An endodontic emergency is defined as a pathology associated with pain or swelling, related to pulp and periapical tissue which should be addressed immediately, leading to an unscheduled visit. Immediate diagnosis and treatment are required to give relief to the patient. Because dental pain has many causes, the clinician must diagnose its origins as quickly as possible to provide fast and effective relief.

Is it actual toothache?
The first challenge for the clinician is to understand if the pain is odontogenic or non-odontogenic. Rarely, pains that are referred to teeth do not actually originate from dental structures, and failure to establish their origin will result in incorrect diagnosis and inappropriate treatment. Non-odontogenic tooth-referred pain can arise and mimic toothache while having its origin in trigeminal neuralgia, atypical facial neuralgia, migrain, temporo-mandibular joint arthrosis or dysfunction; sinusitis may cause ache to upper posterior teeth and otitis can refer pain to mandibular molars. Mandibular left toothache can be due to myocardial infarction or angina. Goes et al. recently published a case report about an acute pontine infarction presenting with acute dental pain. Even mandibular tumor can present itself with dental pain. Linn et al. found in a retrospective study that non-odontogenic pain was present in 12% of the patients referred for endodontic treatment, and that 44% of patients affected by non-odontogenic facial pain had previously received either extractions or endodontic treatment.

Patients affected by non-odontogenic pain often self-diagnose their problem as toothache, and expect quick and efficient resolution of their problem. Symptoms and signs suggestive of non-odontogenic toothache include: persistent, unchanged pain for weeks or months, rarely disrupting sleep; disproportionate responses to diagnostic tests, not reliably related to the pain; pain felt in multiple teeth; repeated or unfinished dental therapies that failed to resolve the pain; inadequate local dental cause for the pain.

It is toothache. So what is the plan?
A correct diagnosis must be assessed, determining the patient’s complaint together with the medical history. Dental history should evaluate recent treatments and any history of trauma. Pain characteristics, such as site, irradiation, time and circumstances of onset, relieving factors, should be investigated. Diagnostic aids, as usual, are periapical X-rays taken with a paralleling technique, ice sticks, hot gutta-percha for testing thermal responses, transillumination and electric pulp tester. Probing is mandatory to find vertical fractures or signs of periodontal disease. Integration of these data should make the clinician able to determine a pulp and periradicular diagnosis.

Signs and symptoms give an indication of the state of the inflamed pulp. Inflammation can be caused by many different factors, including caries, traumatic injury, occlusal trauma, abrasion, abfraction, dental procedures, dentin exposure to bleaching agents or acids, cracked tooth. The question is whether the pulp is reversibly or irreversibly damaged. In the former
case, the inflammatory process may resolve, in a similar fashion to that of other connective tissues; in the latter, if the irritation is severe, inflammatory changes involve the rest of the pulp, eventually leading to total pulp necrosis. The borderline between reversible and irreversible pulpitis is difficult to determine clinically. Reversible pulpitis is generally characterised by sharp sensitivity to cold, sometimes to sweets and sometimes to biting. The painful response to stimuli is not as prolonged and swelling is generally not present; pain ceases as soon as the stimulus is removed. Percussion is not painful, except in cases of occlusal trauma. There are no significant radiographic changes in the periapical region. Treatment follows the management of aetiology, applying a dentine bonding to sensitive dentine, prescribing a desensitizing toothpaste, checking the occlusion, removing caries and placing a restoration. Sealing the dentin with dentin bonding agents at completion of the preparation, as described by Pashley et. al, in 1992 and Magne in 2005, has a positive influence on dentin sensitivity. For a complete analysis of differential diagnosis between reversible and irreversible pulpits, see Cisneros-Capello & Segura-Egea, Aust Endod J 2005.

If pain occurs spontaneously or lingers minutes after the stimulus is removed, then the pulpitis is likely to be irreversible. The patient may be unable to locate the tooth from which the pain originates, even confusing the upper and lower jaw on the same side. When the inflammation has spread throughout the pulp, the application of heat will cause severe, prolonged pain which may be relieved by cold. Pain can be spontaneous and may last several hours. Patient may be woken at night by toothache. The tooth becomes tender to bite on when the inflammation has involved the periodontal ligament, and in this phase the patient will be able to locate the tooth. In early stages, pulp testing evokes sharp, exaggerated, delayed onset, and prolonged responses; in the later stages, heat will be more significant; cold may relieve the pain. Periapical X-rays may be normal, or an enlarged PDL may also be present. In time, total pulp necrosis, acute apical periodontitis and acute periapical abscess may ensue.

The treatment for irreversible pulpitis is removal of pulp tissue followed by cleaning and preparation of the root canal system. Irrigation with sodium hypochlorite before, during and after instrumentation is important. With current endodontic rotary and reciprocating instruments, the task of the removal of pulp tissue can be accomplished predictably and fast enough. Obtaining a complete anaesthesia in these teeth may be difficult, but this topic is discussed elsewhere on this website (http://styleitaliano.hime.host/single-tooth-anesthesia/; https://www.facebook.com/groups/styleitalianoendodontics/permalink/1039905679419447/) Prescription of analgesics after treatment is indicated.

Pain diminishes, but the jaw is badly swollen

Another endodontic emergency is acute periapical abscess. This may be considered an advanced stage of apical periodontitis. It consists of a pus collection into a cavity formed by tissue liquefaction. Bacteria induce an inflammatory response in the periradicular tissues, either chronic or acute. The chronic, often asymptomatic response leads to bone resorption around the root apex. Acute periradicular inflammation in turn usually gives rise to signs and/or symptoms, including pain and swelling. The acute, symptomatic process may develop without previous chronic inflammation or may be the result of exacerbation of a previously chronic asymptomatic lesion.

The patient with acute apical abscesses complains of pain and/or swelling; systemic manifestations, such as fever and lymphadenopathy, may also develop. The tooth is extremely sensitive to percussion, and it may or may not show radiographic evidence of periradicular radiolucency. Pulp tests are negative. Extrusion from the socket will often cause tooth mobility. Acute dental abscesses may cause severe complications and even mortality, as a result of sepsis, airway obstruction, cavernous sinus thrombosis, brain abscess and other conditions. And fatal compliancies from a dental abscess can occur in the 21st century, in the most powerful nation of the world (http://www.wlwt.com/news/tooth-infection-causes-blood-infection-leads-to-mans-death/25868246).

Treatment of acute apical abscesses involves incision for drainage and root canal treatment or extraction of the involved tooth to remove the source of infection. Drainage can be achieved through root canals by first opening up the pulp chamber, but, when swelling is present, incision for drainage should also be performed. Gaining access can be difficult because the tooth is often extremely tender; to reduce the trauma, high speed diamond burs should be used, and the tooth should be gripped gently to reduce vibrations. Dental dam clamp should be paced on an adjacent tooth. Irrigation with sodium hypochlorite and canal debridement with frequent changes of irritant can remove organic and inorganic irritants. After complete instrumentation, a calcium hydroxide dressing should be placed in the canals. In no case a tooth should be left open for drainage. There is clear evidence that the longer a tooth is left open for drainage, the more often apical surgery is required, the more appointments are required to manage the closure of the tooth, the higher the incidence of flare-ups, the higher the number of intracanal bacteria. Only in very rare cases, exudation is so severe that it is virtually impossible to close the tooth, and leaving the tooth open might be considered. Patient should be recalled within 24 hours. Trephination is the surgical perforation of the alveolar cortical plate over the root end of a tooth to release accumulated tissue exudate. The procedure has been recommended for patients with severe recalcitrant periradicular pain of endodontic origin, but its effectiveness has
been questioned and has become less frequent in its use over time. Analgesics may be prescribed for pain control. The use of antibiotics is indicated in severe and complicated abscesses. Keep in mind that extraction may be an alternative to endodontic therapy in selected cases of severe, complicated periapical abscess. Careful reduction of occlusion decreases the incidence of post-operative pain; the final treatment step of all teeth showing tenderness to mastication should be occlusal reduction.

What if it still hurts?
Acute pain following root canal procedures is another not uncommon cause of unscheduled visits. There are several factors associated with pain after root canal treatment, including the presence of pulp debris in the canals, over-instrumentation, canal contents extruded through the apex, missed canals, too high temporary filling. Mild pain is quite common and not alarming after root canal procedures, but continued or intense pain could be a sign for complications. Likely, the most common cause is infection, with pain produced by bacterial endotoxins. Analgesics, antibiotics and causal treatment can be necessary in these cases.

Unscheduled visits can happen also because of persistent pain after successful root canal treatment. Polycarpou et al. (2005) showed that the prevalence of chronic pain after successful endodontic treatment was relatively high (12%) in a tertiary referral center. This high prevalence is probably influenced by the sample characteristics, a more likely estimate being a frequency of 1.6% following dental treatment involving removal of the sensory nerve, such as extraction or root canal treatment (Nixdorf & Moana-Filho, 2011). The mechanisms that have been proposed to be involved are psychological or neuropathic. The most significant risk factors identified for this complication were the presence and duration of preoperative pain from the tooth. Perhaps an important implication of this finding is that preoperative pain should be alleviated by prompt endodontic and pharmacological intervention.