Studies of the capability of bolus swallowing: the maximum tongue pressure and the bolus consistency  
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1. **Introduction**

* Eating and drinking are a very basic human need which provides a great pleasure and enjoyment for individuals as well as for social interactions. However, the prevalence of dysphagia (known as swallowing difficulties) and its management are relatively common as the result of illness and subsequent general weakness.
* Food and pharmaceutical industries are under a growing pressure to design and provide quality food for safe consumption by these disadvantaged populations.
* A combination of critical factors in the individuals’ physiological capabilities of oral food handling (e.g. tongue pressure, muscle strength, the volume of oral cavity, the optimum bolus size) and the applied tongue for bolus swallowing of different consistencies (bolus rheology) have been recently emphasised to trigger entire swallowing actions and to improve the diet for vulnerable patients.

2. **Materials and Methods**

* The physiological capability of individuals in creating oral tongue pressure was conducted using the Iowa Oral Performance Instrument (IOPI) (Figure 1) for healthy volunteers in different age groups.
* Various food boluses of different viscosities were prepared with commercial thickeners for dysphagia and characterised for their rheological properties using a Kinexus Rheometer at 25°C under 50s⁻¹ shear rate. These samples were used during sensory panel tests.

3. **Results and Discussions**

* No significant difference in the maximum tongue pressure and oral volume between the two genders and among young age populations (22–64 years). However, for old age populations (>65 years), both the maximum tongue pressure and the oral volume show a gradual decrease with the increase of age (Figure 2a & 2b).
* A positive correlation was observed between the maximum tongue pressure and the maximum consistency of bolus that one can swallow for those who have lower capability in creating the tongue pressure (<40 kPa). However, for subjects who are capable of producing very high tongue pressure (>40 kPa), a tongue pressure reserve (around a third of their maximum capability) was observed (Figure 3).

4. **Conclusions**

* For safe and comfortable swallowing, the oral physiological conditions and the rheological properties of the food (bolus) are probably the two most important factors.
* Elderly have reduced oral (physiological) capability in handling and swallowing bolus and many elderly may have left no tongue pressure reserve during swallowing

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