To Crush— or Not to Crush……..?

Written by: Yin-Yin Ow, Clinical Publicist, South Australia

Increasingly, pharmacists are faced with the question of whether an oral dosage form can be crushed. This question often comes from nursing staff who are caring for patients who experience difficulties when swallowing. Crushing medications is also an issue where paediatric patients are concerned and where patients need to receive their medications via nasogastric tubes.

A scenario that may be seen in aged care facilities is a nurse carefully grinding a patient's medications in a mortar and pestle and then administering the contents in some form of liquid medium or soft food. Apart from the possibility of cross contamination with other drugs and drug interactions between the crushed powders from the different drugs, there are also other problems.

In this day and age, crushing medications presents a problem. Due to the formulation of highly sophisticated drug delivery systems, there are now many oral dosage forms that should not be crushed. Crushing tablets and the contents of capsules poses the risk of altering pharmacokinetic properties of the medication. Examples of dosage forms affected include enteric-coated, sublingual or buccal, and extended-release tablets or capsules.

In addition to altering pharmacokinetic properties of the drug, crushing also has the potential for unmasking the bitter taste of a drug and some drugs become more capable of staining the oral mucosa and teeth. Other medications may result in increased gastric irritation and corrosion to the oral mucosa.

Finally, there are certain drugs that should not be crushed even though crushing does not alter the dosage form or delivery mechanism. Such drugs are categorised as cytotoxics or hazardous drugs and should not be crushed as they are potentially carcinogenic and/or teratogenic. Crushing may result in aerosolisation of the fine particles which may then be inhaled or come into contact with a health care worker.

A number of reasons prevent the crushing of some medications. The crushing or chewing of sublingual or buccal tablets may cause the drug to be ineffective. When enteric-coated tablets are chewed or crushed, the drug may be released too early and be destroyed by stomach acid or irritate the stomach lining. Extended-release preparations may have an increased risk of side effects or the increased potential for drug toxicity when crushed or chewed. Crushing or breaking of products that are carcinogenic or teratogenic may cause a hazard to health care workers because of aerosolisation of particles.

Enteric coated tablets

Some tablets are enteric coated to control the site at which the active ingredients are released. The coating is designed to dissolve slowly at low pH levels such as in the stomach, and more rapidly at the less acidic areas such as the small intestine. Thus, enteric coating allows for delayed release of a drug and is useful for protecting drugs which are acid labile.

In addition, enteric coating can also serve the purpose of protecting the stomach against drugs that may cause nausea or gastric irritation.

Crushing enteric coated tablets or capsules can thus render a drug inactive as the drug may be released too early and be destroyed by stomach acid. Moreover, it can also increase the incidence of nausea and mucosal irritation.

Sublingual & Buccal tablets

Tablets that are placed under the tongue or in the side of the cheek are designed to produce an immediate effect through rapid absorption via the mucosa. An example is glyceryl trinitrate, used in relieving an angina attack. Crushing these forms of medication may render the drugs ineffective.

Sustained-release tablets

Sustained-release tablets are becoming increasingly more common, and are designed for the drug to be released slowly over time. Such dosage forms have the advantage of reducing the dosing frequency and decrease the severity and frequency of unwanted side effects. In most cases, slow release preparations produce a more constant blood level of the drug than repeated doses of a conventional dosage form.

To Crush—or Not to Crush…..?

Continued……...

Crushing can thus lead to the drug being released all at once, resulting in toxicity or an increased risk of adverse effects.

Sustained-release products often have an abbreviation attached to their brand names, which can give some clue as to whether crushing may affect the formulation. Some common abbreviations for sustained-release products are as follows:

CR controlled release
ER extended release
LA long acting
SR sustained release
TR time release
TD time delay
SA sustained action
XR extended release

Alternatives to crushing

Where a patient is unable to swallow whole tablets or capsules, alternatives may be available and include preparations of extemporaneous liquid formulations, substitution with an injectable form of the medication placed in an appropriate liquid, substituting the drug with another which is clinically similar but available in a liquid form or administering the contents of a capsule mixed in soft food.

Whereby a liquid dosage form is available and is substituted, a change in the dose is usually required. This is particularly so if the tablet or capsule is a sustained released preparation.

If a liquid or suspension is not commercially available, it may be possible to prepare it extemporaneously. If there are no issues concerning the compatibility or changes in absorption of the drug, it may be possible to use the injectable form of the medication by administering it via some liquid such as juice.

Another option is to use an alternative drug in the same class with similar pharmacological actions.

Some capsules that cannot be crushed may be opened up and the contents taken without crushing. This can be achieved by placing the contents in soft food such as apple puree or pudding.

Please see table on pages 7 and 8 or contact your Clinical Pharmacist for further information. HPS

References

American Society of Hospital Pharmacists. ASHP technical assistance bulletin on handling

cytotoxic and hazardous drugs. *Am J Hosp Pharm* 1990; 47:1033–1049.

Mitchell JF. Oral dosage forms that should not be crushed: 1998 update. *Hospital Pharmacy*

1998; 33:399–415.

TABLETS and CAPSULES that MUST NOT BE CRUSHED	
GENERIC NAME	**BRAND NAME**
Alendronate	Fosamax
Altretamine	Hexalen
Amoxycillin/Clavulanic acid	Augmentin Duo; Clavulin Duo
Aspirin (enteric coated) †	Astrix capsules †; Cartia
Bisacodyl	Durolax, Bisalax
Capecitabine	Purinethol
Carbamazepine (sustained release)	Tegretol CR
Cefaclor	Ceclor CD; Keflor Cd
Chlorambucil	Purinethol
Chlorpromazine	Largactil
Cyclophoshamide	Cycloblastin
Cyclosporin	Neoral
Dexchlorpheniramine (sustained release)	Demazin Repetab Polaramine Repetab
Diclofenac (enteric coated)	Voltaren; Fenac; Diclohexal
Diltiazem (sustained release)	Cardizem CD; Vasocardol CD
Dipyridamole SR †	Persantin SR; Asasantin SR
Doxycycline	Doryx; Doxylin; Doxy 100
Erythromycin (film or enteric coated)	EES; E-Mycin; Eryc; Erythrocin
Esomeprazole	Nexium
Etoposide	Vepesid
Felodipine	Felodur; Plendil ER; Agon SR
Glyceryl trinitrate (sub lingual)	Anginine; Isordil sub lingual
Hydroxyurea	Hydrea
Idarubicin	Zavedos
Indapamide 1.5mg	Natrilix SR
Iron products	Ferrogradumet; FGF; Fefol
Isosorbide mononitrate	Monodur; Imdur; Duride; Imtrate
Isotretinoin	Roaccutane; Oratane; Accure
Ketoprofen (sustained release) †	Orudis SR; Oruvail SR
Lansoprazole	Zoton
Levamisole	Ergamisol
Levodopa (sustained release)	Sinemet CR; Madopar HBS
Lithium	Lithicarb
Melphalan	Alkeran
Mesalazine	Mesasal
Methotrexate	Ledertrexate; Methoblastin

To Crush—or Not to Crush…..?

Continued……..

GENERIC NAME	BRAND NAME
Morphine Sulphate †	MS Contin; Kapanol †
Naproxen (sustained release)	Naprosyn SR; Proxen SR
Nifedipine	Adalat; Adalat Oros; Nyefax; Nifecard
Nimodipine	Nimotop
Nitrofurantoin	Macrodantin; Ralodantin
Olsalazine	Dipentum
Omeprazole †	Losec; Acimax; Maxor
Oxycodone (sustained release)	Oxycontin
Pancreatic supplements (protease, lipase, amylase) †	Creon; Cotazym-Forte; Pancrease
Pantoprazole	Somac
Pheniramine (sustained release)	Avil Retard
Potassium chloride (sustained release)	KSR; Slow K; Span K
Quinidine	Kinidin Durules
Quinine	Myoquin; Quinsul; Quinate; Biquinate; Quinbisul
Rabeprazole	Pariet
Risedronate	Actonel
Sulphasalazine	Salazopyrin EN
Temozolomide	Temodal
Theophylline	Nuelin
Valproate Sodium	Epilim; Valpro (100mg only may be crushed)
Venlafaxine (sustained release) †	Efexor-XR
Verapamil (sustained release)	Veracaps; Isoptin SR; Anpec SR; Cordilox SR

† These capsules contain specially coated beads or pellets which should not be crushed. These capsules; however, may be opened. Mix the uncrushed pellets with water and administer as a slurry, or sprinkle the pellets on soft food. The beads or pellets must not be chewed or crushed.

In addition the following medications should be altered with caution. Please check with the Pharmacy before crushing or dissolving.

Amiodarone	Cordarone; Aratac
Carbamazepine	Tegretol; Teril
Digoxin	Lanoxin
Levodopa (all)	Sinemet; Kinson; Madopar
Perhexiline	Pexid
Phenytoin	Dilantin
Warfarin	Coumadin; Marevan

Table compiled by Keli Symons, HPS Clinical Services Manager, Victoria