

# Summary of Product Characteristics

## 1 NAME OF THE MEDICINAL PRODUCT

Veramil 120mg Film-coated Tablets

## 2 QUALITATIVE AND QUANTITATIVE COMPOSITION

Each tablet contains 120 mg of Verapamil hydrochloride.

### Excipients with known effect

Contains Lactose Monohydrate 90.0mg and Sucrose 0.64mg.

For the full list of excipients, see section 6.1.

## 3 PHARMACEUTICAL FORM

Film-coated Tablet.

White, convex, film coated tablet, diameter 10mm coded 'VL 120'.

## 4 CLINICAL PARTICULARS

### 4.1 Therapeutic Indications

- Treatment and / or prophylaxis of;
- Angina pectoris, including Prinzmetal's angina (coronary spasm, vasospastic angina).
- Supraventricular tachycardias such as paroxysmal supraventricular tachycardias, atrial fibrillation/flutter with rapid ventricular response (except in WPW syndrome, see "Contraindications").
- Mild to moderate essential hypertension.

### 4.2 Posology and method of administration

#### Posology

The dose of verapamil hydrochloride should be adjusted individually in accordance with the severity of disease. Long-standing clinical experience shows that the average daily dose in all indications is between 240 mg and 360 mg. The daily dose should not exceed 480 mg on a long-term basis, although a higher dose may be used for a short period. There is no limitation on the duration of use. Verapamil hydrochloride should not be discontinued abruptly after long-term use. It is recommended to taper the dosage.

Veramil 120 mg Tablets should be used for patients likely to display a satisfactory response to low doses (e.g. patients with hepatic dysfunction or elderly patients).

Adults Only:

For the treatment of angina, including Prinzmetal's angina, the usual dose is 120 mg 3 to 4 times daily. Although 80 mg 3 times daily may be adequate in many patients with angina of effort, doses below 120 mg 3 times daily are unlikely to be effective in angina of rest and Prinzmetal's angina.

In cases of supraventricular tachycardia the usual dose is 40 mg to 120 mg 3 to 4 times daily according to the severity of the patient's condition.

For the treatment of essential hypertension the usual dose is 40 mg to 120 mg 3 to 4 times daily. In long-term treatment, a total daily dose of 480 mg should not be exceeded; short-term dose increases are possible only when directed by the physician.

### Special Populations

### *Renal Impairment*

Currently available data are described in Special Warnings and Precautions for Use section. Verapamil hydrochloride should be used cautiously and with close monitoring in patients with impaired renal function.

### *Liver Impairment*

In patients with impaired liver function, metabolism of the drug is delayed to a greater or lesser extent depending on the severity of hepatic dysfunction, thus potentiating and prolonging the effects of verapamil hydrochloride. Therefore, the dosage needs to be adjusted with special cautions in patients with impaired liver function and low doses should be given initially (see Special Warnings and Precautions for Use section).

### Method of administration

Verapamil should not be taken with grapefruit juice (see Section 4.5, Interactions).

The tablets must not be crushed or chewed. For oral use only.

## **4.3 Contraindications**

Veramil Tablets should not be given in the following cases:

Cardiovascular shock, complicated acute myocardial infarction (bradycardia, hypotension, left ventricular failure). Severe conduction disorders (second and third degree AV block, sino-atrial block). Sick sinus syndrome (bradycardia-tachycardia syndrome).

Atrial flutter or atrial fibrillation in the presence of an accessory bypass tract (e.g. Wolff-Parkinson-White, Lown-Ganong-Levine syndromes). These patients are at risk to develop ventricular tachyarrhythmia including ventricular fibrillation if verapamil hydrochloride is administered.

Heart failure with reduced ejection fraction of less than 35%, and/or pulmonary wedge pressure above 20 mm Hg (unless secondary to a supraventricular tachycardia amenable to verapamil therapy).

Hypersensitivity to the active substance or to any of the excipients listed in section 6.1.

Simultaneous intravenous administration of beta-adrenergic blockers (See 4.5 Interaction with other medicinal products and other forms of interaction).

Manifestations of heart failure.

Use in pregnancy unless considered essential by the physician.

## **4.4 Special warnings and precautions for use**

### **Acute Myocardial Infarction**

Use with caution in acute myocardial infarction complicated by bradycardia, marked hypotension, or left ventricular dysfunction.

### **Heart Block/1<sup>st</sup> Degree AV block/Bradycardia/Asystole**

Verapamil hydrochloride affects the AV and SA nodes and prolongs AV conduction time. Use with caution as development of second-or third-degree AV block (contraindication) or unifascicular, bifascicular or trifascicular bundle branch block requires discontinuation reduction in subsequent doses or discontinuation of verapamil hydrochloride and institution of appropriate therapy, if needed.

Verapamil hydrochloride affects the AV and SA nodes and rarely may produce second-or third-degree AV block bradycardia, and, in extreme cases, asystole. This is more likely to occur in patients with a sick sinus syndrome (SA nodal disease), which is more common in older patients.

Asystole in patients other than those with sick sinus syndrome is usually of short duration (few seconds or less), with spontaneous return to AV nodal or normal sinus rhythm. If this does not occur promptly, appropriate treatment should be initiated immediately. See Undesirable Effects Section.

Patients with heart failure or those who are susceptible to heart failure should be fully digitalised before verapamil therapy as it may aggravate or precipitate cardiac failure.

Great care should be taken in:

First-degree atrioventricular block bradycardia < 50 beats/min, hypotension <90 mmHg systolic and ventricular tachycardias (QRS complex  $\geq$  0.12 sec).

If acute cardiovascular side effects arise, treat as for overdose (see Section 4.9, Overdose).

Although impaired renal function has been shown in robust comparator studies to have no effect on verapamil pharmacokinetics in patients with end-stage renal failure, several case reports suggest that verapamil should be used cautiously and with close monitoring in patients with impaired renal function.

### **Colchicine**

There has been a single postmarketing report of paralysis (tetraparesis) associated with the combined use of verapamil and colchicine. This may have been caused by colchicine crossing the blood-brain barrier due to CYP3A4 and P-gp inhibition by verapamil. Combined use of verapamil and colchicine is not recommended. (see Section 4.5, Drug Interactions).

### **Digoxin**

If verapamil is administered concomitantly with digoxin, reduce digoxin dosage. See Interactions with other medicinal drug products and other forms of interaction section.

### **Heart Failure**

Heart failure patients with ejection fraction higher than 35% should be compensated before starting verapamil treatment and should be adequately treated throughout.

### **Hypotension**

Intravenous verapamil hydrochloride often produces a decrease in blood pressure below baseline levels that is usually transient and asymptomatic but may result in dizziness.

**HMG-CoA Reductase Inhibitors ("Statins")** – See *Interaction with other medicinal products and other forms of interaction* section

### **Neuromuscular transmission disorders**

Verapamil hydrochloride should be used in caution in the presence of diseases in which neuromuscular transmission is affected (myasthenia gravis, Lambert-Eaton syndrome, advanced Duchenne muscular dystrophy).

Respiratory standstill has been reported for one patient with progressive muscular dystrophy following administration of Veramil Tablets.

### **Other Special Populations**

#### ***Renal impairment***

Although impaired renal function has been shown in robust comparator studies to have no effect on verapamil pharmacokinetics in patients with end-stage renal failure, several case reports suggest that verapamil should be used cautiously and with close monitoring in patients with impaired renal function.

Verapamil cannot be removed by hemodialysis.

#### ***Liver impairment***

Use with caution in patients with severely impaired liver function (see also Posology section in liver impairment).

## **4.5 Interaction with other medicinal products and other forms of interactions**

In rare instances, including when patients with severe cardiomyopathy, congestive heart failure or recent myocardial infarction were given intravenous beta-adrenergic blocking agents or disopyramide concomitantly with intravenous verapamil hydrochloride, serious adverse effects have occurred.

Concomitant use of verapamil hydrochloride injection with agents that decrease adrenergic function may result in an exaggerated hypotensive response.

*In vitro* metabolic studies indicate that verapamil hydrochloride is metabolized by cytochrome P450 CYP3A4, CYP1A2, CYP2C8, CYP2C9 and CYP2C18. Verapamil has been shown to be an inhibitor of CYP3A4 enzymes and P-glycoprotein (P-gp). Clinically significant interactions have been reported with inhibitors of CYP3A4 causing elevation of plasma levels of verapamil hydrochloride while inducers of CYP3A4 have caused a lowering of plasma levels of verapamil hydrochloride, therefore, patients should be monitored for drug interactions.

The following table provides a list of potential drug interactions with verapamil:

#### Potential Drug Interactions associated with Verapamil

Concomitant drug	Potential effect on verapamil or concomitant drug	Comment
Alpha blockers		
Prazosin	↑ prazosin Cmax (~40%) with no effect on half-life	Additional hypotensive effect.
Terazosin	↑ terazosin AUC (~24%) and Cmax (~25%)	
Antiarrhythmics		
Flecainide	Minimal effect on flecainide plasma clearance (<~10%); no effect on verapamil plasma clearance	Additional Information follows
Quinidine	↓ oral quinidine clearance (~35%)	Hypotension. Pulmonary edema may occur in patients with hypertrophic obstructive cardiomyopathy.
Antiasthmatics		
Theophylline	↓ oral and systemic clearance by ~20%	Reduction of clearance was lessened in smokers (~11%)
Anticonvulsants		
Carbamazepine	↑ carbamazepine AUC (~46%) in refractory partial epilepsy patients	Increased carbamazepine levels. This may produce carbamazepine side effects such as diplopia, headache, ataxia or dizziness.
Phenytoin	↓verapamil plasma concentrations	

**Antidepressants**

Imipramine	↑ imipramine AUC (~15%)	No effect on level of active metabolite, desipramine
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**Antidiabetics**

Glyburide	↑ glyburide C <sub>max</sub> (~28%), AUC (~26%)	
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**Anti-gout agents**

Colchicine	Possible ↑ colchicine levels ↑ colchicine AUC (~2.0fold) and C <sub>max</sub> (~1.3fold)	Reduce colchicine dose (see colchicine label)
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**Anti-infectives**

Clarithromycin	Possible ↑ in verapamil levels	
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Erythromycin	Possible ↑ in verapamil levels	
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Rifampicin	↓ verapamil AUC (~97%), C <sub>max</sub> (~94%), oral bioavailability (~92%) with oral verapamil administration	Blood pressure lowering effect may be reduced.
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Telithromycin	Possible ↑ in verapamil levels	
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**Antineoplastics**

Doxorubicin	↑ doxorubicin AUC (104%) and C <sub>max</sub> (61%) with oral verapamil administration	In patients with small cell lung cancer
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	No significant change in doxorubicin PK with intravenous verapamil administration	In patients with advanced neoplasms
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**Barbiturates**

Phenobarbital	↑ oral verapamil clearance (~5-fold)	
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**Benzodiazepines and other anxiolytics**

Buspirone	↑ buspirone AUC, C <sub>max</sub> by ~3.4-fold	
Midazolam	↑ midazolam AUC (~3-fold) and C <sub>max</sub> (~2-fold)	

**Beta blockers**

Metoprolol	↑ metoprolol AUC (~32.5%) and C <sub>max</sub> (~41%) in angina patients	See Special warnings and precautions for use section
Propranolol	↑ propranolol AUC (~65%) and C <sub>max</sub> (~94%) in angina patients	

**Cardiac glycosides**

Digitoxin	↓ digitoxin total body clearance (~27%) and extrarenal clearance (~29%)	
Digoxin	Healthy subjects: ↑ digoxin C <sub>max</sub> (~44%) ↑ digoxin C <sub>12h</sub> (~53%) , ↑ C <sub>ss</sub> by ~42% and ↑ AUC (50%)	

**H2 Receptor antagonists**

Cimetidine	↑ AUC of R- (~25%) and S- (~40%) verapamil with corresponding ↓ in R- and S-verapamil	Cimetidine reduces verapamil clearance following intravenous verapamil administration
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clearance

***Immunologics/ Immuno-suppressives***

Ciclosporin	↑ ciclosporin AUC, C <sub>ss</sub> , C <sub>max</sub> by ~45%	
Everolimus	everolimus: ↑ AUC (~3.5fold) and ↑ C <sub>max</sub> (2.3fold) verapamil: ↑ C <sub>trough</sub> (2.3fold)	Concentration determinations and dose adjustments of everolimus may be necessary.
Sirolimus	sirolimus: ↑ AUC (~2.2fold), S-verapamil: AUC (~1.5fold)	Concentration determinations and dose adjustments of sirolimus may be necessary.
Tacrolimus	Possible ↑ tacrolimus levels	

***Lipid lowering agents(HMG COA reductase inhibitors)***

Atorvastatin	Possible ↑ atorvastatin levels	Additional information follows
	Increase verapamil AUC (~42.8%)	
Lovastatin	Possible ↑ lovastatin levels ↑ verapamil AUC (~63%) and C <sub>max</sub> (~32%)	
Simvastatin	↑ simvastatin AUC (~2.6-fold), C <sub>max</sub> (~4.6-fold)	

**Serotonin receptor antagonists**

Almotriptan	↑ almotriptan AUC (~20%), ↑ Cmax (~24%)	
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**Uricosurics**

Sulfinpyrazone	↑ verapamil oral clearance (~3-fold) ↓ bioavailability (~60%) No change in PK with intravenous verapamil administration	Blood pressure lowering effect may be reduced
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**Other**

Grapefruit juice	↑ R- (~49%) and S- (~37%) verapamil AUC ↑ R- (~75%) and S- (~51%) verapamil Cmax	Elimination half-life and renal clearance not affected. Grapefruit juice should therefore not be ingested with verapamil.
St. John's Wort	↓ R- (~78%) and S- (~80%) verapamil AUC with corresponding reductions in Cmax	

**Other Drug Interactions and Additional Drug Interaction Information****Antihypertensives, diuretics, vasodilators**

Potential of the hypotensive effect.

**HIV antiviral agents**

Due to the metabolic inhibitory potential of some of the HIV antiviral agents, such as ritonavir, plasma concentrations of verapamil may increase. Caution should be used or dose of verapamil may be decreased.

**Lithium**

Increased lithium neurotoxicity has been reported during concomitant verapamil hydrochloride-lithium therapy with either no change or an increase in serum lithium levels. The addition of verapamil hydrochloride, however, has also resulted in the lowering of the serum lithium levels in patients receiving chronic stable oral lithium. Patients receiving both drugs should be monitored carefully.

**Neuromuscular blockers**

Clinical data and animal studies suggest that verapamil hydrochloride may potentiate the activity of neuromuscular blocking agents (curare-like and depolarizing). It may be necessary to decrease the dose of verapamil hydrochloride and/or the dose of the neuromuscular blocking agent when the drugs are used concomitantly.

### **Aspirin**

Increased tendency to bleed.

### **Ethanol (alcohol)**

Elevation of ethanol plasma levels.

**HMG Co-A Reductase Inhibitors ("Statins"):** treatment with HMG CoA reductase inhibitors (e.g., simvastatin, atorvastatin or lovastatin) in a patient taking verapamil should be started at the lowest possible dose and titrated upwards. If verapamil treatment is to be added to patients already taking an HMG CoA reductase inhibitor (e.g., simvastatin, atorvastatin or lovastatin), consider a reduction in the statin dose and retitrate against serum cholesterol concentrations.

Fluvastatin, pravastatin and rosuvastatin are not metabolized by CYP3A4 and are less likely to interact with verapamil.

### **Dabigatran**

When oral verapamil was co-administered with dabigatran etexilate (150 mg), a P-gp substrate, the C<sub>max</sub> and AUC of dabigatran were increased but magnitude of this change differs depending on time between administration and the formulation of verapamil. When verapamil 120 mg immediate-release was co-administered one hour before a single dose of dabigatran etexilate, the dabigatran C<sub>max</sub> was increased by about 180% and AUC by about 150%. No meaningful interaction was observed when verapamil was administered 2 hours after dabigatran etexilate (increase of C<sub>max</sub> by about 10% and AUC by about 20%).

Close clinical surveillance is recommended when verapamil is combined with dabigatran etexilate and particularly in the occurrence of bleeding, notably in patients having a mild to moderate renal impairment.

### **Metformin**

Co-administration of verapamil with metformin may reduce the efficacy of metformin.

## **4.6 Fertility, pregnancy and lactation**

### Pregnancy

#### *Teratogenic Effects*

There are no adequate and well-controlled study data in pregnant woman.

Animal studies do not indicate direct or indirect harmful effects with respect to reproductive toxicity.

Because animal reproduction studies are not always predictive of human response during pregnancy (especially in the first trimester), verapamil should only be used if considered essential by the physician.

Verapamil crosses the placental barrier and can be detected in umbilical vein blood at delivery.

### Breast-feeding

Verapamil hydrochloride/metabolites are excreted in human breast milk.

Limited data from oral administration has shown that the infant relative dose of verapamil is low (0.1-1% of the mother's oral dose) and that verapamil use may be compatible with breastfeeding.

A risk to the newborns/infants cannot be excluded. Due to the potential for serious adverse reactions in nursing infants, verapamil should only be used during lactation if it is essential for the welfare of the mother.

## **4.7 Effects on ability to drive and use machines**

Due to its antihypertensive effect, depending on individual response, verapamil hydrochloride may affect the ability to react to the point of impairing the ability to drive a vehicle, operate machinery or work under hazardous conditions. This applies all the more at the start of treatment, when the dose is raised, when switching from another drug, and also in conjunction with alcohol. Verapamil may increase the blood levels of alcohol and slow its elimination. Therefore, the effects of alcohol may be exaggerated.

## **4.8 Undesirable effects**

The following adverse reactions have been reported with verapamil from clinical studies, postmarketing surveillance or Phase IV clinical trials and are listed below by system organ class.

Frequencies are defined as:

Very common ( $\geq 1/10$ )

Common ( $\geq 1/100$  to  $< 1/10$ )

Uncommon ( $\geq 1/1,000$  to  $< 1/100$ )

Rare ( $\geq 1/10,000$  to  $< 1/1,000$ )

Very rare ( $< 1/10,000$ )

Not known (cannot be estimated from the available data)

The most commonly reported ADRs were:

headache,

dizziness,

gastrointestinal disorders: nausea, constipation and abdominal pain,

bradycardia,

tachycardia,

palpitations,

hypotension,

flushing,

oedema peripheral,

fatigue.

MedDRA System Organ Class	Common	Uncommon	Rare	Unknown
Immune system disorders				Hypersensitivity
Nervous system disorders	Headache Dizziness		Paraesthesia Tremor	Extrapyramidal disorder, paralysis (tetraparesis) <sup>1</sup> , Seizures
Psychiatric disorders			Somnolence	Nervousness
Ear and labyrinth disorders			Tinnitus	Vertigo
Cardiac disorders	Bradycardia	Palpitations Tachycardia		Atrioventricular block (1°, 2°, 3°), Cardiac failure, Cardiac arrest, Bradyarrhythmia, Sinus arrest, Sinus bradycardia, asystole
Vascular disorders	Flushing, Hypotension			Vasodilatation Erythromelalgia
Respiratory, thoracic and mediastinal disorders				Bronchospasm
Gastrointestinal disorders	Constipation, Nausea	Abdominal pain	Vomiting	Abdominal discomfort, Gingival hyperplasia, Ileus
Skin and subcutaneous tissue disorders			Hyperhidrosis	Angioedema, Stevens-Johnson syndrome, Erythema multiforme, Alopecia, Itching, Pruritus, Purpura, Rash maculopapular, Urticaria, Rash, Erythema
Musculoskeletal and connective tissue disorders				Muscular weakness, Myalgia, Arthralgia
Reproductive system and breast disorders				Erectile dysfunction, Gynaecomastia, Galactorrhoea
General disorders and administration	Oedema peripheral	Fatigue		

site conditions				
Investigations				Hepatic enzymes increased, Transaminases increased, Blood alkaline phosphatase increased, Blood prolactin increased

<sup>1</sup> There has been a single postmarketing report of paralysis (tetraparesis) associated with the combined use of verapamil and colchicine. This may have been caused by colchicine crossing the blood-brain barrier due to CYP3A4 and P-gp inhibitions by verapamil. See Interactions with other medicinal products and other forms of interaction section.

#### Reporting of suspected adverse reactions

Reporting suspected adverse reactions after authorisation of the medicinal product is important. It allows continued monitoring of the benefit/risk balance of the medicinal product. Healthcare professionals are asked to report any suspected adverse reactions via the HPRA Pharmacovigilance, Earlsfort Terrace, IRL - Dublin 2; Tel: +353 1 6764971; Fax: +353 1 6762517. Website: [www.hpra.ie](http://www.hpra.ie); or email: [medsafety@hpra.ie](mailto:medsafety@hpra.ie).

## 4.9 Overdose

Overdosage with Veramil is a medical emergency that can be fatal. The clinical effects usually develop within 30 to 60 minutes of ingestion of an overdose of five to ten times the therapeutic dose. Central nervous system features of overdose include drowsiness, confusion, and, rarely, seizures; coma secondary to cardiovascular collapse may occur. Nausea, vomiting, metabolic acidosis, acute respiratory distress syndrome, and secondary hyperglycaemia may also occur. Hypotension is the most common cardiovascular finding; bradycardia, atrioventricular block, sinus arrest with nodal escape rhythms, and asystole may occur.

The usual intensive care measures should be taken. Fatalities have occurred as a result of overdose.

Verapamil hydrochloride cannot be removed by haemodialysis.

The specific antidote is calcium, e.g. 10-20 ml in a 10% calcium gluconate solution administered intravenously (2.25-4.5 mmol), repeated if necessary or given as a continuous drip infusion (e.g. 5 mmol/hour). The following measures may also be necessary:

In the case of 2<sup>nd</sup> or 3<sup>rd</sup> degree AV block, sinus bradycardia, asystole: Atropine, isoprenaline, orciprenaline or pacemaker therapy. Asystole should be handled by the usual measures including beta adrenergic stimulation (e.g. isoproterenol hydrochloride).

In the case of hypotension: Dopamine, dobutamine, norepinephrine.

If there are any signs of continuing myocardial failure: Dopamine, dobutamine, if necessary repeated calcium injections, and possibly other medication that increases cardiac contractility combined with isoprenaline.

## 5 PHARMACOLOGICAL PROPERTIES

### 5.1 Pharmacodynamic properties

Pharmacotherapeutic group: Selective calcium channel blockers with direct cardiac effects, phenylalkylamine derivatives, ATC code: C08 DA01

Verapamil hydrochloride is a white or practically white crystalline powder. It is practically odourless and has a bitter taste. It is soluble in water, freely soluble in chloroform, sparingly soluble in alcohol and practically insoluble in ether.

The chemical name of verapamil hydrochloride is benzeneacetonitrile,  $\alpha$ -[3-[[2-(3, 4dimethoxyphenyl) ethyl] methylaminol] propyl]-3, 4-dimethoxy- $\alpha$ -(1-methylethyl) hydrochloride.

It has a molecular weight of 491.07 and the molecular formula is C<sub>27</sub>H<sub>38</sub>N<sub>2</sub>O<sub>4</sub>·HCl.

#### Mechanism of action and Pharmacodynamic effects

Verapamil inhibits the transmembrane influx of calcium ions into the heart and vascular smooth muscle cell. The myocardial oxygen demand is lowered directly as a result of the effect on the energy consuming metabolic processes of the myocardial cell and indirectly due to a reduction of the afterload.

Due to its effect on coronary vascular smooth muscle, verapamil enhances myocardial blood flow, even in post-stenotic areas, and relieves coronary spasms.

These properties contribute to the anti-ischaemic and antianginal efficacy of verapamil in all types of coronary artery disease.

Veramil Tablets has a marked antiarrhythmic effect, particularly in supraventricular arrhythmias. It delays impulse conduction in the AV node. Owing to this, sinus rhythm is restored and/or ventricular rate is normalised, depending on the type of arrhythmia. Normally, the rate is either not affected or only minimally lowered.

The antihypertensive effect of verapamil stems from a decrease in peripheral vascular resistance, without an increase in heart rate as a reflex response. As early as day 1 of treatment, blood pressure falls; the effect is found to persist also in long-term therapy.

## 5.2 Pharmacokinetic properties

Verapamil hydrochloride is a racemic mixture consisting of equal portions of the R-enantiomer and the S-enantiomer. Verapamil is extensively metabolized. Norverapamil is one of 12 metabolites identified in urine, has 10 to 20% of the pharmacologic activity of verapamil and accounts for 6% of excreted drug. The steady-state plasma concentrations of norverapamil and verapamil are similar. Steady state after multiple once daily dosing is reached after three to four days.

### Absorption

Greater than 90% of verapamil is rapidly absorbed from the small intestine after oral administration. Mean systemic availability of the unchanged compound after a single dose of IR verapamil is 22% and that of SR verapamil approximately 33%, owing to an extensive hepatic first-pass metabolism. Bioavailability is about two times higher with repeated administration. Peak verapamil plasma levels are reached one to two hours after IR administration, and four to five hours after SR administration. The peak plasma concentration of norverapamil is attained approximately one and five hours after IR or SR administration, respectively. The presence of food has no effect on the bioavailability of verapamil.

Half-life values between 3 and 7 hours have been measured for the elimination of unchanged substance from the plasma after single intravenous and oral administration.

### Distribution

Verapamil is widely distributed throughout the body tissues, the volume of distribution ranging from 1.8-6.8 L/kg in healthy subjects. Plasma protein binding verapamil is approximately 90%.

### Metabolism

Verapamil is extensively metabolized. *In vitro* metabolic studies indicate that verapamil is metabolized by cytochrome P450 CYP3A4, CYP1A2, CYP2C8, CYP2C9 and CYP2C18. In healthy men, orally administered verapamil hydrochloride undergoes extensive metabolism in the liver, with 12 metabolites having been identified, most in only trace amounts. The major metabolites have been identified as various N and O-dealkylated products of verapamil. Of these metabolites, only norverapamil has any appreciable pharmacological effect (approximately 20% that of the parent compound), which was observed in a study with dogs.

In coronary heart disease and hypertension, no correlation was found between the therapeutic effect and the plasma concentration; a definite correlation with the plasma level was determined only for the effect on the PR interval. The concentration curve of verapamil in the plasma is protracted after administration of the sustained-release formulations, and is also flatter and more homogenous than after administration of the instant release formulations.

### Elimination

Following intravenous infusion, verapamil is eliminated bi-exponentially, with a rapid early distribution phase (half-life about four minutes) and a slower terminal elimination phase (half-life two to five hours). Following oral administration, the elimination half-life is three to seven hours. Approximately 50% of an administered dose is eliminated renally within 24 hours, 70% within five days. Up to 16% of a dose is excreted in the feces. About 3% to 4% of renally excreted drug is excreted as unchanged drug. The total clearance of verapamil is nearly as high as the hepatic blood flow, approximately 1 L/h/kg (range: 0.7-1.3 L/h/kg).

## Special Populations

### *Paediatric:*

Limited information on the pharmacokinetics in the paediatric population is available. After intravenous dosing the mean half-life of verapamil was 9.17 hours and the mean clearance was 30L/h, whereas it is around 70 L/h for a 70kg adult. Steady-state plasma concentrations appear to be somewhat lower in the paediatric population after oral dosing compared to those observed in adults.

*Geriatric:* Aging may affect the pharmacokinetics of verapamil given to hypertensive patients. Elimination half-life may be prolonged in the elderly. The antihypersensitive effect of verapamil was found not to be age-related.

*Renal insufficiency:* Impaired renal function has no effect on verapamil pharmacokinetics, as shown by comparative studies in patients with end-stage renal failure and subjects with healthy kidneys. Verapamil and norverapamil are not significantly removed by haemodialysis.

*Hepatic insufficiency:* The half-life of verapamil is prolonged in patients with impaired liver function owing to lower oral clearance and a higher volume of distribution.

Verapamil hydrochloride, administered intravenously, has been shown to be rapidly metabolized.

### 5.3 Preclinical safety data

Reproduction studies have been performed in rabbits and rats at oral verapamil doses up to 1.5 (15 mg/kg/day) and 6 (60 mg/kg/day) times the human oral daily dose, respectively, and have revealed no evidence of teratogenicity. In the rat, however, this multiple of the human dose was embryocidal and retarded fetal growth and development, probably because of adverse maternal effects reflected in reduced weight gains of the dams. This oral dose has also been shown to cause hypotension in rats. There are, however, no adequate and well-controlled studies in pregnant women. The cardiovascular findings and the diffuse gingival hyperplasia seen in the chronic toxicity of verapamil hydrochloride are taken into account in Section 4.8 (Undesirable Effects).

## 6 PHARMACEUTICAL PARTICULARS

### 6.1 List of excipients

Lactose monohydrate Microcrystalline cellulose Gelatin  
Magnesium stearate Colloidal anhydrous silica Hypromellose  
Sucrose  
Titanium dioxide (E 171) Polysorbate 80  
Glycerol 85%

### 6.2 Incompatibilities

Not applicable

### 6.3 Shelf life

3 years.

### 6.4 Special precautions for storage

Do not store above 25°C. Store in the original package in order to protect from light.

### 6.5 Nature and contents of container

100 tablets, polyethylene container.

Not all pack sizes may be marketed.

### 6.6 Special precautions for disposal

No special requirements for disposal.

**7 MARKETING AUTHORISATION HOLDER**

Orion Corporation  
Orionintie 1  
FI-02200 Espoo  
Finland

**8 MARKETING AUTHORISATION NUMBER**

PA1327/008/003

**9 DATE OF FIRST AUTHORISATION/RENEWAL OF THE AUTHORISATION**

Date of first authorisation: 11 September 1985

Date of last renewal: 15 June 2010

**10 DATE OF REVISION OF THE TEXT**

March 2021