

# NEW ROTARY MECHANICAL SYSTEMS THAT USE NI-TI NEEDLES AND THE CROWN-DOWN TECHNIQUE IN ORDER TO PREPARE THE ROOT CHANNELS

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**Abstract:** The preparation of root channels is important in the endodontic treatment which aims at processing the endodontic space with the purpose of accomplishing the medicinal treatment and root filling from the pulp-periodontal infected teeth. Today, within the Crown-Down technique, it is recommended to use the rotary mechanical systems which use endodontic needles made up of Ni-Ti, such as: Profile System (Maillefer), Hero System (Micro-Mega), and the Tri-Auto ZK System (Morita). Regarding the major advantages in using these systems, we can mention: a technique easy to be learnt by the practitioner, high precision system technology, and minimum risk regarding possible therapeutic failures.

**Keywords:** endodontic space, root channel preparation, Crown-Down technique, rotary mechanical systems, Ni-Ti needles

**Rezumat:** Pregătirea canalelor radiculare este un timp de lucru important în endodonție care vizează prelucrarea spațiului endodontic în vederea realizării tratamentului medicamentos și a obturației radiculare de la nivelul dinților infectați pulpo-periodontal. La ora actuală, în cadrul tehnicii Crown-Down se recomandă cu precădere sistemele mecanice rotative care folosesc ace endodontice din Ni-Ti. Dintre acestea enumerăm: sistemul Profile (Maillefer), sistemul Hero (Micro-Mega) și sistemul Tri-Auto ZK (Morita). Ca avantaje majore în utilizarea acestor sisteme, menționăm: ușurința în însușirea tehnicii de lucru pentru practician, tehnologia sistemelor care este de înaltă precizie, gradul de risc care este minim față de eventualele eșecuri terapeutice.

**Cuvinte cheie:** spațiu endodontic, pregătirea canalelor radiculare, tehnica Crown-Down, sisteme mecanice rotative, ace din Ni-Ti

Recent years studies were focused on the study of the improvements necessary to the metal which the channel needles are made up of; their section form, conical shape of their active part led to the conception of certain special needle assembled to a special safesider and the use of the Crown-Down technique, of small speed (150-600 rotations/minute), brings about a better preparation of the root channels.

People reached the conclusion that the Ni-Ti needles give better results in their mechanical use than in

the manual one, as those manual are easier, change their form easily and slips on the dentine area.

Within this context, today, there are many systems, such as:

- Profile system belonging to Maillefer company;
- Hero system of Micro-Mega;
- Tri-Auto ZK system of the Japanese company, Morita.

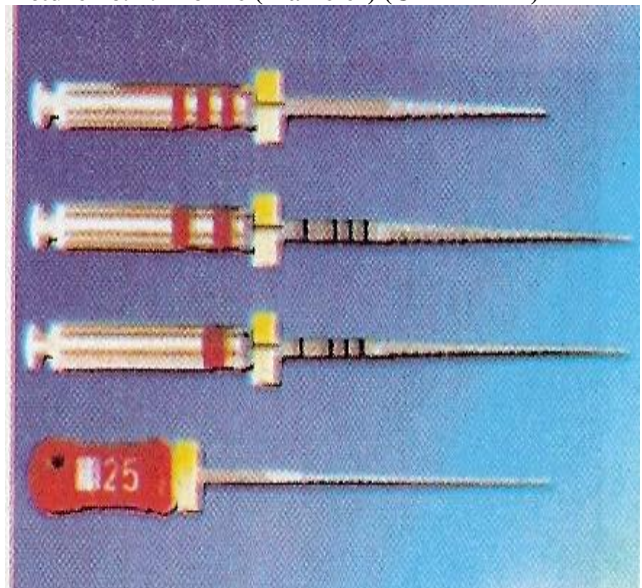
## A. ProFile System (Maillefer)

It uses the ProFile needle assembled on a safesider with constant speed (300-600 rotations/minute), which accomplishes, through the Crown-Down technique, an efficient preparation of all portions of the root channel.

ProFile piles (Picture no. 1), have as their characteristics the increase of the conical shape of the active part (Picture no. 2) that determines the differentiation of three types of instruments:

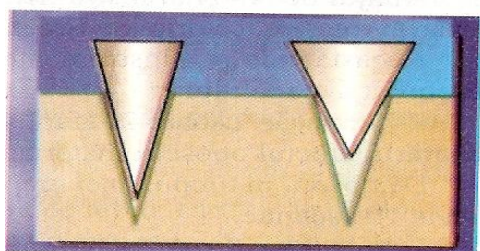
- Maillefer ProFile Orifice Shapers (conical shape 5-8% for the coronary level of the tooth);
- Maillefer ProFile 06 (conical shape 6%, for the middle section of the channel);
- Maillefer ProFile 04 (conical shape 4%, for the apical channel);

Picture no. 1. ProFile (Maillefer) (C HERLEA)



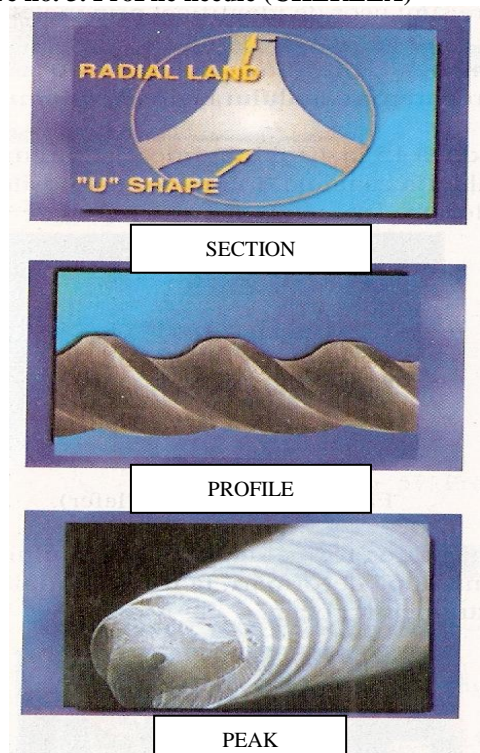
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**Picture no. 2. Conical shape of the ProFile needles (CHERLEA)**



At section level, the ProFile needles have three U-shaped grooves and three small cutting areas. The peak is not a cutter, making possible the advancement of the knife on the channel, with a minimal pressure. Picture no. 3.

**Picture no. 3. ProFile needle (CHERLEA)**

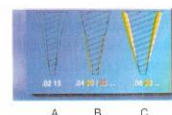


The Crown-Down technique differently uses at the level of the three portions of the channel, those three types of ProFile piles, of sizes corresponding to the channel thickness. This technique observes the following stages:

- Establishing the working length of the channel (minus 3 mm);

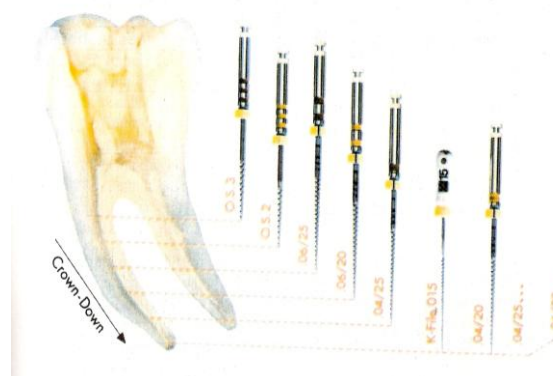
- Preparing the apical area;
- Final finishing. Pictures 4 and 5;

**Picture no. 4. Crown-Down technique (CHERLEA)**



A. Working length  
B. Apical preparation  
C. Final finishing

**Picture no. 5. Crown-Down technique with ProFile needles, according to the size of the channels towards the apex (CHERLEA)**



All these are accomplished under the influence of a continuous irrigation, with 2,5% NaOCl solution, in each stage of the apical preparation and finishing. EDTA solution may also be used alternatively with NaOCl solution.

### **B. Hero-642 system (Micro-Mega)**

Hero High Elasticity in Rotation – 642 uses special thin needles made up of Ni-Ti, acted by a special counter-angle head.

Within the Crown-Down technique, the counter-angle head is or not provided with light (Sirius 04L,06L); it is of low speed (300-600 rotations/minute), using an electrical or air compressed engine. Picture no. 6.

**Picture no. 6. Hero 642 (Micro-Mega) (CHERLEA)**



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Helifile MM needles are changed, thin and different from the classic ones:

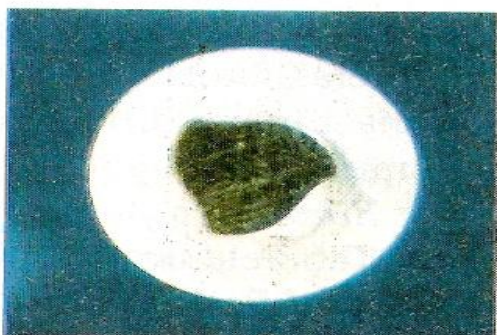
- Conical shape 06%, 04%, 02%,
- Length 21-25-29 mm,
- Peak diameters observe the ISO standards. Table 1.

**Table no. 1. Characteristics of the Hero needles (CHERLEA)**

	20	25	30	35	40	45	Length
6%	0	0	0	-	-	-	21 mm 25 mm
4%	0	0	0	-	-	-	21 mm 25 mm 29 mm
2%	0	0	0	0	0	0	21 mm 25 mm 29 mm

Ni-Ti Needle – HeliFile system have three cutting blades for a positive cut with cleaning effect (pumping movements), while the peak that is placed in the centre of the canal does not make any contact with the walls. Picture no. 7.

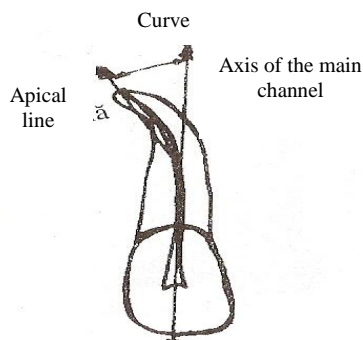
**Picture no. 7. The three cutting areas of Hero 642 (CHERLEA)**



The system's technique is different, according to the curve degree (Picture no. 8) of the root channels, where three types could be distinguished:

- Channels that are easily treated – generally, they are straight and have a curve of maximum 5;
- Channels of average difficulty – where the curve may be  $> 10 < 25$ ;
- Difficult curve – where the curve  $> 25$

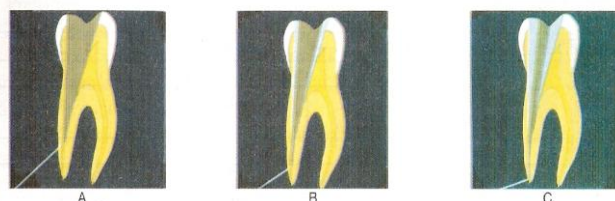
**Picture no. 8. Apical curve (CHERLEA)**



The treatment stages will be made according to their conical shape of the channel instruments 06%, 04%, 02%, reported to those three portions of the channel: coronary, average and apical portions, according to the images of the Pictures no. 9.

**Picture no. 9. Stages of treatment according to the conical shape of the instruments:**

- Conical shape of 0,6 – 1/2 or 2/3 of the working length will be treated;
- Conical shape 0,4 – the working length less 2 mm will be treated;
- Conical shape 0,2 – the entire working length will be treated (CHERLEA).



- In the case of the easy channels, three instruments are used – the blue series or Hero no.30. Table 2.

**Table no. 2. Treatment stages in the easy channels (right or curve  $< 5$ ) Blue series (CHERLEA)**

DIAMETER	6%	4%	2%
No.30	1/2-2/3LL	LL-2mm	LL

- Regarding the channels of average and increased difficulty, the use of the Hero 642 of diameter 30 is completed with needles of diameter 25 and 20, with a conical shape of 06%, 04%, 02%. Table 3.

**Table no. 3. Stages of treatment for the channels with average difficulty (curve  $> 10$  and  $< 25$ ) Red series (CHERLEA)**

DIAMETER	6%	4%	2%
No. 25	1/2-2/3 LL	LL-2mm	LL
No. 30		LL-X	LL

- Regarding the very difficult channels, digging the apical region may be made manually. Table 4.

**Table no. 4. Stages of treatment for the difficult channels. (curve  $> 25$ ) Yellow series (CHERLEA)**

DIAMETER	6%	4%	2%
No. 20	1/2-2/3	LL-2mm	LL
No. 25		LL-X	LL
No. 30			LL
		DIAMETER	LL
			LL
			LL

Regarding the Hero-642 system, it is important to note the following aspects:

Irrespective of the treatment stage or of the channels difficulty level, this method recommends to frequently wash them with plenty of water in order to remove the detritus;

- The method is simple, safe and easy to assimilate because the peak is maintained in the centre of the

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channel and may be combined with sonic or manual instruments;

2. Precautions – Hero 642 needles must be checked after each use and will be thrown away if any default or deformation is observed;

### C. Tri Auto ZK system

With a view to prepare the channels, this system used Ni-Ti needles and a hand safesider without electrical cable and controlled by a microprocessor included in it.

The head of the system may be detached and sterilized and due to the absence of the electrical cable, the piece may be easy to handle. Picture no. 10.

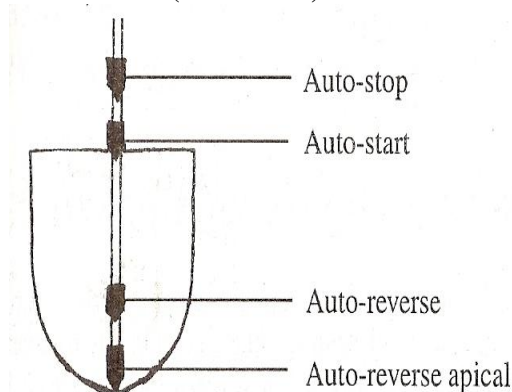
**Picture no. 10. Tri Auto ZK (CHERLEA)**



Thanks to the microprocessor, this system has three self-acting functions:

- auto-start and stop;
- auto-reverse;
- auto-reverse apical. Picture no. 11

**Picture no. 11. Self-acting functions of the Tri Auto ZK instrument (CHERLEA)**



The needle starts rotating when it enters the channel and will automatically advance towards the apex through rotation movements in clockwise. If the needle is “stuck” in the channel, the auto-reverse function enters into action. When the needle reaches the apical constriction, the scale will indicate the value of 0,5 and you will hear a “strong” beep. Afterwards, the auto-reverse apical function enters into action, moment in

which the needle starts to rotate in counter clockwise sense, if it reaches the apex.

The working technique uses Gates-Glidden drills for the apical membrane and a stainless Kerr needle of a size corresponding to the channel for the apical preparation.

The measurement of the length of the channel will be made with Ker standard needle no. 10, which advances in the channel until the metric scale shows -0,5, this way reaching the apex, so the length of the channel will remain in the device memory.

On the self-acting function, a Ni-Ti needle will be assembled for the preparation of the channel that will rotate when the needle enters the channels or will end when the needle is removed from the channel.

The producers sustain that Tri Auto ZK system removes any risk relative to:

- any over-exceed of the apex, through the auto-reverse apical function;
- excessive enlargement of the channel;
- creating thresholds, false ways, through the use of the very flexible Ni-Ti needles;
- breaking the needle through the auto-reverse function.

## CONCLUSIONS

The use of the rotation mechanical systems that use endodontic Ni-Ti needles for the preparation of the root channels emphasized a lot of advantages, such as:

1. accuracy in applying the Crown-Down technique, regarding the preparation of the root channels, irrespective of their curve level;
2. superiority of the endodontic Ni-Ti needles over the manual needles;
3. the modern technology used in the conception of these mechanical systems practically removes any risk in preparing the channels;

If a root channel is perfectly prepared and then correctly sterilized and closed, the acute or chronic periapical complications may be avoided.

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