Development of New Aspiration Needles for Root Canal Irrigation with Negative Pressure

Y. Fukumoto*, T. Yoshioka, H. Suda

Pulp Biology & Endodontics
Tokyo Medical and Dental University, Tokyo, Japan

Introduction

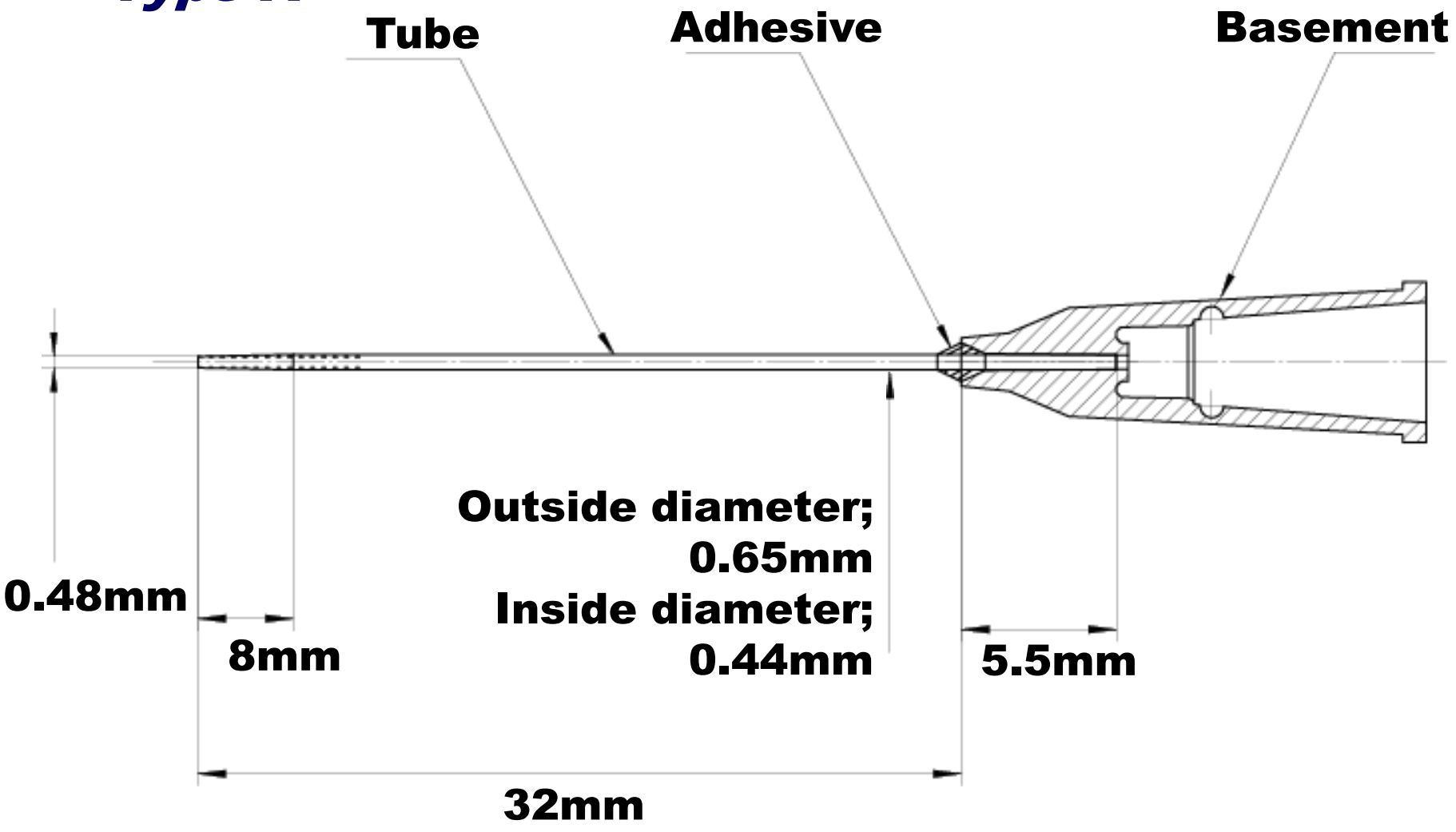
The aspiration needle used for irrigation with negative pressure (INP) in our former study[1)] was a 24G needle. The diameter was suitable in a large apical sized canal (0.50mm). However, in a canal with a small apical diameter of 0.35 mm, a 24G aspiration needle is too large for INP because of its large outside diameter (0.55 mm).

New aspiration needles were designed for INP to fit in a small sized canal (0.35 mm). The aim of this study was to evaluate two types of newly designed aspiration needles (*Types A* and *B*) for INP in narrow canals.

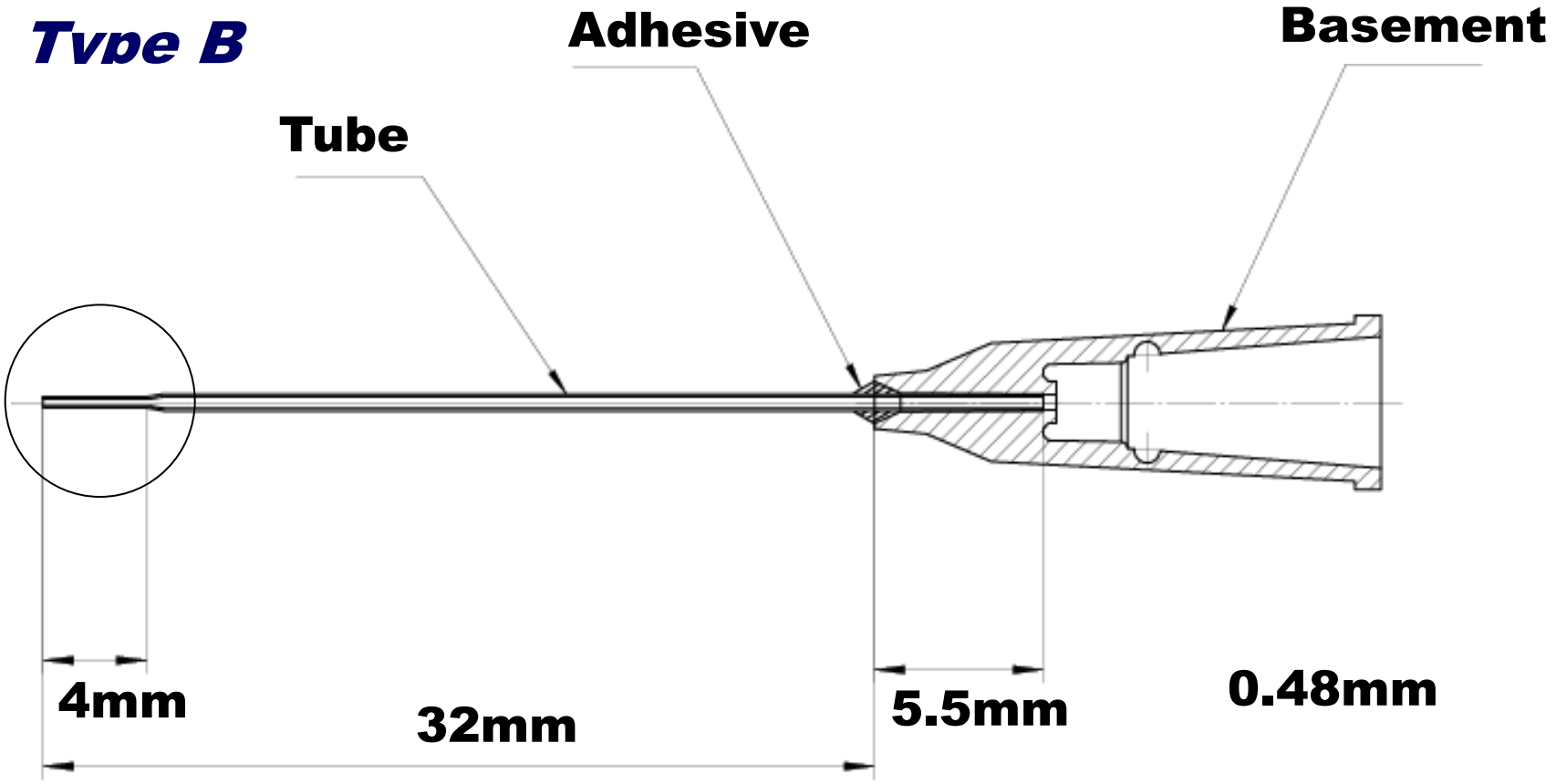
1) Y. Fukumoto, T. Yoshioka, C. Kobayashi, H. Suda, An ex vivo evaluation of a new root canal irrigation technique with intra-canal aspiration, International Endodontic Journal, 39, 93-99, 2006.

Materials and methods

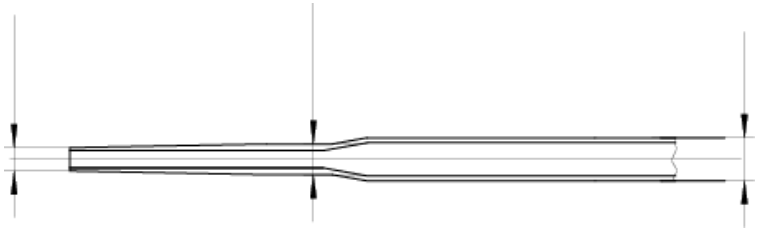
Type A



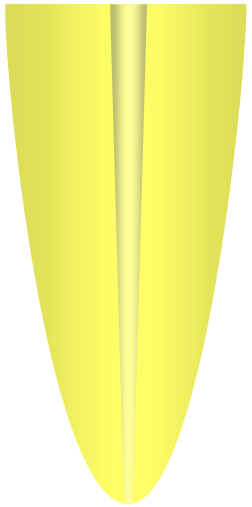
Type B



Outside diameter; 0.35mm
Inside diameter; 0.26mm



Outside diameter; 0.65mm
Inside diameter; 0.50mm



Removal of tooth crown

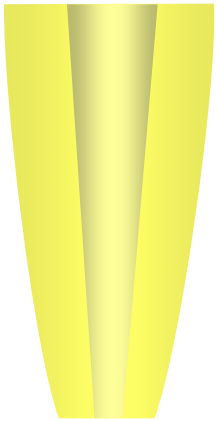
Resection of 3mm of apical root

Root canal preparation

Gates Glidden drills

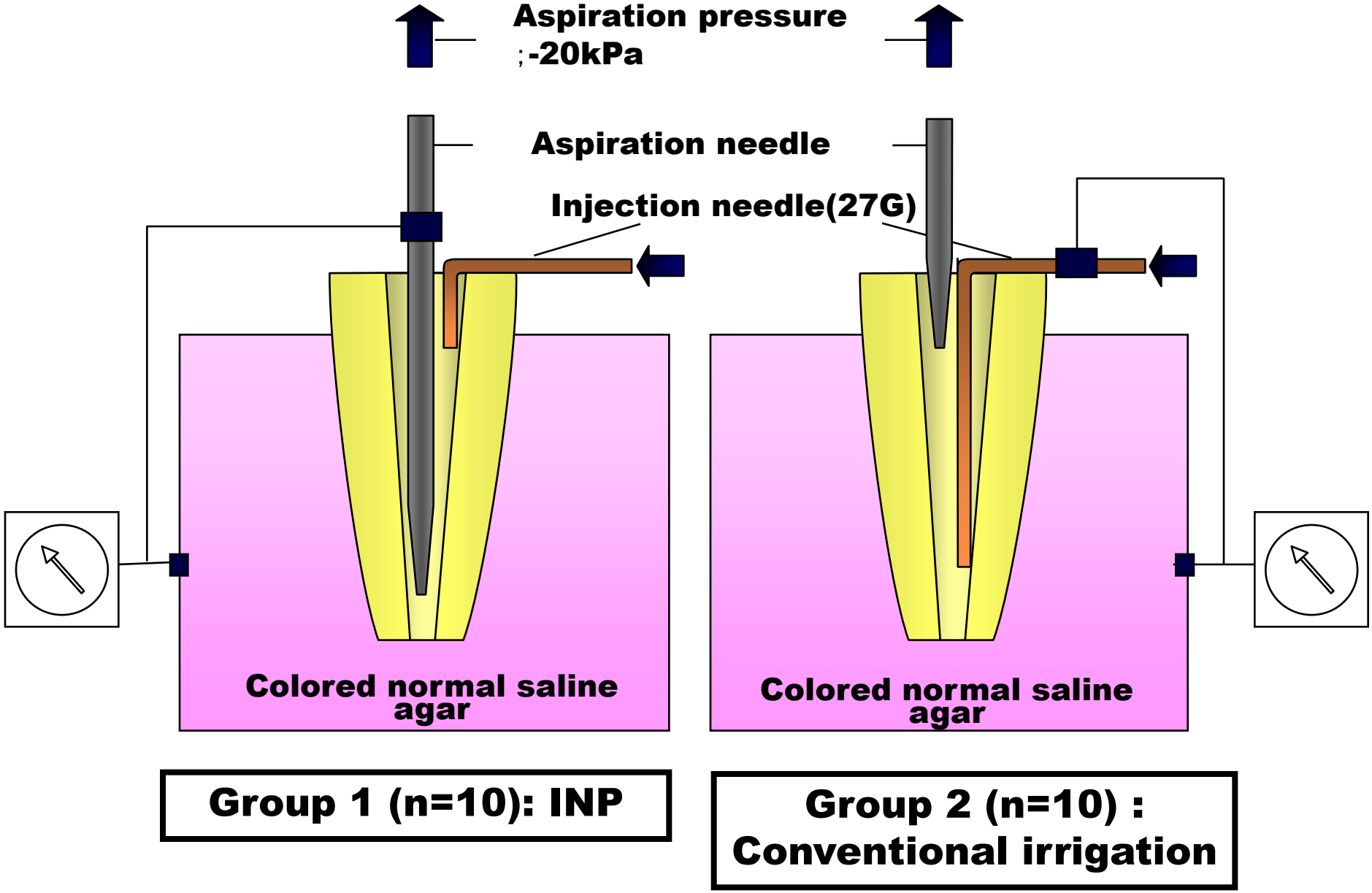
K-file

GT™ rotary instruments



Human lower incisor teeth (n=30)

MAF #35 .10 taper



Control (n=10) Irrigation with 21 ml of water

Irrigation in Groups 1 and 2

Flow rate of irrigant; 3.0ml/min

Aspiration pressure; -20kPa

Irrigation

6% NaOCl 2min (6ml) , Aspiration needle; *Type A*

↓

14% EDTA 3min (9ml) , Aspiration needle; *Type B*

↓

6% NaOCl 2min (6ml), Aspiration needle; *Type B*

Measurements

During irrigation using *Type B* needle, readings of Root ZX™® were recorded.

After irrigation, color change within agar was imaged.

SEM observation

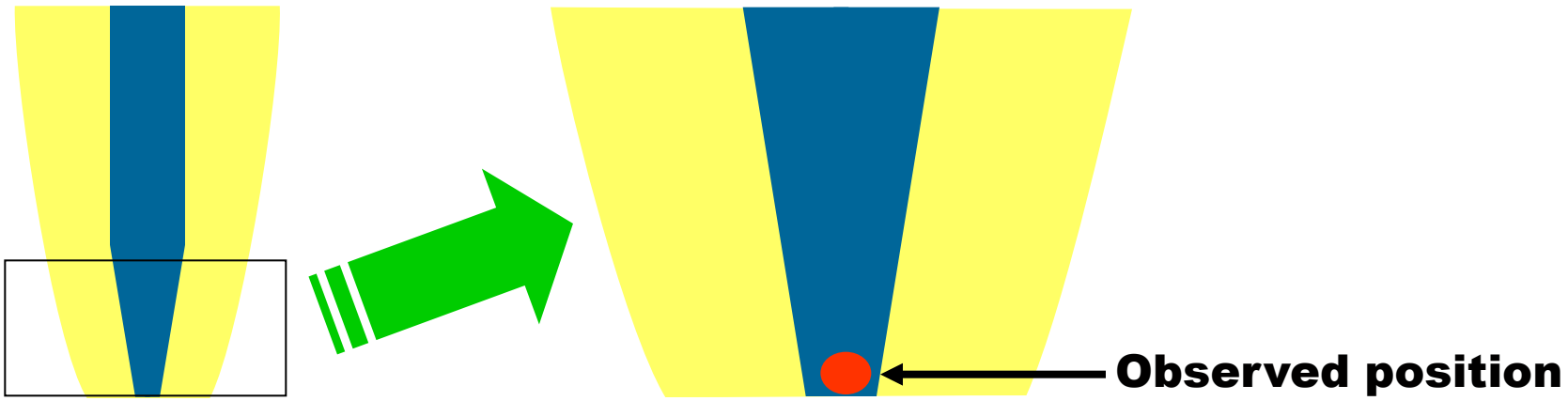
The apical 5 mm of each root was sectioned and then split longitudinally after irrigation.

↓

Preparation for SEM observation

↓

Apical area was imaged at 1000x magnification.



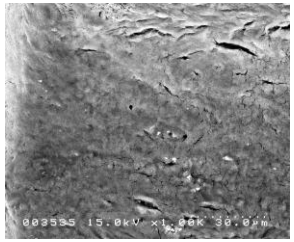
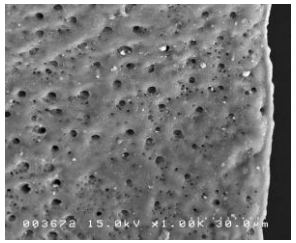
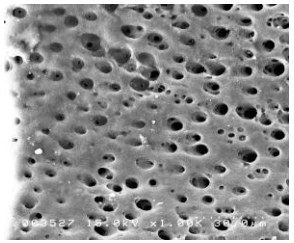
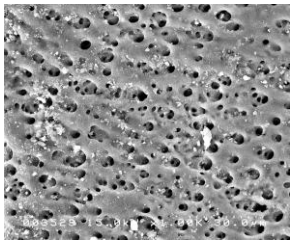
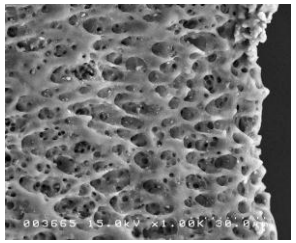
Criteria for assessment of SEM images

Score	0	1	2	3	4
Openings of dentinal tubules	Most/ all tubule openings obscured	Most tubules open	All tubules open	All tubules open	All tubules open
Structure of the intertubular dentine	No dissolution	No dissolution	No dissolution	Partial dissolution	Considerable dissolution

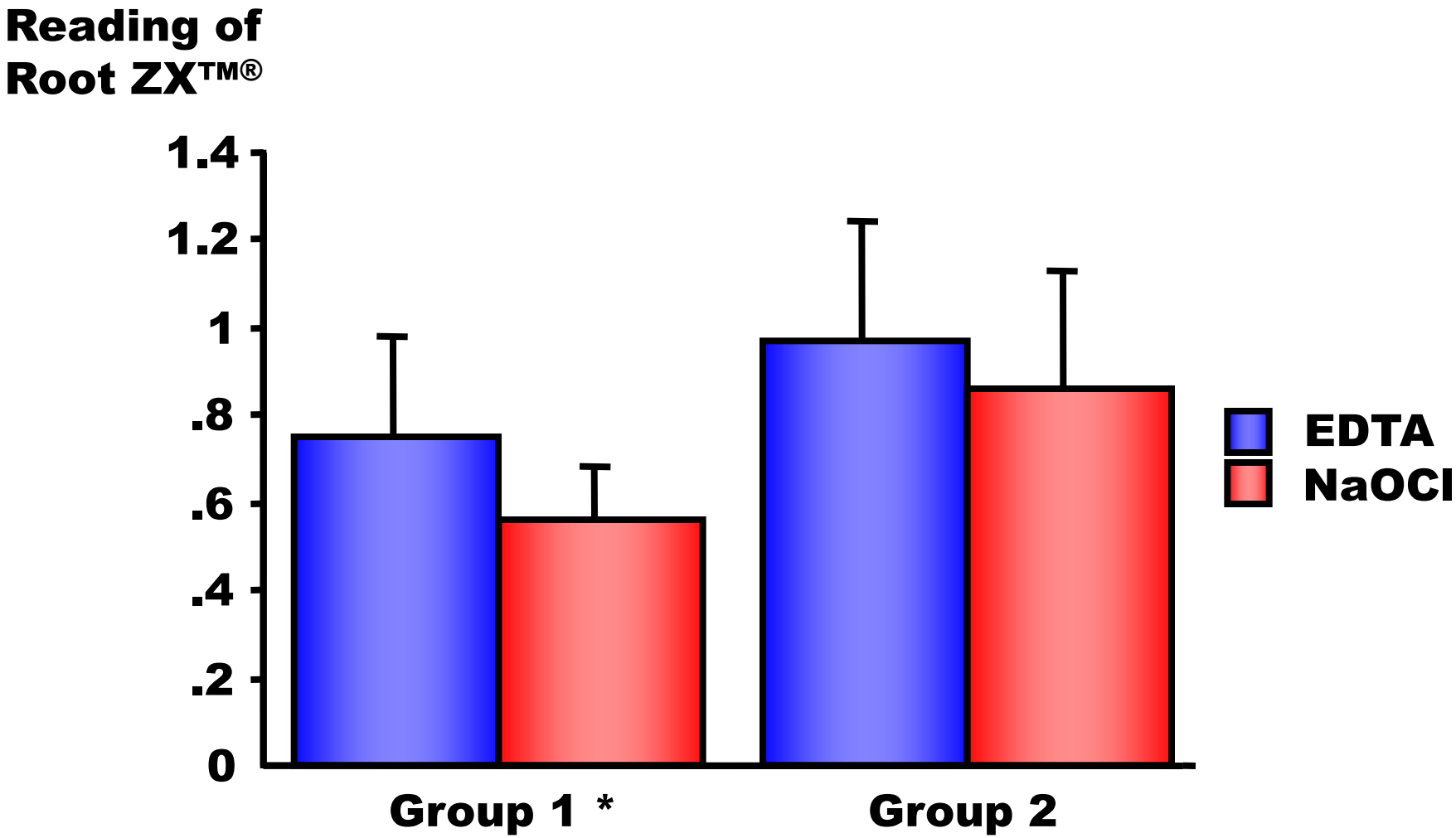
Results

SEM score of each group

100μm

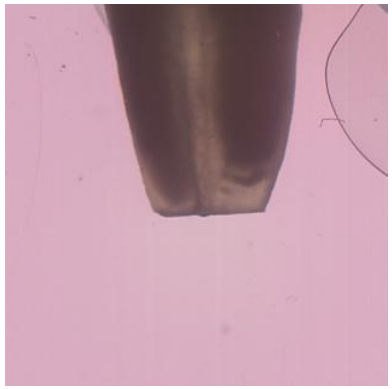
Score	0	1	2	3	4
Representative Image					
	Control	Group 2	Group 1	Group 1	Group 2
Group 1	1	2	4	2	1
Group 2	2	3	1	2	2
Control	9	1	0	0	0

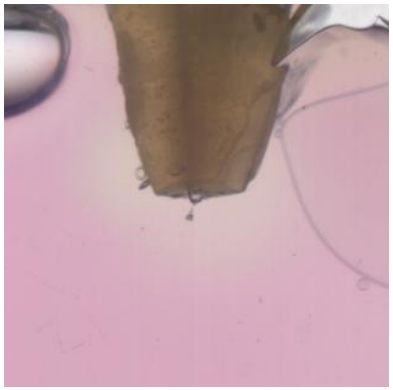
Significant difference among three groups : *p<0.05*
(Logistic regression)



Readings of Root ZX™® during irrigation

: *p<0.05 (Fisher's PLSD, Two-way ANOVA)





(mm²/100mm²)

60
50
40
30
20
10
0

Group 1 *

Group 2

Ratios of discolored area to the total area

*: *p<0.05 (Fisher's PLSD, One-way ANOVA)*

Discussion

In Group 1, Root ZX™® readings during irrigation were in accord with the deepest penetration depth of irrigants with smear layer removal at the apical canal and little apical extrusion of irrigants.

Although Root ZX™® readings in Group 2 during irrigation represented a shorter penetration depth for the irrigants than those in group 1, the irrigants removed the smear layer and extruded through the root apex. Root ZX™® readings did not correspond to the irrigant position in Group 2.

Conclusions

The newly designed aspiration needles for root canal irrigation with negative pressure were shown to be effective in a canal with a small apical diameter of 0.35 mm.