CLINICAL AND RADIOGRAPHIC EVALUATION OF INTENTIONAL REPLANTATION OF TEETH UTILIZING ATRAUMATIC EXTRACTION TECHNIQUE AND BIODENTIN AS ROOT END RESTORATIVE MATERIAL. AN IN VIVO STUDY

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Abstract:
Aims: Aim is to evaluate the clinical and radiographic outcome of Intentional Replantation of teeth utilizing Atraumatic extraction technique and Biodentin as root end restorative material.

Materials and Methods: Any patients irrespective of age & sex who reported to the Department of Conservative Dentistry & Endodontics, D. J. College of Dental Sciences & Research with the post endodontic treatment periapical pathology where orthograde retreatment and apical surgery was unfeasible or declined by patients and where extraction be the last resort was selected for the procedure. Informed consent was taken. Retention and healed status without complications (periapical radiolucency, external root resorption, ankylosis, signs/symptoms, probing <6 mm) was recorded and analyzed with Kaplan-Meier survival analysis and Cox proportional hazard regression model (P < .05). Bivariate associations of the investigated variables with the main complications (ankylosis, periapical radiolucency, external root resorption) evaluated.

Results: Cumulative healed rates from 60% at 6 months to 92% at 12months seen. Complications leading to extraction observed in 1 of 15 attending teeth. The Kaplan-Meier survival function suggested an expected 1-year cumulative retention rate of 92%. Among the 15 teeth, 1 tooth with complication was due to persistent periapical radiolucency and mobility.

Null hypothesis was that IR is to preserve the natural dentition, there by upholding the main goal of Conservative treatment.

Conclusions: Within the limitations of this study, after analyzing the results and obtaining a complete follow up of 12 months radiographically and clinically, it can be concluded that Intentional replantation is an alternative treatment and should be included in the savior procedures as it has shown a success rate of 92%.

Keywords: endodontic complications, intentional replantation, physics forceps, Biodentin

Introduction:
The primary goal of endodontic treatment is to take care of the integrity of the natural dentition that is important for full perform and natural aesthetics. In spite the very fact that non-surgical endodontic procedures have a high success rate, failures do occur. Root canal re-treatment or surgical endodontic intervention often managed these, however in some cases that re-treatment or apical surgery is not possible or impractical, intentional replantation is also thought about as an answer to preserve the tooth. We typically think intentional replantation procedure of as an ultimate resort however why not, if it's to preserve nature dentition.
Grossman has outlined intentional replantation, “as the purposeful removal of a tooth and its reinsertion into the socket almost immediately after the apical seal.”

Intentional replantation isn’t a completely unique procedure. It’s reported as back as in the eleventh century once Albulcasis, Associate nursing Arab physician explained replantation according to Weinberger. The development of the technique in later years has included modification of methods of tooth extraction, root-end surgery and preparation, handling of the tooth during cautiously throughout surgical manipulation and materials used for root-end filling. There are some of prognostic factors for IR, for example, guaranteeing a sound periodontic ligament (PDL), preventing mechanical damage and microorganism contamination, short extra oral time and careful handling of the tooth.

Mostly clinical and radiographic assessments are used to investigate the rate of success of the procedure that primarily rely upon peri-radicular healing. With acceptable case selection and strict execution of treatment protocols, it very well is also viewed as an affordable treatment of choice with usually better prognosis. The principle advantage of intentional replantation procedure is that tooth surfaces, as well as inaccessible areas, are often visualized and instrumented whole while not harming contiguous periodontal tissues, adding to restoration of sound peri-radicular tissues.

Multiple studies have shown that IR features a high survival rate. A meta-analysis revealed in 2015 that enclosed eight studies have shown a survival rate of 88% for IR teeth. The evolution of the procedure in recent times has concerned modification of techniques for tooth extraction, root-end surgery and preparation, handling of the tooth throughout surgical manipulation, and materials used for root-end filling.

Periodontal ligament Preservation Factors:

Atraumatic extraction:
The Physics forceps were developed by Golden Dental Solutions, Michigan that relies on the biomechanical principles of a first-class lever, creep and stress distribution without the compressing, grasping, twisting and pulling forces to perform atraumatic extraction.

Extra oral time:
Proposals for extraoral times have likewise differed. In 1966, Grossman elaborated the time out of the mouth to be "an issue of minutes," listening of expressly that the pdl explicitly saved alive for fifteen to twenty minutes. Kratchman suggested a most extreme extraradicular time of 10 to 15 minutes.

The technique itself, however, is easy but should be performed meticulously in sterile conditions. The juncture in any replantation following extraction or avulsion is that the maintenance and preservation of the cellular vitality of the periodontal ligament that is very important for the regeneration of the pdl, therefore to the survival of the tooth. Hank’s balanced salt solution is the best medium to keep the pdl safe. The extracted tooth ought to be kept moist all the time throughout the extraoral manipulation.

Retrograde Restorations:
Retrograde filling materials like amalgam, gutta percha, zinc-oxide eugenol cements were ordinarily used retrograde filling material within the past. With development of your time numerous retrograde filling materials of endodontic surgery were introduced that have superior properties. Recent advancements in retrograde filling material are bioactive filling materials like Mineral trioxide aggregate (MTA), Mineral trioxide aggregate plus and Biodentin.

Bio-dentine shows apatite formation when immersion in phosphate solution indicative of its bioactivity, because of its higher handling properties. The working time of Biodentin is up to 6 minutes with an initial setting period of 9–12 minutes and final setting time of 45 minutes. a positive feature of Biodentin was that blood contamination had no impact on the push-out bond strength, irrespective of the duration of...
setting time, that makes it a good alternative as retrograde restoration.

**Aim:**

Aim is to evaluate the clinical and radiographical healing outcome of Intentional Replantation of teeth utilizing Atraumatic extraction technique and Biodentin as root end restorative material.

**Materials and Methods**

Any patients no matter age & sex who reported to the Department of Conservative medicine & endodontics, D. J. college of Dental Sciences & research with the post endodontic treatment periapical pathology where orthograde retreatment and top surgery was infeasible or declined by patients and wherever extraction be the last resort was selected for the procedure. The ethical committee of the D.J college of Dental science and research approved the study.

Informed consent was taken.

A criterion was included in selection of patients-

**Inclusion Criteria**

- Teeth with separated instrument in canal on the far side peri apical region, where in the retreatment was unsuccessful.
- Teeth with recurrent endodontic failures, wherever apical surgery was difficult to perform.
- Large peri-apical lesions, but without periodontal pockets and/or mobility.
- Teeth having periodontal pockets >4mm, and therefore there was no communication with the pocket and the peri-radicular lesion.
- Teeth with calcified canals with persistent apical periodontal disease wherever in endodontic treatment was difficult.

**Exclusion Criteria**-

- Teeth with class 2 mobility or greater, was excluded from the study.
- Teeth with divergent roots or with weakened coronal tooth structure.
- Teeth with preoperative periodontal defects >6mm.
- Teeth with resorption were excluded.

**Surgical Procedure**

Before the surgical treatment of endodontic surgery, a preoperative RVG was taken to locate the separated instrument and to measure the lesion.

The following are the detailed Surgical Procedure Steps:

- Each patient was directed to rinse his or her mouth with 15 ml of chlorhexidine mouth wash 0.12% for 2 minutes to decrease the microorganism load throughout and after surgery.
- All teeth were extracted under local anesthesia using with 2% Lignocaine with 1:80,000 vasoconstrictor. (Lignox).
- The attached gingiva and adjacent interdental papillae were separated from the tooth with a periosteal elevator.
- Extraction was carefully done care using Physics forceps, the utilization of elevators was contraindicated to avoid the potential injury to the periodontal ligament. The physics forceps have 2 handles, one among that is connected to a bumper that functions as the fulcrum throughout extraction. it's applied to the buccolabial side, typically at the mucogingival junction. the opposite beak is applied to the palate/lingual side of the tooth into the gingival sulcus, at a lower level than the bumper. This “beak and bumper” style aids the extraction without the utilization of excessive force. Thus, the beaks of forceps are placed on the crown and weren't were not the Cemento-enamel junction to avoid violating the integrity of the periodontium.
- After extraction, touching the alveolar socket was avoided to keep up the integrity of the bony part of the periodontal ligament. only if necessary, the apical area of socket was to be curetted gently to get rid of any pathosis. This should solely take a couple of seconds.
- With the tooth held between the forefinger and thumb (from crown portion) of the non-operating hand and also the root portion kept continuously soaked with physiological normal saline 0.9% (NaCl--) by spouting from a 10ml disposable syringe, 2-3mm of the apex was
resected by a small tapered diamond bur mounted on a high-speed air rotor under copious distal water irrigation. The resected end of tooth is flattened and a small class I cavity of 2mm depth and encompassing the width of the canal was prepared with a small diamond pro-ultra-piezo tip.

- The apex was gently dried and Biodentin was mixed and prepared in a very little ball and compacted into the cavity with the condenser.
- Before the tooth was to get replaced within the socket, the walls of socket were gently flushed with normal saline to get rid of the blood clot. Additionally, the tooth was irrigated with saline to get rid of any residual cotton fibers and debris from root end filling material.
- The tooth was gently placed into its socket. Slight pressure was applied to the buccal and lingual cortical plates to make sure adaptation.
- The time was calculated from the start of extraction to complete insertion of the tooth in its socket ranged between (10-15) minutes.
- The patient was requested to carefully bite on his teeth and also the occlusion was checked. The tooth ought to be free from occlusion.
- Tooth stability was reinforced with composite splinting and splint was removed after three weeks.
- After the procedure patients were recalled in to assess the clinical and radiographic signs of healing. Follow up was regular for 12 months (2nd week, 1st month, 3rd month, 6th month and 12 months post operatively).

**Healing Criterion:**
Follow up criteria were based on clinical and radiographical observations at every visit and as follows:

**Clinical Examination:**
- Pain level evaluated by the visual analogue scale (VAS) as no pain, mild pain, moderate pain, severe pain.
- Presence or absence of sinus was ascertained in oral examination as present and absent.
- Mobility of replanted tooth this criterion, was recorded in line with the subsequent classification: Grace & Smales mobility Index
  - Grade 0: No apparent mobility
  - Grade 1: Perceptible mobility <1mm in buccolingual direction
  - Grade 2: >1mm but <2mm
  - Grade 3: >2mm or repressibility within the socket

**Radiographic Examination:**
- Periapical radiolucency by scrutiny the pre and post RVG periapical radiolucency taking opinion of 2 specialists not concerned in procedure.
- Root resorption by comparing pre and post RVG
- Bone ankylosis by clinical percussion and RVG analysis.

**Outcome Assessment:**
Information of each patient were recorded in MS word 10. preoperative data associated with the (sex, age), and endodontic condition (periapical radiolucency, sinus tract, root filling adequacy). Patients were regular for post-treatment follow-up examinations at 1, 3, 6, and 12 months. Patients who failed to show at regular examinations were contacted by phone and rescheduled. Patients were educated regarding the findings at every follow-up session. Outcome in all retained teeth was assessed by combined clinical and radiographic criteria. Teeth were thought of healed, after they had no periapical radiolucency, no proof of external root resorption or ankylosis (indicated by percussion sound and blurring of the periodontal ligament area in periapical radiographs), no signs/symptoms, and probing depth <6 mm. Prevalence of any of the above was recorded as a complication. 2 examiners evaluated the radiographs independently by using standardized analysis criteria for periapical healing, ankyloses, and periodontal involvement. Inter-examiner reliability was determined with Cohen kappa statistics in accordance with Landis and koch 47

**Statistical Analysis:**
All subjects with 12 months of follow-up were included in the analysis. Kaplan-Meier survival curves were plotted to chart retained teeth during the duration of the follow-up period, as well as healed teeth free of complications (periapical radiolucency, external root resorption, ankylosis,
signs/symptoms, probing >6 mm). Bivariate associations between complications and clinical variables were explored with the log-rank test, followed by multivariate analysis with the Cox proportional hazard model. All statistical analyses were performed with SPSS v21.0 software and interpreted at the 5% level.

Case 1:
Case 2:
Instrument separation in mesio-buccal canal beyond apex

Results

Table 1: Characteristics of the Study Sample of Treated by Intentional Replantation and Bivariate Associations between Investigated Variables and Occurrence of Main Complications during the Follow-up Period

| Pre-operative variable | Complications, n (%) | Pain | Mobility | Periapical radiolucency | Root resorption | Ankylosis |
|------------------------|----------------------|------|----------|-------------------------|-----------------|----------|
| Female (05)            |                      | 04 (80.0%) | 04 (80.0%) | 04 (80%) | 00 (0%) | 00 (0%) |
| Male (10)              |                      | 09 (90%) | 09 (90%) | 07 (70%) | 00 (0%) | 00 (0%) |
| P= 0.571               |                      | P= 0.571 | P= 0.571 | P= 0.593 | P= 1.000 | P= 1.000 |
| Less than 40 years (09)|                      | 07 (77.8%) | 07 (77.8%) | 06 (66.7%) | 00 (0%) | 00 (0%) |
| More than 40 years (06)|                      | 06 (100%) | 06 (100%) | 05 (83.3%) | 00 (0%) | 00 (0%) |
| P= 0.343               |                      | P= 0.343 | P= 0.462 | P= 1.000 | P= 1.000 |
| PR Absent (03)         |                      | 02 (66.7%) | 02 (66.7%) | 02 (66.7%) | 00 (0%) | 00 (0%) |
| PR Present (12)        |                      | 11 (91.7%) | 11 (91.7%) | 09 (75.0%) | 00 (0%) | 00 (0%) |
| P= 0.371               |                      | P= 0.371 | P= 0.637 | P= 1.000 | P= 1.000 |
| Mobility Absent (04)   |                      | 04 (100%) | 04 (100%) | 00 (0%) | 00 (0%) | 00 (0%) |
| Mobility Present (11)  |                      | 09 (81.8%) | 09 (81.8%) | 11 (100%) | 00 (0%) | 00 (0%) |
| P= 0.524               |                      | P= 0.524 | P= 0.001 | P= 1.000 | P= 1.000 |
| Sinus Absent (15)      |                      | 13 (88.7%) | 13 (88.7%) | 11 (73.3%) | 0 (0%) | 00 (0%) |
| Sinus Present (00)     |                      | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
Graph 1:

Graph 2: Kaplan Meier Curve

Table 2: Cumulative Healed Rate of Replanted Teeth at Scheduled Follow-up Intervals

| Observation | Eligible | Lost to follow up | Examined | Complication | Healed  |
|-------------|----------|-------------------|----------|--------------|---------|
| 3 months    | 15       | 00                | 15       | 09           | 60%     |
| 6 months    | 15       | 01                | 14       | 00           | 100%    |
| 12 months   | 14       | 00                | 14       | 01           | 92.85%  |
Table 3: Kaplan-Meier survival function curve after intentional replantation of teeth with follow-up examinations

|          | Eligible | Extracted | Survival Rate |
|----------|----------|-----------|---------------|
| 3 months | 15       | 00        | 100%          |
| 6 months | 15       | 00        | 100%          |
| 12 months| 14       | 01        | 92.85%        |

Table 4: Complications recorded during follow-up period of teeth with follow-up examinations after intentional replantation.

|          | Pain Present | Swelling Present | Mobility Present | Sinus Present | Periodontal pocket Present |
|----------|--------------|------------------|------------------|---------------|--------------------------|
| 2 Weeks  | 13           | 0                | 11               | 0             | 4                        |
|          | 86.7%        | 0.0%             | 73.3%            | 0.0%          | 20.0%                    |
| 1 Month  | 00           | 0                | 2                | 0             | 0                        |
|          | 0.0%         | 0.0%             | 13.3%            | 0.0%          | 0.0%                     |
| 3 Month  | 00           | 0                | 1                | 0             | 0                        |
|          | 0.0%         | 0.0%             | 6.7%             | 0.0%          | 0.0%                     |
| 6 Month  | 00           | 0                | 0                | 0             | 0                        |
|          | 0.0%         | 0.0%             | 0.0%             | 0.0%          | 0.0%                     |
| 12 Months| 00           | 0                | 0                | 0             | 0                        |
| P value  | 0.001 (Sig)  | 1.000 (NS)       | 0.001 (Sig)      | 1.000 (NS)    | 0.099 (NS)               |

Table 4: Cox Proportional Hazard Model Identifying Predictors of Occurrence of Main Complications up to 12 Months after Intentional Replantation

|                    | Regression coefficient (b) | Standard error (b) | P value | Hazard ratio |
|--------------------|----------------------------|--------------------|---------|--------------|
| Gender             | -0.576                     | 0.421              | 0.548   | 0.612        |
| Periapical Radiolucency | -0.168                  | 0.475              | 0.627   | 0.823        |
| Age                | 0.546                      | 0.439              | 0.211   | 0.523        |
| Mobility           | 2.321                      | 0.412              | 0.031   | 2.123        |
Inter examiner agreement regarding preoperative periapical lesions, root-filling adequacy, postoperative periapical lesions, and external root resorption ranged from $k = 0.94$ to $0.97$, suggesting very good agreement.

Of 15 cases, 1 case was lost to follow-up within 6 months before the first juncture used for analysis. The attending sample of 14 out of 15 teeth and cases (92% recall) is characterized in regard to preoperative variables in Table 1. The majority of subjects were males and younger than 40 years of age. The teeth were molars with periapical radiolucency, adequate root filling, and without sinus tract. All the teeth were root-end filling used was Bio-dentine and replanted within 15 minutes. Follow-up periods ranged from 1 month, 3 months, 6 months and 12 months. Cumulative healed rates observed from 60% at 6 months to 92% at 12months (Table 2).

The Kaplan-Meier survival function (Table 1) suggested an expected 1-year cumulative retention rate of 92%.

The complications recorded during the follow-up period shown in Table 4. Among the 15 teeth, 1 tooth with complication, due to persistent periapical radiolucency and mobility was extracted.

Bivariate associations of the investigated variables with the main complications (Pain, Mobility ankylosis, periapical radiolucency, external root resorption) presented in Table 1. Periapical radiolucency was significantly less ($P = .063$) in teeth with preoperative periapical radiolucency. Periapical radiolucency was significant in teeth present with preoperative mobility. The cox proportional Hazard ration of 2.12 was seen with the complication of mobility.

**Discussion:**

As Grossman stated, “Intentional replantation should no longer be considered a “last resort” treatment, prescribed to hopeless teeth.1 It is certainly not as ‘a procedure with the poorest prognosis’ in view of Wein. Long-term results indicates that the success rates of IR and apical surgery are comparable, though recent studies support apical surgery. IR is less invasive procedure compared to apical surgery.1,9 Advantage of IR over apical surgery is that there is good access to the tip of root and root end preparation and restoration are done better extra orally. IR is relatively fast and simple procedure that gives the patient minimal postoperative discomfort and has less possible complications and less cost than periapical surgery and dental implant.

The duration and method of extraction, extra-oral time and preservation of cellular vitality of periodontal ligament are critical parameters. These parameters are controlled by performing whole procedure under aseptic conditions and extra oral time should be brief < 15min.10,11 which has a good impact on the maintaining cell viability of PDL. In this study, the extra oral time was kept maintained at 10-15mins. Extending the extra oral time above 15 mins increased risk of post treatment complications mainly ankylosis. Oral hygiene plays an important role in success of the IR, thus use of 2% chlorohexidine month was prior to surgery was done to reduce the bacterial load. Antibiotic therapy was also given 2 days prior to surgery and continued for further 3days.20,23

Splinting was done for the stabilizing the tooth and splint removed after 3 weeks. The use of a semi-rigid splint was preferred since it does not hamper physiologic mobility, further decreasing chances of ankylosis.14 In addition, fibre-reinforced splints offer the advantage of increased strength and fracture toughness which are particularly desirable properties in the mandibular molar region.24,26

The recent modern technique for IR by using the latest technique and materials and instruments has been shown to have a very good success rate. The good prognosis also depends on atraumatic extraction means minimum damage to surrounding tissues and bone is very important. So, this study was done by using Physics Forceps for extraction. Which lead to the minimum damage to the PDL and the bone. Torabinejad et al28 did a systemic review and meta-analysis of articles from 1966-2014 and have reported a success rate for intentional
replantation of 88%. Root resorption was reported as an adverse outcome in all included studies, with an overall prevalence of 11%. Other studies have shown clinical success rate of intentional replantation cases after 1 year be 89% which decreased to 59% at 5 years. Jang et al. found higher success rates for teeth in which the extraoral time was minimal, that is, 15 min or less compared with those which were kept out for >15 min. Similarly, Hammarström et al. showed that intentionally replanted teeth with 1 h of extraoral time revealed extensive root resorption whereas the other teeth with 15 min of extraoral time showed better periodontal healing associated with reattachment of the periodontal membrane. We tried to avoid this aspect as extraoral wet time by keeping the tooth moist in saline for the minimum 15 minutes of extraoral time. We used the normal saline as a medium to prevent dehydration and damage to PDL cells which is essential in the peri-radicular healing. Using saline as a root hydration medium has been followed unanimously till recently by Choi et al., Asgary et al., Cho et al., and Jang et al.

In this study, the tooth was moist continuously. This helped in prevention of resorptive processes such as replacement resorption, ankylosis, and external root resorption.

Once the tooth extraction was completed, most operators, Kratchma and Peer recommended holding the tooth by the crown with a saline-soaked gauze as a measure to provide continued hydration of the root surface and periodontal ligament cells. Nearly the same number recommended holding the tooth by the crown using the beaks of the forceps, limiting contact to enamel.

Studies by Guy and Goerig, Dumsha and Gutman, a recommended root-end preparation on an “as-needed” basis. The root-end preparations come in various lengths and techniques. Some authors reported 2 to 3 mm, others 3 to 4 mm, and Deeb reported one-third the root length. Carbide bur is usually used to prepare the root end by most of the authors Cho et al. were the only authors that reported the use of ultrasonic instrumentation for root-end preparation, and especially in cases of thin roots.

Highly recommendations were optimum resection of 3 mm root, a 0o bevel angle, and a 3-mm root preparation depth. Which we followed in our cases.

In this study. Bio ceramic root end restoration, Bio-dentine was used for root end restorations. Bio-dentine shows apatite formation after immersion in phosphate solution indicative of its bioactivity. Because of its better handling properties.

In this study, the extra-alveolar duration was less than 15 minutes. Semi ridged splinting was used to secure the stability of the replanted tooth because rigid splinting may harbour bacteria, delay healing and promote replacement resorption by not allowing physiological mobility. Patient hygiene plays a compulsory role in plaque control before and after surgery which successively has significant influences in success of the treatment. In the current study, scaling and polishing and chlorhexidine mouth wash before and after surgery was administered.

Following intentional replantation, there was marginal bone loss but less risk of causing bone dehiscence and in fact no soft tissue injury or scars in comparison with surgery because the osteogenic capacity of periosteum was reduced. In most cases of peri-radicular surgery, there's usually post-operative discomfort like pain and swelling while intentional replantation is typically uneventful. the lack of pain in this study is comparable to the literature.

Most studies have reported minor complaint of pain or discomfort. Any pain and swelling are presumably associated with the extraction instead of the replantation portion of the procedure. Therefore, the initial pain and swelling should not be confused with rejection.

Replacement resorption and ankylosis are often used as synonyms. Ankylosis is a common finding following tooth replantation and the anklylosed teeth may remain for many years. Clinically, ankylosis is diagnosed by absent tooth mobility and by a percussion tone that is higher than in a normal tooth. In this study the Ankylosis was not reported in any case, it’s because our extraoral time was maintained and kept under 20 min.
Several resources have reported the success rate of intentional replantation. The success rate of intentional replantation as stated by Kingsbury varies from 52% to 95%, inversely related to the observation period and criteria of success. In a study of 31 teeth followed for up to 22 years, Bender and Rossman found that 81 percent of them were successful and Weissenberg reported a success rate of 95% for 151 teeth followed for 3 years.

The current study showed around 92% success rate over a 1 year follow up. Importantly, the rates of retention (>92%) and healing (72%–91%) reported herein and in other contemporary studies (18–22) were consistent with the rates of functional retention (90%–95%) and complete healing (74%–85%) reported for both nonsurgical endodontic treatment and apical surgery.28,29,33,39 The comparable retention and healing prognosis supported the use of intentional replantation as an endodontic treatment modality.

Null hypothesis was that IR is to preserve the natural dentition, there by upholding the primary goal of Conservative treatment.

**Conclusion:**

Within the limitations of this study, after analyzing the results and obtaining a complete follow up of 12 months radiographically and clinically, it can be concluded that Intentional replantation is a treatment of choice and should be included in the savior procedures as it has shown a success rate of 92% and with the innovation of the bioactive material like biodentin, the success rate high. IR will achieve a good success rate with bio-regenerative materials and be much less costly than most treatment options with proper case selection and proper training.

However, further clinical trials are needed to explore the long-term retention period of the Intentionally Replanted teeth.

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