Sealer group	Grade*	1wk	2wks	4wks	12wks	Interpretation
PCS** (n=12/wk)	1	0	1	4	5	acceptable
	2	4	6	4	5	
	3	8	5	4	2	
	Mean±SD	2.67±.49	2.33±.65	2.00±.85	1.75±.75	
ARSI*** (n=12/wk)	1	0	1	3	8	acceptable
	2	6	6	6	2	
	3	6	5	3	2	
	Mean±SD	2.50±.52	2.33±.65	2.00±.73	1.50±.79	
ARSII*** (n=12/wk)	1	0	0	2	7	acceptable
	2	4	6	7	1	
	3	8	6	3	4	
	Mean±SD	2.67±.49	2.50±.52	2.08±.66	1.75±.96	
CAPSEAL I (n=12/wk)	1	2	1	6	9	acceptable
	2	4	9	4	2	
	3	6	2	2	1	
	Mean±SD	2.33±.77	2.08±.51	1.67±.77	1.33±.65	
CAPSEAL II (n=12/wk)	1	2	1	5	8	acceptable
	2	4	8	5	4	
	3	6	3	3	0	
	Mean±SD	2.33±.77	2.17±.57	1.75±.75	1.33±.49	
Control (n=4/wk)	1	4	4	4	4	
	2	0	0	0	0	
	3	0	0	0	0	
	Mean±SD	1±.00	1±.00	1±.00	1±.00	

* Grade 1 : No/slight inflammation, Grade 2 : moderate inflammation, Grade 3 : severe inflammation

** PCS : Pulp Canal Sealer EWT

*** ARSI :Apatite Root Sealer type I, ARSII : Apatite Root Sealer type II

Working length change by instrumentation in curved canals

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I. Objectives

Tendency of the files to straighten themselves in the canal creates apical zips and removes excessive amount of dentin from the inner wall of the curvature. This effect also tends to straighten the canal and therefore may shorten the working length.

[redacted]he study was to evaluate the change of working length in curved canals after instrumentation with stainless steel hand [redacted]ckel-titanium hand instruments, and nickel-titanium rotary instruments.

II. Materials and Methods

Mesiobuccal or distobuccal canals of maxillary molars and mesiobuccal or mesiolingual canals of mandibular molars were selected. Forty specimens were divided into four groups according to the instruments used: stainless steel K-files (MANI®, Matsutani Seisakusho Co. Takanezawa, Japan), nickel-titanium K-files (Naviflex NT™, Brassler, Savannah, U.S.A.), Profile®, and ProTaper™ (Dentsply-Maillefer, Ballaigues, Switzerland). Occlusal surface of each tooth and root apex were flattened by using diamond burs and sandpaper. Before instrumentation, a rubber stop was fixed with glue to the #10 K-files of initial working length in each tooth. After access cavity preparation was made, working length was determined before canal instrumentation by passing a #10 K-file just through the apical foramen. In all groups, crown-down technique was used to prepare the canals, that is, coronal one-third of the canal was flared before apical two-thirds of the canal was instrumented. In two hand instrumentation groups, coronal flaring was made with Gates Glidden burs. Apical canals were instrumented until apical diameter had attained a size of 30. Positional relation between the tooth apex and the file tip was examined under a stereomicroscope after each instrumentation, and the images were stored in a computer using a CCD camera and micro VIDEO Studio 2000 program. The change of file tip position after instrumentation was measured by using AutoCAD 2000 (Autodesk Corp., San Rafael. CA, U.S.A.) after coronal flaring and after apical canal preparation. Data of working length change were statistically analyzed with one-way ANOVA and Tukey' s studentized range test.

III. Results

1. Working lengths were decreased significantly in each step in all instrumentation groups ($p<0.05$).
2. Coronal flaring using Gates Glidden burs in hand instrument groups caused.
3. Whole canal instrumentation using hand stainless steel K-files caused significantly more working length change than in ProFile instrumentation group ($p<0.05$).

IV. Conclusions

Working lengths change was observed in each step in all instrumentation groups, and ProFile instrumentation group seems to induce less change of working length compared to hand instrumentation groups.