Endoscopic Retrieval of an Endodontic File from the Duodenum: A Case Report

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Patients undergoing dental procedures are potentially at risk for inadvertently swallowing or aspirating foreign objects. Although the majority of ingested objects pass through the gastrointestinal tract without causing harm, they sometimes cause bowel obstructions and perforations, which may require endoscopic or surgical removal or repair.[1] Preexisting medical conditions such as hernias, inflammatory bowel disease, tumors, diverticula, and adhesions can increase the risk of gastrointestinal perforation.[2] Aspiration of dental instruments is less common but often results in more serious sequellae. In a 2007 French study investigating the frequency of aspiration and ingestion of endodontic instruments, researchers found that all aspiration cases required hospitalization while only 36% of ingestion cases required hospitalization.[3] Foreign body aspiration has been reported to cause pneumothorax,[4] and in a recent case, complications associated with the aspiration of a small dental implant wrench led to a patient's death.[5]

In order to prevent these situations from occurring, dentists often use a protective barrier, such as a rubber dam. Besides blocking aspiration and swallowing of foreign objects, debris, etchants, disinfectants, and irrigating solutions, the rubber dam creates a dry, clean, isolated operating field, retracting and protecting soft tissues. It also reduces the risk of root canal system contamination, creates a barrier to the spread of infectious agents between patient, dentist and auxiliary, increases visibility, and maximizes procedure efficiency.[6] Use of the rubber dam decreases temperature and relative humidity in the oral cavity, thus facilitating higher bond strengths during adhesion procedures.[7]

We present a case in which a patient swallowed a root canal file during an endodontic procedure that was performed without a rubber dam. An endoscopy became necessary to successfully remove the file from the patient's duodenum. The ramifications of this occurrence are discussed.

Case Report

A middle-aged female presented to the emergency department complaining of a sharp pain in the epigastric region of her abdomen. The patient underwent root canal therapy on tooth #18 the previous day. Her general dentist performed the procedure, and she stated that no rubber dam was used. During the procedure, the patient felt as though she swallowed something. She was assured that she had not, and was sent home upon completion of the root canal. The patient reported feeling fine when she left the dentist's office. On presentation to the hospital, her physical exam was unremarkable. She was afebrile with a normal heart rate and blood pressure. Her abdomen was soft, nontender, and nondistended, with normal bowel sounds.

X-rays (Figure 1) revealed no free intraperitoneal air and a linear radiopaque object with surrounding ring projecting over the right aspect of the L4 vertebral body in the erect view and right of the L3 vertebral body in the supine view. The x-rays could not definitively determine the object's exact location, nor could they discern whether the object was located externally or contained within the patient's bowel.

The emergency department contacted the on-call gastroenterologist, who recommended a non-contrast CT scan to better visualize the object's location within the bowel and determine if the object was potentially retrievable via endoscopy or if a surgical approach would be needed. The CT scan revealed a 3.6cm radiopaque, linear, needle-like foreign body consistent with the size and shape of an endodontic file, located within the third portion of the duodenum (Figure 2). The foreign body was oriented perpendicular to the bowel lumen, and the tip may have been lodged in the duodenal wall. No surrounding inflammatory changes were visible and no free intraperitoneal air was identified.

The decision was made to attempt endoscopic retrieval. A GIF-H180 Olympus endoscope was introduced through the patient's mouth and advanced to the third portion of the duodenum, where an endodontic file was seen adherent to the duodenal mucosa (Figure 3). A rat-tooth forceps was used to dislodge it in a perpendicular direction to the sharp end insertion site (Figure 4). The tip was then grabbed with the rat-tooth forceps and moved proximally, where it was captured by a snare and brought close to the edge of the scope. With good visualization, the endodontic file was then transported into the body of the stomach, where the tip was pulled into the plastic sheath of the snare. The red file handle was held tightly inside the overtube of the snare, and then drawn out through the mouth (Figure 5). The patient tolerated the procedure well and had an uneventful postoperative course.

Discussion

Incidents involving accidental swallowing or aspiration of foreign materials present with varying degrees of morbidity and even mortality. In this instance, our patient was fortunate that the file did not move beyond the duodenum. In a similar case involving an ingested endodontic file, a small difference in file orientation led to perforation of the patient's jejunum.[1] The caudal position of the plastic handle may have played some role in impeding perforation

or further movement along the intestinal tract. Had the foreign body implanted in a more distal location, it is unlikely that the instrument would have been retrievable with a standard endoscope. A partial bowel resection or enterotomy would have then been indicated. Additionally, the file could have penetrated through the bowel lumen, causing a bowel perforation and necessitating more extensive surgery.

Consequences of this severity are preventable if the rubber dam is utilized, yet a significant number of general dentists do not consistently use them when performing endodontic procedures. Whitten, et al., found that only 59% of general dentists always used a rubber dam when performing root canal procedures as opposed to 92% of endodontists.[8] Hill and Rubel had similar results: only 58% of general dentists reported always using a rubber dam.[9]

A deficit in training does not appear to be the primary cause of rubber dam underutilization. Whitworth, et al., found that a clinician's dental school had a significant impact on rubber dam usage, with graduates from one institution being significantly more likely to utilize a rubber dam than graduates from a different school. Of the dentists surveyed, only 13% thought their rubber dam training was insufficient.[10] In a 2008 survey of U.S. general dentists, 26% reported inadequate rubber dam training.[9] Other studies noted difficulty and/or length of application and perceived patient aversion as the most frequently cited reasons for not using a rubber dam.[9,10,11,12,13] Mala, et al., noted that 90% of senior dental students felt that endodontic procedures performed with a rubber dam were more successful than those performed without a rubber dam. Yet, 53% thought they were difficult to apply, and 45% believed patients disliked them. Interestingly, 62% of surveyed students reported that their use of rubber dams would most likely decline once in private practice.[13]

Perceptions regarding length of application and patient dislike appear to be unsupported. Stewardson and McHugh found that most dentists and dental students take no longer than one to two minutes to properly place a rubber dam. They also found that the majority of patients were not averse to the rubber dam placement and many patients preferred its utilization during dental procedures.[14] Perception of patient dislike seems to correlate more with the dentist's attitude about rubber dam use than the patient's, as dentists who frequently used a rubber dam were unlikely to see patient aversion as a barrier to acceptance.[8]

Cohen and Schwartz state that failure to use a rubber dam during endodontic treatment is one of the "most obvious departures from the standard of care" and legally indefensible in court.[15] They define standard of care as "the care that a reasonably prudent practitioner would perform [*sic recte* provide] under the same or similar circumstances." No written case law pertaining solely to rubber dam use exists, therefore in the courtroom the determination of a breach in the standard of care ultimately depends upon expert testimony and how the case is presented to the jury. Thus, court rulings on this issue are case specific.

Earlier court cases ruled it acceptable not to use a rubber dam in certain situations. In a 1975 lawsuit involving a patient swallowing a dental instrument, the dentist claimed the patient's tooth was so badly decayed he could not attach a rubber dam clamp to it, and the court ruled in favor of the dentist.[16] Another case where a patient swallowed a root canal file yielded a similar result. The dentist stated he chose not to use a rubber dam because the affected tooth had a large amalgam filling that he feared would fracture if the rubber dam clamp were to be applied. He considered his decision not to use a rubber dam a "method of treatment," and the court ruled in favor of the dentist.[17]

However, in Simpson v. Davis (1976), the Kansas Supreme Court expressly stated that not using a rubber dam was a departure from the standard of care.[18]

While lawsuits had varying results, it is the opinion of the authors that prior successful defenses will no longer hold up in today's legal system. Since Sprowl v. Ward (1983), the author's search yielded a paucity of lawsuits brought forth based upon lack of use of a rubber dam, perhaps because they are usually settled before trial and such settlements are nondisclosable. This would support our view that malpractice insurance companies consider the use of a rubber dam as the standard of care for endodontic procedures and that deviation from this standard is indefensible in court.

General practitioners engaged in the performance of specialty procedures are held to the same standards as specialists. This precedent was established by Chubb v. Holmes in 1930 and upheld in Simpson v. Davis in 1976.[18,19] Since rubber dam use is universally accepted by practicing endodontists, it follows that general dentists must also use it in order to conform to the standard of endodontic specialty care.

Conclusion

Use of a rubber dam constitutes the standard of care and best practice for endodontic procedures. It protects the patient from swallowing or aspirating foreign materials and enhances the sterility and efficiency of the procedure. Rubber dam use complements universal precautions, protecting the patient, dentist, and dental auxiliary from transfer and spread of infectious material. Use of the rubber dam should be considered mandatory for performance of endodontic procedures.

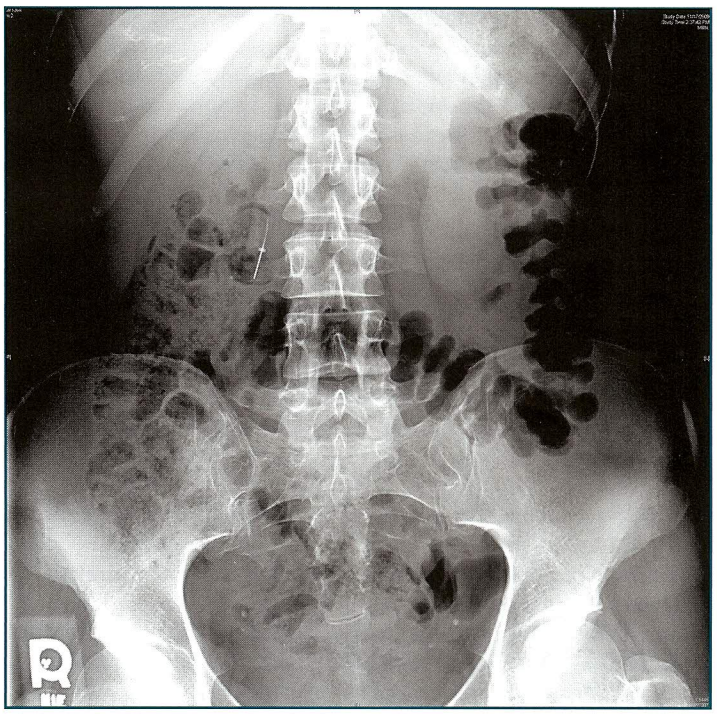

Figure 1: Erect view of abdomen demonstrating linear radiopaque object (endodontic file) over the right aspect of L4 vertebral body.

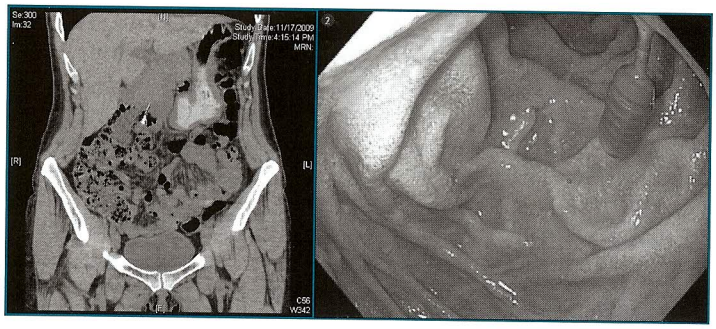

Figure 2: CT scan with linear needle-like foreign body (endodontic file) identified within the third portion of the duodenum.

Figure 3: Endoscopic view of endodontic file adherent to duodenal mucosa.

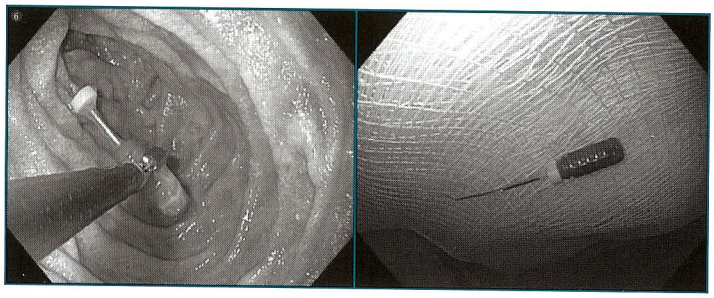

Figure 4: Endoscopic view of rat tooth forceps used to dislodge endodontic file from duodenum.

Figure 5: Removed endodontic file.

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