

Threshold size of Tablet and Capsule : Prospective Study

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Abstract: *Background: Medical tablets and capsules are the most commonly used dose form due to their portability. However, their enormous size frequently causes difficulties during swallowing, which might lead to decreased drug adherence. The authors examined postmarketing surveillance data to assess the size of medical tablets and capsules that patients consider too large to swallow.*

Aim: This study aims to learn the law behind keeping the shape or size of capsules/ tablets in higher dimensions.

Method: A dataset was created from the package inserts of the reported medications based on reports from patients saying that the pill or capsule was too large for consumption. Two analyses were performed: size distribution histogram analysis and geometric analysis utilizing linear approximation.

Conclusion: The size of tablets/capsules that patients consider too large to consume. As a result, while creating or modifying tablets/capsules, the drug should be scored, divided into smaller dosages, or redesigned as an orally disintegrating formulation.

Keywords: Size, Shape, Tablet, Capsule, Dimension, Law, Physics

I. INTRODUCTION

When compared to other medicine forms, medicinal tablets, and capsules are more portable and are the most commonly used dosage form. However, the size of some medical tablets/capsules makes them difficult to swallow. They cause patients discomfort and, in certain cases, a decrease in treatment adherence.^{1,2} To address this issue, the global pharmaceutical sector should be aware of the right size of medical tablets and capsules for patients. Many researches have been conducted to study the forms and sizes of medical tablets and capsules.

The following shortcomings were found in these studies: (i) the majority were small clinical studies involving healthy volunteers and did not reflect the evaluation and tolerance of real patients; (ii) the majority only investigated the diameter of round tablets and did not consider the three-dimensional shape of tablets; and (iii) the studies only compared patient preferences using different tablet/capsule sizes and did not focus on the appropriate size range or threshold size (Fig. 1).

There is a simple law of thermal that is linear area and bulk expansion have been discussed in the light of coefficient of linear expansion (α_L), coefficient of area expansion, (α_A) and coefficient of volume expansion length (α_V).

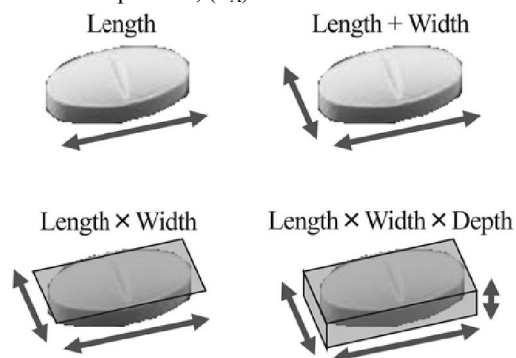


Fig. 1: Indices of the size of pills/tablets/capsules dosage form

Thermal expansion is observed in the solid-liquid and gases. Gases expand much more rapidly than liquid and liquids expand much more quickly than solids for a given rise in temperature.

In the case of linear expansion if L is the original length of the substance, which is exposed to heat then for a slight change in temperature ΔT , Corresponding change in length ΔL .

$$\Delta L/L = \alpha_L \cdot \Delta T$$

Where α_L is the coefficient of linear expansion

If the matter or substance is in two dimension / area/ shape, then fractional change in area will be

$$\Delta A/A = \alpha_A \cdot \Delta T$$

Where α_A is the coefficient of area expansion

If the matter or substance is in the form of cubic/ bulk/ volume shape exposed to heat.

$$\Delta V/V = \alpha_V \cdot \Delta T$$

Where α_V is the coefficient of volume expansion

$$\text{Consequently } \alpha_V : \alpha_A : \alpha_L = 1 : 2 : 3 \quad (I_3)$$

It means the coefficient of area expansion is half of the coefficient of the linear expansion and the coefficient of volume expansion is one third of the coefficient of linear expansion.

Hot temperature or low both can change the potential of medicines. For medicines, pharmaceutical company indicates temperature range between which medicine should be stored. If it does not show that effectiveness then potency will be affected due to oxidation or light exposure.

Pharmaceutical company tries best to keep size and shape of the pills/ capsule or medicine in higher dimension rather than lower dimension α_V is one third of the α_L and α_A is half of the α_L .

The temperature affect is more prominent in lower dimension than higher dimension that is why we hardly see the linear dimension pills or medicine to adopt by pharmaceutical company to avoid as discomfort to swallow.

II. CONCLUSION

I_3 (length + width + depth) is an appropriate indicator of medical tablet/capsule size, and $I_3 = 21$ mm is the size of medical tablet/capsules that patients believe are too large to take. Furthermore, for round tablets, a diameter of 8 mm is the minimum size. $I_3 = 21$ mm medical tablets/capsules are too large for patients to swallow. This study was successful in obtaining useful pharmaceutical knowledge for the design and development of medication formulations.

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