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July 14, 2020

NSK's Observation on the research paper

"In vitro study of anti-suck-back ability by themselves on new high-speed air turbine handpieces"

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Published by Dental Materials Journal (2010)


Dental Materials Journal 2010; 29(6): 649–654

In vitro study of anti-suck-back ability by themselves on new high-speed air turbine handpieces

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The anti-suck-back ability of five new high-speed air turbine handpiece models was evaluated in this study. First, suck-back pressure with water displacement within a glass tube was measured. Next, under three different conditions, how many on-off times it takes before fluorescent stains became visible on a piece of gauze at the exhaust vent was counted and the presence of fluorescent stains on the exhaust vents itself was examined. As a result, the water height for each part of one handpiece, the TWINPOWER TURBINE PAR-4HX-O, was below 0 mm. Except for under full emersion, this model, the TWINPOWER TURBINE PAR-4HX-O, did not have any visible fluorescence penetration to the exhaust vent even after 500 on-off switches under fume/mist conditions. Conversely, the other handpieces (Ti-Max X700L, T1 CONTROL, SYNEA TA-98CLED, GENTLE silence LUX 8000B) showed suck-back. In conclusion, the first mentioned new turbine handpiece, the TWINPOWER TURBINE PAR-4HX-O, had a possibility of no suck-back by itself. However, full immersion of the whole head of the handpiece which is not completely sealed must be avoided to prevent liquid intake.

Keywords: Suck-back, Air turbine handpiece, Cross infection

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The Test Method & Result of The Paper

Fig. 1
Complete test setup : Measuring suckback pressure of the whole handpiece brand.

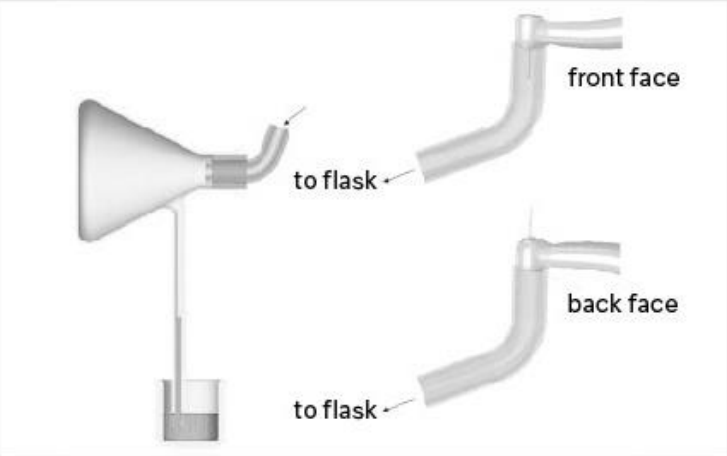


Fig. 2
Face test setup : Measuring suckback pressure of each face of the handpiece.

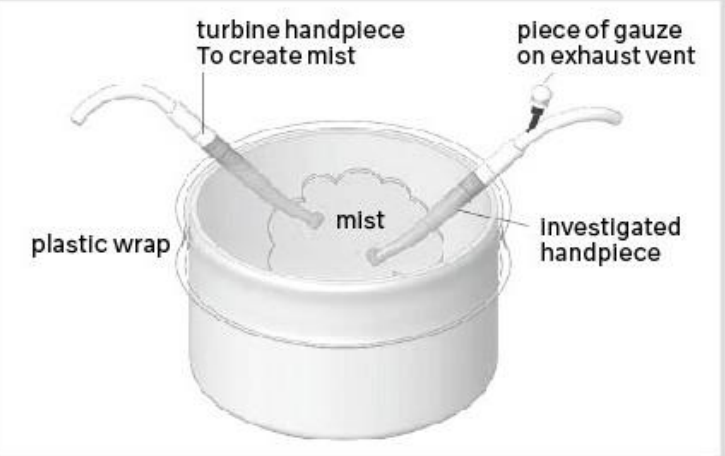


Fig. 3
Test setup to verify suckback Mist condition

※ These figures are extracted from the paper

One of the test result of the paper

Maximum water height Mean (SD)mm, n=5

Handpiece model	Whole head	Front face	Back face
A	426.0 (5.5)	358.0 (4.5)	219.0 (1.2)
B	31.4 (0.5) *	34.6 (0.5)	<0

* no significant difference (p>0.01)

According to this paper, Sample ID A, or NSK Ti-Max X700L, showed the highest water height in the table “Maximum negative pressure of turbine handpieces measured as the maximum water height.” Table 2, p652.

Our Observation on The Paper

Fig. 1
Complete test setup : Measuring suckback pressure of the whole handpiece brand.

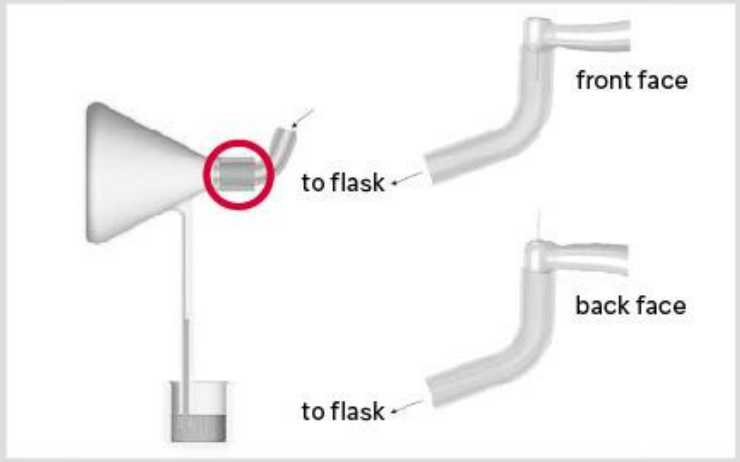


Fig. 2
Face test setup : Measuring suckback pressure of each face of the handpiece.

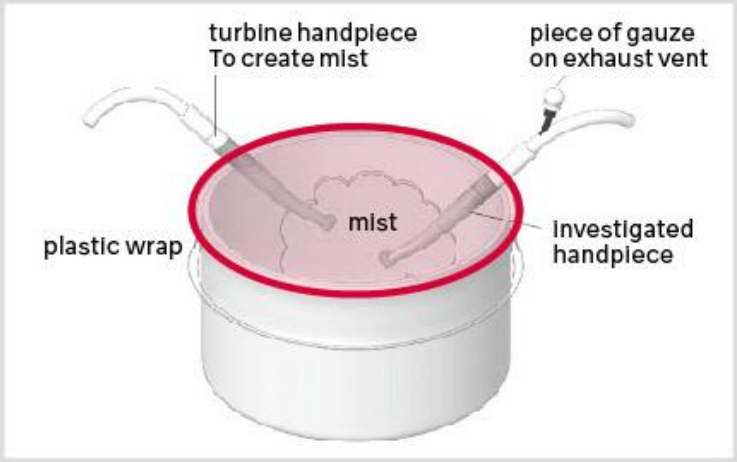


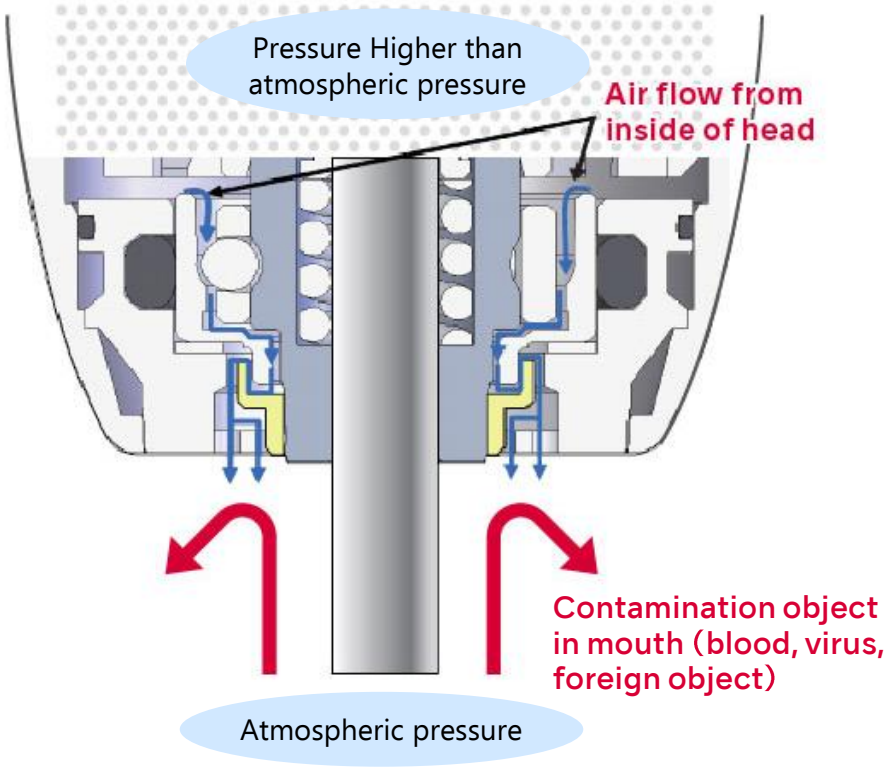
Fig. 3
Test setup to verify suckback Mist condition

All three test method were done in **sealed** condition.
During normal clinical treatment, there are no circumstances where turbine is operated under such sealed state.

NSK's Anti Suckback system called "Clean Head System" uses the pressure difference between inside and outside of the turbine to block extraneous substance going into the head of handpiece. This test method of the paper will create misleading perception to the effectiveness of the Anti-Suckback function of our Clean Head System.

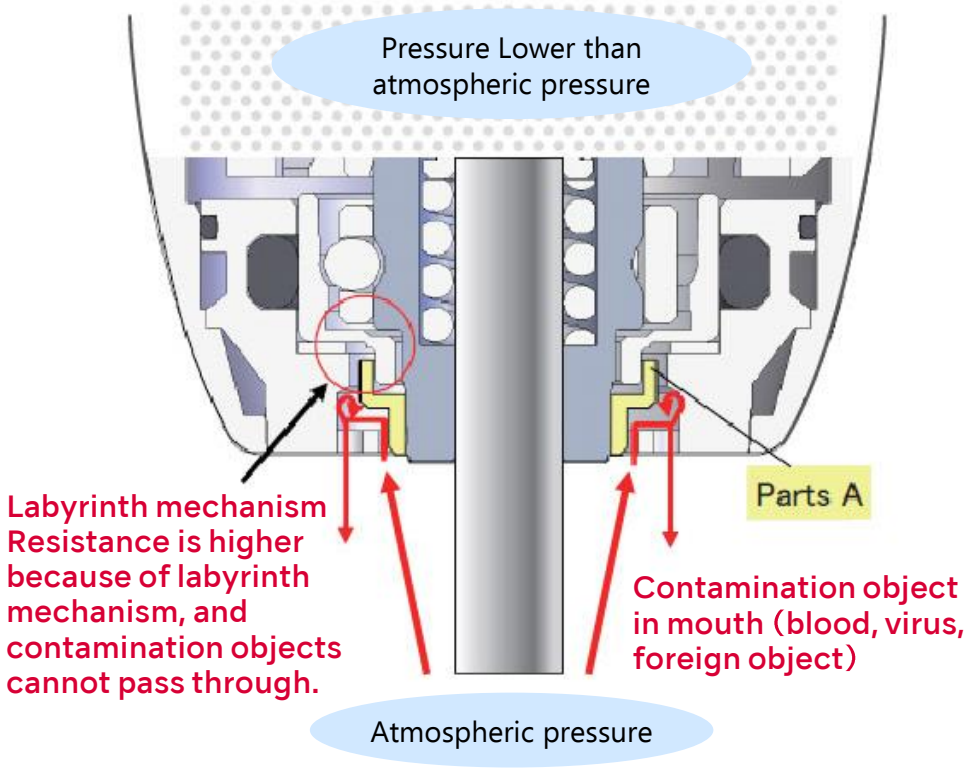
Clean Head System (NSK Anti-Suckback system)

During Rotation



During the rotation, contamination object will not enter to the inside of head.
The inside air pressure is higher than outside, therefore the air flows from inside to outside.

Right After Stopping



After the air supply stopped, cartridge still rotate with momentum. “parts A” will rotate together with rotor and the contamination object in mouth will be flown out from head by centrifugal force.

Our Experiment

Objective To measure the effectiveness of NSK Clean Head System

Testing Procedure

Submerge tip of head 1mm below the red Iodine Solution

1. Operate Turbine for 10 sec

2. Stop Turbine for 10 sec

Repeat 10 times

Result of Our Experiment

After experiment, red iodine traces can be found on the following:

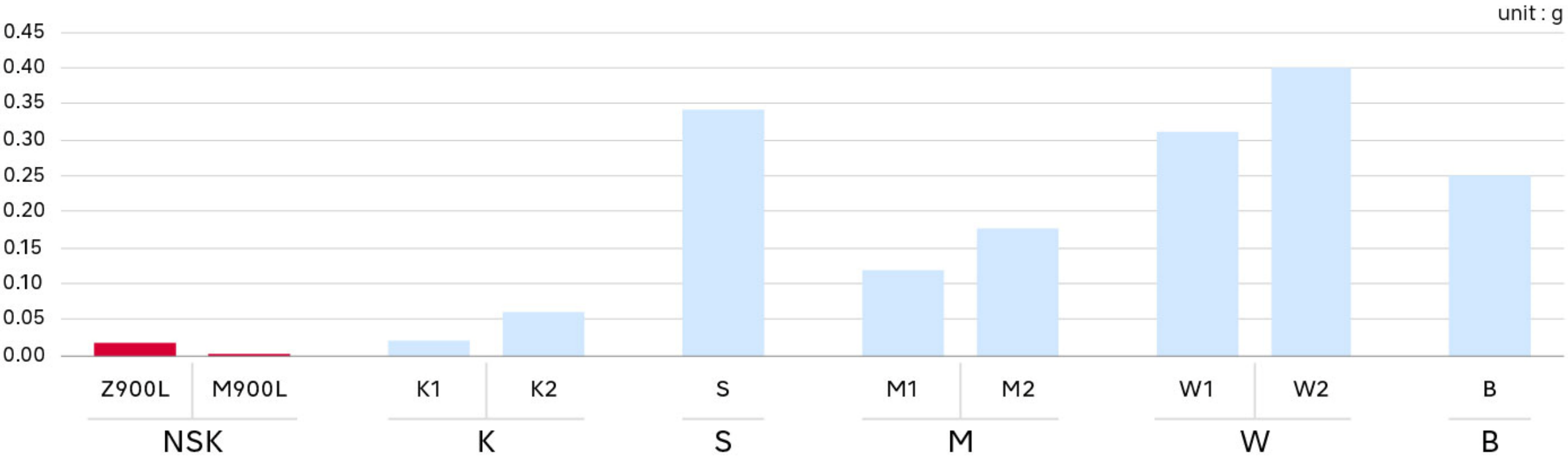
	NSK		K		S	M		W		B
	Z900L	M900L	K1	K2	S	M1	M2	W1	W1	B
A	○	○	○	×	×	×	×	×	×	×
B	○	○	○	×	×	×	×	×	×	×

× = Red iodine traces found

NSK Z900L & M900L and K1 did not suck back red iodine at all.
However, the other companies' turbines sucked back not only to the rotor, but also to the hose.

Result of Our Experiment

Suckback Test Results: weight of suckback water



The amounts of residue sucked back by NSK Z900L & M900L and K1 were very minimal.
However, the ones of the other companies' turbines were substantially larger.

CREATE IT.