Technique for the removal of metallic fragments lodged in root canals

by Jean Masseran
Introduction

The masserann method is a technique for the removal of metallic fragments which remain lodged in root canals. This technique is of value in a number of cases which could not be treated by conventional methods.

The great advantage of this method is that the fragment may be removed quickly, with a minimal loss of substance, without heating and without the risk of pushing the fragment still further into the canal. This technique has been practiced to date by several dentists using handmade instruments.

Because of the excellent results obtained with the Masserann technique, MICRO-MEGA has produced a complete, easy-to-handle set of instruments so that the Masserann method can be available to all practitioners.
Method used up to now

The different methods used up to now to remove metallic fragments from root canals, and which are described here, are often unsuccessful. One method consists in attempting to prise out the fragments after partially freeing with very fine burs. Very often, however, this results in a lateral perforation of the root canal. Another lengthy method is by trying to "nibble" away the entire length of the fragment, guided only by tactile sense, and relying on a visible check as to whether or not a particle of metal still remains. The risk here is that the fragment is pushed further towards the apex.

Still another technique is to attempt to reduce the diameter of the metallic fragment with a trepan bur and thread a portion of the fragment so that some form of handle can be attached. The fragment is extracted by using a turning or to-and-fro movement.

The principle of the Masserann method

The principle of the method consists in freeing the broken fragment around its periphery. For this, a hollow trepan bur is used, the inner diameter of which corresponds to the diameter of the fragment. The fragment itself serves as a guide and makes the creation of a false route impossible. Consequently, the fragment appears in a cylinder of dentine or sealer. Or, in other words, in the middle of a circular "trench".

When using this method, the result will be two-fold:
- The resistance of the fragment to being removed will be reduced with the increasing depth of penetration.
- The "trench" will permit a second instrument to be inserted with which to grip and extract the fragment.

The instrumentation

The Masserann kit is delivered in a sterilisable box and comprises:
1. A series of 14 trepan burs of 1.1 to 2.4 mm. diameter - a progressive increase of 1/10 mm. to each bur. The wall of the trepan is less than 0.25 mm. thick. The trepan is used for:
   (a) Freeing the fragment.
   (b) Gripping and extracting the fragment.
   All trepans bear a coloured ring, corresponding to the diameter, from light to dark shades (white, yellow, red, blue, brown and black). These coloured rings provide easy identification of the various sizes.
2. A handle into which the trepan may be screwed.
3. A milled holder, into which the trepan may be screwed.
4. A flat spanner for tightening or releasing the trepan from the handle or holder. The spanner may also be used for turning the trepan when in use.

5. Two Masserann “star” gauges, each carrying 7 tubes, the diameters of which progressively increase by 1/10 mm. These gauges facilitate the choice of the trepan and indicate the direction of the canal.

6. A flat gauge which includes a graduated tapered slot for ascertaining the trepan of correct diameter. The upper scale indicates the inner diameter of the trepan; the lower scale indicates the external diameter. The round holes on the flat gauge indicate the diameter of burs.

7. Two Masserann extractors (tubular) for removing fine broken root canal instruments.

8. Two Gates drills.

**Practical use**

**Three groups of fragments**

The practitioner will find different kinds of fragments in root canals:

**Group 1:** Fragments of posts, burs, diamonds and silver points.

**Group 2:** Parts of Gates, Mooser drills and other types of engine reamers.

**Group 3:** Root canal instruments of fine diameter.

**Choice of the trepan**

**Case A. Part of the fragment is visible**

The smallest tube of the Masserann gauge, which can be pushed over the fragment without using force is selected.

The number indicated on the Masserann gauge gives the outer diameter of the corresponding trepan.

**Example:** Tube No. 17 is the easiest to be pushed over the visible fragment. Therefore, the choice of trepan is the one which touches both sides of the tapered slot in the flat gauge at the graduation mark 13-17.
Case B. The fragment is not visible
One of the tubes of the Masserann "Star" gauge is gently introduced into the cavity of the tooth. The corresponding number of the gauge gives the inner diameter of the trepan to be used.
Example: Tube No. 17. This gives an indication of the diameter of the fragment. The required trepan is the one which, when inserted into the tapered slot of the flat gauge, stops at the mark 17-21 (the trepan must excavate around the fragment embedded in the canal).

Introduction of the trepan
The trepan is pushed over the end of the fragment and is turned in an anti-clockwise direction. This may be carried out in several different ways:
- with the handle.
- with the milled holder.
- with the spanner.
- with the aid of a speed-reducing straight or contra-angle handpiece.

Group 1
Posts, burs, diamonds and silver points
The operation is in two stages.

Stage 1. Setting free
The trepan bur of the Masserann Kit has only two short, robust saw teeth. These teeth are cut in such a way that the trepan, guided by the fragment, will create a circular "trench" around the periphery of the broken fragment embedded in the dentine or cement.
If the trepan is removed at this stage, the fragment will remain untouched - as the core formed by the hollow cylinder of the trepan.
This stage of the operation is completed when the depth is sufficient (usually, about half the length of the fragment) to allow the fragment to be gripped for removal during stage two of the operation.
A slight lubrication of the canal will facilitate the procedure. The trepan should be given only a few turns at a time. From time to time, it should be removed and the debris cleared out of the canal.
If the trepan becomes blunt, it should be replaced or sharpened (See page 11).

Stage 2. Gripping and extracting the fragment
The instrument used for this operation grips the fragment so that it can be extracted by a pulling and twisting movement.
The trepan, complete with fragment, is then removed.

Please note: In order to show the way instruments work, we have described them as two different appliances. However, in reality, the precise manufacturing of the MICRO-MEGA trepans allows their use in both the freeing and the extraction of fragments (French patent No. 1/516/015).

Case A. Part of the fragment is visible

Setting free

After having exposed 2 to 3 mm. of the fragment, it is important to ensure that the inner diameter of the trepan already used is not too wide. If necessary, use a trepan of smaller diameter to correspond to the exact diameter of the fragment.

Gripping

After having exposed the broken segment up to
about half of its depth, a trepan is used, the diameter of which is one size smaller than the one used up to now. This has to grip onto the metal until it is sufficiently secured in order that the fragment may be pulled out.

**Case B. A fragment is lodged deep in the canal**

**Approach**

Before setting the fragment free with the aid of the trepan, the canal should be prepared i.e. it has to be enlarged to the size of the outer diameter of the trepan.

This preparation work is performed with a round bur, the size of which is chosen with the help of the holes in the flat gauge.

After checking the direction of the axis of the root, the trepan is introduced. When boring, no undue pressure should be used thus avoiding excessive strain on the teeth of the instrument. If a tooth of the trepan gets caught, or even breaks, this is the result of incorrect use of the instrument.

The direction of the trepan may be corrected with the help of a radiograph showing the trepan in place.

**Gripping**

The procedure is as previously described.

**Special cases**

**Tapered posts:** In this case, one uses instruments of decreasing diameter until a cylindrical segment is created, and the remaining procedure is as described above.

**Points with irregularities (screw-posts, grooves, striations, etc.):** The setting free must be done on the entire length of the fragment. This operation is lengthy and more dentine must be sacrificed.

**A broken trepan tooth in the canal:** The trepan is sharpened again but in the order direction (if before it was cutting clockwise, it should now cut in an anti-clockwise direction). After this, the trepan is introduced into the canal and the broken tooth of the trepan is pushed in the same direction. This procedure is usually successful.
Group 2
Gates and Mooser drills

This group includes those instruments which have three or four cutting edges and are generally used for preparing the canal for a post-crown. The operation for setting free such instruments remains the same. The operation of gripping and extracting is easier if the practitioner cuts one or more notches in the trepan, using a cutting disc. These notches grip into the unevenness of the fragment, so that the trepan acts as a screwdriver.

Group 3
Fine instruments

The method here consists in opening the canal so that it is possible to introduce the small special Masserann extractor in which the broken part may be gripped and extracted.

This extractor consists in a small tube A which contains an internal embossment B. Opposing B, in the interior of the tube, is a moveable abutment C, with which the fragment, when lodged in the tube, can be secured (fig. 1).

Procedure of operation

Let suppose that a broken fragment remains at the apex of the canal (fig. 2, 3). With a round bur, the axis of the canal is reached. With a single-rooted tooth, the direct way passes through the point or middle of the incisal edge, which one should not hesitate to sacrifice (fig. 4).

According to the size of the canal, select one of the two Masserann extractors. If the diameter of the canal allows, it is easier to use the larger instrument.

Then choose, with the help of the flat gauge, the corresponding Gates drill and the trepan.

Example: having chosen the 1.5 mm. extractor, use the flat gauge to choose the trepan (1.5 mm.) on the graduation mark 15-12. Since there is no hole in this position for choosing the Gates bur, take the next bigger one, which is the one opposite the graduation mark 16-12.

Approach

The canal is prepared with the Gates bur until the fragment (fig. 5) is reached. As the Gates drill is guided, a false route is impossible, as it might occur with a bur or reamer for instance.

Be always sure that a broach No 5 goes through till the broken instrument to let the Gates freely progress.
Setting free
Then, the trepan is introduced in the prepared canal and exactly fits the path created by the Gates drill.
A circular trench of about 4 or 5 mm. deep is made around the fragment which will then stand free in the canal (fig. 6, 7).
This is noticed after removing the trepan after three or four turns (See group 1, setting free).
The end of the trepan will be full of dentine particles. If this shows the impression of the fragment to be removed, the trepan has the correct direction.
Otherwise, it would appear that a false route has been taken and a radiograph is necessary.

Gripping
After setting free, introduce the open Masserann extractor over the exposed fragment.
Press the extractor firmly into the canal and turn the screw ring, which makes the abutment (C) advance and grip the fragment of metal at the embossment (B) (fig. 8). Then, the whole is removed by turning in an anti-clockwise direction. All canal instruments are similar to wood-screws and can only be pulled out by unscrewing them.
When the broken instrument has been removed, a ledge will be seen to have been made by the action of the trepan. This can be removed by inserting the Gates drill and penetrating a further 2 - 3 mm.
Untoerseen incidents during operation

During the freeing of the fragment, it may happen that (in very calcified canals) the trepan creates a cylinder of dentine of several millimeters in length.

In this case, the Masserann extractor will not be able to be inserted and the dentine will have to be removed in order that the fragment can be gripped.

There are two ways to proceed:

a) If the broken instrument is large, it is sufficient to continue work with the trepan. Eventually, the cylinder of dentine will break off in the trepan and, very often, the offending fragment is removed at the same time.

b) If the fragment is fine, the created cylinder of dentine is removed using a trepan of a smaller diameter.

Please note: It is not claimed that all fragments can be removed from a canal. The canal must be straight, or be able to be put straight, as fragments, lodged around the curve of a canal, cannot be approached by the MICRO-MEGA instrumentation. Therefore, the chance of success has to be evaluated beforehand with the aid of a radiograph of the tooth.

1. Broken Mooser drill
2. Caught in the trepan
3. The fragment is removed from the root.
4. A broken reamer in the canal of an upper premolar.
   An instrument has been introduced in order to show more clearly where the fragment is situated.
5. The reamer in the trepan.
6. The fragment has been removed, the root ready for filling.
Sharpening the teeth of a trepan

The illustrations below show how the practitioner can sharpen a trepan. This is done by 5 cuts, using a disc.
1. The tube is cut at right angles to the axis (fig. 1).
2. Now, a longitudinal cut is made at a shallow angle, almost perpendicular to the axis of the first cut (about 10°) (fig. 2).
3. Finally, the edges of the two teeth are filed as in fig. 3. Fig. 4 shows the profile of the edges of the two teeth.
AN "ERROR" TO BE AVOIDED:

The broken instrument remains at the apex of the flat oval canal. The practitioner has already tried to enlarge this canal, in order to remove the metallic fragment. The trepan risks to slide beside the fragment, through it seems on the X-ray (right) that the fragment is exactly placed in the middle of the extractor.

CAUTION!

The Gates bur has a diameter of 14/10. Before placing the extractor n° 15 a trepan n° 15 or 16 should be passed through.
Composition of the Masserann Kit

2 extractors: 1 Ø 1.2       6601
           1 Ø 1.5       6602
1 flat spanner       6605
1 flat gauge        6606
1 handle            6604
1 milled holder     6603
1 star gauge 11 to 17 6607
1 star gauge 18 to 24 6608
1 series of 14 trepan burs into lengths:
   1 trepan bur Ø 1.1 (long)  6623/L
   1 trepan bur Ø 1.1 (short) 6623/C
2 trepan burs Ø 1.2       6624/L - 6624/C
2 trepan burs Ø 1.3       6625/L - 6625/C
2 trepan burs Ø 1.4       6626/L - 6626/C
2 trepan burs Ø 1.5       6627/L - 6627/C
2 trepan burs Ø 1.6       6628/L - 6628/C
2 trepan burs Ø 1.7       6629/L - 6629/C
2 trepan burs Ø 1.8       6630/L - 6630/C
2 trepan burs Ø 1.9       6631/L - 6631/C
2 trepan burs Ø 2.0       6632/L - 6632/C
2 trepan burs Ø 2.1       6633/L - 6633/C
2 trepan burs Ø 2.2       6634/L - 6634/C
2 trepan burs Ø 2.3       6635/L - 6635/C
2 trepan burs Ø 2.4       6636/L - 6636/C

drawings:
   trepan bur (long)
   trepan bur (short)
   extractor
   star gauge 11 to 17
   star gauge 18 to 24
   flat gauge
   flat spanner

The trepan burs are sold in plates of 4 instruments, i.e. twice two lengths of a same number.
The other instruments are sold per piece.
Caution!

The trepans are made of a specially hardened steel, to work in dentine, but no too hard in order to avoid breakage. Nevertheless, they are fragile because of their thinness which has been reduced to a minimum to avoid too much destruction of the dentine (1.5 tenth of a millimeter). Therefore, they cannot be used indefinitely.

For a screw-post's extraction, the extracting trepan grips into the fragment being damaged and not fit for another use without sharpening. In many cases, it has to be replaced.

When one is setting free a broken instrument, it can happen that the trepan touches the instruments during its work, even more if it progresses sidewise. In this case, it can be very quickly damaged.

All the same, when one is pushing a trepan into a conical hole, the two teeth are drawn together. Then it becomes necessary to begin with a cylindrical bur of the same diameter as the trepan in order to let it work in a cylinder instead of a cone.

In any case, a used trepan is totally or partially damages. It has to be sharpened or replaced.