

## Original Research

### Management of immature permanent teeth with revascularization procedures

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#### ABSTRACT:

**Background:** The traumatic injury of an immature permanent tooth can lead to the loss of pulp vitality and arrested root development. The present study assessed revascularization procedures for the management of traumatized permanent teeth.

**Materials & Methods:** 50 immature, nonvital maxillary anterior teeth were subjected to revascularization. An IOPAR was taken at baseline record to compare with follow-up radiographs to be taken at intervals of every 6 months. **Results:** Out of 50 patients, males were 28 and females were 22. Narrowing of the wide apical opening was evident in 40 (80%). Thickening of apical dentinal walls was seen in 8 (16%) and lateral dentinal walls was evident in 20 (40%) of cases. Increased root length was observed in 32 (64%) of cases. Healing of periapical lesions was seen in 35 (70%). None of the cases presented with pain.

**Conclusion:** Revascularization procedure was effective in management of immature permanent teeth.

**Key words:** revascularization, Non vital, periapical pathology

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#### INTRODUCTION

The traumatic injury of an immature permanent tooth can lead to the loss of pulp vitality and arrested root development. The consequences of interrupted development include a poor crown-root ratio, a root with very thin walls, an increased risk of fracture, and an apex that is open. Challenges in treating the incompletely developed root.<sup>1</sup> Tooth fracture constitutes 4%–5% and luxation injuries 30%–44% of all dental trauma injuries. Because of their position, the anterior teeth tend to bear the brunt of many impact injuries. The injuries vary from avulsion to intrusion, lateral displacement, fracture, or just a concussion.<sup>2</sup> In many cases, the injury causes cessation of tooth development. Because the root development takes place for almost 2 years after the tooth has erupted into the oral cavity, an incompletely formed apex is one of the most common features seen in traumatized teeth.<sup>2</sup>

Management of immature non vital teeth poses a great challenge to the clinician. Most of the clinicians rely on traditional calcium hydroxide apexification.<sup>3</sup> Calcium hydroxide induced apexification has its own limitations such as long-term therapy for barrier formation; and, strengthening or reinforcing of the thin fragile blunderbuss canals is not achieved.<sup>4</sup> Instead, its long term therapy has shown to make the tooth brittle due to its hygroscopic and proteolytic properties. Even after apexification procedure, the clinician has to go for conventional root canal obturation as the barrier formed is often porous and not continuous.<sup>5</sup>

Regenerative Endodontics is biologically-based procedure designed to predictably replace damaged, diseased, or missing structures, including dentin and root structures as well as cells of the pulp-dentin complex, with live viable tissues, preferably of the same origin, that restore the normal physiologic functions of the pulp-dentin complex. Endodontic management of

such teeth includes surgery and retrograde sealing, calcium hydroxide-induced apical closure (apexification), and, more recently, placement of an apical plug of mineral trioxide aggregate (MTA) and gutta-percha obturation.<sup>6</sup> The present study assessed revascularization procedures for the management of traumatized permanent teeth.

**MATERIALS & METHODS**

The present study was conducted among 50 immature, nonvital maxillary anterior teeth. All patients were informed regarding the study and their consent was obtained. The study was approved from institutional ethical committee.

Data pertaining to patients such as name, age, gender etc. was recorded. In all teeth, endodontic treatment was initiated, and after infection control, revascularization was performed. The access cavity was sealed with glass ionomer cement. An IOPAR was taken at baseline record to compare with follow-up radiographs to be taken at intervals of every 6 months. Result thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of patients**

<b>Total- 50</b>		
<b>Gender</b>	<b>Males</b>	<b>Females</b>
<b>Number</b>	28	22

Table I shows that out of 50 patients, males were 28 and females were 22.

**Table II Assessment of parameters**

<b>Parameters</b>	<b>Number</b>	<b>Percentage</b>
<b>Narrowing of apical opening</b>	40	80%
<b>Thickening of apical dentinal walls</b>	8	16%
<b>Thickening of lateral dentinal walls</b>	20	40%
<b>Increased root length</b>	32	64%
<b>Healing of periapical lesions</b>	35	70%
<b>Pain</b>	0	0

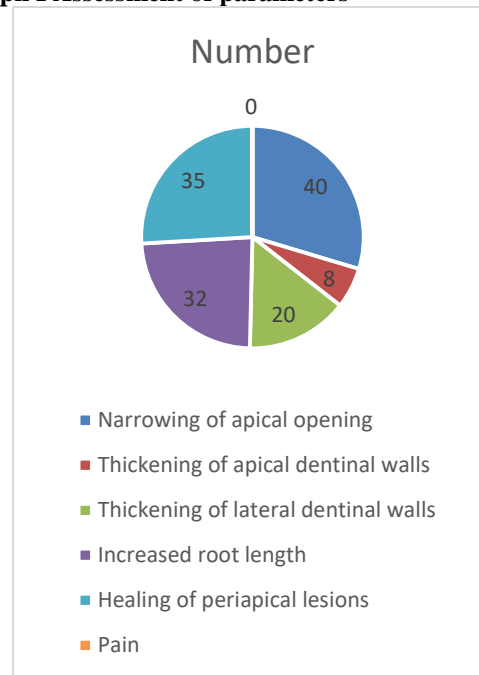
Table II, graph I shows that narrowing of the wide apical opening was evident in 40 (80%). Thickening of apical dentinal walls was seen in 8 (16%) and lateral dentinal walls was evident in 20 (40%) of cases. Increased root length was observed in 32 (64%) of cases. Healing of periapical lesions was seen in 35 (70%). None of the cases presented with pain.

**DISCUSSION**

Trauma to the anterior teeth, commonly found among young children, accounts for one third of all traumatic

injuries in boys and one fourth of all injuries in girls. The concept of pulp regeneration was first noted in traumatic avulsed and replanted immature teeth. Rule documented root development and apical barrier formation in cases of pulpal necrosis.<sup>6</sup> Obturation of wide canal systems requires precise fabrication of a customized gutta-percha cone, and there is danger of splitting of the root during lateral condensation. Many blunderbuss canals with flaring walls cannot be obturated and sealed by orthograde methods and might require apical surgery and retrograde sealing of the canal. The authors emphasized on the importance of sterile blood clot and granulomatous tissue within the pulpal cavity.<sup>7</sup> Various possible explanations have been given to explain why apexogenesis/maturogenesis can occur in these infected immature permanent teeth.<sup>8</sup> The present study assessed revascularization procedures for the management of traumatized immature permanent teeth.

**Graph I Assessment of parameters**



In this study, out of 50 patients, males were 28 and females were 22. The presence of mesenchymal stem cells residing in the apical papilla, also known as stem cells of apical papilla (SCAP), which are the multi-potent dental pulp stem cells, and resistant to necrosis/infection. The exact etiology, pathogenesis or histo-pathological events that occur in this regenerative process are still not known.<sup>8</sup>

Frank<sup>9</sup> popularized calcium hydroxide apexification by using a mixture of camphorated monochlorophenol (CMCP) and calcium hydroxide [Ca (OH)<sub>2</sub>]. Hiethersay<sup>10</sup> discarded CMCP because of its toxic

effects, and used only Ca (OH)<sub>2</sub> to treat 21 necrotic, immature teeth. Majority of cases showed appreciable healing. One of the teeth was extracted because of root fracture and was histologically examined. Histopathological sections revealed new tissue formation consisting of pulp, interglobular dentin, and cementum and periodontal ligament (PDL) fibers. This led to the belief that regeneration of dental tissues was possible. Since then, various clinical studies had demonstrated the efficacy of Ca (OH)<sub>2</sub> in apexification. However, all the case reports and studies have documented only apical closure. There was no root elongation or maturation and all cases required subsequent root canal obturation. Ca (OH)<sub>2</sub> therapy was also shown to pose a threat of root fracture in 77% of immature teeth.

We observed narrowing of the wide apical opening was evident in 40 (80%). Thickening of apical dentinal walls was seen in 8 (16%) and lateral dentinal walls was evident in 20 (40%) of cases. Increased root length was observed in 32 (64%) of cases. Healing of periapical lesions was seen in 35 (70%). None of the cases presented with pain. Shah et al<sup>11</sup> evaluated the efficacy of revascularization in 14 cases of infected, immature teeth. Endodontic treatment was initiated, and after infection control, revascularization was performed. The access cavity was sealed with glass ionomer cement. The cases were followed up at regular intervals of 3 months; the range in follow-up was 0.5–3.5 years. The outcomes were as follows. Radiographic resolution of periradicular radiolucencies was judged to be good to excellent in 93% (13 of 14) of the cases. In the majority of cases, a narrowing of the wide apical opening was evident. In 3 cases, thickening of apical dentinal walls and increased root length were observed. The striking finding was complete resolution of clinical signs and symptoms and appreciable healing of periapical lesions in 78% (11 of 14) of cases. Thickening of lateral dentinal walls was evident in 57% (8/14) of cases, and increased root length was observed in 71% (10/14) of cases. None of the cases presented with pain, reinfection, or radiographic enlargement of preexisting apical pathology.

## CONCLUSION

Authors found that revascularization procedure was effective in management of immature permanent teeth.

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