

Biomarkers Tied to Colorectal Cancer in Smokers

BY SUSAN LONDON

SAN FRANCISCO — Older women who smoke have an elevated risk of colorectal cancer, but they have a particularly high risk of cancers containing certain molecular features, a large prospective study has found.

Former and current smokers were much more likely than never smokers to develop colorectal cancers associated

with a CpG island methylator phenotype and/or a BRAF mutation in the analysis of data and tissue samples from 37,399 women enrolled in the Iowa Women's Health Study.

"Existing observational data support a positive association between cigarette smoking and incident colorectal cancer," lead author Dr. David Limsui said at a meeting on gastrointestinal cancers sponsored by the American Society of

Clinical Oncology. "However, the molecular mechanisms underlying cigarette smoking-induced colorectal carcinogenesis remain incompletely defined."

Studies have implicated hypermethylation of CpG islands, genome regions rich in CpG dinucleotides, noted Dr. Limsui, of the Mayo Clinic in Rochester, Minn. Patients having widespread methylation in these regions are said to have a CpG island methylator phenotype

(CIMP). This phenotype has been associated with mutation of BRAF, a gene involved in cell signaling and cell growth.

Dr. Limsui and his coinvestigators analyzed data and tissue samples from women who were aged 55-69 years at baseline, had never had cancer, and reported their smoking status; 4% of the women developed colorectal cancer during a follow-up of 18 years.

Never smokers contributed 68% of 603,671 person-years of follow-up, former smokers contributed 19%, and current smokers contributed 13%.

The investigator assessed formalin-fixed, paraffin-embedded tumor specimens, available for 555 women with can-

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cer, for CIMP status and the presence of BRAF mutation.

In a multivariate analysis among the entire cohort adjusted for potential confounders (age, body mass index, waist-to-hip ratio, physical activity, alcohol consumption, hormone replacement therapy use, and dietary factors), former and current smokers had 1.15 and 1.25 times the risk of any colorectal cancer, compared with never smokers.

The findings were similar when cumulative smoking was considered. Specifically, relative to their never-smoking peers, women having 1-19, 20-39, and 40 or more pack-years of exposure had 1.13, 1.11, and 1.38 times the risk, respectively, of any colorectal cancer.

The risk of CIMP-negative cancer did not vary by smoking status or exposure, but the risk of CIMP-positive cancer did. Compared with never smokers, former and current smokers had 1.21 and 1.85 times the risk of CIMP-positive cancer, respectively—increases that were more striking than those for colorectal cancer generally, Dr. Limsui commented.

The risk for CIMP-positive cancer among women with 1-19, 20-39, and 40 or more pack-years of smoking exposure was 1.32, 1.24, and 1.79, respectively, compared with never smokers.

Similarly, the risk of cancer without BRAF mutation did not vary by smoking status or exposure, but the risk of BRAF-mutated cancer did, he said. Compared with never smokers, former and current smokers had relative risk of 1.36 and 1.89—values again higher than those for colorectal cancer generally.

The relative risk for BRAF-mutated cancer among women with 1-19, 20-39, and 40 or more pack-years of smoking exposure was 1.58, 1.24, and 1.90, compared with never smokers.

Dr. Limsui reported that he had no conflicts of interest in association with the study. ■

AMRIX®

(Cyclobenzaprine Hydrochloride Extended-Release Capsules)

Rx Only

Brief Summary of Prescribing Information. The following is a brief summary only. Please see full Prescribing Information for complete product information.

DESCRIPTION

AMRIX® (Cyclobenzaprine Hydrochloride Extended-Release Capsules) is a skeletal muscle relaxant which relieves muscle spasm of local origin without interfering with muscle function. The active ingredient in AMRIX extended-release capsules is cyclobenzaprine hydrochloride, USP.

AMRIX extended-release capsules for oral administration are supplied in 15 and 30 mg strengths.

INDICATIONS AND USAGE

AMRIX is indicated as an adjunct to rest and physical therapy for relief of muscle spasm associated with acute, painful musculoskeletal conditions. Improvement is manifested by relief of muscle spasm and its associated signs and symptoms, namely, pain, tenderness, and limitation of motion.

AMRIX should be used only for short periods (up to two or three weeks) because adequate evidence of effectiveness for more prolonged use is not available and because muscle spasm associated with acute, painful musculoskeletal conditions is generally of short duration and specific therapy for longer periods is seldom warranted.

AMRIX has not been found effective in the treatment of spasticity associated with cerebral or spinal cord disease or in children with cerebral palsy.

CONTRAINDICATIONS

- Hypersensitivity to any component of this product.
- Concomitant use of monoamine oxidase (MAO) inhibitors or within 14 days after their discontinuation.
- Hyperpyretic crisis seizures and deaths have occurred in patients receiving cyclobenzaprine (or structurally similar tricyclic antidepressants) concomitantly with MAO inhibitor drugs.
- During the acute recovery phase of myocardial infarction, and in patients with arrhythmias, heart block conduction disturbances, or congestive heart failure.
- Hyperthyroidism.

WARNINGS

AMRIX is closely related to the tricyclic antidepressants, e.g., amitriptyline and imipramine. In short term studies for indications other than muscle spasm associated with acute musculoskeletal conditions, and usually at doses somewhat greater than those recommended for skeletal muscle spasm, some of the more serious central nervous system reactions noted with the tricyclic antidepressants have occurred (see WARNINGS, below, and ADVERSE REACTIONS section of full Prescribing Information).

Tricyclic antidepressants have been reported to produce arrhythmias, sinus tachycardia, prolongation of the conduction time leading to myocardial infarction and stroke. AMRIX may enhance the effects of alcohol, barbiturates, and other CNS depressants.

As a result of a two-fold higher cyclobenzaprine plasma levels in subjects with mild hepatic impairment, as compared to healthy subjects, following administration of immediate-release cyclobenzaprine and because there is limited dosing flexibility with AMRIX, use of AMRIX is not recommended in subjects with mild, moderate or severe hepatic impairment.

As a result of a 40% increase in cyclobenzaprine plasma levels and a 56% increase in plasma half-life following administration of AMRIX in elderly subjects as compared to young adults, use of AMRIX is not recommended in elderly.

PRECAUTIONS

General

Because of its atropine-like action, AMRIX should be used with caution in patients with a history of urinary retention, angle-closure glaucoma, increased intraocular pressure, and in patients taking anticholinergic medication.

Information for Patients

AMRIX, especially when used with alcohol or other CNS depressants, may impair mental and/or physical abilities required for performance of hazardous tasks, such as operating machinery or driving a motor vehicle.

Drug Interactions

AMRIX may have life-threatening interactions with MAO inhibitors. (See CONTRAINDICATIONS.) AMRIX may enhance the effects of alcohol, barbiturates, and other CNS depressants. Tricyclic antidepressants may block the antihypertensive action of guanethidine and similarly acting compounds. Tricyclic antidepressants may enhance the seizure risk in patients taking tramadol (ULTRAM® [tramadol HCl tablets, Ortho-McNeil Pharmaceutical]) or ULTRACET® [tramadol HCl and acetaminophen tablets, Ortho-McNeil Pharmaceutical].

Carcinogenesis, Mutagenesis, Impairment of Fertility

In rats treated with cyclobenzaprine for up to 67 weeks at doses of approximately 5 to 40 times the maximum recommended human dose, pale, sometimes enlarged, livers were noted and there was a dose-related hepatocyte vacuolation with lipidosis. Cyclobenzaprine did not affect the onset, incidence, or distribution of neoplasia in an 81-week study in the mouse or in a 105-week study in the rat. At oral doses of up to 10 times the human dose, cyclobenzaprine did not adversely affect the reproductive performance or fertility of male or female rats.

A battery of mutagenicity tests using bacterial and mammalian systems for point mutations and cytogenic effects have provided no evidence for a mutagenic potential for cyclobenzaprine.

Pregnancy

Pregnancy Category B: Reproduction studies have been performed in rats, mice, and rabbits at doses up to 20 times the human dose and have revealed no evidence of impaired fertility or harm to the fetus due to cyclobenzaprine. There are, however, no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, this drug should be used during pregnancy only if clearly needed.

Nursing Mothers

It is not known whether this drug is excreted in human milk. Because cyclobenzaprine is closely related to the tricyclic antidepressants, some of which are known to be excreted in human milk, caution should be exercised when AMRIX is administered to a nursing woman.

Pediatric Use

Safety and effectiveness of AMRIX has not been studied in pediatric patients.

Use in the Elderly

The plasma concentration and half-life of cyclobenzaprine are substantially increased in the elderly when compared to the general patient population (see CLINICAL PHARMACOLOGY, Pharmacokinetics, Special Populations, Elderly in full Prescribing Information). Accordingly, AMRIX should not be used in the elderly.

ADVERSE REACTIONS

The most common adverse reactions in the two 14-day clinical efficacy trials are presented in Table 1.

Table 1: Incidence of the Most Common Adverse Reactions Occurring in ≥3% of Subjects in Any Treatment Group in the Two Phase 3, Double-Blind AMRIX Trials

	AMRIX 15 mg N = 127	AMRIX 30 mg N = 126	Placebo N = 128
Dry mouth	6%	14%	2%
Dizziness	3%	6%	2%
Fatigue	3%	3%	2%
Constipation	1%	3%	0%
Somnolence	1%	2%	0%
Nausea	3%	3%	1%
Dyspepsia	0%	4%	1%

In a postmarketing surveillance program (7607 patients treated with cyclobenzaprine 10 mg TID), the adverse reactions reported most frequently were drowsiness, dry mouth, and dizziness.

Among the less frequent adverse reactions, there was no appreciable difference in incidence in controlled clinical studies or in the surveillance program. Adverse reactions which were reported in 1% to 3% of the patients were: fatigue/tiredness, asthenia, nausea, constipation, dyspepsia, unpleasant taste, blurred vision, headache, nervousness, and confusion. The following adverse reactions have been reported in post-marketing experience or with an incidence of less than 1% of patients in clinical trials with the 10 mg TID tablet:

Body as a Whole: Syncope; malaise.

Cardiovascular: Tachycardia; arrhythmia; vasodilatation; palpitation; hypotension.

Digestive: Vomiting; anorexia; diarrhea; gastrointestinal pain; gastritis; thirst; flatulence; edema of the tongue; abnormal liver function and rare reports of hepatitis, jaundice, and cholestasis.

Hypersensitivity: Anaphylaxis; angioedema; pruritus; facial edema; urticaria; rash.

Musculoskeletal: Local weakness.

Nervous System and Psychiatric: Seizures; ataxia; vertigo; dysarthria; tremors; hypertonia; convulsions; muscle twitching; disorientation; insomnia; depressed mood; abnormal sensations; anxiety; agitation; psychosis, abnormal thinking and dreaming; hallucinations; excitement; paresthesia; diplopia.

Skin: Sweating.

Special Senses: Ageusia; tinnitus.

Urogenital: Urinary frequency and/or retention.

DRUG ABUSE AND DEPENDENCE

Pharmacologic similarities among the tricyclic drugs require that certain withdrawal symptoms be considered when AMRIX (Cyclobenzaprine Hydrochloride Extended-Release Capsules) is administered, even though they have not been reported to occur with this drug. Abrupt cessation of treatment after prolonged administration rarely may produce nausea, headache, and malaise. These are not indicative of addiction.

OVERDOSAGE

Although rare, deaths may occur from overdosage with AMRIX. Multiple drug ingestion (including alcohol) is common in deliberate cyclobenzaprine overdose. **As management of overdose is complex and changing, it is recommended that the physician contact a poison control center for current information on treatment.** Signs and symptoms of toxicity may develop rapidly after cyclobenzaprine overdose; therefore, hospital monitoring is required as soon as possible.

All patients suspected of an overdose with AMRIX should receive gastrointestinal decontamination. This should include large volume gastric lavage followed by activated charcoal. If consciousness is impaired, the airway should be secured prior to lavage and emesis is contraindicated.

The principles of management of child and adult overdose are similar. It is strongly recommended that the physician contact the local poison control center for specific pediatric treatment.

DOSAGE AND ADMINISTRATION

The recommended adult dose for most patients is one (1) AMRIX 15 mg capsule taken once daily. Some patients may require up to 30 mg/day, given as one (1) AMRIX 30 mg capsule taken once daily or as two (2) AMRIX 15 mg capsules taken once daily.

It is recommended that doses be taken at approximately the same time each day.

Use of AMRIX for periods longer than two or three weeks is not recommended (see INDICATIONS AND USAGE).

Dosage Considerations for Special Patient Populations: AMRIX should not be used in the elderly or in patients with impaired hepatic function (see WARNINGS).

HOW SUPPLIED

AMRIX extended-release capsules are available in 15 and 30 mg strengths, packaged in bottles of 60 capsules.

KEEP THIS AND ALL MEDICATION OUT OF THE REACH OF CHILDREN. IN CASE OF ACCIDENTAL OVERDOSE, SEEK PROFESSIONAL ASSISTANCE OR CONTACT A POISON CONTROL CENTER IMMEDIATELY.

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