

Investigating the Effect of Tablet Size and Shape on Swallowing Using an *In Vitro* Model

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Abstract

Purpose: Dysphagia imposes significant limitations to oral drug therapy. The conditions leading the acceptance of different tablet sizes and shapes lack mechanistic understanding and rely on practitioner's experience. An *In Vitro* test is proposed as a tool to quantitatively assess the role of tablet size and shape in the oral phase of swallowing.

Methods: The *In Vitro* setup allows to study the tablet and bolus attributes at different simulated tongue forces in a geometry reproducing the key features of the oral cavity. The evolution of the velocity of the bolus, the oral transit time and the relative position of the tablets within the bolus were quantified *In Vitro* from high speed camera recordings.

Results: The swallowing performance of tablets decreases with their cross sectional area in the direction of swallow. This effect was accentuated by low applied tongue driving force and thin suspending liquid vehicles. The relative position of the tablets in the bolus evolved during the swallow highlighting a slower flow of the smallest and largest tablets compared to the bolus flow. Finally, results show that a single tablet flows faster than several smaller tablets of equivalent total volume.

Conclusions: These results highlight the important interplay of tablet size, shape and liquid viscosity and the meaningful contribution that *In Vitro* methods can provide to pre-screening tablet design before *In Vivo* evaluation.

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