Apical Limit of Root Canal Instrumentation and Obturation, Part 2. A Histological Study

**Authors:** Ricucci & Langeland  
**Year:** 1998  
**Journal:** IEJ

**Aim**
- To investigate the histopathological response of the intra-canal pulp tissue, the pulp tissue contained in the lateral canals, apical ramifications, and periapical tissues to endodontic procedures when performed short of or beyond the apical constriction, in vital and necrotic pulp conditions.

**Materials & Methods**
- 41 teeth (49 roots) from 36 patients were used in this study.
  a- In 10 roots, biopsies of the apex & periapical bone were taken following instrumentation and Ca(OH)2 medication.
  b- In 19 roots, biopsies of the apex with surrounding periapical tissue were taken following RCT 18 days to 10 yrs. earlier
  c- 20 roots were scheduled for extraction following RCT performed 5 months to 7yrs. previously.
- The teeth were grouped as teeth with pre-op:
  a- Vital pulps (25 roots)
  b- Necrotic pulps (24 roots)
- Specimens were histologically processed and evaluated.

**Results**
- In all cases remnants of pulp tissue and dentine chips often intermixed with sealer were found at different levels in the root canals.
- The most favorable histological conditions were when the instrumentation and obturation remained at or short of the apical constriction.
- Extrusion of sealer and/or GP into the periapical tissue, lateral canals and apical ramifications, resulted in severe inflammation despite clinical absence of pain.

**Conclusion**
- Best prognosis for RCT is adequate instrumentation and homogeneous obturation to the apical constriction.
- The worst prognosis for RCT is instrumentation and filling beyond the apical constriction.
- The 2nd worst prognosis is obturation ≥ 2 mm short of the apical constriction, combined with poor instrumentation and obturation.
- The distance between the foramen and the apical constriction is often more than 1 mm.
- Lateral canals and/or apical ramifications:
  a- cannot be debrided mechanically or chemically
  b- when filled, the injected material causes tissue destruction and inflammation
  c- radiographic demonstration of them does not mean excellence in endodontics

**Authors**
Domenico Ricucci & Kaare Langeland