

Ketorolac Tromethamine Ophthalmic Solution, 0.5%

- Ketorolac Tromethamine Ophthalmic Solution is indicated for the temporary relief of ocular itching due to seasonal allergic conjunctivitis. Ketorolac Tromethamine Ophthalmic Solution is also indicated for the treatment of postoperative inflammation in patients who have undergone cataract extraction
- Ketorolac Tromethamine Ophthalmic Solution is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formulation
- Available direct or through your authorized wholesaler or distributor



Ketorolac Tromethamine Ophthalmic Solution



Ketorolac Tromethamine Ophthalmic Solution, 0.5%



RSS Barcoded



UPC Barcoded

NDC #	DESCRIPTION	SIZE	UNIT OF SALE	BRAND COMPARE	ORANGE BOOK CODE
17478-209-19	0.5% Sterile Ophthalmic Solution	3 mL	1	Acular® by Allergan	AT
17478-209-10	0.5% Sterile Ophthalmic Solution	5 mL	1	Acular® by Allergan	AT
17478-209-11	0.5% Sterile Ophthalmic Solution	10 mL	1	Acular® by Allergan	AT

EACH mL CONTAINS:

ACTIVE:	Ketorolac Tromethamine 0.5%;
PRESERVATIVE:	Benzalkonium Chloride 0.01%;
INACTIVES:	Edetate Disodium 0.1%, Octoxynol 40, Sodium Chloride and Hydrochloric Acid and/or Sodium Hydroxide maybe added to adjust pH (6.8 to 7.4) and Purified Water.

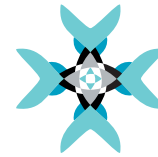
NDC #	CARDINAL	AMERISOURCEBERGEN	MCKESSON	MORRIS DICKSON
17478-209-19	4260972	061-531	1662592	025346
17478-209-10	4260980	061-499	1662600	025353
17478-209-11	4260998	061-539	1663053	025361



ANTI-INFLAMMATORIES

Ketorolac Tromethamine Ophthalmic Solution, 0.4%

- Ketorolac Tromethamine Ophthalmic Solution, 0.4% is indicated for the reduction of ocular pain and burning/stinging following corneal refractive surgery
- Ketorolac Tromethamine Ophthalmic Solution, 0.4% is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formulation
- Available direct or through your authorized wholesaler or distributor



Ketorolac Tromethamine Ophthalmic Solution



Ketorolac Tromethamine Ophthalmic Solution, 0.4%

NDC #	DESCRIPTION	SIZE	UNIT OF SALE	BRAND COMPARE	ORANGE BOOK CODE
17478-208-10	0.4% Sterile Ophthalmic Solution	5 mL	1	Acular® LS by Allergan	AT

EACH mL CONTAINS:	
ACTIVE:	Ketorolac Tromethamine 0.4%;
PRESERVATIVE:	Benzalkonium Chloride 0.006%;
INACTIVES:	Edetate Disodium 0.015%, Octoxynol 40, Sodium Chloride and Purified Water. May contain Hydrochloric Acid and/or Sodium Hydroxide (to adjust the pH).

NDC #	CARDINAL	AMERISOURCEBERGEN	MCKESSON	MORRIS DICKSON
17478-208-10	4260964	061-510	1663145	025379



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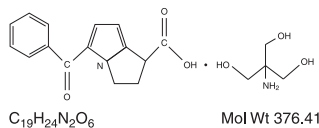
KETOROLAC TROMETHAMINE OPHTHALMIC SOLUTION, 0.4%

Rx only

DESCRIPTION

Ketorolac Tromethamine Ophthalmic Solution, 0.4% is a member of the pyrrolo-pyrrole group of nonsteroidal anti-inflammatory drugs (NSAIDs) for ophthalmic use.

Chemical Name: (±)-5-Benzoyl-2,3-dihydro-1H-pyrrolizine-1-carboxylic acid, compound with 2-amino-2-(hydroxymethyl)-1,3-propanediol (1:1).



Contains: Active: ketorolac tromethamine 0.4%. **Preservative:** benzalkonium chloride 0.006%. **Inactives:** edetate disodium 0.015%, octoxynol 40, sodium chloride and purified water. May contain hydrochloric acid and/or sodium hydroxide (to adjust the pH).

Ketorolac Tromethamine Ophthalmic Solution 0.4% is supplied as a sterile isotonic aqueous 0.4% solution, with a pH of approximately 7.4. Ketorolac Ophthalmic Solution is a racemic mixture of R-(+) and S-(-) ketorolac tromethamine. Ketorolac tromethamine may exist in three crystal forms. All forms are equally soluble in water. The pKa of ketorolac is 3.5. This white to off-white crystalline substance discolors on prolonged exposure to light. The osmolality of Ketorolac Ophthalmic Solution is approximately 290 mOsm/kg.

CLINICAL PHARMACOLOGY

Mechanism of Action

Ketorolac Ophthalmic Solution is a nonsteroidal anti-inflammatory drug which, when administered systemically, has demonstrated analgesic, anti-inflammatory, and anti-pyretic activity. The mechanism of its action is thought to be due to its ability to inhibit prostaglandin biosynthesis. Ketorolac tromethamine given systemically does not cause pupil constriction.

Pharmacokinetics

One drop (0.05 mL) of 0.5% ketorolac tromethamine ophthalmic solution was instilled into one eye and one drop of vehicle into the other eye TID in 26 normal subjects. Only 5 of 26 subjects had a detectable amount of ketorolac in their plasma (range 10.7 to 22.5 ng/mL) at day 10 during topical ocular treatment. When ketorolac tromethamine 10 mg is administered systemically every 6 hours, peak plasma levels at steady state are around 960 ng/mL.

Clinical Studies

In two double-masked, multi-centered, parallel-group studies, 313 patients who had undergone photorefractive keratectomy received Ketorolac Tromethamine Ophthalmic Solution, 0.4% or its vehicle QID for up to 4 days. Significant differences favored Ketorolac Ophthalmic Solution for the reduction of ocular pain and burning/stinging following photorefractive keratectomy surgery.

Results from clinical studies indicate that ketorolac tromethamine has no significant effect upon intraocular pressure.

The safety and effectiveness of Ketorolac Tromethamine Ophthalmic Solution in post-cataract surgery patients has not been established.

INDICATIONS AND USAGE

Ketorolac Tromethamine Ophthalmic Solution, 0.4% is indicated for the reduction of ocular pain and burning/stinging following corneal refractive surgery.

CONTRAINDICATIONS

Ketorolac Tromethamine Ophthalmic Solution, 0.4% is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formulation.

WARNINGS

There is the potential for cross-sensitivity to acetylsalicylic acid, phenylacetic acid derivatives, and other nonsteroidal anti-inflammatory agents. Therefore, caution should be used when treating individuals who have previously exhibited sensitivities to these drugs.

With some nonsteroidal anti-inflammatory drugs there exists the potential for increased bleeding time due to interference with thrombocyte aggregation. There have been reports that ocularly applied nonsteroidal anti-inflammatory drugs may cause increased bleeding of ocular tissues (including hyphemas) in conjunction with ocular surgery.

PRECAUTIONS

General: All topical nonsteroidal anti-inflammatory drugs (NSAIDs), including ketorolac tromethamine ophthalmic solution, may slow or delay healing. Topical corticosteroids are also known to slow or delay healing. Concomitant use of topical NSAIDs and topical steroids may increase the potential for healing problems.

Use of topical NSAIDs may result in keratitis. In some susceptible patients, continued use of topical NSAIDs may result in epithelial breakdown, corneal thinning, corneal erosion, corneal ulceration or corneal perforation. These events may be sight threatening. Patients with evidence of corneal epithelial breakdown should immediately discontinue use of topical NSAIDs and should be closely monitored for corneal health.

Postmarketing experience with topical NSAIDs suggests that patients with complicated ocular surgeries, corneal denervation, corneal epithelial defects, diabetes mellitus, ocular surface diseases (e.g., dry eye syndrome), rheumatoid arthritis, or repeat ocular surgeries within a short period of time may be at increased risk for corneal adverse events which may become sight threatening. Topical NSAIDs should be used with caution in these patients.

Postmarketing experience with topical NSAIDs also suggests that use more than 24 hours prior to surgery or use beyond 14 days post-surgery may increase patient risk for the occurrence and severity of corneal adverse events.

It is recommended that Ketorolac Ophthalmic Solution be used with caution in patients with known bleeding tendencies or who are receiving other medications, which may prolong bleeding time.

Information for Patients: Ketorolac Ophthalmic Solution should not be administered while wearing contact lenses.

Carcinogenesis, Mutagenesis, Impairment of Fertility:

Ketorolac tromethamine was neither carcinogenic in rats given up to 5 mg/kg/day orally for 24 months (156 times the maximum recommended human topical ophthalmic dose, on a mg/kg basis, assuming 100% absorption in humans and animals) nor in mice given 2 mg/kg/day orally for 18 months (62.5 times the maximum recommended human topical ophthalmic dose, on a mg/kg basis, assuming 100% absorption in humans and animals).

Ketorolac tromethamine was not mutagenic *in vitro* in the Ames assay or in forward mutation assays. Similarly, it did not result in an *in vitro* increase in unscheduled DNA synthesis or an *in vivo* increase in chromosome breakage in mice. However, ketorolac tromethamine did result in an increased incidence in chromosomal aberrations in Chinese hamster ovary cells.

Ketorolac tromethamine did not impair fertility when administered orally to male and female rats at doses up to 280 and 499 times the maximum recommended human topical ophthalmic dose, respectively, on a mg/kg basis, assuming 100% absorption in humans and animals.

Pregnancy:

Teratogenic Effects: Pregnancy Category C:

Ketorolac tromethamine, administered during organogenesis, was not teratogenic in rabbits or rats at oral doses up to 112 times and 312 times the maximum recommended human topical ophthalmic dose, respectively, on a mg/kg basis assuming 100% absorption in humans and animals. When administered to rats after Day 17 of gestation at oral doses up to 46 times the maximum recommended human topical ophthalmic dose on a mg/kg basis, assuming 100% absorption in humans and animals, ketorolac

tromethamine resulted in dystocia and increased pup mortality. There are no adequate and well-controlled studies in pregnant women. Ketorolac Ophthalmic Solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nonteratogenic Effects:

Because of the known effects of prostaglandin-inhibiting drugs on the fetal cardiovascular system (closure of the ductus arteriosus), the use of Ketorolac Ophthalmic Solution during late pregnancy should be avoided.

Nursing Mothers: Caution should be exercised when Ketorolac Ophthalmic Solution is administered to a nursing woman.

Pediatric Use: Safety and effectiveness of ketorolac tromethamine in pediatric patients below the age of 3 have not been established.

Geriatric Use: No overall differences in safety or effectiveness have been observed between elderly and younger patients.

ADVERSE REACTIONS

The most frequently reported adverse reactions for Ketorolac Ophthalmic Solution occurring in approximately 1 to 5% of the overall study population were conjunctival hyperemia, corneal infiltrates, headache, ocular edema and ocular pain.

The most frequent adverse events reported with the use of ketorolac tromethamine ophthalmic solutions have been transient stinging and burning on instillation. These events were reported by 20%- 40% of patients participating in these other clinical trials.

Other adverse events occurring approximately 1%-10% of the time during treatment with ketorolac tromethamine ophthalmic solutions included allergic reactions, corneal edema, iritis, ocular inflammation, ocular irritation, ocular pain, superficial keratitis, and superficial ocular infections.

Clinical Practice: The following events have been identified during post-marketing use of ketorolac tromethamine ophthalmic solutions in clinical practice. Because they are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. The events, which have been chosen for inclusion due to either their seriousness, frequency of reporting, possible causal connection to topical ketorolac tromethamine ophthalmic solutions, or a combination of these factors, include corneal erosion, corneal perforation, corneal thinning and epithelial breakdown (see **PRECAUTIONS, General**).

DOSAGE AND ADMINISTRATION

The recommended dose of Ketorolac Tromethamine Ophthalmic Solution, 0.4% is one drop four times a day in the operated eye as needed for pain and burning/stinging for up to 4 days following corneal refractive surgery.

Ketorolac tromethamine ophthalmic solution has been safely administered in conjunction with other ophthalmic medications such as antibiotics, beta blockers, carbonic anhydrase inhibitors, cycloplegics, and mydriatics.

HOW SUPPLIED

Ketorolac Tromethamine Ophthalmic Solution, 0.4% is supplied sterile in a white LDPE boston round bottle with a LDPE natural-colored dropper tip and a gray short skirt cap as follows:

5 mL in 10 mL bottle - NDC 17478-208-10

Storage: Store at 20°C to 25°C (68°F to 77°F) [see USP Controlled Room Temperature].

Akorn
Manufactured by: Akorn, Inc.
Lake Forest, IL 60045

KRAON

Rev. 08/09

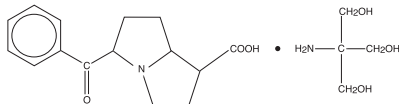
KETOROLAC TROMETHAMINE OPHTHALMIC SOLUTION, 0.5%

Sterile

Rx only

DESCRIPTION

Ketorolac Tromethamine Ophthalmic Solution is a member of the pyrrolopyrrole group of nonsteroidal anti-inflammatory drugs (NSAIDs) for ophthalmic use. Its chemical name is (±)-5-benzoyl-2, 3-dihydro-1H-pyrrolizine-1-carboxylic acid, compound with 2-amino-2-(hydroxymethyl)-1,3-propanediol (1:1) and it has the following structural formula:



The molecular formula of Ketorolac Tromethamine Ophthalmic Solution is C₁₅H₁₃NO₃•C₄H₁₁NO₃.

Ketorolac Tromethamine Ophthalmic Solution is supplied as a sterile isotonic aqueous 0.5% solution, with a pH of 7.4.

Ketorolac Tromethamine Ophthalmic Solution is a racemic mixture of R-(+) and S-(-)-ketorolac tromethamine.

Ketorolac tromethamine may exist in three crystal forms. All forms are equally soluble in water. The pKa of ketorolac is 3.5. This white to off-white crystalline substance discolors on prolonged exposure to light. The molecular weight of ketorolac tromethamine is 376.41. The osmolality of Ketorolac Tromethamine Ophthalmic Solution is 290 mOsmol/kg.

Each mL of Ketorolac Tromethamine Ophthalmic Solution contains:

Active: ketorolac tromethamine 0.5%

Preservative: benzalkonium chloride 0.01%

Inactives: edetate disodium 0.1%; octoxynol 40; sodium chloride; hydrochloric acid and/or sodium hydroxide may be added to adjust pH (6.8 to 7.4) and purified water.

CLINICAL PHARMACOLOGY

Ketorolac tromethamine is a nonsteroidal anti-inflammatory drug which, when administered systemically, has demonstrated analgesic, anti-inflammatory, and anti-pyretic activity.

The mechanism of its action is thought to be due to its ability to inhibit prostaglandin biosynthesis. Ketorolac tromethamine given systemically does not cause pupil constriction.

Prostaglandins have been shown in many animal models to be mediators of certain kinds of intraocular inflammation. In studies performed in animal eyes, prostaglandins have been shown to produce disruption of the blood-aqueous humor barrier, vasodilation, increased vascular permeability, leukocytosis, and increased intraocular pressure. Prostaglandins also appear to play a role in the miotic response produced during ocular surgery by constricting the iris sphincter independently of cholinergic mechanisms.

Two drops (0.1 mL) of 0.5% Ketorolac Tromethamine Ophthalmic Solution instilled into the eyes of patients 12 hours and 1 hour prior to cataract extraction achieved measurable levels in 8 of 9 patients' eyes (mean ketorolac concentration 95 ng/mL aqueous humor, range 40 to 170 ng/mL). Ocular administration of ketorolac tromethamine reduces prostaglandin E₂ (PGE₂) levels in aqueous humor. The mean concentration of PGE₂ was 80 pg/mL in the aqueous humor of eyes receiving vehicle and 28 pg/mL in the eyes receiving ketorolac tromethamine ophthalmic solution, 0.5%.

One drop (0.05 mL) of 0.5% Ketorolac Tromethamine Ophthalmic Solution was instilled into one eye and one drop of vehicle into the other eye TID in 26 normal subjects. Only 5 of 26 subjects had a detectable amount of ketorolac in their plasma (range 10.7 to 22.5 ng/mL) at Day 10 during topical ocular treatment. When ketorolac tromethamine 10 mg is administered systemically every 6 hours, peak plasma levels at steady state are around 960 ng/mL.

Two controlled clinical studies showed that Ketorolac Tromethamine Ophthalmic Solution was significantly more effective than its vehicle in relieving ocular itching caused by seasonal allergic conjunctivitis.

Two controlled clinical studies showed that patients treated for two weeks with Ketorolac Tromethamine Ophthalmic Solution were less likely to have measurable signs of inflammation (cell and flare) than patients treated with its vehicle.

Results from clinical studies indicate that ketorolac tromethamine has no significant effect upon intraocular pressure; however, changes in intraocular pressure may occur following cataract surgery.

INDICATIONS AND USAGE

Ketorolac Tromethamine Ophthalmic Solution is indicated for the temporary relief of ocular itching due to seasonal allergic conjunctivitis. Ketorolac Tromethamine Ophthalmic Solution is also indicated for the treatment of postoperative inflammation in patients who have undergone cataract extraction.

CONTRAINDICATIONS

Ketorolac Tromethamine Ophthalmic Solution is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formulation.

WARNINGS

There is the potential for cross-sensitivity to acetylsalicylic acid, phenylacetic acid derivatives, and other nonsteroidal anti-inflammatory agents. Therefore, caution should be used when treating individuals who have previously exhibited sensitivities to these drugs.

With some nonsteroidal anti-inflammatory drugs, there exists the potential for increased bleeding time due to interference with thrombocyte aggregation. There have been reports that ocularly applied nonsteroidal anti-inflammatory drugs may cause increased bleeding of ocular tissues (including hyphemas) in conjunction with ocular surgery.

PRECAUTIONS

General: All topical nonsteroidal anti-inflammatory drugs (NSAIDs) may slow or delay healing. Topical corticosteroids are also known to slow or delay healing. Concomitant use of topical NSAIDs and topical steroids may increase the potential for healing problems.

Use of topical NSAIDs may result in keratitis. In some susceptible patients, continued use of topical NSAIDs may result in epithelial breakdown, corneal thinning, corneal erosion, corneal ulceration or corneal perforation. These events may be sight threatening. Patients with evidence of corneal epithelial breakdown should immediately discontinue use of topical NSAIDs and should be closely monitored for corneal health.

Postmarketing experience with topical NSAIDs suggests that patients with complicated ocular surgeries, corneal denervation, corneal epithelial defects, diabetes mellitus, ocular surface diseases (e.g., dry eye syndrome), rheumatoid arthritis, or repeat ocular surgeries within a short period of time may be at increased risk for corneal adverse events which may become sight threatening. Topical NSAIDs should be used with caution in these patients.

Postmarketing experience with topical NSAIDs also suggests that use more than 24 hours prior to surgery or use beyond 14 days post-surgery may increase patient risk for the occurrence and severity of corneal adverse events.

It is recommended that Ketorolac Tromethamine Ophthalmic Solution be used with caution in patients with known bleeding tendencies or who are receiving other medications which may prolong bleeding time.

Information for Patients: Ketorolac Tromethamine Ophthalmic Solution should not be administered while wearing contact lenses.

Carcinogenesis, Mutagenesis, and Impairment of Fertility:

Ketorolac tromethamine was not carcinogenic in rats given up to 5 mg/kg/day orally for 24 months (151 times the maximum recommended human topical ophthalmic dose, on a mg/kg basis, assuming 100% absorption in humans and animals) nor in mice given 2 mg/kg/day orally for 18 months (60 times the maximum recommended human topical ophthalmic dose, on a mg/kg basis, assuming 100% absorption in humans and animals).

Ketorolac tromethamine was not mutagenic *in vitro* in the Ames assay or in forward mutation assays. Similarly, it did not result in an *in vitro* increase in unscheduled DNA synthesis or an *in vivo* increase in chromosome breakage in mice. However, ketorolac tromethamine did result in an increased incidence in chromosomal aberrations in Chinese hamster ovary cells.

Ketorolac tromethamine did not impair fertility when administered orally to male and female rats at doses up to 272 and 484 times the maximum recommended human topical ophthalmic dose, respectively, on a mg/kg basis, assuming 100% absorption in humans and animals.

Pregnancy: Teratogenic Effects: Pregnancy Category C. Ketorolac tromethamine, administered during organogenesis, was not teratogenic in rabbits or rats at oral doses up to 109 times and 303 times the maximum

recommended human topical ophthalmic dose, respectively, on a mg/kg basis assuming 100% absorption in humans and animals. When administered to rats after Day 17 of gestation at oral doses up to 45 times the maximum recommended human topical ophthalmic dose, respectively, on a mg/kg basis assuming 100% absorption in humans and animals, ketorolac tromethamine resulted in dystocia and increased pup mortality. There are no adequate and well-controlled studies in pregnant women. Ketorolac Tromethamine Ophthalmic Solution should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nonteratogenic Effects: Because of the known effects of prostaglandin-inhibiting drugs on the fetal cardiovascular system (closure of the ductus arteriosus), the use of Ketorolac Tromethamine Ophthalmic Solution during late pregnancy should be avoided.

Nursing Mothers: Caution should be exercised when Ketorolac Tromethamine Ophthalmic Solution is administered to a nursing woman.

Pediatric Use: Safety and efficacy in pediatric patients below the age of 3 have not been established.

Geriatric Use: No overall differences in safety or effectiveness have been observed between elderly and younger patients.

ADVERSE REACTIONS

The most frequent adverse events reported with the use of ketorolac ophthalmic solution have been transient stinging and burning on instillation. These events were reported by up to 40% of patients participating in clinical trials.

Other adverse events occurring approximately 1% -10% of the time during treatment with ketorolac ophthalmic solution including allergic reactions, corneal edema, iritis, ocular inflammation, ocular irritation, superficial keratitis, and superficial ocular infections.

Other adverse events reported rarely with the use of ketorolac tromethamine ophthalmic solutions included corneal infiltrates, corneal ulcer, eye dryness, headaches, and visual disturbance (blurry vision).

Clinical Practice: The following events have been identified during post-marketing use of ketorolac tromethamine ophthalmic solution 0.5% in clinical practice. Because they are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. The events, which have been chosen for inclusion due to either their seriousness, frequency of reporting, possible causal connection to topical ketorolac tromethamine ophthalmic solution 0.5%, or a combination of these factors, including corneal erosion, corneal perforation, corneal thinning and epithelial breakdown (see **PRECAUTIONS, General**).

DOSAGE AND ADMINISTRATION

The recommended dose of Ketorolac Tromethamine Ophthalmic Solution is one drop (0.25 mg) four times a day for relief of ocular itching due to seasonal allergic conjunctivitis.

For the treatment of postoperative inflammation in patients who have undergone cataract extraction, one drop of Ketorolac Tromethamine Ophthalmic Solution should be applied to the affected eye(s) four times daily beginning 24 hours after cataract surgery and continuing through the first 2 weeks of the postoperative period.

Ketorolac Tromethamine Ophthalmic Solution has been safely administered in conjunction with other ophthalmic medications such as antibiotics, beta blockers, carbonic anhydrase inhibitors, cycloplegics, and mydriatics.

HOW SUPPLIED

Ketorolac Tromethamine Ophthalmic Solution is supplied sterile in white LDPE plastic bottles with natural droppers and gray short skirt caps as follows:

3 mL in 10 mL bottle - NDC 17478-209-19

5 mL in 10 mL bottle - NDC 17478-209-10

10 mL in 10 mL bottle - NDC 17478-209-11

Storage: Store at 20° to 25°C (68° to 77°F) [see USP Controlled Room Temperature]. Protect from light. Retain in carton until time of use.

Akorn
Manufactured by: Akorn, Inc.
Lake Forest, IL 60045