Compliant, fluid mechanical actuator and the procedure for insertion as adaptive cochlear implant electrode carrier

System: Monolithic, fluid mechanical actuator with distributed compliance for a continuous changing of its curvature

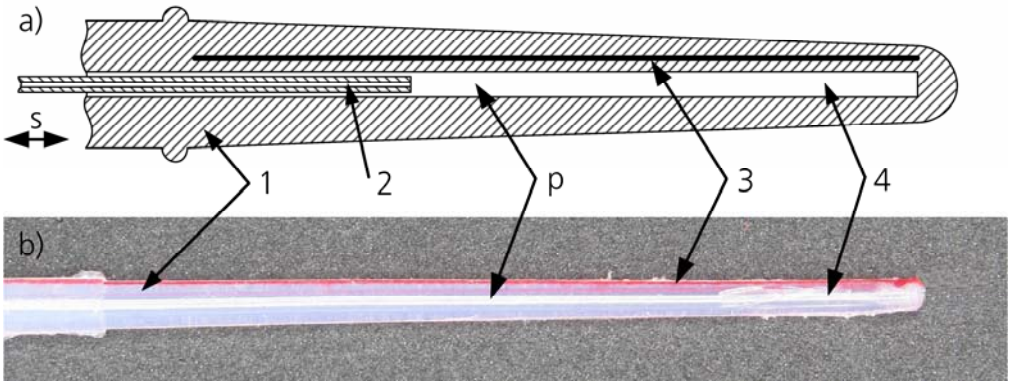

Fig. 1: a) Schematic diagram for the construction of the fluid mechanical actuator and b) functional models on the scale of 3:1: 1 fluid mechanical actuator; 2 stylet; 3 threadlike fibre, 4 cavity, p internal pressure, s displacement (relative movement of the stylet vis-à-vis the actuator)

Functional principle:

- The required compliance of the actuator is realized by the use of hyper elastic material (silicone)
- In the actuators side wall a fibre is embedded, which has a very low section modulus against bending, and it expands only marginally by tensile load (pliable and tensile strength)
- Under pressure change in the cavity of the actuator, the latter curls about its longitudinal axis, because the silicone expands more than the fibre

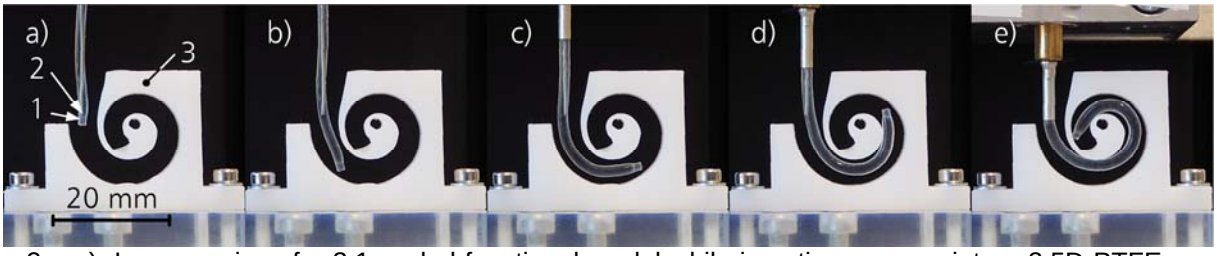

Fig. 2 a-e): Image series of a 3:1 scaled functional model while insertion process into a 2.5D PTFE model of the cochlea: 1 fluid mechanical actuator; 2 stylet; 3 2.5D PTFE model of the cochlea

Characteristics and advantages:

- The curvature of the electrode carrier can be adapted / changed in a stepless manner by the interplay of changes in the internal pressure p in the cavity (4) and the hollow stylet (2) displaceably arranged inside the actuator (see Fig. 1)
- Simple construction enables two step manufacturing

Application:

- In medical technology, for a gentle implantation of electrode carriers in the human inner ear (lower insertion forces on the anatomical structures)
- As a active movable endoskope tip / section of an endoskope

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