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Original Review Article

SUBLINGUAL TABLET- ADVANCEMENT IN TABLET DOSAGES FORM

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Abstract

Sublingual drug delivery is often an alternate and better choice of route in comparison to oral drug delivery as sublingually administered dosage forms bypass hepatic metabolism. A rapid onset of pharmacological effect is usually desired for a few drugs, especially those utilized in the treatment of acute disorders and need onset of action. Sublingual tablets disintegrate rapidly and therefore the bit of saliva present is typically sufficient for achieving disintegration of the dosage form including better dissolution and increased bioavailability with effective therapeutic range. Sublingual tablets were found to possess better characteristics in comparison to standard conventional dosage forms. Sublingually administered tablets achieved better bioavailability, rapid onset of action and better dissolution properties increasing the fast disintegration. The addition of Superdisintegrants facilitated rapid disintegration and this approach is often needed to treat acute disorders or emergency conditions with showing onset of action. The sublingual route of administration is often used for drugs which undergo first pass metabolism or degradation within the GIT process. Drugs administered sublingually tend to possess better bioavailability which is better approach other than conventional tablets.

Keywords: Sublingual, Superdisintegrants, self-medication; Fast disintegration; bioavailability.

INTRODUCTION

Novel drug delivery system of drugs is in demand from last two decade due to its better patient compliance and better option in emergencies. Systemic drug delivery through the sublingual route had emerged from the desire to provide immediate onset of pharmacological effect. Dysphagia (difficulty in swallowing) may be a common problem of all age groups, especially geriatric and pediatric patients who are mentally unfit in swallowing these dosage forms. Sublingual route of administration of the drug means placement of the drug under the tongue and drug reaches directly in to the blood stream through the ventral surface of the tongue and floor of the mouth. The absorption of the drug through the sublingual route is 3 to 10 times greater than oral route and is only surpassed by hypodermic injection. For these formulations, the small volume of saliva is usually sufficient to end in tablet disintegration within the mouth.

Sublingual absorption is usually rapid in action, but also short acting in duration. Nitroglycerine, is the best example that, is an effective antiangina drug but is extensively metabolized when taken orally (>90%). it's rapidly absorbed through the sublingual mucosa, and its peak plasma level is reached within 1-2 min.[1-4]

Mechanism of sublingual absorption

The mucosal lining consists of three distinct layers. The outermost layer is that the epithelial membrane, which consists of stratified squamous epithelial cells and features a protective barrier function. The innermost layer of the epithelial membrane is termed the basement membrane that replenishes the epithelium. Below the epithelium lies the lamina propria followed by the submucosa. The lamina propria may be a hydrated and fewer dense layer of connective tissue containing collagen and elastic fibres. The oral submucosa is additionally richly furnished with blood vessels.[5-7]

Drugs for sublingual administration

Sublingually absorbed nutrition, which avoids exposure to the gastric system and liver, means direct nutritional benefits, particularly important for sufferers of gastrointestinal difficulties like ulcers, hyperactive gut, coeliac disease, those with compromised digestion, the elderly and invalids–the nutritional benefit is independent of gastro-intestinal influences.[8]

Advantages

• Liver bypassed and also drug is protected against degradation because of pH and digestive enzymes of the GI tract.

• Improved patient compliance because of the minimizing of associated pain with injections; administration of medication in unconscious or incapacitated patients.

All given Low dosage gives high efficacy as hepatic first-pass metabolism is avoided.

The large contact surface of the oral contributes to rapid and extensive drug absorption for onset of Action.

A relatively rapid onset of action is often achieved as compared to the oral route.

Rapid absorption and better blood levels due to higher bioavailability.

They also present the advantage of providing fast dissolution and disintegration in mouth without any water or Chewing.[9]

Disadvantages

Sublingual medication can't be used when a patient is uncooperative. Since sublingual administration of medicine interferes with eating, drinking, and talking, this route is usually considered unsuitable for prolonged administration. The patient shouldn't smoke while taking sublingual medication because smoking causes vasoconstriction of the vessels. This may decrease the absorption of the medication.[10]

Formulation aspects of sublingual tablet

The distinct feature within the formulation of sublingual tablets involves the choice of suitable excipients of bland taste that shall ultimately leading to a rapidly disintegrating tablet they're by enhancing the dissolution of active ingredient.

There are two differing types of the sublingual tablet:

1. Molded Sublingual Tablets.
2. Compressed Sublingual Tablets.

Molded sublingual tablets

Molded sublingual tablets are usually prepared from soluble ingredients in order that the tablets are completely and rapidly soluble. They contain, additionally to the drug, an excipient or base namely lactose, dextrose, sucrose, mannitol or other rapidly soluble materials or mixtures of those ingredients. Tablets containing insoluble excipients could also be prepared from finally divided kaolin, carbonate, phosphate or other insoluble powders. To ensure rapid

solubility of the soluble tablets, the excipients are usually skilled a fine screen or # 120 mesh bolting cloth. After the excipients are blended with the drug, the powder mix is moistened with the solvent, which is most ordinarily alcohol and water mixture. Other volatile solvents, like acetone or hydrocarbons, can also be used. Antioxidants like sodium bisulphate and buffers or other ingredients could also be added to enhance the physical and chemical stability of the merchandise to extend the hardness and reduce the erosion on the sides of the tablets during handling, agents like glucose, sucrose, acacia or povidone could also be added to the solvent mixture.[11]

Compressed sublingual tablets

Compressed sublingual tablets are often prepared by two different methods:

a) Wet Granulation method
b) Direct compression method

The directly compressible sublingual tablet formulation contains directly compressible soluble excipients, an excellent disintegrant, and lubricant. it's going to also contain microcrystalline cellulose, a dry binder, buffers, surface-active agents, sweeteners, and flavors. Sugar-based excipients are widely used as bulking agents due to their high aqueous solubility, sweetness, pleasant feeling within the mouth, and good taste-masking. Nearly all sublingual formulations incorporate some saccharide-based material. the selection of an appropriate disintegrant and its amount are critical for achieving a quick disintegration and dissolution rate. Sometimes effervescent agents are wont to increasing disintegration and dissolution of sublingual tablets.[12]

In vitro and in vivo evaluation
Physical evaluation

All batches of sublingual formulations like tablets and films were evaluated for weight variation and drug content. But hardness and friability were calculated for tablets. As the hardness of sublingual tablet is a crucial factor because if the sublingual tablet is just too hard, the solvent-borne drug attenuation might not occur into the inside portion of the tablet and thus remain on a surface portion of the tablet, where the drug attenuation might not adhere to the sublingual tablet.

If the sublingual tablet is just too soft, the sublingual tablet could also be disintegrated by the solvent of the drug attenuation. Preferably, the solvent-borne drug attenuation should be absorbed into the inside of the sublingual tablet.

Weight variation test is conducted by selecting 20 tablets randomly as per IP. [13]

Disintegration time (DT)

A relatively simple method with rigorous conditions has been developed to guage the DT of sublingual tablets. Each individual tablet is dropped into 10-mL glass tube (1.5-cm diameter) containing 2 ml water, and therefore the time required for complete tablet disintegration is observed visually and recorded employing a stopwatch. The visual inspection is often enhanced by gently rotating the tube at a forty five ° angle, without agitation, to distribute any tablet particles which may mask any remaining undisintegrated portion of the tablets.[14]

Wetting time (WT)

Although a wetting test isn't a USP standard test, it's useful for internal control and provides a supportive evaluation of those sublingual tablets. Using this test, the time required for moisture to penetrate the tablet completely is measured and possibly represents the time required to release the drug within the presence of minute volumes of saliva.[14]

Friability

Twenty tablets are to be weighed and placed during a Roche friabilator and therefore the equipment has got to be

rotated at 25 rpm for 4 min. Tablets are often calculated by:

$$\% \text{ Friability} = \frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \text{ X } 100$$

In vivo evaluation

Pharmacokinetic data analysis and bioavailability evaluation Rabbits are described together of the few laboratory animals that don't have keratinized mucosa, thus closely resembling human sublingual mucosal tissue 25. The maximal plasma concentration (Cmax) and therefore the time to achieve maximum plasma concentration (Tmax) are often directly obtained from the plasma data. the world under the plasma concentration curve (AUC) also can calculate using the trapezoidal rule then the bioavailability.[15]

Recent developments

Nitroglycerine-delivering sublingual aerosol formulation (nitro-glycerine in propellants) during a metered-dose spraying pump, Nitrolingual spray, was developed. It delivers nitroglycerine by spraying onto or under the tongue within the sort of spray droplets, which ultimately increase the absorption and hence the bioavailability of nitroglycerine. The rapid onset of action is usually required in case of hypertension.[15]

CONCLUSION

In conclusion, this review demonstrates that there are variety of commercially available sublingual formulations manufactured using various technologies. The publically available information on sublingual tablets implies that this dosage form has good potential to enhance drug delivery in treating variety of indications. In most reported cases, it's been shown that the sublingual dosage form not only improves the patient's compliance, but also reduces the time for the onset of the drug action, and increases the bioavailability of drugs as compared to standard tablets.

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