**ENDO REMOVAL SYSTEM**

Set of endodontic micro instruments for removing broken canal instruments

*by K. Gonczowski*
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Dr Krzysztof Gończowski graduated from the Jagiellonian University, Cracow. From 2001 to 2008 he was employed as an assistant and lecturer at the Dental Institute (Division of Dental Propedeutics and Integrated Dentistry, Division of Preventive Dentistry and Endodontics) in Cracow. In 2005 Dr Gończowski received a doctoral degree in medicine from the Jagiellonian University in Cracow, and in 2007 he became a specialist in preventive dentistry and endodontics. Since 2001 he has been in private dental practice in Cracow. From 2006 to 2012 he was the medical manager of Indexmedica Inc. and since 2012 he has been the medical CEO of DENTestetica Dental Clinic in Cracow. He received two scholarships to study at German universities in Cologne and Munich. Since 2005 he has been involved in training dental doctors both in Poland and abroad (in over 30 countries within Europe, Asia and Africa), lecturing on endodontics, dental local anaesthesia and resuscitation. Dr Gończowski is a member of various Polish and international scientific associations: IADR (International Association for Dental Research), ESE (European Society of Endodontology), SAAD (Society for the Advancement of Anaesthesia in Dentistry), ERC (European Resuscitation Council), PTS (Polish Dental Association). He has published over 35 scientific articles in Polish and foreign dental journals. He has received many awards for his research, e.g. the CED Travel Stipend (IADR) on two occasions, and the Expertise Talent Award Europe for Young Scientists. In 2010 he designed a system of endodontic microinstruments to remove broken dental tools from root canals - the Endo Removal System® (Cerkamed). He is one of the originators of ENDO-STATION® (Cerkamed), a system of irrigating root canals. He specializes in pain-free dentistry, endodontics and microsurgery.
Introduction
Removing a piece of broken endodontic instrument or a radix post is one of the most difficult operations performed by dental surgeons. A commonly used method for removing fragments of endodontic instruments is the ultrasound method. This method consists of unblocking and mobilizing the separated fragment of the instrument by the use of a vibrating ultrasound tip, without water cooling, and by inspecting it visually through magnifying glasses or a surgical microscope. The biggest drawback of this method is the lack of possibility to directly seize the broken instrument. It very often happens that after breaking the old material filling in the root canal and mobilizing the fragment of the endodontic instrument, it is technically impossible to remove the foreign body, for example, because it is located deep inside the narrow root canal. Therefore, using specially designed micro clamp instruments together with a set of endodontic micro chisels makes it possible to remove the broken instrument extremely quickly and easily, without any risk of complications, such as perforation of the root canal wall. Three micro clamp instruments and five micro chisels have been designed and produced in line with the principles of work ergonomics using a surgical microscope and with the use of top class surgical steel alloys.
Working principles

Working with the ERS system of micro instruments - Endo Removal System, designed by Dr Gończowski, is based on a few simple principles:

1. Initial identification of the location of a broken endodontic instrument using RVG and/or CBCT
2. Performing the operation inspected visually through magnifying glasses or by use of an endodontic microscope
3. Obtaining the widest possible access to the broken instrument by use of the ultrasound system and/or by use of special endodontic burs (e.g. Munce)
4. Unblocking and mobilizing the broken fragment of instrument by use of ultrasound and/or by use of endodontic micro chisels from the ERS system
5. Seizing and removing the broken fragment of instrument by use of a micro clamp instrument or endodontic micro lever of the ERS system - the type of micro instrument is selected depending on the depth reached during the operation, the diameter of the root canal and the blocking strength of the broken fragment
130-130
Endodontic micro tweezers
1) **Endodontic micro tweezers (code: 130-130)**

Total length: 130 mm  
Length of tips: 25 mm  
Length of serrated working part: 5 mm  
Diameter of working part with tips closed: 0.6-0.8 mm  
Force of pressure: 100-150 g

**Operational parameters:**

- Long, thin tips bent at a 60° angle to the handle enabling the introduction of the instrument deep into the root canal, as well as ensuring comfort while using a microscope and without obscuring the field of vision.
- The pointed and serrated working part makes it easy to firmly seize the broken instrument in the root canal.
- Directly behind the serrated working part there is a micro pin stabilizing the position of tips when they are closed. As a result, the repeatability of the position of both the serrated working parts against each other was obtained, and the frequent effect of tips passing each other was eliminated.
- Wide middle section on the handle with anti-sliding grooves.
- Two pins stabilizing the position of the handles against each other and preventing deformation of the delicate serrated working part by excessive clamping of the instrument.
- Specially designed holes in the handle which make it easier to hold the instrument in a stable position.

**Application:**
Removing fragments of broken endodontic instruments from root canals after first being unblocked by use of ultrasound. Thanks to the appropriately shaped profile of the very long, thin, serrated working part, this instrument enables the surgeon to reach broken endodontic instruments at considerable depths, as well as seize them firmly and remove from the root canal.

**Technique:**
An identified fragment of a broken endodontic instrument should first be unblocked using any ultrasound system equipped with the correct extensions. This applies to both broken endodontic instruments blocked in empty root canals, and fragments of instruments blocked by old material filling in a root canal (e.g. cement or Endomethason). Only loose fragments of broken endodontic instruments can be removed using the micro tweezers. Releasing a blocked fragment of a broken endodontic instrument, or attempting to pull it out by force from the old filling material, without the use of ultrasound, may result in irreparable damage to the micro tweezers.
Clamp Instruments

018-180
Endodontic micro forceps
2) Endodontic micro forceps (code: 018-180)

- Total length: 170 mm
- Length of tips: 30 mm
- Diameter of working part with tips closed: 0.8 mm
- Strength of pressure: 200-300 g

**Operational parameters:**
- The long, thin tips bent at a 90° angle to the handle make it possible to introduce the instrument deep into the root canal as well as ensuring comfort while using a microscope and without obscuring the field of vision.
- The working part has three movable and serrated jaws at the tip for extremely strong and firm seizing of a broken instrument inside the root canal in any configuration – the broken instrument is positioned centrally between the serrated edges of the three jaws, or laterally in the slit between any two jaws.
- The triple jaws of the micro forceps are clamped by means of a sliding-over tube and not by means of a lever, so the opening angle is minimal and the instrument itself can be introduced deep into a root canal while viewed through a microscope. This mechanism also eliminates the adverse phenomenon of tips „passing” each other.
- A spring in the handle automatically opens the forceps when pressure is released.
- The ergonomic and comfortable handle is textured to stabilize the grip.

**Application:**
Removing fragments of broken endodontic instruments from root canals after previously releasing them using ultrasound, or in the case of soft materials (e.g. Endomethason), removing broken fragments directly, without the use of ultrasound. Thanks to its appropriately shaped profile and a long, ultra thin (0.8 mm), serrated working part, this instrument enables the surgeon to reach broken endodontic instruments at considerable depths and firmly seize the broken fragments removing them from the root canal.

**Technique:**
An identified fragment of a broken endodontic instrument must first be unblocked using any ultrasound system equipped with the correct extensions. This applies both to broken endodontic instruments blocked in empty root canals and fragments of instruments immobilized by the hard material filling in a root canal (e.g. cement). A unique concept of three moving jaws, locked by a sliding-over tube, is utilised in this micro instrument. This allows the broken instrument to be seized strongly and firmly. The strength with which a broken instrument can be removed from a root canal is so powerful that in the case of soft materials (e.g. Endomethason) an attempt can be made to remove the instrument without the previous use of ultrasound. A broken fragment of an instrument can be seized centrally between three moving jaws, or laterally in a slit between any two jaws.
Clamp Instruments

118-125
Endodontic forceps
3) **Endodontic forceps (code: 118-125)**

Total length: 125 mm  
Length of tips: 20 mm  
Length of serrated working part: 5 mm  
Diameter of working part with tips closed: 0.8 mm  
Strength of pressure: 150-200 g

**Operational parameters:**

- The long, thin tips bent at a 60° angle to the handle enable the instrument to be introduced deep into the root canal as well as ensuring comfort while using a microscope and without obscuring the field of vision.
- The pointed and serrated working part enables the firm grip of a broken instrument or a silver pin in the root canal.
- The forceps have been equipped with a special set of serrated teeth positioned stepwise to the long axis of the tips, instead of being placed at a right angle as in classic serration. This makes it easier to introduce the instrument into the root canal and increases the pressure on the broken instrument. The unusual setting of the serration ensures a stronger resistance when removing broken instruments.
- The long axis of the forceps is S-shaped to enable the surgeon to go around the corner of the mouth and freely manipulate the instrument viewed through the microscope without obscuring the field of vision.
- The spring in the handle automatically opens the forceps when pressure is released.
- The ergonomic and comfortable handle is textured to ensure a secure grip of the instrument.

**Application:**

Removing fragments of broken endodontic instruments from root canals after first unblocking them with ultrasound, and removing silver pins. Thanks to its appropriately shaped profile and its unusually long, thin, serrated working part, this instrument enables a surgeon to reach broken fragments of endodontic instruments at considerable depths, seize them and remove them from the root canal. The special arrangement of serrated teeth positioned stepwise and the greater thickness of the tips make the instrument helpful in removing silver pins which have not been cemented, without the use of ultrasound. Silver pins are relatively soft, which significantly limits the application of ultrasound for their removal (there is a high risk of part of a pin breaking off where the ultrasound extension makes contact with the pin).

**Technique:**

An identified fragment of a broken endodontic instrument must first be unblocked using any ultrasound system equipped with the correct extensions. This applies both to broken endodontic instruments stuck in empty root canals and fragments of instruments immobilized by old material filling in a root canal (e.g. cement or Endomethason). Due to a greater strength in pressure than in the case of micro tweezers, and the special positioning of serrated teeth, which can become stuck in soft silver alloy, this instrument is particularly recommended for removing silver pins.
Endodontic micro chisels

015-195
Endodontic micro probe - bent

015-205
Endodontic micro probe - straight
1) **Endodontic micro probe - bent and straight (code: 015-195, 015-205)**

- Total length: 195 mm (bent), 205 mm (straight)
- Length of working part: 30 mm
- Diameter of working part: 0.5 mm

**Operational parameters:**

- Stainless steel with plastic properties so that the micro probe can be bent to fit the shape of a root canal.
- The long and sharply pointed working part allows the micro probe to be introduced deep inside the root canal without obscuring the field of vision while using the microscope.
- A light and ergonomic non-slip handle with a large diameter and profiled cuts for stable grip of the instrument.

**Application:**

Identification of access into root canals, and establishing the position and blocking force of broken endodontic instruments and silver pins in root canals.

**Technique:**

To ensure free access to the operational field under the microscope the probe must be appropriately bent to the shape of the root canal, e.g. using a special bending tool for canulas with liquid gutta-percha or an endodontic line from Dentsply-Maileffer, fitted with two pins for bending endodontic instruments.
Endodontic micro chisels

016-002
Endodontic inwards micro chisel

016-001
Endodontic outwards micro chisel
2) **Endodontic inwards and outwards micro chisel (code: 016-002, 016-001)**

Total length: 205 mm  
Length of working part: 7 mm  
Width of working part: 0.6 mm

**Operational parameters:**

- Stainless steel with plastic properties so that the micro chisel can be bent to fit the shape of a root canal.
- Long and sharply pointed working part so that the micro chisel can be introduced deep inside the root canal without covering the field of vision in the microscope.
- The working part has the shape of a micro chisel: a semicircular cross-section and a sharp cutting edge at the top.
- A light and ergonomic non-slip handle with a large diameter and profiled cuts for a stable grip of the instrument.

**Application:**  
Unblocking and releasing broken fragments of endodontic instruments or silver pins in root canals.

**Technique:**  
The working part of the micro chisel is introduced between the wall of a root canal and the broken and blocked fragment of an endodontic instrument. The micro chisel should be directed with its concave surface towards the instrument which is being removed.
Endodontic micro chisels

017-008
Endodontic micro lever
3) Endodontic micro lever (code: 017-008)

Total length: 205 mm
Length of working part: 7.5 mm
Diameter of working part (rounded cutting edge): 0.6 mm
Exit diameter of cone blocking the broken instrument: 0.8 mm

Operational parameters:
- Stainless steel with plastic properties enabling the micro lever to be bent to fit the shape of a root canal.
- The long and thin working part allows the micro lever to be introduced deep inside a root canal without covering the field of vision under the microscope.
- The working part has the shape of a semi-open tube with a sharp cutting edge at the top. After the first 1 mm the rounded cutting edge turns into a cone that widens towards the handle, which is responsible for blocking the released fragment of a broken endodontic instrument. Above the cone there is a small window through which one can view through the microscope the depth to which the micro lever is introduced to the broken instrument.
- The semi-open tube makes it possible to clean the working part with mandryl to remove retention material (depending on the expected bonding power: sticky wax or glassionomer cement), block the broken instrument with an endodontic micro probe or introduce a loop-shaped piece of thin endodontic wire when using the „lasso“ method.
- A light and ergonomic non-slip handle with a large diameter and profiled cuts for a stable grip of the instrument.

Application:
Removing fragments of broken endodontic instruments from root canals after they have been unblocked using ultrasound systems.

Technique:
Retention material is applied to the working part of the micro lever on the cutting edge side (the top of the instrument). Depending on the expected bonding power sticky wax or glassionomer cement can be used. Once the working part is prepared it is applied to the broken, previously unblocked fragment of an endodontic instrument. After waiting for the time required for glassionomer cement to bond, or immediately when using sticky wax, the micro lever should be taken out of the root canal together with the seized broken instrument. After the operation is finished (before sterilization) the working part must be carefully cleaned to remove the remains of the retention material (e.g. ultrasound washer and mandryl). Alternatively, it is possible to use the technique of wedging the broken fragment of an endodontic instrument by simultaneously using the micro lever and the micro probe. It is also possible to use the „lasso“ technique which consists of seizing the broken instrument by tightening a loop made from a piece of thin orthodontic wire.
SET OF ENDODONTIC MICRO INSTRUMENTS FOR REMOVING BROKEN CANAL INSTRUMENTS

BEFORE USE PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY
PRODUCT FOR DENTAL USE ONLY
NON - STERILE PRODUCT STERILIZE DIRECTLY BEFORE USE

HANDLING THE TOOLS MADE OF STAINLESS STEEL
Special processes have been undertaken during the manufacture of the instruments to ensure corrosion-resistant. In spite of this, the durability of the instruments depends on their proper use and correct maintenance.

Cleaning, rinsing and washing
The packaged instruments are non-sterile. Before sterilization these new instruments should be washed thoroughly with warm water and using detergent. Before each use the instruments must be sterilized.

Sterilization
All (reusable) dental instruments must be disinfected, then washed out to remove detergent and then dried before sterilization. Ultrasonic cleansing is recommended in particular as the most effective sterilization.

Recommended sterilization methods:

<table>
<thead>
<tr>
<th>Method</th>
<th>Recommended temperature and duration</th>
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</thead>
<tbody>
<tr>
<td>Steam autoclave</td>
<td>121 °C, for 20 minutes</td>
</tr>
<tr>
<td>Dry air</td>
<td>160 °C, from 60 to 120 minutes</td>
</tr>
<tr>
<td>Chemical vapours</td>
<td>132 °C, for appr. 20 minutes</td>
</tr>
</tbody>
</table>

PRECAUTIONS
Adhere to the guidelines for cleaning and sterilization of the dental instruments.

STORAGE
Instruments should be stored in temperatures ranging between 5-30°C and relative humidity up to 70%. Before use inspect the instrument for any contamination or damage of the material structure (cracks, bends, fragments, peeling, etc). Failure to adhere to the above stated instructions decrease instrument durability and reduce instrument lifetime.

Manufacturer provides the guarantee for a year after the date of purchase provided the adherence to the stated instruction of maintenance.
PRO
Endodontic micro tweezers
(code: 130-130)
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Endodontic forceps
(code: 118-125)
Endodontic micro probe - straight
(code: 015-205)
Endodontic micro probe - bent
(code: 015-195)
Endodontic outwards micro chisel
(code: 016-001)
Endodontic inwards micro chisel
(code: 016-002)
Endodontic micro lever
(code: 017-008)

PLUS
Endodontic micro forceps
(code: 018-180)
Endodontic forceps
(code: 118-125)
Endodontic micro probe - bent
(code: 015-195)
Endodontic micro lever
(code: 017-008)

BASIC
Endodontic micro forceps
(code: 018-180)
Endodontic micro probe - bent
(code: 015-195)
Endodontic micro lever
(code: 017-008)