Learning from errors

Dental avulsion due to direct laryngoscopy during the induction of general anaesthesia and avulsed teeth in nasopharynx

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Summary

General anaesthesia was induced to a 32-year-old female patient. During direct laryngoscopy, the four upper front incisors were avulsed and fell into the patient's oral cavity without fracture. After endotracheal intubation, her oral cavity was searched laryngoscopically but the teeth were not found. Radiological findings of her chest and abdomen obtained by the C-armed x-ray device and endoscopic findings of the oesophagus were normal. Her head and neck imaging revealed a radiopaque lesion in the nasopharyngeal area. Later, the nasopharyngeal area was examined endoscopically and the teeth were removed following adenoidectomy. We emphasise that preoperative evaluation is essential for dental injuries, and patients with a risk of dental injury must be detected before surgery. The localisation of the broken teeth must be identified and removed, and one must keep in mind that the dental fragments can travel to the nasopharynx.

BACKGROUND

Perioperative dental injury is the most common complaint among all medico-legal complaints related to anaesthesia and is the cause of one-third of the lawsuits regarding medico-legal anaesthesia.^{1–3} This is because of the causal relationship between anaesthesia and dental injuries. While most of the perioperative dental injuries occur during endotracheal intubation, they can also occur when excessive force is used for airway, endotracheal tube or laryngeal mask airway (LMA) removal when the patient awakes from anaesthesia or in the recovery room as a result of a masseter spasm due to shivering.^{2–5}

The incidence of perioperative dental injury in retrospective studies is 0.02–0.07% but a higher rate of 0.1% has been reported in a prospective study by an educational institution.^{2–5–7} According to the relevant literature, the most immediate cause for concern in the case of dental injuries besides the prevention of the injuries and what should be done to reduce the injuries or after an injury occurs is that the avulsed tooth, crown or denture can cause tracheal aspiration.^{8–9} If a tooth, crown or denture is avulsed, its localisation must be determined and the foreign body must immediately be removed to avoid negative consequences.

In this case report, the evaluation and management of a 32-year-old patient whose four upper middle incisors were avulsed during laryngoscopy and were not visible upon the inspection of the oral cavity are presented.

CASE PRESENTATION

A 32-year-old patient planning to undergo a laparoscopy and a hysteroscopy due to infertility was evaluated as American Society of Anesthesiologist (ASA) physical status class I upon preoperative examination. The patient was taken to the operating theatre and vascular access was

inserted. Her heart rate, peripheral oxygen saturation and blood pressure were monitored non-invasively. Anaesthesia was induced with 350 mg pentothal, 6 mg vecuronium and 100 mcg fentanyl and the patient was ventilated with 100% O₂ by mask. Direct laryngoscopy was performed with a Macintosh laryngoscope for endotracheal intubation. During laryngoscopy, the four upper middle incisors of the patient suddenly fell as one piece into the oral cavity and disappeared from view upon attempt at removal. Meanwhile, the patient was endotracheally intubated after the vocal cords were examined laryngoscopically to ensure that no foreign body was present. Her breath sounds, lung expansion and SpO₂ were normal. The oral cavity was searched again by laryngoscope and with the naked eye. There was no distinctive injury in the alveolar space of the avulsed teeth. The patient's head and neck, chest and abdomen were evaluated radiologically by the C-armed x-ray device in the operating theatre to determine the localisation of the avulsed teeth. There were no radiopaque lesions on the images of the chest and the abdomen. The patient's head and neck imaging revealed a foreign body that did not look exactly like avulsed teeth in the nasopharyngeal area (figure 1). Because the teeth were thought to be in the nasopharynx, it was planned to move the avulsed teeth towards the oropharynx with the help of a nasogastric tube and then grab the teeth from the oral cavity using Magill forceps; however, the manoeuvre was a failure.

The foreign body image in the nasopharyngeal area was consulted with otorhinolaryngologists intraoperatively and it was evaluated as an artefact by them. It was learned from the patient's relatives that her four front teeth were dental bridges. This was thought that the teeth could not be radiopaque and rigid oesophagoscopy was performed by the otorhinolaryngologists but the avulsed teeth were not found. Trans-nasal endoscopy was performed to reach the

Figure 1 A foreign body in the nasopharyngeal area in x-ray imaging.

foreign body image in the nasopharynx which was previously assumed to be an artefact. A foreign body was spotted in the nasopharynx but because the adenoids were enlarged and the foreign body was stuck in the nasopharynx it could not be removed. The avulsed teeth were removed with difficulty after an adenoidectomy was performed with permission from the patient's relatives (figure 2). Radiological imaging was repeated after the removal of the avulsed teeth and the foreign body image that was evaluated as an artefact had disappeared (figure 3). The avulsed teeth were observed and it was seen that the two middle incisors were not implanted in the alveolar space but were adhered to the teeth on the side and to the two lateral incisors (figure 2). Because of the manipulations during the search and removal of the teeth, the patient had 300 ml bleeding and oedema formed on her upper respiratory tract and most notably on her tongue; 60 mg prednisolone and 40 mg famotidine was administered

Figure 2 The avulsed teeth.

Figure 3 The x-ray imaging after the removal of the avulsed teeth.

intravenously to combat the oedema. The planned surgery was performed and the patient was extubated without any problems at the end of the surgery.

DISCUSSION

As aforementioned, in the perioperative period, a systematic approach is needed for dental injuries that occur/can occur during anaesthesia administration. First of all, the patient must be evaluated for the risk of dental injury and precautions must be taken for high-risk patients. The situation must also be shared with the patient. The risk of dental injury increases in the presence of pre-existing dental illness, crowns, bridges, heavily restored teeth, dentures, isolated or loose teeth and inadequate preoperative evaluation. Moreover patients with 6–8 years of age, old patients and patients with difficult intubation are prone to dental injuries.^{2 6 9 10} The evaluation of the oral cavity in the preoperative period was insufficient in our patient. During the intraoperative evaluation it was observed that although the patient was of a young age, most of her teeth were decayed and broken and she had a partial denture in her four upper front incisors as seen in figure 2. Moreover, the patient had poor hygiene and her hair was thinning despite her age. Intubation of patients with a risk of dental injury must be performed delicately and the possibility of a dental injury must be explained to the patients in the preoperative period and the dental findings of all the patients must be recorded on a dental chart.

Another important factor for dental injuries during endotracheal intubation is the laryngoscopy technique and the type of the blade used. The laryngoscope must be moved directly upwards without bending because using the upper incisors and the maxillary jaw as a fulcrum for the blade can result in dental injury.^{2 3 6} It has been reported that dental injury is more likely when a Macintosh blade is used (as it was for our patient) and Miller blade prevents dental injury.¹¹ For this reason, Miller blade can be preferred for patients with a risk of dental

injury. Another way to protect the teeth for patients with high risk is a standard tooth-protector and silicone paste.¹²

If the tooth is avulsed from the root in patients with dental injury, splint or reimplantation must be performed. When the reimplantation is performed within the first 30 min, the rate of success is as high as 90%.^{13 14} Reimplantation was not performed for our patient because the teeth were not avulsed from the root.

As mentioned above, dental injury mostly occurs during endotracheal intubation and extubation when the muscles are relaxed and the respiratory tract reflexes are depressed, causing a severe risk for tracheal aspiration. Therefore, the broken tooth fragment must be found and removed. If the teeth are in a localised area that can be reached by the hand, they can be removed manually otherwise hands must not be used to remove the fragment because this can cause the tooth to move forward. The tooth fragment can cause upper/lower respiratory tract or gastrointestinal tract obstruction and perforation depending on its size.^{13 15 16} If the location of the avulsed fragment is unknown, chest and abdomen imaging must be performed immediately to determine whether the tooth is aspirated or it has passed into the gastrointestinal tract. Our patient's head and neck, chest and abdomen were examined immediately with the C-armed x-ray device in the operating theatre. Her oesophagus was evaluated endoscopically and after the avulsed teeth were spotted in her nasopharynx, they were removed endoscopically. Because the nasopharynx is an organ that is hard to manipulate and has rich blood flow, the patient had adenoid hypertrophy and the avulsed teeth were stuck in the mucous membrane of the nasopharynx, the removal of the teeth were difficult and this prolonged the process causing oedema and bleeding in the oral cavity.

As a result, management of dental injury includes: (1) evaluation of the risk for dental injury in the preoperative period and taking the required precautions; (2) if dental injury has occurred and the tooth is avulsed from the root, reimplantation must be performed; (3) the localisation of the broken tooth fragments must be determined and the tooth must be removed; (4) one must keep in mind that the dental fragments can travel to the nasopharyngeal area in addition to the respiratory tract and the gastrointestinal system; and (5) the patient must be admitted to a dentist in the postoperative period.

Learning points

- ▶ Evaluation of the risk for dental injury in the preoperative period and taking the required precautions.
- ▶ If dental injury has occurred and the tooth is avulsed from the root, reimplantation must be performed.
- ▶ The localisation of the broken tooth fragments must be determined and the tooth must be removed.
- ▶ One must keep in mind that the dental fragments can travel to the nasopharyngeal area in addition to the respiratory tract and the gastrointestinal system.
- ▶ The patient must be admitted to a dentist in the postoperative period.

Competing interests None.

Patient consent Obtained.

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Ozer AB, Erhan OL, Demirel I, Keles E. Dental avulsion due to direct laryngoscopy during the induction of general anaesthesia and avulsed teeth in nasopharynx. *BMJ Case Reports* 2012;10.1136/bcr-2012-006898, Published XXX

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