Loss of a tooth during diabetic ketoacidosis

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DESCRIPTION
A 55-year-old man was presented to our hospital with progressive fatigue, nausea and weight loss of 8 kg during the previous 3 months. Physical examination revealed no abnormalities involving chest, abdomen and extremities. The patient had bleeding during brushing and alveolar pyorrhoea in the morning. Several signs of periodontitis were observed, including recession and inflammation-induced swelling of the gingival tissue and attachment loss (figure 1A). Some molar teeth had been improperly lost for an adult of his age (figure 1B,C). The patient had no history of a sudden onset of severe pain with fluctuant swelling of the gingiva and pus bag or the circumscribed swelling on the attached gingiva was not observed, indicating the absence of concurrent periodontal abscess (figure 1A,B).

Laboratory examination showed high levels of fasting plasma glucose (411 mg/dL; reference range, 60–110 mg/dL), serum C peptide (3.01 ng/mL; reference range, 1.13–2.73 ng/mL) and glycated haemoglobin (HbA1c, 11.6%; reference range, 4.6–6.2%). Metabolic acidaemia with an elevated anion gap (19.9 mEq/L; reference range, 10.0–14.0 mEq/L) due to high serum ketone levels (5.8 mmol/L; reference range, <0.6 mmol/L) confirmed a diagnosis of diabetic ketoacidosis (DKA). Serum C reactive protein (CRP) level (0.81 mg/dL; reference range, 0–0.40 mg/dL) indicated the presence of concomitant systemic inflammation. The patient underwent a non-contrast-enhanced CT to elucidate coexisting disorder(s). CT findings were unremarkable except for a hyperattenuating mass (15 mm in diameter) in the upper abdomen (figure 2A). Three-dimensional analysis of CT scan revealed a mass in the transverse colon identical to a molar tooth (figure 2B,C). Abdominal radiographs at 2 years before the admission and 2 weeks after the admission were unremarkable with no findings of a calcified mass (online supplementary figure 1A,B).

Therefore, the tooth, if swallowed would have passed without staying or being incarceration in the digestive tract and excreted possibly within 1–2 days. Furcation involvement is infection with the bacterial plaque of bifurcation and trifurcation of molar’s root, which approximately doubles the risk of molar tooth loss. Dental radiograph confirmed impaired support of his teeth by horizontal and vertical loss of alveolar bone suggestive of furcation lesions. There were signs of recent loss of the right maxillary wisdom tooth because the alveolar bone in the tooth socket was almost unaltered (arrow).
tooth was likely to have fallen out when the patient developed DKA, most likely as a result of severe periodontitis including furcation involvements, although the patient had no memory of swallowing a tooth.

Treatment with intravenous saline and regular insulin injections was immediately initiated, and then the symptoms disappeared within few days as DKA resolved. The negative result of serum antilipase antibody level (<5 U/mL) for type 1 diabetes mellitus (DM) and transient insulin-requiring profile (around 1 month) confirmed a diagnosis of ketosis-prone type 2 DM. The patient received follow-up treatment with oral metformin hydrochloride and non-surgical odontotherapy with adequate personal oral hygiene. Haematological findings revealed the improvement of glycemic control and systemic inflammation at 1.5 months (HbA1c, 7.5% and CRP, 0.25 mg/dL) and 3 months (HbA1c, 6.2% and CRP, 0.07 mg/dL) after treatment initiation (online supplementary figure 2). The patient maintained appropriate glycemic control with normal HbA1c levels for the succeeding year (HbA1c, 6.0% and 5.9% at 6 and 12 months after treatment initiation, respectively) and had not taken any additional glucose-lowering agent during the clinical course (online supplementary figure 2).

Periodontitis is a chronic inflammatory disorder by putative pathogens such as Porphyromonas gingivalis and Tannerella forsythia. In comparison with monocytes from non-diabetic individuals, those from patients with DM when challenged with lipopolysaccharides derived from the outer membrane component of these pathogens produce significantly greater concentrations of tumour necrosis factor-α, interleukin-1β and prostaglandin E2, and decreased expression of receptor activator of NF-κB ligand in the nearby alveolar bone. These are implicated in the worsening of periodontitis and a net increase in tooth loss in patients with DM. The patient was not aware that he had DM until the first visit to our department. Although the evidence for periodontal disease as a predictor of incident DM is conflicting, Lalla et al had offered a clinical approach that can be easily used in dental care settings. Their simple algorithm comprising only two dental parameters—the number of missing teeth (≥4 missing teeth) and percentage of deep periodontal pockets (≥26% deep pockets)—was effective in identifying 73% of patients with unrecognised pre-diabetes or DM. Approximately 35% of adults in Japan visit a dentist at least once a year and >90% of individuals with periodontitis may be candidates for diabetes screening, according to the guidelines set by the American Diabetes Association. The patient underwent odontotherapy at a dental clinic more than a few years before the hospitalisation. Although it remains unclear whether the patient had been suffering from severe periodontal disease and had several missing molars, his oral symptoms at the moment may be indicative of the presence of glucose intolerance. The serum CRP levels of the patient gradually decreased in parallel with the improvement in his oral hygiene confirmed using serial gross findings and the information provided by the patient, which was likely to precipitate proper glycemic control by eliminating insulin resistance.

The tooth lost during DKA was representative of the bidirectional relationship between diabetes and periodontal disease. The two diseases are interrelated and may amplify one another. This case shows the importance of substantial examination for oral health that may be associated with unrecognised glucose intolerance.

Acknowledgements The author thanks Ikuyo Kanai and Masumi Shinagawa (Department of Oral Surgery, Toshiba Rinkan Hospital) for their collaboration.

Competing interests None declared.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

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