indian Journal of Dental Research                                   | PubMed         | Case report   | Stapler pin                            | 13y | Male   | #21, apical extrusion                      | Extraction                        |
| Nadkarni U <i>et al.</i> , <sup>(20)</sup>   | 2002 | Quintessence International                                          | PubMed         | Case report   | Sewing needle                          | 12y | Male   | #16, palatal canal                         | File and tweezer                  |
| McAuliffe N <i>et al.</i> , <sup>(2)</sup>   | 2005 | International Journal of Pediatric Dentistry                        | PubMed         | Case report   | Stapler pin                            | 11y | Male   | #21, within the root canal                 | Barbed broach                     |
| Ozsezer E <i>et al.</i> , <sup>(21)</sup>    | 2006 | Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology Journal | PubMed         | Case report   | Minute hand of a watch and pencil lead | 14y | Female | #11, within apical third of the root canal | H-file                            |
| Prabhakar A <i>et al.</i> , <sup>(22)</sup>  | 2008 | International Endodontic Journal                                    | PubMed         | Case report   | Piece of ornament                      | 12y | Male   | #11, within the apical third of root canal | File and tweezer                  |

|                                                |      |                                                                       |                |                                   |                                             |            |              |                               |                                                            |
|------------------------------------------------|------|-----------------------------------------------------------------------|----------------|-----------------------------------|---------------------------------------------|------------|--------------|-------------------------------|------------------------------------------------------------|
| Aduri R<br><i>et al.</i> , <sup>(23)</sup>     | 2009 | Journal of Indian Society of Pedodontics and Preventive Dentistry     | PubMed         | Case report                       | Stapler pin                                 | 12y        | Female       | #26, palatal root             | Ultrasonic scaler used to loosen and removed with explorer |
| Gadgil R<br><i>et al.</i> , <sup>(24)</sup>    | 2009 | British Dental Journal                                                | PubMed         | Case report                       | Bunch of incense sticks                     | 13y        | Male         | #21, apical extrusion         | Extraction                                                 |
| Kataoka S<br><i>et al.</i> , <sup>(25)</sup>   | 2010 | Journal of Health Sciences                                            | Google Scholar | Case report                       | Metal Nail                                  | 12y        | Male         | #11, within the root canal    | Three K-files interlaced for removal                       |
| Pinky C<br><i>et al.</i> , <sup>(6)</sup>      | 2011 | Journal of Clinical and Experimental Dentistry                        | Google Scholar | Case report                       | Fingernails& metal pin                      | 11y        | Male         | #21 within the root canal     | k-file                                                     |
| Khan S<br><i>et al.</i> , <sup>(7)</sup>       | 2011 | Asian Journal of Oral Health and Allied Sciences                      | Google Scholar | Case report                       | Thorn                                       | 14y        | Male         | #12 within the root canal     | K & H-file                                                 |
| Rangeeth B<br><i>et al.</i> , <sup>(26)</sup>  | 2011 | Journal of the Indian Society of Pedodontics and Preventive Dentistry | PubMed         | Case report                       | Wood based material                         | 13y        | Male         | #32 within the root canal     | K-file                                                     |
| Chand K<br><i>et al.</i> , <sup>(27)</sup>     | 2013 | Journal of Conservative Dentistry                                     | PubMed         | Case report                       | Stapler pin                                 | 14y        | Male         | #11 pulp chamber & root canal | H-file                                                     |
| Ramugade M<br><i>et al.</i> , <sup>(28)</sup>  | 2014 | Singapore Dental Journal                                              | PubMed         | Case report                       | Sewing needle                               | 13y        | Male         | #21 within the root canal     | K & H -files                                               |
| Mahesh R<br><i>et al.</i> , <sup>(13)</sup>    | 2014 | Ethiopian Journal of Health sciences                                  | PubMed         | Case report                       | Metal pin                                   | 11y        | Male         | #21 within root canal         | H-file                                                     |
| Kumar D<br><i>et al.</i> , <sup>(29)</sup>     | 2016 | Endodontology                                                         | Google Scholar | Case series                       | Broken needle<br>Stapler pin and pencil tip | 10y<br>14y | Male<br>Male | #21 and #22<br>#21            | H-file<br>H-file                                           |
| Rathore K<br><i>et al.</i> , <sup>(30)</sup>   | 2017 | Saudi Journal of Oral and Dental Research                             | Google Scholar | Case report                       | Metal wire                                  | 10y        | Male         | #21 within the root canal     | Extraction                                                 |
| Lakhani B<br><i>et al.</i> , <sup>(16)</sup>   | 2019 | International Journal of Clinical Pediatric Dentistry                 | Google Scholar | Case report                       | Match sticks                                | 13y        | Male         | #21                           | H-file                                                     |
| Ashqar N<br><i>et al.</i> , <sup>(31)</sup>    | 2019 | Journal of Clinics and Practice                                       | PubMed         | case report and literature review | Metal screw                                 | 11y        | Male         | #26 pulp chamber              | H-file                                                     |
| Rawat G<br><i>et al.</i> , <sup>(32)</sup>     | 2023 | National Research Denticon                                            | Google Scholar | Case report                       | Incense stick                               | 16y        | Male         | #11 pulp chamber              | Extraction                                                 |
| Chourasia H<br><i>et al.</i> , <sup>(33)</sup> | 2023 | European Journal of General Dentistry                                 | Google Scholar | Case report                       | Sewing needle                               | 13y        | Male         | #11& #21                      | Shepherd's Hook and Steiglitz Forceps                      |
| Ahemd M,<br><i>et al.</i> , <sup>(34)</sup>    | 2025 | University Journal of Dental Sciences                                 | Google Scholar | Case report                       | Ballpoint pen nib                           | 14y        | Male         | #16                           | Explorer                                                   |

plan included the retrieval of the foreign object from the canal. Infiltration anaesthesia was administered using 2% lignocaine with adrenaline (1:200000). While probing the caries to remove the food debris, resistance was encountered. An attempt was made to clear the debris and open the access using a small round diamond bur (BR-45). During this process, black debris emerged from the pulp chamber upon excavation. Once the access was gained, the canal was instrumented using Kerr files ranging from size 15k-25k (21mm) with copious saline irrigation until no further resistance was felt. Multiple small black flecks were retrieved from the canal, and necrosed discoloured pulp tissue was extirpated (Figure 2d). The working length was determined (Figure 2e). Cleaning and shaping were done using rotary files (Super Endo-21mm) in the order Sx, S2, F1, with thorough saline irrigation. Canal was obturated using calcium hydroxide and iodoform paste (Metapex-MetaBiomed) (Figure 2f). The access was then sealed with Type II glass ionomer cement (Shofu-Japan) (Figure 2g).

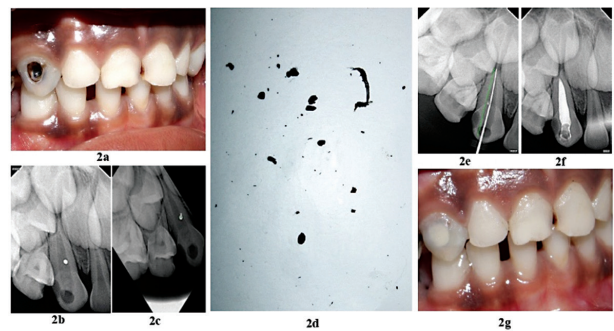
### Case report 2

A 9-year-old girl presented with the main complaint of pain in the upper right posterior tooth area, which had persisted for the past two months. The pain was continuous, dull aching, aggravated at night and relieved with medications. The patient was otherwise medically normal, with no systemic illnesses or special needs.

On clinical examination, intraoral swelling and sinus tract opening in relation to #55 with no exudate and an extraoral swelling that was diffuse, soft, tender and had ill-defined borders was seen. The patient had undergone pulpectomy and a stainless steel crown 3 years ago, and the crown was dislodged within 6 months. The patient was apparently healthy.

On further examination, the patient gave a history of inserting the wooden part of a Q-tip into the pulp space after crown dislodgment. Radiographic examination revealed radiolucency in enamel, dentin and pulp and radiopacity in the middle third of the mesiobuccal root, suggestive of obturation material. Radiolucency in the furcation area extending till the coronal 1/3rd of the root of underlying #15 (Nolla's stage 7) mesially. (Figure 3a)

The patient was advised to take antibiotics and analgesics for 5 days, after which the tooth was planned for extraction. The mucobuccal fold was dried with cotton, and



**Figure 2:** (2a) Pre-operative Clinical image showing #53; (2b) Pre-operative IOPA of #53; (2c) Pre-operative IOPA of #53 using SLOB rule to confirm the position of the radiopacity; (2d) Retrieved pencil graphite fragments, eraser particles and extirpated pulp; (2e) Working length determination; (2f) Obturation with calcium hydroxide and iodoform paste; (2g) Post-operative clinical image showing #53.

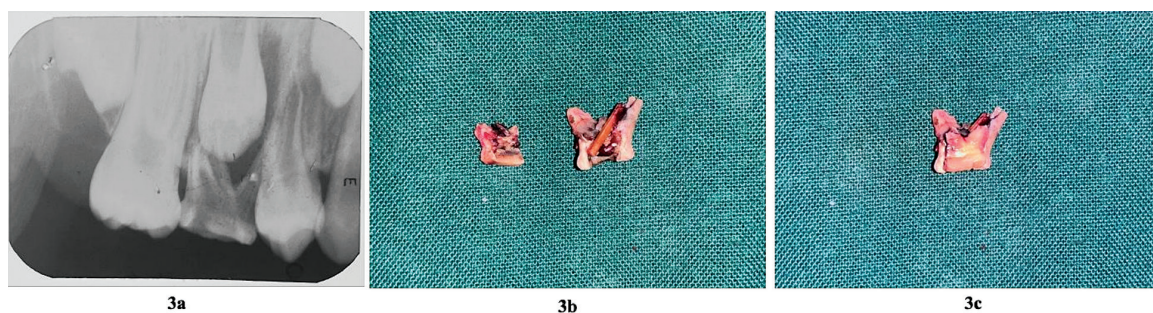
benzocaine gel 20% (Septodont Pro-Gel B) was applied for topical anaesthesia. Field block and palatal infiltration were administered in relation to #55 using 2% lignocaine hydrochloride with adrenaline (1:200000). After achieving anaesthesia, the tooth was extracted, which revealed a wooden stick that was inserted distobuccally into the pulp space. (Figure 3b & 3c) The abscess was drained, the socket was irrigated with normal saline, and haemostasis was achieved. Post-extraction instructions were given. The patient was reviewed after 1 week.

### Case report 3

A 13-year-old boy reported with a chief complaint of pain in the lower left back tooth region for the past 4 days. The pain was continuous, dull aching, aggravated on mastication and at night, and relieved under medication. The patient was medically fit and healthy, without any pre-existing conditions or special healthcare requirements.

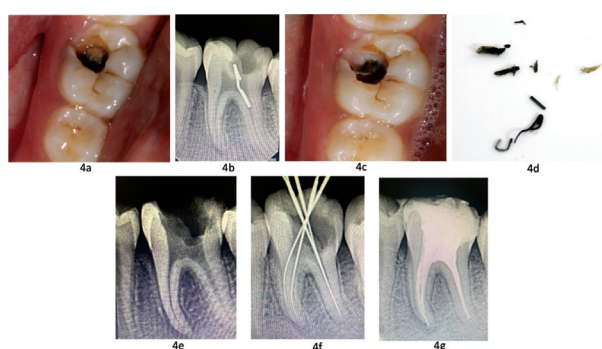
On clinical examination, dental caries in #36 was seen. (Figure 4a) An intraoral periapical radiograph was then taken for assessment, which revealed a radio-opaque object measuring about 8 mm in length in the pulp chamber and distal root canal. (Figure 4b) On further examination, the patient revealed a habit of inserting a stapler pin, finger nail and pencil tip into the open carious lesion to relieve pain.

The treatment plan was the retrieval of foreign objects from the root canal spaces. An inferior alveolar nerve block was administered using 2% lignocaine with adrenaline to achieve adequate anaesthesia. While



**Figure 3:** (3a) Pre-operative IOPA of #55; (3b) Extracted #55 showing wooden fragment of Q-tip; (3c) Extracted #55 with fragments in place.

removing caries using a small round bur (BR-45), resistance was felt, uncovering the presence of a metallic object. (Figure 4c) The access was subsequently enlarged to facilitate its removal. The metallic object was carefully extracted using Mathieu's pliers and a spoon excavator. Canals were instrumented using Kerr files (sizes 15K-25K, 25mm) with copious saline irrigation until complete patency was achieved. During the debridement process, multiple small black flecks, two fingernail fragments, and necrotic, discoloured pulp tissue were retrieved. (Figure 4d) A post-retrieval radiograph was then taken to confirm the complete removal of the foreign object and to establish the working length (Figure 4e & 4f). Subsequently, the canals were further instrumented using rotary files (Super Endo-25mm) with thorough saline irrigation to ensure complete cleaning and shaping. Obturation was then performed using 6% 25mm Gutta-Percha, followed by sealing of the access cavity with Type 2 glass ionomer cement (Shofu, Japan). (Figure 4g).



**Figure 4:** (4a) Pre-operative clinical image of #36; (4b) Pre-operative IOPA of #36; (4c) Image showing the exposed metal object from the access cavity of #36; (4d) Retrieved stapler pin, pencil graphite fragments and finger nail pieces. (4e) IOPA after retrieval of foreign objects in #36; (4f) Working length determination in #36; (4g) Obturated with gutta percha in #36.

Foreign object entrapment in the pulp space poses not only a risk of dental infection but also the potential for swallowing or aspiration of smaller objects that can potentially obstruct the airway. Swallowing foreign objects can result in chemical reactions within the body, leading to toxic effects. When such objects become lodged in soft tissues like the gums or soft palate, they may cause inflammation, scarring, infections, abscesses, cysts, swelling, or growths resembling tumours.<sup>(35)</sup> The effect of a foreign object in primary teeth can result in the perforation of the floor of the pulp chamber and subsequently disrupt the development of permanent teeth, leading to complications like odontoma, impaction, or dilaceration requiring immediate intervention.<sup>(35)</sup> The current systematic review showed that the majority of affected children were otherwise healthy and typically developing, with only isolated cases reporting behavioural challenges or special healthcare needs. Therefore, this behaviour appears to be common among the general paediatric population rather

## Discussion

Dental caries can be a source of pain and discomfort in children. A prolonged delay in addressing their dental needs could result in the development of habits, such as placing foreign objects in the mouth to relieve this distress and irritation.<sup>(27)</sup> This also increases the likelihood of these items becoming lodged in their teeth, leading to infection.<sup>(27)</sup> Often, the parents are uninformed due to the associated fear factor.<sup>(26)</sup> In such instances, the foreign entity's existence is mostly discovered during routine dental X-rays, as in these reported series of cases.<sup>(27)</sup> This pattern was also reflected in the systematic review findings, where foreign objects were frequently detected incidentally during radiographic examinations rather than being voluntarily reported by parents or caregivers.

than being confined to children with special needs.

Across the reviewed studies and the present case series, a consistent behavioural trend was noted. Children tend to use easily accessible household or stationery items such as stapler pins, pencil tips, matchsticks and beads as coping mechanisms for unresolved pulpal pain. This highlights an important preventive opportunity for timely intervention of open carious lesions, and improved parental awareness may reduce self-injurious oral behaviours and prevent complications.

Although the results section presents detailed case descriptions, the broader review findings showed clear patterns in treatment decisions based on dentition and prognosis. In primary teeth, extraction was the most frequently reported treatment due to advanced infection or root resorption, whereas file-based retrieval and endodontic therapy were preferred in permanent teeth when the object was accessible and periapical involvement was limited. There is no standard recommendation for foreign body retrieval; various methods have been reported, such as ultrasonic equipment, fine forceps, endodontic files, and tweezers to re-negotiate the canal and complete treatment successfully.

Fragments of pencil tips consist of graphite (a form of carbon), clay (aluminium silicate), along with various waxes and lacquers. Although graphite and clay are chemically inactive, if they remain in tissue for an extended period, they can cause issues such as local pain, pigmentation, abscesses, and a non-allergic granulomatous reaction known as pencil granuloma.<sup>(3)</sup> Eraser consists of sulphur that's incorporated during manufacturing to provide elasticity, explaining the radiopacity.<sup>(36)</sup> Stapler pin, on the other hand, is made of steel wire galvanised for durability and coated with zinc for corrosion resistance. The metal component remains radiopaque. These material properties influence their detectability and management, where radiopaque metals are easily identified, but radiolucent objects like wood may remain undetected radiographically, delaying diagnosis.

In the reviewed literature, multiple retrieval approaches have been documented to remove foreign objects from the pulp space of primary and permanent teeth (Graph 1). Extraction was the most frequently performed method in primary dentition, with 13 cases reported<sup>(8-10,12-17)</sup>, compared with only 5 cases in permanent teeth.<sup>(9,19,24,30,32)</sup> Conversely, conservative retrieval using hand instru-

mentation was more often attempted in permanent teeth. The H file, for example, was the most commonly utilised method in permanent teeth, used in 7 cases<sup>(7,13,21,27-29)</sup>, and notably was not used in primary teeth. Additional manual strategies, such as K file, interlaced K files, and combinations like K- and H-files or file with tweezers combinations, were also exclusively used in permanent teeth.<sup>(6,7,19,20,22,25,26,28)</sup>

Ultrasonic-assisted retrieval, such as an ultrasonic scaler combined with an explorer or tweezers, was used in both types of dentition, although more sparingly.<sup>(24)</sup> Simple tools like tweezers and explorers, alone or in combination with Stieglitz forceps, were also used in a few cases in permanent teeth.<sup>(18,33,34)</sup>

A wide variety of foreign objects from the pulp spaces of both primary and permanent teeth are documented in the literature. (Graph 2) Stapler pins were the most prevalent objects in both dentitions, with equal occurrence in permanent (4 cases)<sup>(2,19,23,27)</sup>, and in primary teeth (4 cases).<sup>(8,10,13,17)</sup> Composite objects like a stapler pin with metal wire, pencil lead, or aluminium foil were found in both groups, but were more frequently noted in permanent teeth.<sup>(8,15)</sup>

Objects such as sewing needles, beads, metal pins, and screws were predominantly observed in permanent dentition, indicating more intentional or complex insertion behaviours.<sup>(6,13,18,19,21,25,28-31,33)</sup> In contrast, simpler objects like paper clips and metal balls were found exclusively in primary teeth.<sup>(9,16)</sup> Additionally, unusual materials like jewellery components, incense sticks, and matchsticks appeared only in permanent teeth.<sup>(16,19,21,22,24,26,32)</sup>

A key limitation of this manuscript stems from the heterogeneity in reporting across the included literature. The absence of standardised protocols for documenting patient symptoms, foreign body retrieval methods, and long-term follow-up introduced potential bias and variability in the data. Furthermore, radiographic limitations posed diagnostic challenges, as conventional radiographs cannot detect radiolucent objects like wood or plastic. The retrospective nature of the data, primarily drawn from published case reports, is susceptible to missing or incomplete information, thereby impacting the comprehensiveness and generalizability of our findings. Moreover, limited behavioural and psychosocial documentation restricted a deeper understanding of why children engage in such self-injurious practices.

Future research should expand behavioural assessment, including parental awareness, dental anxiety, coping strategies, and accessibility to dental care. Development of standardised diagnostic and imaging protocols, including CBCT or MRI for non-radiopaque objects, is recommended to enhance early detection.

Implementing preventive educational programmes for parents and children is crucial to mitigating self-injurious behaviours. Additionally, laboratory studies are needed to understand the biocompatibility and tissue response of commonly inserted materials. Finally, expanding the dataset through larger systematic reviews or multicentre meta-analyses would provide a more robust understanding of the prevalence, patterns, and outcomes associated with intraoral foreign object entrapment.

This review provides the most up-to-date synthesis of paediatric cases reporting foreign body entrapment in pulp space, integrating evidence from over three decades and supplementing the literature with three new clinical cases. A predefined protocol, duplicate screening, and critical appraisal tools were used to enhance reliability.

## Conclusions

Foreign body entrapment in the pulp space of children's teeth, though uncommon, can lead to persistent symptoms and serious complications if overlooked. This review and case series highlight how children may insert objects into open carious lesions, making diagnosis challenging. Prompt clinical and radiographic assessment is key to identifying and managing such cases effectively. Raising awareness among parents and dental professionals, along with early intervention and preventive education, can significantly reduce the risks and improve outcomes in paediatric dental care.

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## Conflict of Interest

The authors declare no conflict of interest.

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