

NSV: a device for managing velopharyngeal incompetence

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The photograph above is a device for improving hypernasal speech caused by velopharyngeal incompetence.

In making conversational speech, the soft palate has a role to block the oral cavity and a nasal cavity. The soft palate is lifted functionally and closes rhinopharynx, thus internal pressure of oral cavity is increased and it enables pronunciation and deglutition. This function is called rhinopharynx close function, but the function of the soft palate is often disrupted by the physical impediment (rhinopharynx dysraphism) caused by cerebrovascular disorder or the head injury. As a result, breathing air leaks out to the nose, and the conversational words become indistinct.



Fig1. NSV inserted in nasal cavity

Fig 2. Impression model of the nasal cavity. EXAFINE (putty type & injection type) and EXABITE of GC are used as impression material.

PLP (Palatal Lift Prosthesis) is used to improve the speech disorder caused by the velopharyngeal incompetence. It is the device with lamina, attached to the floor end of maxillary denture, lifts soft palate mechanically and close rhinopharynx. Many thesis describe speech quality has been improved by PLP, but there are the some shortcomings in PLPs.

1. It is difficult to apply PLP for the patient who are edentulous or have lost majority of the teeth, because the PLP lifts the soft palate mechanically and requires retentive force than conventional maxillary denture. (There ARE cases that report the application of PLP)
2. Some patients may feel intense incongruity of inserting PLP.

We developed NSV for the purpose of improving the shortcomings of PLP. (Fig 1) It is a device designed to insert in nostril and is easy for patients to put in and take out the device. The impression of the nasal cavity is taken (Fig 2) using silicone impression materials and the working model is made. The body is made of resin and includes valve structure inside. This valve designed to close at the time of pronunciation, and to open in inhaling the air (Fig 3).

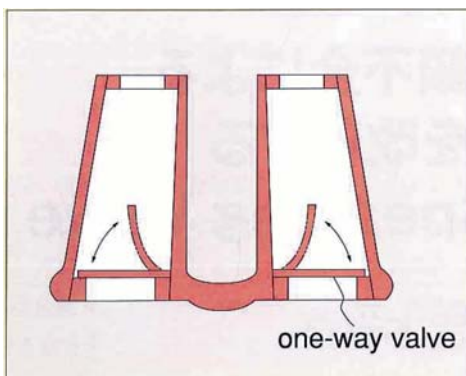


Fig 3. Structure of NSV. The valve is designed to open one-way, reducing air in conversational speech.



Fig 4. Nasometer II (KayPENTAX). Measure the ratio of sound pressure emitted from the nose in conversational speech.

We fabricated NSV for the patients suffering from velopharyngeal incompetence caused by cerebrovascular disorder or the head injury and made evaluations as follows:

1. Intelligibility Test of 100 Japanese Words

The patients read aloud 100 Japanese syllables and seven audiences write it down what they hear. We scored the correct answer.

2. Measurement of Nasalance score using NasometerII (KayPENTAX company) (Fig4)

NasometerII is the device to measure the ratio of sound pressure emitted from the nose at the time of pronunciation as the Nasalance score.

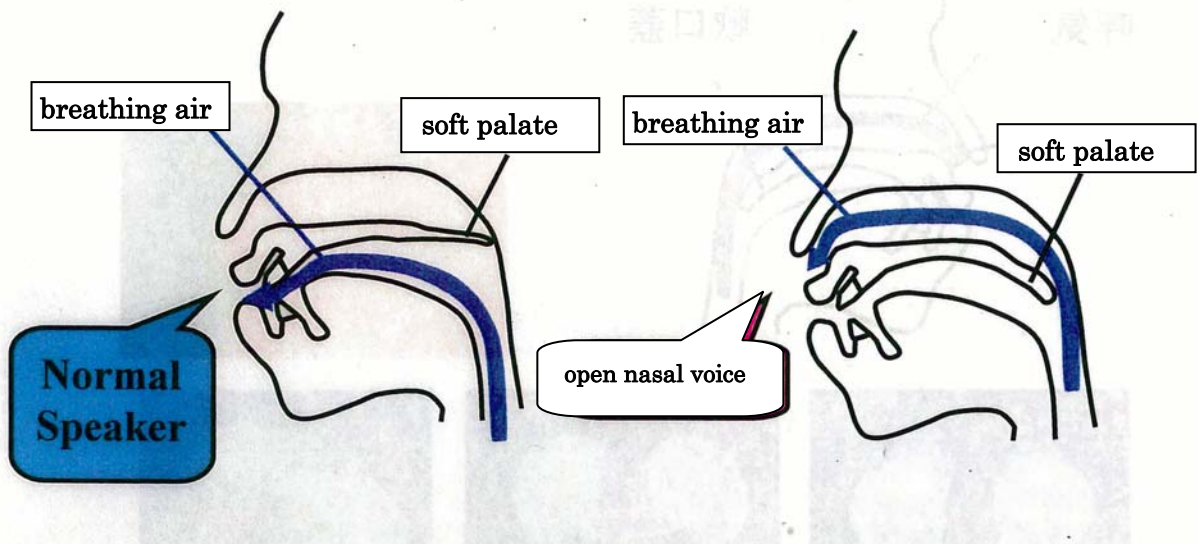
The score was improved by wearing NSV. That is, the air leaking from the nose was decreased at the time of conversation.

We also applied the same test to those who had both PLP and NSV. Although each device improved the intelligibility, the ratio of improvement was larger in using NSV. Moreover, the questionnaire resulted in the better comfortability in wearing NSV.

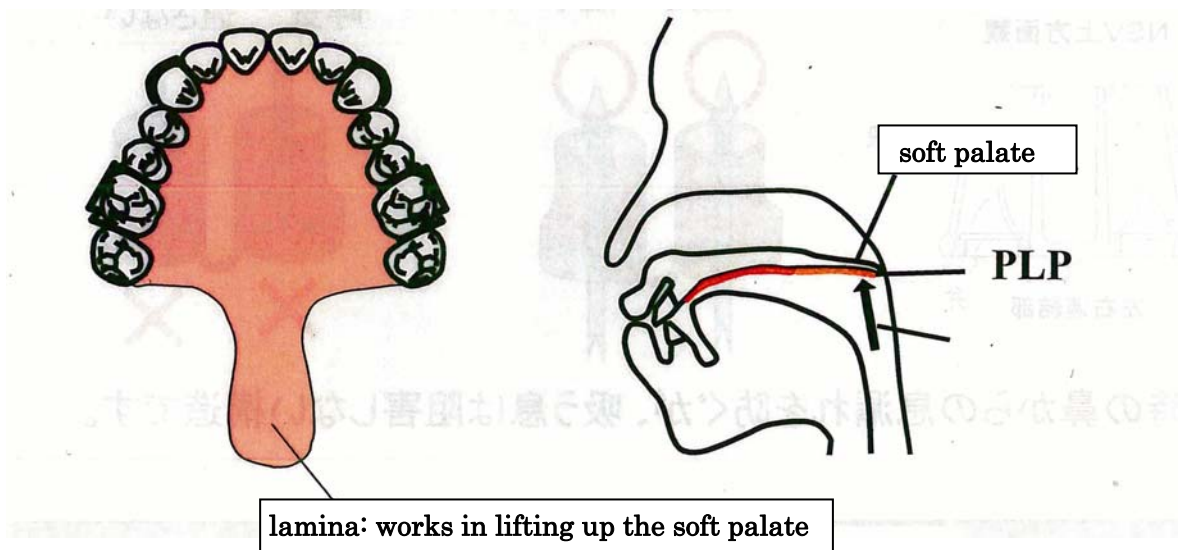
Up to now, intelligibility of the conversational speech is better improved by NSV than PLP, but the volume of the resonance cavity after blocking the palatal cleft is different between NSV and PLP and we are now continuing the further research including the acoustic analysis.

Rhinopharynx Dysrhythmism

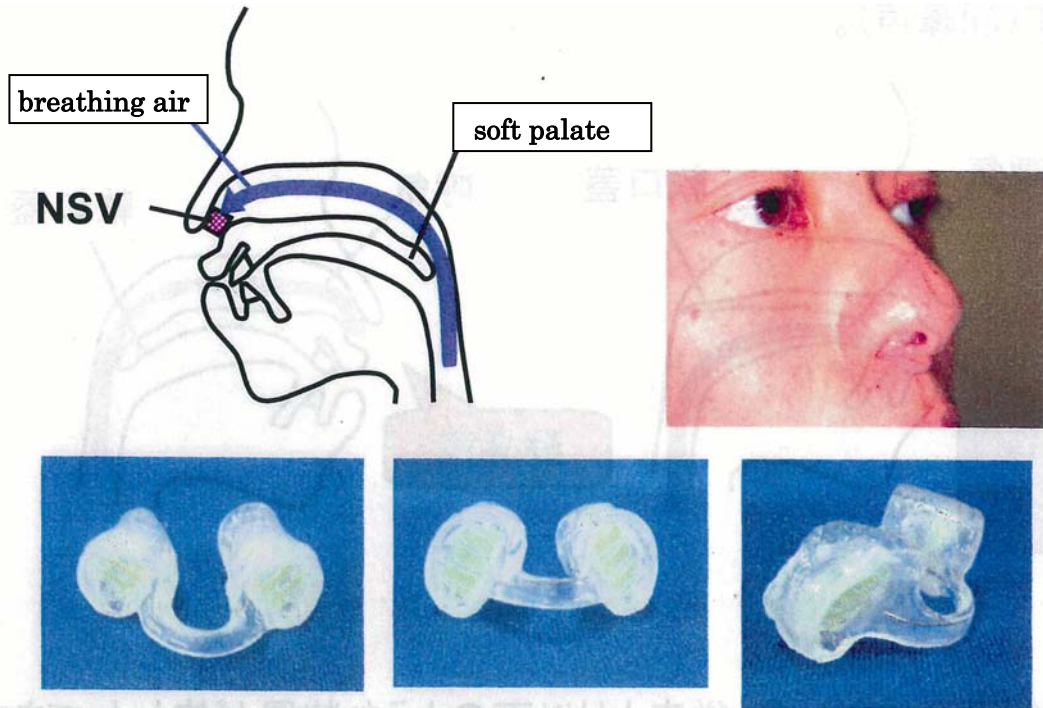
If the soft palate is paralyzed, the air leaks from the nose and articulation becomes indistinct.
(open nasal voice)



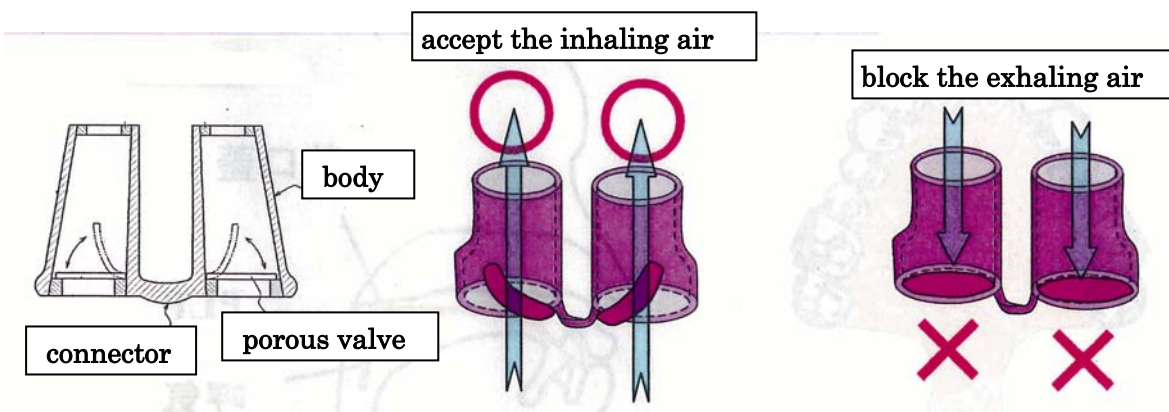
PLP (Palatal Lift Prosthesis)



NSV (Nasal Speaking Valve)



Structure of NSV



Applicable case of NSV

The conversational speech can be improved in clipping the nose?
(The device is adjustable according to the articulation level of the patient).