Formulation of a palatal adhesive strip to secure electronic measuring devices inside the oral cavity

Christoph Wagner[1†], Lydia Stappenbeck[2], Peter Birkholz[1], Bernhard Lehnert[2]

[1]Institute of Acoustics and Speech Communication, Technische Universität Dresden
[2]Dept. Phoniatrics and pedaudiology, clinic for ears-, nose-, throad-diseases, head and neck surgery, Universitätsmedizin Greifswald
[†]Contact: christoph.wagner@tu-dresden.de

Background: Stroke patients commonly suffer from dysphagia and/or dysarthria. Intraoral measuring devices can aid in therapy and training, but conventionally have to be tailored towards the patients' palate. This greatly limits the flexibility of these devices. As such, we searched for an adhesive solution that could hold a measuring and training device in place on different palates. A number of formulations for buccal adhesives exist [1], however, none directly specify their application for palatal adhesion.

We describe the formulation of a biocompatible, palatal adhesive for securing an electronic measuring device against the hard palate for a set time while performing oral exercises.

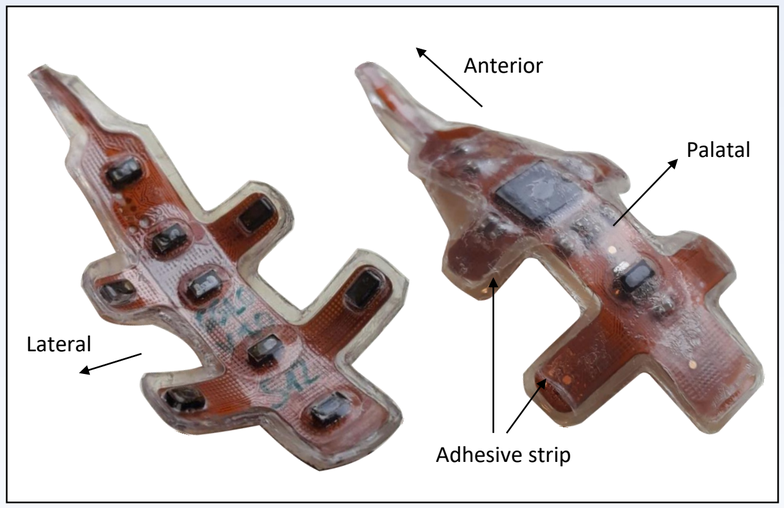

Figure 1: Precast intraoral sensor dummy which is placed against the hard palate. Left: Sensor side facing the tongue. Right: Sensor side in contact with the hard palate.

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[1] Donelly et al., „Mucoadhesive drug delivery systems", *Journal of Bioallied Sciences*, vol. 3, no. 1, pp. 89-100, 2011

Materials and Methods: The adhesives consisted of carboxymethyl cellulose, Polyox ® 303 WSR and Glycerol with a concentration ratio of 1% : 0:5% : 0:25% (CMC:Polyox:Glycerol) and were prepared as a solution in distilled water.

The dry adhesive films (40 x 60 mm^2) were placed on double-sided medical-grade transfer tape (Type 4075, 3M) to allow the film to stick to the devices' encapsulant (ErkoFlex ®, Erkodent). A dummy of our intraoral sensor device (Figure 1) was glued on to the hard palates of 10 healthy subjects (age 20 to 50) by pressing it in place for 10 seconds. The subjects were instructed to perform a series of tongue movements, which included swallowing and clicking of the tongue for up to 4 minutes.

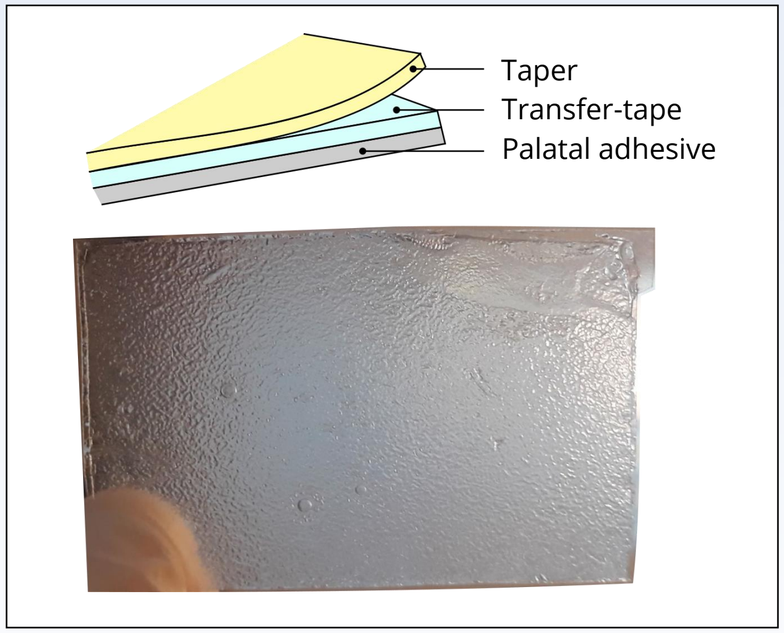

Figure 2: Top: Adhesive strip structure. Once the taper is removed, the transfer-tape sticks to the sensors' encapsulat while the palatal adhesive sticks to the hard palate. Bottom: Adhesive strip after fabrication. The palatal adhesive is shown in plan view.

Results: Each adhesive held the device in place for the full duration of the experiment. In 50% of the cases, the device did loosen in the medio sagittal plane but not laterally. A sip of water caused additional loosening. In all cases, no adhesive leftovers remained when purposely removed from the hard palate.

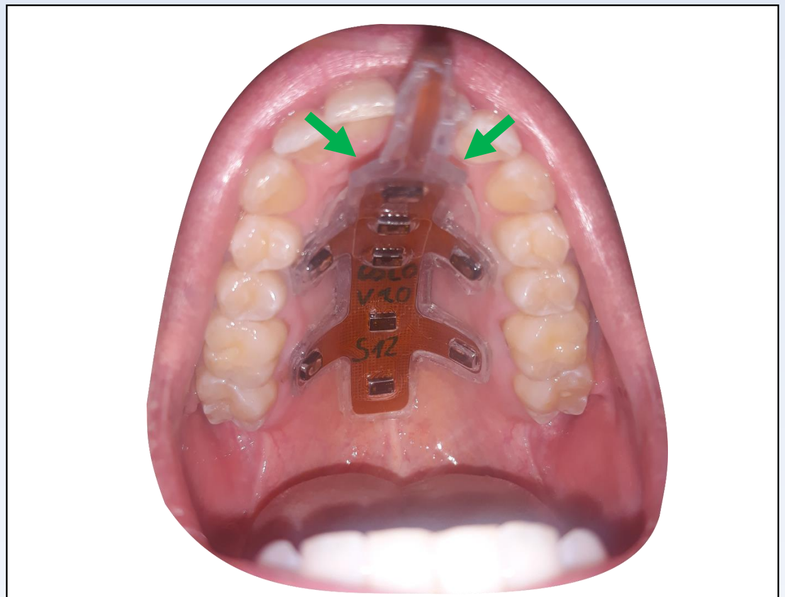

Figure 3: Sensor placement against the hard palate. Green arrows indicate regions of frequent detachment.

Conclusion: The proposed adhesive formulation is, within certain limitations, suitable for securing intraoral measuring equipment against the hard palate. No conclusions can yet be made for retention times above 4 min or in the presence of xerostomia. Variations of the formulation and application are likely to increase adhesion time and durability.