The main goal of an endodontic treatment is the thorough cleaning and shaping of the root canal system and its complete obturation with an inert filling material. However, in order to ensure successful treatment, prior knowledge of the root canal anatomy is necessary, based on the careful interpretation of angled radiographs, proper access preparation, and a detailed exploration of the interior of the tooth, as incomplete or untreated canals may cause the treatment to fail.

History and Anatomical Configuration
Fig. 1 – Mandibular molars are most often decayed teeth, and may therefore require endodontic treatment, even at a young age. The mandibular first molar is one of the most frequently treated teeth, accounting for 17.4% of all endodontic procedures. Among endodontically treated teeth, mandibular molars are most frequently extracted, and one of the main reasons for extraction is failure of endodontic treatment (19.3%).

Fig. 2 – Therefore, prior knowledge of the anatomy of the root canal system, together with the one of the anatomical variations that may occur in various populations, is likely to increase treatment success rates.

Fig. 3 – The mesial root of mandibular molars commonly presents 1 mesiobuccal and 1 mesiolingual canals; however, other anatomical configurations have also been reported in the literature (de Pablo, Estevez, Peix Sanchez, Heilborn, & Cohenca, 2010).
In 1974, Barker, Parsons, Mills and Williams (1974) and Vertucci and Williams (1974) were the first Authors to demonstrate the presence of an extra and independent canal in the mesial root of mandibular molars using the clearing technique. Later, Pomeranz, Eidelman, and Goldberg (1981) presented a comprehensive in vivo study describing its morphology and clinical management. Since then, several Authors have reported this anatomical variation which has been termed intermediate canal (Fabra-Campos, 1989), mesio-central canal (Navarro, Luzi, Garcia, & Garcia, 2007), third mesial canal (Holtzmann, 1997), accessory mesial canal (Karapinar-Kazandag, Basrani, & Friedman, 2010), and middle mesial canal (MMC) (Pomeranz et al., 1981; Azim, Deutsch, & Solomon, 2015; Baugh & Wallace, 2004; Bond, Hartwell, Donnelly, & Portell, 1988; Nosrat, Deschenes, Tordik, Hicks, & Fouad, 2015).
Fig. 5 – Some Authors reported cases of mesial roots with four canals, although this finding should be considered rare.

It has been also postulated that, during the growth of the root, the connective pulp tissue is compressed by the accumulation of secondary dentin, which would form vertical dentinal partitions inside the root canal cavity, thus creating 3 mesial root canals. Some Authors support the view that MMC canals can be easily located in patients of a younger age group, but progressively decrease its incidence with age.
In the literature, this anatomical variation has been found in a percentage frequency ranging from 0.26% (Kim, Kim, Woo, & Kim, 2013) to 46.15% (Azim et al., 2015).

Pomeranz et al. classified the middle mesial canal into 3 possible canal configurations: fin, confluent, or independent.

**Fig. 6**  
*Independent*

If the canal remained completely separate from mesiolingual and mesiobuccal canals throughout its course.
**Fig. 7**  
*Confluent*  
When the middle mesial canal originated as a separate orifice and later on its course joined the mesiobuccal or mesiolingual canal.

**Fig. 8**  
*Fin*  
When there was a communication between middle mesial canal with either mesiobuccal or mesiolingual canal and an instrument could pass freely between them. In this case the origin of the canal was at the middle of the lingual canal. The second picture show the obturation without sealer, the third picture show a k-file through beyond the apex to the origin of the canal.

Versiani based on Pommeranz study, showned 48 different configuration of MMC.
Fig. 9 – When an additional mesial canal is present, it is located between the two main canals and its orifice is often hidden by a dentinal projection of the pulp chamber wall. This layer of dentin can be differentiated from the pulp chamber floor because its color is lighter and similar to the dentin layer that hides the MB2 orifice in maxillary molars. An operating microscope and ultrasonic tips or long shank round burs should be used to visualize and carefully remove the dentinal strip, respecting the pulp chamber floor, thus finding the extra canal orifices. During this procedures Endodontist has to take care because of the small dentin thickness toward the furcation side in relation to the MMC orifice (0.80–2.20mm), which increases the risk of root perforation. Thus, it would be advisable that clinicians use less tapered instruments during MMC preparation in order to avoid excessive dentin removal.