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Case Report

Dentistry Section

The Charisma of 3D Imaging in Managing Endodontic Mishaps in Calcified Canal: A Case Report

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ABSTRACT

Management of calcified canals is always challenging and is much more prone to mishaps such as perforations and ledge formations. The Two-dimensional (2D) imaging has a limitation, the 2D image of a Three-dimensional (3D) structure overlaps adjacent structures even over the root canals. This can create large confusion during treatment. Here, we are reporting a case where 2D imaging misled the treatment and 3D imaging evolved as a magical tool. A 32-year-old female, presented with complaints of pain, blackish discolouration and repeated sinus tract formation after her initial sitting of previous root canal treatment with upper right front tooth #11. On the radiograph, improper obturation and periapical radiolucency were evident. Hence, re-root canal treatment was advised and initiated. Gutta-percha was removed and radiographs were taken to ensure the removal of gutta-percha followed by working length estimation, which was satisfactory. After following all irrigation protocols, calcium hydroxide was placed as intracanal medicament but the patient came after two days with a draining pus sinus. The same happened with double antibiotic paste. Hence, Cone-beam Computed Tomography (CBCT) was advised. A buccal perforation and calcified unnegotiated canal were evident in all sections of CBCT. With the consent of the patient, the canal was again negotiated and guided with multiple angled radiographs. Intraoperative CBCT was advised with a master gutta-percha cone to verify the correct position of the canal. After verification, perforation was sealed with biodentine followed by obturation with crown placement in subsequent visits. Thus, 2D imaging can be misleading and 3D imaging is a guiding tool.

Keywords: Biodentine, Buccal perforation, Calcification, Cone-beam computed tomography, Three-dimensional

CASE REPORT

A 32-year-old female patient presented with the chief complaint of mild dull aching pain associated with her right front tooth for five years and moderate throbbing pain with the same tooth for the last three months for which she was having analgesics twice or thrice a week. She was referred to the Department of Conservative Dentistry and Endodontics for its treatment. She had a history of root canal treatment three months back with the same tooth but had persistent pain and food lodgment with it. Also, there was a complain of blackish discolouration for seven to eight years. She did give a history of trauma in her childhood involving her right front tooth. The patient was examined after obtaining consent.

On oral examination, blackish discolouration was seen with tooth #11, with dislodged postendodontic restoration [Table/Fig-1a]. On vertical percussion and palpation of the adjacent tissue area, a positive response was obtained. On radiographic examination, coronally dislodged restoration was appreciated along with unsatisfactory obturation with voids and a periapical radiolucency suggesting periapical lesion with tooth #11 [Table/Fig-1b]. A diagnosis of a previously treated tooth with acute exacerbation of chronic periapical abscess was made with tooth #11.

The treatment plan included re-root canal treatment of #11 which was explained to the patient and after obtaining proper consent of the patient the treatment was initiated.

After anaesthetising the tooth and proper isolation, the gutta-percha was retrieved. Gutta-percha was softened with heated pluggers and retrieved using a conventional H-file. Single cone obturation was removed from the infected canal. Radiographically working length was established [Table/Fig-1c]. The canals were then irrigated with 3.25% Sodium Hypochlorite with a conventional irrigation technique. After relatively drying of the canal freshly mixed calcium hydroxide paste was placed as an intracanal medicament but on the radiograph, a hazy unevenly distributed radiopacity was observed after its placement [Table/Fig-1d]. The patient returned with pain and sinus tract opening after two days of placement of calcium hydroxide. After proper irrigation and drying of the canal, the double antibiotic paste was applied as an intracanal medicament this time. But patient returned the very next day with a larger sinus tract. Hence, Cone-beam Computed Tomography (CBCT) was advised to the patient to which she agreed.

All the scans were done using a CBCT machine (Kodak Carestream 9200, North America) and the sections thus obtained were analyzed using on-demand software (Kodak Carestream, North America). In the axial and sagittal sections of CBCT, buccal perforation was evident [Table/Fig-1e]. In coronal sections, a calcified canal was seen along with periapical radiolucency. In the sagittal section, the deviated buccal path of the canal created by the bur was seen along with a partially calcified canal along with periapical radiolucency.

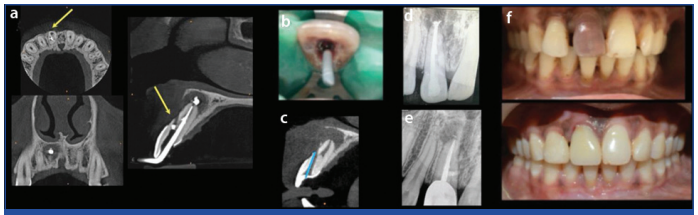
The patient was informed of the condition and a newer treatment plan was designed and explained to the patient. The true canal was again negotiated with different angulated radiographs as the paralleling cone technique radiographs were misleading towards the buccal perforation as the correct canal path [Table/Fig-1f].

Working length was again established and confirmed with help of multiple angulated radiographs [Table/Fig-1g]. Two orifices were appreciated.

Chemomechanical preparation was done with utmost care and calcium hydroxide was placed as an intracanal medicament as large periapical radiolucency was associated with the main canal. In the next sitting master cone, a gutta-percha radiograph was taken with different angulation [Table/Fig-1h]. Two orifices were appreciated clinically also [Table/Fig-1i]. As 2D radiography was misleading the treatment, an intraoperative CBCT scan with the master cone gutta-percha placed into the canal was advised [Table/Fig-2a].

[Table/Fig-1a-i]: (a) Preoperative photograph. (b) Preoperative radiograph. (c) Removal of gutta-percha and determining the radiographic working length. (d) Placement of calcium hydroxide as an intracanal medicament and hazy appearance. (e) CBCT image: arrow in axial section showing the buccal perforation. Arrow in frontal section showing the partial calcification and apical radiolucency extension. Arrow in sagittal section showing deviated buccal path, partially calcified canal along with periapical radiolucency. (f) Severe distal angulated radiograph showing slight discrepancy in the canal not evident with normal angulation. (g) and (h). True canal negotiated, cleaned and master cone radiograph obtained with distal angulated radiographs. (i) Clinical picture of the buccal perforation site and palatal side true canal (arrows).

The axial and sagittal sections verified the correct path of the canal and gutta-percha. Master cone gutta-percha was placed in the canal [Table/Fig-2b]. Perforation repair was done by measuring the exact buccal perforation length with an inbuilt measurement tool in CBCT software [Table/Fig-2c] and the buccal perforation was repaired with biodentine (Septodent), a bioceramic repair material. After 12 minutes of the setting of biodentine, final obturation was carried out [Table/Fig-2d]. In subsequent visits, an all-ceramic crown was prepared and cemented to resolve the complaint of discolouration. On first year follow-up satisfactory healing was observed [Table/Fig-2e,f].



[Table/Fig-2a-f]: (a) Intraoperative CBCT with master cone: axial and sagittal section confirming the placement of gutta percha in the true canal. (b) Clinical photograph of buccal perforation site and palatal true canal with master cone gutta percha. C: Measurement of the exact buccal perforation length by inbuilt measurement tool in CBCT software. (d) Final obturation and perforation sealing with Biodentine. (e) One year follow-up radiograph (f) Pre and postoperative clinical images after crown placement

DISCUSSION

Dystrophic pulpal calcification is seen widely in cases of trauma. They are defined as irregular biocalcification of pulp occurring during states of mineral imbalances [1]. Many cases remain unnoticed and may be diagnosed accidentally during routine radiography [2]. Clinically such cases of calcifications present with a slight change in the hue and value of the tooth. Yellowish and more dense whitish hue can be seen in such cases as the pulp chamber gets filled with reactionary and reparative dentine [3]. Mostly, such cases do not require endodontic intervention, which is only indicated when pain is associated with necrotic pulp or a periapical lesion is associated with the same [4].

A similar case was reported, with buccal perforation in a calcified canal by Casadei A et al., who have also used guided CBCT and CAD/CAM in maxillary premolar [5]. In a case reported by Alves R et al., surgical management of perforated obturated GP was carried out [6]. The dynamic navigation system is the new era tool for managing such cases with more ease and perfection in which CBCT-guided software is the main equipment used [1].

In the above case, 2D radiography misled the treatment. The patient reported with the obturating material in the buccal perforation area and not the true canal, which was responsible for pain and sinus tract but it was not diagnosed with the conventional radiograph as the 2 vertical paths overlapped, one of the buccal perforation and another of the true canal. One of the other shortcomings of the case was not relying on the apex locator (RootZX mini) findings as the pretended canal (in real the perforation) was weeping and wet.

The use of low volume CBCT is increasing in diagnosing, planning and treating such difficult cases where radiographs have misled the treatment [7,8]. An intraoperative CBCT are rarely advised due to exposure concerns but it was necessary in this case [9].

In a review by Haridas H et al., in 2016, radiation exposure of a small volume CBCT image (ranging from 19-43 uSv) was compared with a panoramic radiograph (12-26 uSv) [10]. Assouline SL et al., showed the importance and usefulness of a second intraoperative CBCT during maxillofacial surgeries [11]. But its importance has not been appreciated yet, in the field of endodontics. For its use in endodontics, risks and advantages should be analysed before opting for an intraoperative CBCT, as in this case. All the aspects including the finances were also discussed with the patient. As the patient was financially sound, she agreed for obtaining a second intraoperative CBCT scan.

CBCT also guided the correct path of the canal after the chemomechanical preparation, using intraoperative CBCT with master cone gutta percha placed in the canal. Advances in bioceramic materials (e.g., biodentine, MTA) have increased the prognosis of the treatment in such difficult cases. Biodentine was preferred in this case over MTA due to its better handling properties, fast setting, and bio-sealing property [12,13]. One of the disadvantages of biodentine over MTA was its low radiopacity [14].

CONCLUSION(S)

Mishaps during treating calcified canals are inadvertent but can be prevented by precise diagnosis and treatment planning. The 2D radiographs can be misleading as in this case and CBCT came out as a wonder guiding tool for not only diagnosing, and treatment planning but also for verifying the misguided path of the treatment and correcting the mishap.

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