

Bypassing a fractured instrument

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Fig. 1 _Diagnostic radiograph showing a separated instrument in the canal at the curvature.



_Case report

A 60-year-old patient was referred to our practice. He had type II diabetes, but no other health problems and hence was assigned an American Society of Anesthesiologists score of two. The patient had acute pulpitis on tooth #20. The referring dentist had performed a preliminary root-canal treatment but had been unable to pass the curvature.

Before starting the treatment, a new diagnostic radiograph was taken (Fig. 1). It showed a fractured instrument in the curvature of the root. The tooth was isolated with a rubber dam and the coronal filling was removed. Straight-line access was established, as this is imperative to be able to reach and see the fractured instrument. In this case, the fractured instrument could not be visualised (Fig. 2). The decision was made to try to bypass the instrument rather than try to retrieve it. The key factors for this decision were the impossibility of visualising the instrument, the location of the instrument, the

_In a previous case report published in *roots* 3/10, I demonstrated the possibility of removing a fractured instrument from the root canal.¹ In some cases, however, removal of a fractured instrument is impossible or undesirable. Favourable factors for the removal of a fractured instrument are straight canals, incisors and canines; localisation before the curvature; length of fragment of more than 5 mm; localisation in the coronal or mesial third of the root canal; reamer or lentulo spirals; and hand NiTi K-files.^{2,3} If the case does not fulfil one or more of these criteria, removal of the fractured instrument might be impossible. Teeth with small roots may also be excluded for instrument removal, since excess removal of dentine will compromise the long-term prognosis of the tooth. In these cases, alternatives to instrument removal will have to be sought. Alternatives are leaving the instrument in place, surgical removal, extraction or bypassing the instrument. In the following case report, I will demonstrate the manner in which a fractured instrument can be bypassed.

Table I _Shaping sequence of the first appointment.

First appointment
D-Finder 08
D-Finder 10
K-file 08
K-file 10
PathFile 13
PathFile 16
PathFile 19
Flexile file 20
ProTaper S1 hand file
ProTaper S2 hand file

Table I

limited thickness of the root and the canal's oval shape. Bypassing was started by introducing a size 08 D-Finder (Mani Inc.) to the instrument. The D-Finder was used for probing and searching for a way to bypass the instrument. After a few tries, I was able to get the D-Finder past the instrument (Fig. 3). Working length was established using the Root ZX mini (J. Morita) and confirmed radiographically (Fig. 4). The complete shaping sequence of the first appointment is shown in Table I.

During the shaping of the canal, copious irrigation with 5% sodium hypochlorite was performed. Patency was kept with a size 08 K-file (Mani Inc.) between every instrument. After the canal had been shaped using a size 20 Flexile file (Mani Inc.) and a ProTaper S2 hand file (DENTSPLY Maillefer), calcium hydroxide (Ultradent Products Inc.) was placed in the canal and the cavity was sealed with a cotton pellet and a temporary restoration in Fuji IX Fast A1 (GC).

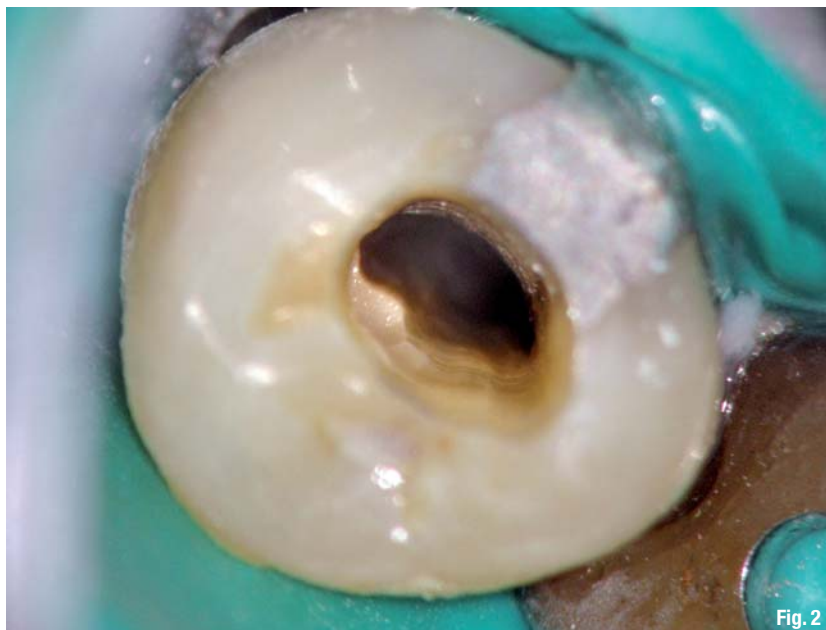


Fig. 2

Fig. 2 The instrument was not visible through the microscope.

Second appointment	
Flexile file 20	
ProTaper F1 hand file	
Flexile file 25	
ProFile 25.04	
ProFile 30.04	
ProTaper F1 hand file	
Flexile file 30	

Table II

Two weeks later, the patient returned for his second appointment. The tooth was again isolated and this time, the old amalgam filling was removed. The carious dentine was then removed with LN burs (DENTSPLY Maillefer) and an Automatrix (DENTSPLY Caulk) was placed around the tooth. This should have been carried out at the first appointment; however, it was too tempting to try to bypass the fractured instrument first. Next, the calcium-hydroxide paste was removed using 10% citric acid and passive ultrasonic irrigation with an Irrisafe tip (Satelec). Further shaping of the canal was performed and copious cleaning was carried out using 5% sodium hypochlorite. The complete shaping sequence of the second appointment is shown in Table II.

Table II Shaping sequence of the second appointment.

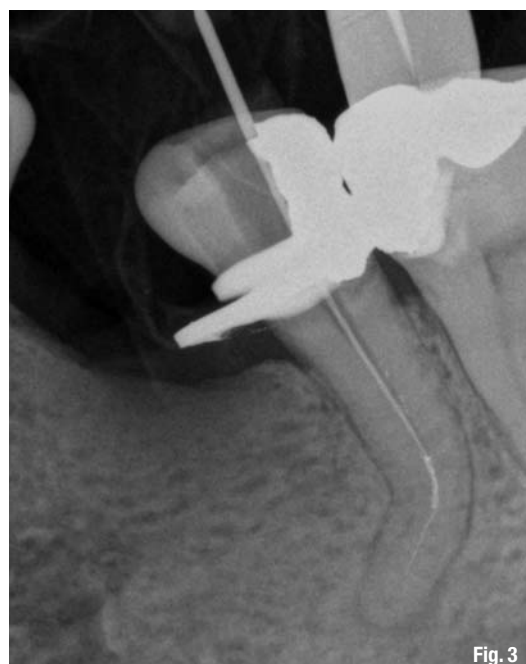


Fig. 3

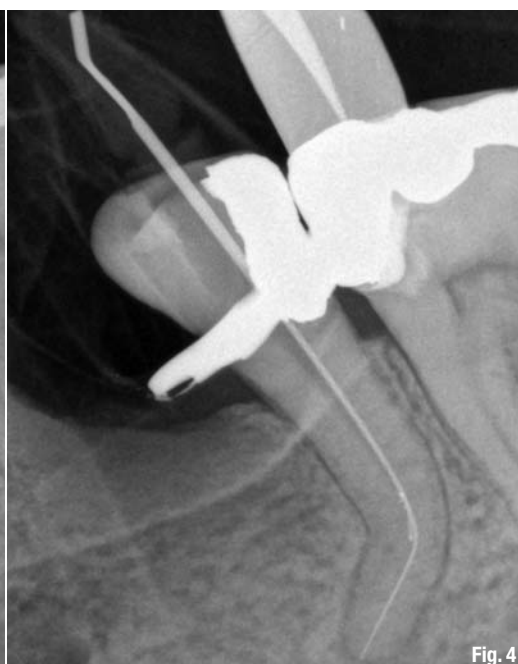


Fig. 4

Fig. 3 Bypassing of the instrument with a size 08 D-Finder.

Fig. 4 Working length determination.

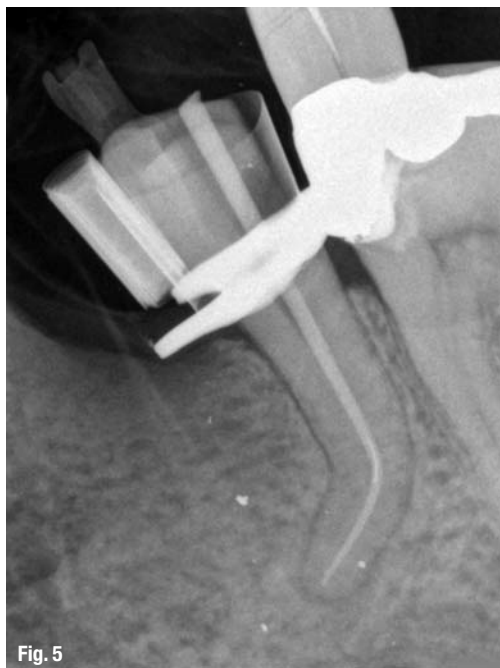


Fig. 5



Fig. 6



Fig. 7



Fig. 8

Fig. 5_ Gutta-percha cone-fitting.

Fig. 6_ The pulp chamber after obturation with gutta-percha.

Fig. 7_ Final radiograph (parallel).

Fig. 8_ Final radiograph (angled).

The canal was shaped to an apical size of 30. Smear layer removal was performed with a rinse of 10% citric acid. A final wash of the canal was carried out with sterile saline. The canal was then dried with paper points (Roeko). A 04 tapered gutta-percha cone was fitted into the canal.


Topseal (DENTSPLY Maillefer) was used as a root-canal sealer. After radiographical confirmation (Fig. 5), additional gutta-percha cones, ISO size 20, were placed into the canal, according to the cold lateral condensation technique. Next, the gutta-percha was removed to about 5 mm from the apex with the System B Elements Obturation Unit (SybronEndo). Owing to the curvature, it was not possible to go any deeper. Hence, I decided to create

a hybrid technique with cold lateral condensation. Finally, the backfill was done with the Elements Obturation Unit. After obturation (Fig. 6), a temporary restoration in glass-ionomer cement (Fuji IX FAST A1, GC) was placed. Final radiographs were taken, both parallel and angled (Figs. 7 & 8). The prognosis of this case was excellent and the patient was referred to his general dentist for a definitive coronal restoration.

_Conclusion

Sometimes removal of a fractured instrument is impossible or undesirable. In these cases, bypassing the instrument is a valid alternative, which can lead to a favourable outcome as presented in this case.

Editorial note: A complete list of references is available from the publisher.

_about the author	roots
	<p>Dr Rafaël Michiels graduated from the Department of Dentistry at Ghent University, Belgium, in 2006. In 2009, he completed the three-year postgraduate programme in Endodontics at the University of Ghent. He works in two private practices limited to Endodontics in Belgium. He can be contacted at rafael.michiels@gmail.com and via his website www.ontzenuwen.be.</p>