

*In the name of GOD*

*Most Gracious, Most Merciful*

- . Praise be to God, the Cherisher and Sustainer of the worlds;*
- . Most Gracious, Most Merciful;*
- . The only owner of the Day of Recompense.*
- . You (Alone) do us worship, and You (Alone) we ask for help.*
- . Show us the straight way,*
- . The way of those on whom you have bestowed, you're Grace, neither of those who earned Your Anger nor of those who went astray.*

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Comparison of the amount of debris extruded  
apically , in two rotary techniques: Flexmaster  
and M2**

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شیراز

*Dedicated to :*

*My Parents*

*Whose indefinite devotion can not be appreciated by anything in the  
world.*

*Dedicated to :*

*My Beloved  
Brothers and Sisters,*

*Eng. Maryam Niknam*

*Eng. Mehrnaz Niknam*

*Abdosaheb*

*Hadiéh*

*Dariush*

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*These two scholars enrich the lives of their students, their colleagues  
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## **Introduction**

There are different types of instruments and techniques for canal preparation. The extrusion of debris from the apex during this procedure is problematic. Several studies have been conducted to eliminate this problem that may cause flare-ups which is originated by the introduction of bacteria, pulpal tissue and irrigating solutions into the periapical tissues. One proposed solution to prevent infective flare-ups is the appropriate selection of instrumentation technique to extrude lesser amounts of debris apically. Crown down technique for debris extrusion has been the most effective one.

In Crown down technique, since larger files first enlarge the coronal two-thirds of the canals, the reduction of the amount of debris extrusion occurs. Nowadays rotary instruments, which are base on crown down technique have been used extensively by Endodontists and they have been recommended for the extrusion of lesser debris. The rotary instruments reduce debris extrusion in comparison with manual ones which maybe due to the use of Crown down technique.

Recently, M2 rotary system has been introduced. The manufacturers have proposed to use single length technique, in which every file from the first file to the last should reach the apex. It is certain that in conventional technique (step back) more

debris extrusion occurs which maybe true to M2 (single length technique) due to the similarity between both techniques.

The purpose of this study is to compare of the amount of debris extruded apically, using the Flex Master rotary files through crown down technique, and the M2 rotary files through single length technique.



**Chapter 1**

**Endodontic Instruments**

## **Introduction**

<sup>2</sup>Historically, very little was done to improve the quality or standardization of instruments until the 1950s, when two research groups started reporting on the sizing, strength, and materials that went into hand instruments. After the introduction of standardized instruments,<sup>3</sup> about the only changes made were the universal use of stainless rather than carbon steel and the addition of smaller (Nos. 6 and 8) and larger (No. 110 to 140) sizes as well as color coding and the reemergence of power-driven instruments. By 1962, a working committee on standardization had been formed including manufacturers, the American Association of Endodontists (AAE), and the American Dental Association (ADA). This group evolved into the present day International Standards Organization (ISO). It was not until 1976, however, that the first approved specification for root canal instruments was published (ADA Specification No. 28), 18 years after Ingle and Levine first proposed standardization in 1958.<sup>4</sup>

After initial resistance by many manufacturers, who felt that the change would entail a “considerable investment in new dies and machinery to produce them,” all manufacturers, worldwide, eventually accepted the new sizing. This numbering system, last revised in 2002,<sup>5</sup> using numbers from 6 to 140, was not just arbitrary but was based on the diameter of the instruments in hundredths of a millimeter at the beginning of the tip of the blades, a point called D0 (diameter 1), and extending up the

blades to the most coronal part of the cutting edge at D16 (diameter 2)—16 mm in length. Additional revisions are under way to cover instruments constructed with new materials, designs, and tapers greater than 0.02 mm/mm. At the present time, instruments with a taper greater than the ISO 0.02 mm/mm have become popular: 0.04, 0.06, and 0.08.

## **Endodontic Instruments<sup>6</sup>**

Many different types of instruments have been designed for procedures performed inside the pulp space. These include manually operated instruments for root canal preparation, engine-driven and energized instruments for root canal preparation, instruments for root canal obturation, and rotary instruments for post space preparation.

### **ISO Classification of instruments used for pulp space preparation**

Endodontic instruments for root canal preparation can be divided into three groups:

**Group I:** Hand and finger-operated instruments, such as barbed broaches and K- type and H- type instrument.

**Group II:** Low speed instruments on which the latch type of attachment is part of the working section. Typical instruments in this group are Gates-Glidden (GG) burs and Peesoreamers.

**Group III:** Engine-driven instruments similar to the hand- and finger-operated instruments. In recent years, the use of nickel-titanium rotary instruments has become popular, and although not standardized, these instruments are included in this category.