

Prior Preeclampsia Boosts Hypertension Risk

BY MITCHEL L. ZOLER

FROM THE ANNUAL MEETING OF THE AMERICAN COLLEGE OF CARDIOLOGY

NEW ORLEANS – Women who had early preeclampsia while pregnant faced a threefold increased risk for hypertension 10 years following the affected pregnancy, according to a Dutch study.

But the women showed no significantly increased risk for diabetes, hyper-

cholesterolemia, or metabolic syndrome, Dr. José T. Drost said at the meeting.

This study showed a “very striking, pretty dramatic” difference in the prevalence of hypertension after 10 years, at 44% among women with preeclampsia compared with 17% in women who did not have preeclampsia, said Dr. Glenn A. Hirsch, a cardiologist and director of cardiac rehabilitation at Johns Hopkins Bayview Medical Center, Baltimore.

“Metabolic syndrome may be part of the underlying causal pathway, as waist/hip ratio was increased at baseline in the women with preeclampsia,” Dr. Hirsch said.

The Preeclampsia Risk Evaluation in Females (PREVFEM) study was a 10-year follow-up evaluation of 339 women who developed early preeclampsia while treated at the Isala Clinics during 1991-2005, and 332 matched control women who

were pregnant at the same time but did not develop preeclampsia. Dr. Drost and her associates defined early preeclampsia as new-onset hypertension, with a blood pressure of at least 140/90 mm Hg, plus new-onset proteinuria, at a level of at least 0.3 g/24 hr, that first appeared after the 20th gestational week but before the 32nd gestational week.

At the time of the index pregnancy, the age of the women with preeclampsia av-

MULTAQ® (dronedarone) Tablets

Rx Only

Brief Summary of Prescribing Information

WARNING: HEART FAILURE

MULTAQ is contraindicated in patients with NYHA Class IV heart failure, or NYHA Class II – III heart failure with a recent decompensation requiring hospitalization or referral to a specialized heart failure clinic [see Contraindications (4)].

In a placebo-controlled study in patients with severe heart failure requiring recent hospitalization or referral to a specialized heart failure clinic for worsening symptoms (the ANDROMEDA Study), patients given dronedarone had a greater than two-fold increase in mortality. Such patients should not be given dronedarone [see Clinical Studies (14.3) in the full prescribing information].

1 INDICATIONS AND USAGE

MULTAQ is indicated to reduce the risk of cardiovascular hospitalization in patients with paroxysmal or persistent atrial fibrillation (AF) or atrial flutter (AFL), with a recent episode of AF/AFL and associated cardiovascular risk factors (i.e., age >70, hypertension, diabetes, prior cerebrovascular accident, left atrial diameter ≥50 mm or left ventricular ejection fraction [LVEF] <40%), who are in sinus rhythm or who will be cardioverted [see Clinical Studies (14) in the full prescribing information].

2 DOSAGE AND ADMINISTRATION

The only recommended dosage of MULTAQ is 400 mg twice daily in adults. MULTAQ should be taken as one tablet with the morning meal and one tablet with the evening meal. Treatment with Class I or III antiarrhythmics (e.g., amiodarone, flecainide, propafenone, quinidine, disopyramide, dofetilide, sotalol) or drugs that are strong inhibitors of CYP3A (e.g., ketoconazole) must be stopped before starting MULTAQ [see Contraindications (4)].

4 CONTRAINDICATIONS

MULTAQ is contraindicated in patients with:

- NYHA Class IV heart failure or NYHA Class II – III heart failure with a recent decompensation requiring hospitalization or referral to a specialized heart failure clinic [see Boxed Warning and Clinical Studies (14.3) in the full prescribing information]
- Second- or third-degree atrioventricular (AV) block or sick sinus syndrome (except when used in conjunction with a functioning pacemaker)
- Bradycardia <50 bpm
- Concomitant use of strong CYP 3A inhibitors, such as ketoconazole, itraconazole, voriconazole, cyclosporine, telithromycin, clarithromycin, nefazodone, and ritonavir [see Drug Interactions (7.2)]
- Concomitant use of drugs or herbal products that prolong the QT interval and might increase the risk of Torsade de Pointes, such as phenothiazine anti-psychotics, tricyclic antidepressants, certain oral macrolide antibiotics, and Class I and III antiarrhythmics
- QTc Bazett interval ≥500 ms or PR interval >280 ms
- Severe hepatic impairment
- Pregnancy (Category X): MULTAQ may cause fetal harm when administered to a pregnant woman. MULTAQ is contraindicated in women who are or may become pregnant. If this drug is used during pregnancy, or if the patient becomes pregnant while taking this drug, the patient should be apprised of the potential hazard to a fetus [see Use in Specific Populations (8.1)].
- Nursing mothers [see Use in Specific Populations (8.3)]

5 WARNINGS AND PRECAUTIONS

5.1 Patients with New or Worsening Heart Failure during Treatment

Postmarketing cases of new onset and worsening heart failure have been reported during treatment with MULTAQ. Advise patients to consult a physician if they develop signs or symptoms of heart failure, such as weight gain, dependent edema, or increasing shortness of breath. If heart failure develops or worsens, consider the suspension or discontinuation of MULTAQ.

5.2 Liver Injury

Hepatocellular liver injury, including acute liver failure requiring transplant, has been reported in patients treated with MULTAQ in the post-marketing setting. Advise patients treated with MULTAQ to report immediately symptoms suggesting hepatic injury (such as anorexia, nausea, vomiting, fever, malaise, fatigue, right upper quadrant pain, jaundice, dark urine, or itching). Consider obtaining periodic hepatic serum enzymes, especially during the first 6 months of treatment. It is not known whether routine periodic monitoring of serum enzymes will prevent the development of severe liver injury. If hepatic injury is suspected, promptly discontinue MULTAQ and test serum enzymes, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase, as well as serum bilirubin, to establish whether there is liver injury. If liver injury is found, institute appropriate treatment and investigate the probable cause. Do not restart MULTAQ in patients without another explanation for the observed liver injury.

5.3 Hypokalemia and Hypomagnesemia with Potassium-Depleting Diuretics

Hypokalemia or hypomagnesemia may occur with concomitant administration of potassium-depleting diuretics. Potassium levels should be within the normal range prior to administration of MULTAQ and maintained in the normal range during administration of MULTAQ.

5.4 QT Interval Prolongation

Dronedarone induces a moderate (average of about 10 ms but much greater effects have been observed) QTc (Bazett) prolongation [see Clinical Pharmacology (12.2) in the full prescribing information and Clinical Studies (14.1) in the full prescribing information]. If the QTc Bazett interval is ≥500 ms, MULTAQ should be stopped [see Contraindications (4)].

5.5 Increase in Creatinine after Treatment Initiation

Serum creatinine levels increase by about 0.1 mg/dL following dronedarone treatment initiation. The elevation has a rapid onset, reaches a plateau after 7 days and is reversible after discontinuation. If an increase in serum creatinine occurs and plateaus, this increased value should be used as the patient's new baseline. The change in creatinine levels has been shown to be the result of an inhibition of creatinine's tubular secretion, with no effect upon the glomerular filtration rate.

5.6 Women of Childbearing Potential

Pre-menopausal women who have not undergone a hysterectomy or oophorectomy must use effective contraception while using MULTAQ. Dronedarone caused fetal harm in animal studies at doses equivalent to recommended human doses. Women of childbearing potential should be counseled regarding appropriate contraceptive choices taking into consideration their underlying medical conditions and lifestyle preferences [see Use in Specific Populations (8.1)].

6 ADVERSE REACTIONS

The following safety concerns are described elsewhere in the label:

- New or worsening heart failure [see Warnings and Precautions (5.1)]
- Liver Injury [see Warnings and Precautions (5.2)]
- Hypokalemia and hypomagnesemia with potassium-depleting diuretics [see Warnings and Precautions (5.3)]
- QT prolongation [see Warnings and Precautions (5.4)]

6.1 Clinical Trials Experience

The safety evaluation of dronedarone 400 mg twice daily in patients with AF or AFL is based on 5 placebo controlled studies, ATHENA, EURIDIS, ADONIS, ERATO and DAFNE. In these studies, a total of 6285 patients were randomized and treated, 3282 patients with MULTAQ 400 mg twice daily, and 2875 with placebo. The mean exposure across studies was 12 months. In ATHENA, the maximum follow-up was 30 months.

In clinical trials, premature discontinuation because of adverse reactions occurred in 11.8% of the dronedarone-treated patients and in 7.7% of the placebo-treated group. The most common reasons for discontinuation of therapy with MULTAQ were gastrointestinal disorders (3.2% versus 1.8% in the placebo group) and QT prolongation (1.5% versus 0.5% in the placebo group).

The most frequent adverse reactions observed with MULTAQ 400 mg twice daily in the 5 studies were diarrhea, nausea, abdominal pain, vomiting, and asthenia.

Table 1 displays adverse reactions more common with dronedarone 400 mg twice daily than with placebo in AF or AFL patients, presented by system organ class and by decreasing order of frequency. Adverse laboratory and ECG effects are presented separately in Table 2.

Table 1: Adverse Drug Reactions that Occurred in at Least 1% of Patients and Were More Frequent than Placebo

	Placebo (N=2875)	Dronedarone 400 mg twice daily (N=3282)
Gastrointestinal		
Diarrhea	6%	9%
Nausea	3%	5%
Abdominal pain	3%	4%
Vomiting	1%	2%
Dyspeptic signs and symptoms	1%	2%
General		
Asthenic conditions	5%	7%
Cardiac		
Bradycardia	1%	3%
Skin and subcutaneous tissue		
Including rashes (generalized, macular, maculo-papular, erythematous), pruritus, eczema, dermatitis, dermatitis allergic	3%	5%

Photosensitivity reaction and dysgeusia have also been reported at an incidence less than 1% in patients treated with MULTAQ.

The following laboratory data/ECG parameters were reported with MULTAQ 400 mg twice daily.

Table 2: Laboratory data/ECG parameters not necessarily reported as adverse events

	Placebo (N=2875)	MULTAQ 400 mg twice daily (N=3282)
Serum creatinine increased ≥10% five days after treatment initiation	21%	51%
	(N=2237)	(N=2701)
QTc Bazett prolonged (>450 ms in males >470 ms in females)	19%	28%

Assessment of demographic factors such as gender or age on the incidence of treatment-emergent adverse events did not suggest an excess of adverse events in any particular sub-group.

6.2 Postmarketing Experience

The following adverse reactions have been identified during post-approval use of MULTAQ. Because these reactions are reported voluntarily from a population of an unknown size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

Cardiac: Heart failure [see Warnings and Precautions (5.1)].

eraged 30 years, while the controls' average age was 29 years. The index pregnancy was the first pregnancy for 80% of the women with preeclampsia and for 70% of the controls, said Dr. Drost, a researcher in the cardiology department at the Isala Clinics in Zwolle, the Netherlands.

At a screening examination performed a mean of 9-11 years following the index pregnancy, the average blood pressure of the women who had preeclampsia was 127/86 mm Hg, compared with an average of 119/79 in the controls. The prevalence of hypertension was 44% in the women with a history of preeclampsia

and 17% in the controls. Women in both groups had a similar average BMI, 29.9 and 26.2 kg/m², respectively, but the women with a history of preeclampsia had a higher average waist circumference, 87 cm, compared with 83 cm in the controls; and hip circumference, 104 cm, compared with 100 cm in the controls. The prevalence of proteinuria, de-



finied as a spot urine protein level of more than 0.15 g/L, was 11% in the women with a history of preeclampsia and 6% in the controls, a significant difference. In a multivariate analysis that controlled for differences in age, years following pregnancy, and waist circumference, the women with a history of preeclampsia had a significant, 3.3-fold in-

DR. DROST

creased risk for hypertension at their follow-up screening examination, compared with the control women, Dr. Drost reported. The prevalence of diabetes and hypercholesterolemia was similar in the two groups at follow-up.

However, the prevalence of metabolic syndrome at follow-up reached 18% in the women who had preeclampsia and 9% in the control women. After adjustment, this represented a 60% increased risk for metabolic syndrome in the women with a history of preeclampsia that fell short of statistical significance.

Dr. Drost had no disclosures. ■

Postmarketing cases of new onset and worsening heart failure have been reported during treatment with MULTAQ.

Hepatic: Serum hepatic enzymes and serum bilirubin increase: Hepatocellular liver injury, including acute liver failure requiring transplant, has been reported [see *Warnings and Precautions* (5.2)].

7 DRUG INTERACTIONS

Dronedaronone is metabolized primarily by CYP 3A and is a moderate inhibitor of CYP 3A and CYP 2D6 [see *Clinical Pharmacology* (12.3) in the full prescribing information]. Dronedaronone's blood levels can therefore be affected by inhibitors and inducers of CYP 3A, and dronedaronone can interact with drugs that are substrates of CYP 3A and CYP 2D6.

Dronedaronone has no significant potential to inhibit CYP 1A2, CYP 2C9, CYP 2C19, CYP 2C8 and CYP 2B6. It has the potential to inhibit P-glycoprotein (P-gP) transport.

Pharmacodynamic interactions can be expected with beta-blockers; calcium antagonists and digoxin [see *Drug Interactions* (7.1)].

In clinical trials, patients treated with dronedaronone received concomitant medications including beta-blockers, digoxin, calcium antagonists (including those with heart rate-lowering effects), statins and oral anticoagulants.

7.1 Pharmacodynamic Interactions

Drugs prolonging the QT interval (inducing Torsade de Pointes)

Co-administration of drugs prolonging the QT interval (such as certain phenothiazines, tricyclic antidepressants, certain macrolide antibiotics, and Class I and III antiarrhythmics) is contraindicated because of the potential risk of Torsade de Pointes-type ventricular tachycardia [see *Contraindications* (4)].

Digoxin

Digoxin can potentiate the electrophysiologic effects of dronedaronone (such as decreased AV-node conduction). In clinical trials, increased levels of digoxin were observed when dronedaronone was co-administered with digoxin. Gastrointestinal disorders were also increased. Because of the pharmacokinetic interaction [see *Drug Interaction* (7.3)] and possible pharmacodynamic interaction, reconsider the need for digoxin therapy. If digoxin treatment is continued, halve the dose of digoxin, monitor serum levels closely, and observe for toxicity.

Calcium channel blockers

Calcium channel blockers with depressant effects on the sinus and AV nodes could potentiate dronedaronone's effects on conduction.

Give low doses of calcium channel blockers initially and increase only after ECG verification of good tolerability [see *Drug Interactions* (7.3)].

Beta-blockers

In clinical trials, bradycardia was more frequently observed when dronedaronone was given in combination with beta-blockers.

Give low dose of beta-blockers initially, and increase only after ECG verification of good tolerability [see *Drug Interactions* (7.3)].

7.2 Effects of Other Drugs on Dronedaronone

Ketoconazole and other potent CYP 3A inhibitors

Repeated doses of ketoconazole, a strong CYP 3A inhibitor, resulted in a 17-fold increase in dronedaronone exposure and a 9-fold increase in C_{max}. Concomitant use of ketoconazole as well as other potent CYP 3A inhibitors such as itraconazole, voriconazole, ritonavir, clarithromycin, and nefazodone is contraindicated [see *Contraindications* (4)].

Grapefruit juice

Grapefruit juice, a moderate inhibitor of CYP 3A, resulted in a 3-fold increase in dronedaronone exposure and a 2.5-fold increase in C_{max}. Therefore, patients should avoid grapefruit juice beverages while taking MULTAQ.

Rifampin and other CYP 3A inducers

Rifampin decreased dronedaronone exposure by 80%. Avoid rifampin or other CYP 3A inducers such as phenobarbital, carbamazepine, phenytoin, and St John's wort with dronedaronone because they decrease its exposure significantly.

Calcium channel blockers

Verapamil and diltiazem are moderate CYP 3A inhibitors and increase dronedaronone exposure by approximately 1.4- to 1.7-fold [see *Drug Interactions* (7.1, 7.3)].

Pantoprazole

Pantoprazole, a drug that increases gastric pH, did not have a significant effect on dronedaronone pharmacokinetics.

7.3 Effects of Dronedaronone on Other Drugs

Statins

Dronedaronone increased simvastatin/simvastatin acid exposure by 4- and 2-fold, respectively. Because of multiple mechanisms of interaction with statins (CYPs and transporters), follow statin label recommendations for use with CYP 3A and P-gP inhibitors such as dronedaronone.

Calcium channel blockers

Dronedaronone increases calcium channel blocker (verapamil, diltiazem or nifedipine) exposure by 1.4- to 1.5-fold [see *Drug Interactions* (7.1)].

Sirolimus, tacrolimus, and other CYP3A substrates with narrow therapeutic range

Dronedaronone can increase plasma concentrations of tacrolimus, sirolimus, and other CYP 3A substrates with a narrow therapeutic range when given orally. Monitor plasma concentrations and adjust dosage appropriately.

Beta-blockers and other CYP 2D6 substrates

Dronedaronone increased propranolol exposure by approximately 1.3-fold following single dose administration. Dronedaronone increased metoprolol exposure by 1.6-fold following multiple dose administration [see *Drug Interaction* (7.1)]. Other CYP 2D6 substrates, including other beta-blockers, tricyclic antidepressants, and selective serotonin reuptake inhibitors (SSRIs) may have increased exposure upon co-administration with dronedaronone.

P-glycoprotein substrates

Digoxin

Dronedaronone increased digoxin exposure by 2.5-fold by inhibiting the P-gP transporter [see *Drug Interactions* (7.1)].

Dabigatran

Exposure to dabigatran is higher when it is administered with dronedaronone than when it is administered alone (1.7- to 2-fold).

Other P-gP substrates are expected to have increased exposure when co-administered with dronedaronone.

Warfarin and losartan (CYP 2C9 substrates)

Losartan

No interaction was observed between dronedaronone and losartan.

Warfarin

When healthy subjects were administered dronedaronone 600 mg twice daily, exposure to S-warfarin was higher than when warfarin was administered alone (1.2-fold). Exposure to R-warfarin was unchanged and there were no clinically significant increases in INR.

More patients experienced clinically significant INR elevations (≥ 5) usually within 1 week after starting dronedaronone vs. placebo in patients taking oral anticoagulants in ATHENA. However, no excess risk of bleeding was observed in the dronedaronone group.

Postmarketing cases of increased INR with or without bleeding events have been reported in warfarin-treated patients initiated on dronedaronone. Monitor INR after initiating dronedaronone in patients taking warfarin.

Theophylline (CYP 1A2 substrate)

Dronedaronone does not increase steady state theophylline exposure.

Oral contraceptives

No decreases in ethinylestradiol and levonorgestrel concentrations were observed in healthy subjects receiving dronedaronone concomitantly with oral contraceptives.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category X [see *Contraindications* (4)]

MULTAQ may cause fetal harm when administered to a pregnant woman. In animal studies, dronedaronone was teratogenic in rats at the maximum recommended human dose (MRHD), and in rabbits at half the MRHD. If this drug is used during pregnancy or if the patient becomes pregnant while taking this drug, the patient should be apprised of the potential hazard to the fetus.

When pregnant rats received dronedaronone at oral doses greater than or equal to the MRHD (on a mg/m² basis), fetuses had increased rates of external, visceral and skeletal malformations (craniochisis, cleft palate, incomplete evagination of pineal body, brachygnathia, partially fused carotid arteries, truncus arteriosus, abnormal lobation of the liver, partially duplicated inferior vena cava, brachydactyly, ectrodactyly, syndactyly, and anterior and/or posterior club feet). When pregnant rabbits received dronedaronone, at a dose approximately half the MRHD (on a mg/m² basis), fetuses had an increased rate of skeletal abnormalities (anomalous ribcage and vertebrae, pelvic asymmetry) at doses ≥ 20 mg/kg (the lowest dose tested and approximately half the MRHD on a mg/m² basis).

Actual animal doses: rat (≥ 80 mg/kg/day); rabbit (≥ 20 mg/kg)

8.3 Nursing Mothers

It is not known whether MULTAQ is excreted in human milk. Dronedaronone and its metabolites are excreted in rat milk. During a pre- and post-natal study in rats, maternal dronedaronone administration was associated with minor reduced body-weight gain in the offspring. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from MULTAQ, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother [see *Contraindications* (4)].

8.4 Pediatric Use

Safety and efficacy in children below the age of 18 years have not been established.

8.5 Geriatric Use

More than 4500 patients with AF or AFL aged 65 years or above were included in the MULTAQ clinical program (of whom more than 2000 patients were 75 years or older). Efficacy and safety were similar in elderly and younger patients.

8.6 Renal Impairment

Patients with renal impairment were included in clinical studies. Because renal excretion of dronedaronone is minimal [see *Clinical Pharmacology* (12.3) in the full prescribing information], no dosing alteration is needed.

8.7 Hepatic Impairment

Dronedaronone is extensively metabolized by the liver. There is little clinical experience with moderate hepatic impairment and none with severe impairment. No dosage adjustment is recommended for moderate hepatic impairment [see *Contraindications* (4) and *Clinical Pharmacology* (12.3) in the full prescribing information].

10 OVERDOSAGE

In the event of overdosage, monitor the patient's cardiac rhythm and blood pressure. Treatment should be supportive and based on symptoms.

It is not known whether dronedaronone or its metabolites can be removed by dialysis (hemodialysis, peritoneal dialysis or hemofiltration).

There is no specific antidote available.

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Mom's Smoking Ups Children's CVD Risk

FROM THE EUROPEAN HEART JOURNAL

Healthy prepubescent children with mothers who smoked during pregnancy have higher systolic blood pressures and lower HDL cholesterol levels than do children born to women who do not smoke while pregnant, Dr. Julian G. Ayer of the University of Sydney, and his colleagues, reported in a longitudinal study.

"Cholesterol levels tend to track from childhood to adulthood, and studies have shown that for every 0.025-mmol/L increase in HDL levels, there is an approximately 2%-3% reduction in the risk of coronary heart disease," Dr. David Celermajer, Scandrett Professor of Cardiology at the university, who led the study, said in a statement. "If we extrapolate this, we can suggest that the difference of 0.15 mmol/L between children of smoking mothers versus nonsmoking mothers might result in a 10%-15% higher risk for coronary disease in the children of smoking mothers."

Results showed that children born to mothers who smoked during pregnancy had lower HDL cholesterol (1.32 vs. 1.50 mmol/L), higher triglycerides (1.36 vs. 1.20 mmol/L) and higher systolic blood pressure (102.1 vs. 99.9 mm Hg). When postnatal ETS exposure and other confounders such as breastfeeding duration, physical inactivity, and maternal exposure to passive smoking during pregnancy were factored into the study, the children still had lower HDL cholesterol (a difference of -0.22 mmol/L) but had no significant difference in systolic blood pressure. When excluding postnatal ETS exposure and including all other confounders, the difference was about -0.14 mmol/L (Eur. Heart J. 2011 June 21 [doi:10.1093/eurheartj/ehr174]).

Included in the study were 328 children from Sydney who were enrolled into the Childhood Asthma Prevention Study (CAPS) at birth and who underwent a lipoprotein study at age 8 years.

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-Nancy Pham