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MINIREVIEWS

Retrieving dental instruments through endoscopy: A literature review

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Abstract

Clinical accidents involving dental instruments and materials inside the oral cavity are reported in the medical literature. Specifically, ingestion and aspiration of foreign bodies have greater prevalence in the routine of medicine and dentistry. Despite being less harmful than aspirations, the accidental ingestion of dental instruments does not always culminate in favorable prognoses. Mostly, complex conditions require medical intervention through endoscopy or surgical approaches. The present research aims to review the literature pointing out the specialties of dentistry most involved with accidental ingestion of dental instruments, highlighting the important role of endoscopy for accurately locating and retrieving foreign bodies. Prosthodontics, operative dentistry, orthodontics, and maxillofacial surgery arose as the specialties in which these accidents are more prevalent. Based on that, general dentists and specialists must be aware for the essential care to avoid such clinical accidents, as well as to know the available tools, such as endoscopy, to overcome these situations in the routine of dentistry.

Key words: Endoscopy; Accidents; Dental instruments; Foreign bodies

Core tip: An effort should be made to avoid breaking dental instruments by preventing their over-use and over-stress. Rubber dams should always be used for hygiene control and to prevent patients from swallowing instruments. When the use of a rubber dam is not

possible, dental instruments should be secured with wires to help avoid and accomplish retrieval. All parts of broken instruments must be retrieved immediately following breakage. If ingested broken instrument parts cannot be retrieved, the patient should be referred for a medical opinion.

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INTRODUCTION

The acute perfectionism of dentistry often makes it necessary to use small instruments for dental procedures that require precise intervention, such as crown preparation for fixed prosthodontics, root canal procedures, and the bonding of orthodontic brackets. Consequently, there is always a risk of an instrument accidentally breaking or falling into the throat of patients and becoming ingested as a foreign body[1]. Following an accidental ingestion, the prognoses strongly depend on the morphology and anatomic location of the foreign body[2]. Favorable prognoses mostly require clinical and radiographic follow up of the foreign body inside the digestive tract[2]. Whereas, unfavorable prognoses often involve more invasive approaches, such as endoscopy[3] and surgical retrieval[4]. After an accidental aspiration, the airways are often compromised resulting in unfavorable prognoses. In this context, medical interventions, such as bronchoscopy[5] and surgical access[6] can become necessary. Considering that some fields of dentistry are more susceptible to ingestion accidents, the present research aimed to review the current literature to identify the dental specialties most involved with such accidents, and highlighting the important role of endoscopy for accurately locating and retrieving foreign bodies from the digestive tract.

EPIDEMIOLOGY

Hisanaga *et al*[1], 2014, retrospectively analized 40 cases of accidental ingestion and the aspiration of foreing bodies that occurred during dental treatment over 4 years in hospital dental clinics. The accidental ingestation occurred most frequently as part of prosthodontic and operative dental treatments (50%), followed by orthodontics (15%) and maxillofacial surgery (7.5%). Approximately 97% of these cases (n = 39) involved the accidental ingestion of dental instruments, of which only one instrument required endoscopic retrieval. The remaining ingestion accidents did not require clinical intervention.

A retrospective investigation of ingestion accidents over 10 years within a dental school was also conducted by Tiwana *et al*[7]. Twenty-five cases, out of the twenty-six, involved accidental ingestion. None of the cases required endoscopic or surgical retrieval. Similar to the previous study, prosthodontics and operative dentistry were involved in 50% of the dental instrument ingestation cases. Maxillofacial surgery contributed 19.2% of the ingestion cases, and orthodontics contributed 11.5%, of the ingestion cases.

A study by Obinata *et al*[8], identified 23 accidents over 5 years where patients had ingested dental instruments. Fifty-two percent of the accidents (n = 12) occurred during prosthodontic procedures, while 13% of the accidents occurred during maxillofacial surgery and 8.7% of the accidents occurred during orthodontics. Only, three cases required endoscopic retrieval of the foreign bodies.

A study by Susini *et al*[9], 2007, analyzed the cases of 464 patients who had accidentally ingested or aspirated dental instruments that were reported to insurance companies. The type and number of dental instruments reported within the study indicated that patients having Prosthodontic treatment were most likely to suffer an accidental ingestion, and accounted for 45% of all the cases. The other dental specialties: Operative dentistry (33.6%) and endodontics (18.1%) also had a high incidence of patients suffering an accidental ingestion of dental instruments.

DENTAL INSTRUMENTS AND ENDOSCOPY

In the medical and dental literature, several studies have reported the accidental ingestion of dental instruments used in prosthodontics and operative dentistry, such as metallic cores[10], prosthetic crowns, dental drills[11] and even removable prostheses. Despite being uncommon, the accidental ingestion of entire prostheses were reported during traffic accidents, meals[12] and sleep[13]. Both the ingestion in the daily routine and the ingestion during dental treatment culminate with similar prognosis, making potentially necessary endoscopic retrieval.

In oral implantology there are reports of small screws being ingested by patients[14], while in endodontics files and clamps are the most ingested instruments by patients[15-20]. In orthodontics, there are cases where patients had ingested entire and fragmented removable appliances[21,22], as well as activation keys[23,24], orthodontic bands[25] and orthodontic wires[26]. Several other instruments, used in general practice, were also found to be accidentally ingested by patients receiving routine dental treatments. Specifically, these instruments were ingested: (1) due to patients' biting and swallowing reactions in response to a dental instrument, where the instrument ends up being dropped into their mouth or throat and swallowed before the dentist can retrieve it; or (2) due to a professional accident: Where the instrument broke and fell into the patients mouth or throat during clinical procedures. Oncel *et al*[27], 2012,

illustrates the first situation reporting a case of accidental ingestion of intraoral mirror that fractured after a patient suddenly clenched his teeth. The mirror was retrieved through endoscopy after reaching the esophagus. On the other hand, cases reporting the lack of instrumental inspection to ensure there are no broken pieces was investigated by Sankar[28] and by Tsitrou *et al*[29]. Both authors reported cases of endoscopic retrieval of triple syringe tips, measuring 12 cm and 9 cm of length respectively, unscrewed during procedures for dental restoration.

DISCUSSION

Dentists have a critical role in preventing the breakage of instruments by preventing their over-use and over-stress. Rubber dams should always be used for hygiene control and to prevent patients from swallowing instruments. When the use of a rubber dam is not possible, dental instruments should be secured with wires or floss to help avoid and accomplish retrieval[3]. By following these safety measures the ingestion of dental instruments by patients can be prevented. If the safety measures fail, all parts of broken instruments must be retrieved immediately by the dentist following breakage. If any ingested broken instrument parts cannot be retrieved, the patient should be referred for a medical opinion.

Immediately following the instrument ingestion by a patient, the first priority is to attempt to retrieve the instrument to prevent it from blocking the patient's airway. If the instrument cannot be retrieved, it is essential to halt dental treatment, remove rubber dams and devices from the mouth, and to monitor the patient's vital signs, followed by the observation of continuous coughing, voice alterations, discomfort, and other clinical signs and symptoms that may aid the differentiation between accidental ingestion and aspiration[2]. If a patient has trouble breathing or is losing consciousness, the emergency services must be called to attend to the life-threatening condition of the patient. If a patient's condition is not life-threatening they must be referred for a medical exam. If the instrument is not visible a radiographic inspection of thorax and abdomen must be performed[2,20].

If dental instruments reach the digestive tract, they tend to be naturally eliminated without major complications[10,11]. However, instruments with larger dimensions, such as triple syringe tips, prostheses, and dental mirrors may not be eliminated, becoming stuck along the esophagus and stomach, making it necessary to perform an endoscopic intervention[2,16,25]. Endoscopy may also be needed to retrieve instruments with a complex morphology, such as endodontic files and dental drills, which can perforate and adhere to the mucosa of digestive tract[15,19,24]. On the other hand, surgical approaches become indicated when the instruments become stuck in anatomic positions not reachable through endoscopy[13,24]. Consequently, major damages to the mucosa, digestive tract, and systemic health can be avoided. Additional limitations for the use of endoscopy are the time elapsed from the accident and the size of foreign body. Specifically, small foreign bodies ingested a long time ago may reach the intestine and not be visible through endoscopy[14,16].

CONCLUSION

An effort should be made to avoid breaking dental instruments by preventing their over-use and over-stress. Rubber dams should always be used for hygiene control and to prevent patients from swallowing instruments. When the use of a rubber dam is not possible, dental instruments should be secured with wires to help avoid and accomplish retrieval. All parts of broken instruments must be retrieved immediately following breakage. If ingested broken instrument parts cannot be retrieved, the patient should be referred for a medical opinion.

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