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HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use GADAVIST safely and effectively. See full prescribing information for GADAVIST.

GADAVIST (gadobutrol) injection, for intravenous use
Initial U.S. Approval: 2011

WARNING: NEPHROGENIC SYSTEMIC FIBROSIS (NSF)
See full prescribing information for complete boxed warning

Gadolinium-based contrast agents (GBCAs) increase the risk for NSF among patients with impaired elimination of the drugs. Avoid use of GBCAs in these patients unless the diagnostic information is essential and not available with non-contrasted MRI or other modalities.

- **The risk for NSF appears highest among patients with:**
  - **Chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2), or**
  - **Acute kidney injury.**
- **Screen patients for acute kidney injury and other conditions that may reduce renal function. For patients at risk for chronically reduced renal function (for example, age >60 years, hypertension or diabetes), estimate the glomerular filtration rate (GFR) through laboratory testing (5.1).**

----------RECENT MAJOR CHANGES----------

Indications and Usage, MRI of the CNS (1.1)	12/2014
Indications and Usage, MRI of the Breast (1.2)	6/2014
Dosage and Administration, Recommended Dose (2.1)	12/2014
Warnings and Precautions, Overestimation of Extent of Malignant Disease in MRI of the Breast (5.5)	6/2014

----------INDICATIONS AND USAGE----------

Gadavist is a gadolinium-based contrast agent indicated for use with magnetic resonance imaging (MRI):

- To detect and visualize areas with disrupted blood brain barrier (BBB) and/or abnormal vascularity of the central nervous system in adult and pediatric patients (including term neonates) (1.1)
- To assess the presence and extent of malignant breast disease (1.2)

----------DOSAGE AND ADMINISTRATION----------

- Recommended dose for adults and pediatric patients (including term neonates) is 0.1 mL/kg body weight (2.1)
- Administer as an intravenous bolus injection (2.2)
- Follow injection with a normal saline flush (2.2)

----------DOSAGE FORMS AND STRENGTHS----------

Gadavist injection contains 604.72 mg gadobutrol/mL (equivalent to 1 mmol gadobutrol/mL) and is available in vials and prefilled syringes (3)

----------CONTRAINDICATIONS----------

History of severe hypersensitivity reaction to Gadavist (4)

----------WARNINGS AND PRECAUTIONS----------

- Nephrogenic Systemic Fibrosis has occurred in patients with impaired elimination of GBCAs. Higher than recommended dosing or repeated dosing appears to increase the risk (5.1)
- Anaphylactic and other hypersensitivity reactions with cardiovascular, respiratory or cutaneous manifestations, ranging from mild to severe, including death, have occurred. Monitor patients closely during and after administration of Gadavist (5.2)

----------ADVERSE REACTIONS----------

Most common adverse reactions (incidence ≥ 0.5%) are headache, nausea, and dizziness (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Bayer HealthCare Pharmaceuticals Inc. at 1-888-842-2937 or FDA at 1-800-FDA-1088 or *www.fda.gov/medwatch*

See 17 for PATIENT COUNSELING INFORMATION

Revised: 12/2014

FULL PRESCRIBING INFORMATION: CONTENTS*

*Sections or subsections omitted from the full prescribing information are not listed

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FULL PRESCRIBING INFORMATION

WARNING: NEPHROGENIC SYSTEMIC FIBROSIS (NSF)

Gadolinium-based contrast agents (GBCAs) increase the risk for NSF among patients with impaired elimination of the drugs. Avoid use of GBCAs in these patients unless the diagnostic information is essential and not available with non-contrasted MRI or other modalities. NSF may result in fatal or debilitating fibrosis affecting the skin, muscle and internal organs.

- **The risk for NSF appears highest among patients with:**
  - **Chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2), or**
  - **Acute kidney injury.**
- **Screen patients for acute kidney injury and other conditions that may reduce renal function. For patients at risk for chronically reduced renal function (for example, age > 60 years, hypertension or diabetes), estimate the glomerular filtration rate (GFR) through laboratory testing.**
- **For patients at highest risk for NSF, do not exceed the recommended Gadavist dose and allow a sufficient period of time for elimination of the drug from the body prior to any re-administration *[see Warnings and Precautions (5.1)]*.**

1 INDICATIONS AND USAGE

1.1 Magnetic Resonance Imaging (MRI) of the Central Nervous System (CNS)

Gadavist is indicated for use with magnetic resonance imaging (MRI) in adult and pediatric patients (including term neonates) to detect and visualize areas with disrupted blood brain barrier (BBB) and/or abnormal vascularity of the central nervous system.

1.2 MRI of the Breast

Gadavist is indicated for use with MRI to assess the presence and extent of malignant breast disease.

2 DOSAGE AND ADMINISTRATION

2.1 Recommended Dose

The recommended dose of Gadavist for adult and pediatric patients (including term neonates) is 0.1 mL/kg body weight (0.1 mmol/kg). Refer to Table 1 to determine the volume to be administered.

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Table 1: Volume of Gadavist Injection by Body Weight

Body Weight		Volume to be Administered, mL
lb	**kg**	
5.5	2.5	0.25
11	5	0.5
22	10	1
33	15	1.5
44	20	2
55	25	2.5
66	30	3
77	35	3.5
88	40	4
99	45	4.5
110	50	5
132	60	6
154	70	7
176	80	8
198	90	9
220	100	10
242	110	11
264	120	12
286	130	13
308	140	14

2.2 Administration Guidelines

- Gadavist is formulated at a higher concentration (1 mmol/mL) compared to certain other gadolinium based contrast agents, resulting in a lower volume of administration. Closely examine Table 1 to determine the volume to be administered.
- Use sterile technique when preparing and administering Gadavist.
- Administer Gadavist as an intravenous bolus injection, manually or by power injector, at a flow rate of approximately 2 mL/second.
- Follow Gadavist injection with a normal saline flush to ensure complete administration of the contrast.
- Contrast-enhanced MRI can commence immediately following contrast administration.

2.3 Drug Handling

- Visually inspect Gadavist for particulate matter and discoloration prior to administration. Do not use the solution if it is discolored, if particulate matter is present or if the container appears damaged.
- Do not mix Gadavist with other medications and do not administer Gadavist in the same intravenous line simultaneously with other medications because of the potential for chemical incompatibility.

Vials

- Draw Gadavist into the syringe immediately before use.
- Do not pierce the rubber stopper more than once. Discard any unused vial contents.

Pre-filled syringes

- Remove the tip cap from the pre-filled syringe immediately before use. Discard any unused syringe contents.

3 DOSAGE FORMS AND STRENGTHS

Gadavist is a sterile, clear, and colorless to pale yellow solution for injection containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol gadobutrol/ mL) supplied in single-dose vials and pre-filled disposable syringes.

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4 CONTRAINDICATIONS

Gadavist is contraindicated in patients with history of severe hypersensitivity reactions to Gadavist.

5 WARNINGS AND PRECAUTIONS

5.1 Nephrogenic Systemic Fibrosis

Gadolinium-based contrast agents (GBCAs) increase the risk for nephrogenic systemic fibrosis (NSF) among patients with impaired elimination of the drugs. Avoid use of GBCAs among these patients unless the diagnostic information is essential and not available with non-contrast MRI or other modalities. The GBCA-associated NSF risk appears highest for patients with chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2) as well as patients with acute kidney injury. The risk appears lower for patients with chronic, moderate kidney disease (GFR 30 to 59 mL/min/1.73m^2) and little, if any, for patients with chronic, mild kidney disease (GFR 60 to 89 mL/min/1.73m^2). NSF may result in fatal or debilitating fibrosis affecting the skin, muscle and internal organs. Report any diagnosis of NSF following Gadavist administration to Bayer Healthcare (1-888-842-2937) or FDA (1-800-FDA-1088 or www.fda.gov/medwatch).

Screen patients for acute kidney injury and other conditions that may reduce renal function. Features of acute kidney injury consist of rapid (over hours to days) and usually reversible decrease in kidney function, commonly in the setting of surgery, severe infection, injury or drug-induced kidney toxicity. Serum creatinine levels and estimated GFR may not reliably assess renal function in the setting of acute kidney injury. For patients at risk for chronically reduced renal function (for example, age > 60 years, diabetes mellitus or chronic hypertension), estimate the GFR through laboratory testing.

Among the factors that may increase the risk for NSF are repeated or higher than recommended doses of a GBCA and degree of renal impairment at the time of exposure. Record the specific GBCA and the dose administered to a patient. For patients at highest risk for NSF, do not exceed the recommended Gadavist dose and allow a sufficient period of time for elimination of the drug prior to re-administration. For patients receiving hemodialysis, consider the prompt initiation of hemodialysis following the administration of a GBCA in order to enhance the contrast agent's elimination *[see Use in Specific Populations (8.6) and Clinical Pharmacology (12.3)]*. The usefulness of hemodialysis in the prevention of NSF is unknown *[see Clinical Pharmacology (12.3)]*.

5.2 Hypersensitivity Reactions

Anaphylactic and other hypersensitivity reactions with cardiovascular, respiratory or cutaneous manifestations, ranging from mild to severe, including death, have uncommonly occurred following Gadavist administration *[see Adverse Reactions (6)]*.

- Before Gadavist administration, assess all patients for any history of a reaction to contrast media, bronchial asthma and/or allergic disorders. These patients may have an increased risk for a hypersensitivity reaction to Gadavist.
- Administer Gadavist only in situations where trained personnel and therapies are promptly available for the treatment of hypersensitivity reactions, including personnel trained in resuscitation.

Most hypersensitivity reactions to Gadavist have occurred within half an hour after administration. Delayed reactions can occur up to several days after administration. Observe patients for signs and symptoms of hypersensitivity reactions during and following Gadavist administration.

5.3 Acute Kidney Injury

In patients with chronic renal impairment, acute kidney injury sometimes requiring dialysis has been observed with the use of some GBCAs. Do not exceed the recommended dose; the risk of acute kidney injury may increase with higher than recommended doses.

5.4 Extravasation and Injection Site Reactions

Ensure catheter and venous patency before the injection of Gadavist. Extravasation into tissues during Gadavist administration may result in moderate irritation *[see Nonclinical Toxicology (13.2)]*.

5.5 Overestimation of Extent of Malignant Disease in MRI of the Breast

Gadavist MRI of the breast overestimated the histologically confirmed extent of malignancy in the diseased breast in up to 50% of the patients *[see Clinical Studies (14.2)]*.

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6 ADVERSE REACTIONS

The following serious adverse reactions are discussed elsewhere in labeling:

- Nephrogenic Systemic Fibrosis (NSF) *[see Boxed Warning and Warnings and Precautions (5.1)]*.
- Hypersensitivity reactions *[see Contraindications (4) and Warnings and Precautions (5.2)]*.

6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice.

The adverse reactions described in this section reflect Gadavist exposure in 6,330 subjects (including 184 pediatric patients, ages 0 to 17 years) with the majority receiving the recommended dose. Approximately 50% of the subjects were male and the ethnic distribution was 60% Caucasian, 30% Asian, 6% Hispanic, 2% Black, and 3% patients of other ethnic groups. The average age was 55 years (range from1 week to 93 years).

Overall, approximately 4% of subjects reported one or more adverse reactions during a follow-up period that ranged from 24 hours to 7 days after Gadavist administration.

Adverse reactions associated with the use of Gadavist were usually mild to moderate in severity and transient in nature.

Table 2 lists adverse reactions that occurred in ≥ 0.1% subjects who received Gadavist.

Table 2: Adverse Reactions

Reaction	**Rate (%) n=6330**
Headache	1.5
Nausea	1.2
Dizziness	0.5
Dysgeusia	0.4
Feeling Hot	0.4
Injection site reactions	0.4
Vomiting	0.4
Rash (includes generalized, macular, papular, pruritic)	0.3
Pruritus (includes generalized)	0.2
Erythema	0.2
Hypersensitivity/Anaphylactoid*	0.1
Dyspnea	0.1
Paresthesia	0.1

*Hypersensitivity/anaphylactoid reaction may occur with one or more of the following adverse reactions: for example, hypotension, urticaria, face edema, eyelid edema, flushing

Adverse reactions that occurred with a frequency of < 0.1% in subjects who received Gadavist include: loss of consciousness, convulsion, parosmia, tachycardia, palpitation, dry mouth, malaise and feeling cold.

6.2 Postmarketing Experience

The following additional adverse reactions have been reported during postmarketing use of Gadavist. Because these reactions are reported voluntarily from a population of uncertain size, it is not possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

- Cardiac arrest
- Nephrogenic Systemic Fibrosis (NSF)
- Hypersensitivity reactions (anaphylactic shock, circulatory collapse, respiratory arrest, pulmonary edema, bronchospasm, cyanosis, oropharyngeal swelling, laryngeal edema, blood pressure increased, chest pain, angioedema, conjunctivitis, hyperhidrosis, cough, sneezing, burning sensation, and pallor) *[see Warnings and Precautions (5.2)]*

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8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category C

Risk Summary

There are no adequate and well-controlled studies of Gadavist in pregnant women. GBCAs cross the human placenta. Limited human data on exposure to GBCAs during pregnancy does not show adverse effects in exposed neonates. Animal reproductive studies were conducted (see Animal Data). Embryolethality but no teratogenic effects were observed in monkeys, rabbits and rats. Use Gadavist during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Animal Data

Embryolethality was observed when gadobutrol was administered intravenously to monkeys during organogenesis at doses 8 times the recommended single human dose (based on body surface area); gadobutrol was not maternally toxic or teratogenic at this dose. Embryolethality and retardation of embryonal development also occurred in pregnant rats receiving maternally toxic doses of gadobutrol (≥ 7.5 mmol/kg body weight; equivalent to12 times the human dose based on body surface area) and in pregnant rabbits (≥ 2.5 mmol/kg body weight; equivalent to 8 times the recommended human dose based on body surface area). In rabbits, this finding occurred without evidence of pronounced maternal toxicity and with minimal placental transfer (0.01% of the administered dose detected in the fetuses).

Gadavist was not teratogenic when given intravenously to monkeys during organogenesis at doses up to 8 times the recommended single human dose (based on body surface area) but was embryolethal at that dose. Because pregnant animals received repeated daily doses of Gadavist, their overall exposure was significantly higher than that achieved with the standard single dose administered to humans.

8.3 Nursing Mothers

It is not known whether Gadavist is present in human milk. However, reports on use of other GBCAs indicate that 0.01 to 0.04% of the maternal gadolinium dose is present in breast milk and there is limited GBCA gastrointestinal absorption in the breast-fed infant. In rat lactation studies, gadobutrol was present in milk in amounts less than 0.1% of the dose intravenously administered and the gastrointestinal absorption is poor (approximately 5% of the dose orally administered was excreted in the urine). In lactating rats receiving 0.5 mmol/kg of intravenous [^{153}Gd]-gadobutrol, 0.01% of the total administered radioactivity was transferred to the pup via maternal milk, within 3 hours after administration.

A lactating woman may consider interrupting breastfeeding and pumping and discarding breast milk up to18 hours after Gadavist administration in order to minimize exposure to a breastfed infant.

8.4 Pediatric Use

The safety and effectiveness of Gadavist have been established in pediatric patients born at 37 weeks gestation or later based on imaging and pharmacokinetic data in 138 patients ages 2 to 17 years and 44 patients ages 0 to less than 2 years and extrapolation from adult data. The frequency, type, and severity of adverse reactions in pediatric patients were similar to adverse reactions in adults *[see Adverse Reactions (6.1)]*. No dose adjustment according to age is necessary in pediatric patients *[see Dosage and Administration (2.1), Clinical Pharmacology (12.3), and Clinical Studies (14.1)]*. The safety and effectiveness of Gadavist have not been established in premature infants.

NSF Risk

No case of NSF associated with Gadavist or any other GBCA has been identified in pediatric patients ages 6 years and younger. Pharmacokinetic studies suggest that clearance of Gadavist is similar in pediatric patients and adults, including pediatric patients age younger than 2 years. No increased risk factor for NSF has been identified in juvenile animal studies of gadobutrol. Normal estimated GFR (eGFR) is around 30 mL/min/1.73m^2 at birth and increases to mature levels around 1 year of age, reflecting growth in both glomerular function and relative body surface area. Clinical studies in pediatric patients younger than 1 year of age have been conducted in patients with the following minimum eGFR: 31 mL/min/1.73m^2 (age 2 to 7 days), 38 mL/min/1.73m^2 (age 8 to 28 days), 62 mL/min/1.73m^2 (age 1 to 6 months), and 83 mL/min/1.73m^2 (age 6 to 12 months).

Juvenile Animal Data

Single and repeat-dose toxicity studies in neonatal and juvenile rats did not reveal findings suggestive of a specific risk for use in pediatric patients including term neonates and infants.

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8.5 Geriatric Use

In clinical studies of Gadavist, 1,377 patients were 65 years of age and over, while 104 patients were 80 years of age and over. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients. In general, use of Gadavist in elderly patients should be cautious, reflecting the greater frequency of impaired renal function and concomitant disease or other drug therapy. No dose adjustment according to age is necessary in this population.

8.6 Renal Impairment

Prior to administration of Gadavist, screen all patients for renal dysfunction by obtaining a history and/or laboratory tests *[see Warnings and Precautions (5.1)]*. No dosage adjustment is recommended for patients with renal impairment.

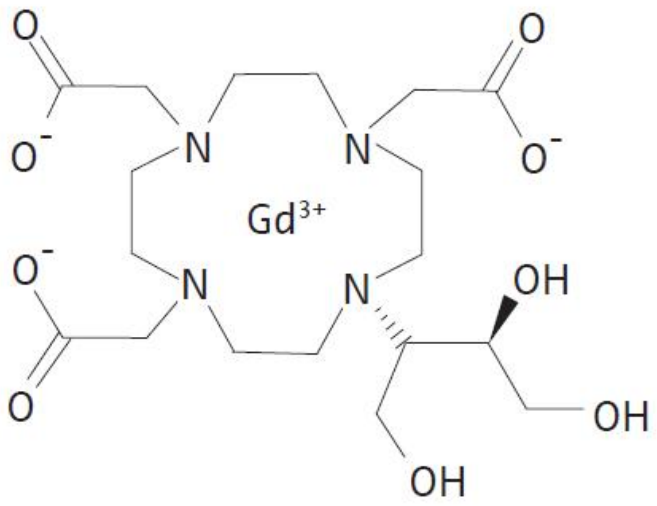
Gadavist can be removed from the body by hemodialysis *[see Warnings and Precautions (5.1) and Clinical Pharmacology (12.3)]*.

10 OVERDOSAGE

The maximum dose of Gadavist tested in healthy volunteers, 1.5 mL/kg body weight (1.5 mmol/kg; 15 times the recommended dose), was tolerated in a manner similar to lower doses. Gadavist can be removed by hemodialysis *[see Use in Specific Populations (8.6) and Clinical Pharmacology (12.3)]*.

11 DESCRIPTION

Gadavist (gadobutrol) injection is a paramagnetic macrocyclic contrast agent administered for magnetic resonance imaging. The chemical name for gadobutrol is 10–[(1SR,2RS)–2,3–dihydroxy–1–hydroxymethylpropyl]–1,4,7,10–tetraazacyclododecane–1,4,7–triacetic acid, gadolinium complex. Gadobutrol has a molecular formula of $C_{18}H_{31}GdN_4O_9$ and a molecular weight of 604.72.



Gadavist is a sterile, clear, colorless to pale yellow solution containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol/mL) as the active ingredient and the excipients calcobutrol sodium, trometamol, hydrochloric acid (for pH adjustment) and water for injection. Gadavist contains no preservatives.

The main physicochemical properties of Gadavist (1 mmol/mL solution for injection) are listed below:

Density (g/mL at 37°C)	1.3
Osmolarity at 37°C (mOsm/L solution)	1117
Osmolality at 37°C (mOsm/kg H_2O)	1603
Viscosity at 37°C (mPa·s)	4.96
pH	6.6–8

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The thermodynamic stability constants for gadobutrol (log Ktherm and log Kcond at pH 7.4) are 21.8 and 15.3, respectively.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

In MRI, visualization of normal and pathological tissue depends in part on variations in the radiofrequency signal intensity that occurs with:

- Differences in proton density
- Differences of the spin-lattice or longitudinal relaxation times (T_1)
- Differences in the spin-spin or transverse relaxation time (T_2)

When placed in a magnetic field, Gadavist shortens the T_1 and T_2 relaxation times. The extent of decrease of T_1 and T_2 relaxation times, and therefore the amount of signal enhancement obtained from Gadavist, is based upon several factors including the concentration of Gadavist in the tissue, the field strength of the MRI system, and the relative ratio of the longitudinal and transverse relaxation times. At the recommended dose, the T_1 shortening effect is observed with greatest sensitivity in T_1-weighted magnetic resonance sequences. In T_2*-weighted sequences the induction of local magnetic field inhomogeneities by the large magnetic moment of gadolinium and at high concentrations (during bolus injection) leads to a signal decrease.

12.2 Pharmacodynamics

Gadavist leads to distinct shortening of the relaxation times even in low concentrations. At pH 7, 37°C and 1.5 T, the relaxivity (r_1) - determined from the influence on the relaxation times (T_1) of protons in plasma - is 5.2 L/(mmol·sec) and the relaxivity (r_2) - determined from the influence on the relaxation times (T_2) - is 6.1 L/(mmol·sec). These relaxivities display only slight dependence on the strength of the magnetic field. The T_1 shortening effect of paramagnetic contrast agents is dependent on concentration and r_1 relaxivity (see Table 3). This may improve tissue visualization.

Table 3: Relaxivity (r_1) of Gadolinium Chelates at 1.5 T

Gadolinium-Chelate	r_1 ($L \cdot mmol^{-1} \cdot s^{-1}$)
Gadobenate	6.3
Gadobutrol	5.2
Gadodiamide	4.3
Gadofosveset	16
Gadopentetate	4.1
Gadoterate	3.6
Gadoteridol	4.1
Gadoversetamide	4.7
Gadoxetate	6.9

r_1 relaxivity in plasma at 37°C

Compared to 0.5 molar gadolinium-based contrast agents, the higher concentration of Gadavist results in half the volume of administration and a more compact contrast bolus.

Gadavist is a highly water-soluble, extremely hydrophilic compound with a partition coefficient between n-butanol and buffer at pH 7.6 of about 0.006.

12.3 Pharmacokinetics

Distribution
After intravenous administration, gadobutrol is rapidly distributed in the extracellular space. After a gadobutrol dose of 0.1 mmol/kg body weight, an average level of 0.59 mmol gadobutrol/L was measured in plasma 2 minutes after the

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injection and 0.3 mmol gadobutrol/L 60 minutes after the injection. Gadobutrol does not display any particular protein binding. In rats, gadobutrol does not penetrate the intact blood-brain barrier.

Metabolism
Gadobutrol is not metabolized.

Elimination
Values for AUC, body weight normalized plasma clearance and half-life are given in Table 4, below.

Gadobutrol is excreted in an unchanged form via the kidneys. In healthy subjects, renal clearance of gadobutrol is 1.1 to 1.7 mL/(min·kg) and thus comparable to the renal clearance of inulin, confirming that gadobutrol is eliminated by glomerular filtration.

Within two hours after intravenous administration more than 50% and within 12 hours more than 90% of the given dose is eliminated via the urine. Extra-renal elimination is negligible.

Specific Populations
Gender
Gender has no clinically relevant effect on the pharmacokinetics of gadobutrol.

Geriatric
A single IV dose of 0.1 mmol/kg Gadavist was administered to 15 elderly and 16 non-elderly subjects. AUC was slightly higher and clearance slightly lower in elderly subjects as compared to non-elderly subjects *[see Use in Specific Populations (8.5)]*.

Pediatric
The pharmacokinetics of gadobutrol were evaluated in two studies in a total of 130 patients age 2 to less than 18 years and in 43 patients less than 2 years of age (including term neonates). Patients received a single intravenous dose of 0.1 mmol/kg of Gadavist. The pharmacokinetic profile of gadobutrol in pediatric patients is similar to that in adults, resulting in similar values for AUC, body weight normalized plasma clearance, as well as elimination half-life. Approximately 99% (median value) of the dose was recovered in urine within 6 hours (this information was derived from the 2 to less than 18 year old age group).

Table 4: Pharmacokinetics by Age Group (Median [Range])

	0 to < 2 years N=43	**2 to 6 years N=45**	**7 to 11 years N=39**	**12 to < 18 years N=46**	**Adults N=93**
AUC (µmolxh/L)	781 [513, 1891]	846 [412, 1331]	1025 [623, 2285]	1237 [946, 2211]	1072 [667, 1992]
CL (L/h/kg)	0.128 [0.053, 0.195]	0.119 [0.080, 0.215]	0.099 [0.043, 0.165]	0.081 [0.046, 0.103]	0.094 [0.051, 0.150]
t1/2 (h)	2.91 [1.60, 12.4]	1.91 [1.04, 2.70]	1.66 [0.91, 2.71]	1.68 [1.31, 2.48]	1.80 [1.20, 6.55]
C20 (µmol/L)	367 [280, 427]	421 [369, 673]	462 [392, 760]	511 [387, 1077]	441 [281, 829]

Renal Impairment
In patients with impaired renal function, the serum half-life of gadobutrol is prolonged and correlated with the reduction in creatinine clearance.

After intravenous injection of 0.1 mmol gadobutrol/kg body weight, the elimination half-life was 5.8 ± 2.4 hours in mild to moderately impaired patients ($80 > CL_{CR} > 30$ mL/min) and 17.6 ± 6.2 hours in severely impaired patients not on dialysis ($CL_{CR} < 30$ mL/min). The mean AUC of gadobutrol in patients with normal renal function was 1.1 ± 0.1 mmol·h/L, compared to 4.0 ± 1.8 mmol·h/L in patients with mild to moderate renal impairment and 11.5 ± 4.3 mmol·h/L in patients with severe renal impairment.

Complete recovery in the urine was seen in patients with mild or moderate renal impairment within 72 hours. In patients with severely impaired renal function about 80% of the administered dose was recovered in the urine within 5 days.

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For patients receiving hemodialysis, physicians may consider the prompt initiation of hemodialysis following the administration of Gadavist in order to enhance the contrast agent's elimination. Sixty-eight percent (68%) of gadobutrol is removed from the body after the first dialysis, 94% after the second dialysis, and 98% after the third dialysis session. *[See Warnings and Precautions (5.1) and Use in Specific Populations (8.6)]*.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

No carcinogenicity studies of gadobutrol have been conducted.

Gadobutrol was not mutagenic in *in vitro* reverse mutation tests in bacteria, in the HGPRT (hypoxanthine-guanine phosphoribosyl transferase) test using cultured Chinese hamster V79 cells, or in chromosome aberration tests in human peripheral blood lymphocytes, and was negative in an *in vivo* micronucleus test in mice after intravenous injection of 0.5 mmol/kg.

Gadobutrol had no effect on fertility and general reproductive performance of male and female rats when given in doses 12.2 times the human equivalent dose (based on body surface area).

13.2 Animal Toxicology and/or Pharmacology

Local intolerance reactions, including moderate irritation associated with infiltration of inflammatory cells was observed after paravenous administration to rabbits, suggesting the possibility of occurrence of local irritation if the contrast medium leaks around veins in a clinical setting *[see Warnings and Precautions (5.4)]*.

14 CLINICAL STUDIES

14.1 MRI of the CNS

Patients referred for MRI of the central nervous system with contrast were enrolled in two clinical trials that evaluated the visualization characteristics of lesions. In both studies, patients underwent a baseline, pre-contrast MRI prior to administration of Gadavist at a dose of 0.1 mmol/kg, followed by a post-contrast MRI. In study A, patients also underwent an MRI before and after the administration of gadoteridol. The studies were designed to demonstrate superiority of Gadavist MRI to non-contrast MRI for lesion visualization. For both studies, pre-contrast and pre-plus-post contrast images (paired images) were independently evaluated by three readers for contrast enhancement and border delineation using a scale of 1 to 4, and for internal morphology using a scale of 1 to 3 (Table 5). Lesion counting was also performed to demonstrate non-inferiority of paired Gadavist image sets to pre-contrast MRI. Readers were blinded to clinical information.

Table 5: Primary Endpoint Visualization Scoring System

Score	Visualization Characteristics		
	Contrast Enhancement	**Border Delineation**	**Internal Morphology**
1	None	None	Poorly visible
2	Weak	Moderate	Moderately visible
3	Clear	Clear but incomplete	Sufficiently visible
4	Clear and bright	Clear and complete	N/A

Efficacy was determined in 657 subjects. The average age was 49 years (range 18 to 85 years) and 42% were male. The ethnic representations were 39% Caucasian, 4% Black, 16% Hispanic, 38% Asian, and 3% of other ethnic groups.

Table 6 shows a comparison of visualization results between paired images and pre-contrast images. Gadavist provided a statistically significant improvement for each of the three lesion visualization parameters when averaged across three independent readers for each study.

Table 6: Visualization Endpoint Results of Central Nervous System Adult MRI Studies with 0.1 mmol/kg Gadavist

Endpoint	Study A N=336	Study B N=321

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	Pre-contrast	Paired	Difference*	Pre-contrast	Paired	Difference
Contrast Enhancement	0.97	2.26	1.29^	0.93	2.86	1.94^
Border Delineation	1.98	2.58	0.60^	1.92	2.94	1.02^
Internal Morphology	1.32	1.93	0.60^	1.57	2.35	0.78^
Average # Lesions Detected	8.08	8.25	0.17**	2.65	2.97	0.32^^

* Difference of means = (paired mean) – (pre-contrast mean)
^ $p<0.001$
^^ Met noninferiority margin of -0.35
** Did not meet noninferiority margin of -0.35

Performances of Gadavist and gadoteridol for visualization parameters were similar. Regarding the number of lesions detected, study B met the prespecified noninferiority margin of -0.35 for paired read versus pre-contrast read while in Study A, Gadavist and gadoteridol did not.

For the visualization endpoints contrast enhancement, border delineation, and internal morphology, the percentage of patients scoring higher for paired images compared to pre-contrast images ranged from 93% to 99% for Study A, and 95% to 97% for Study B. For both studies, the mean number of lesions detected on paired images exceeded that of the pre-contrast images; 37% for Study A and 24% for Study B. There were 29% and 11% of subjects in which the pre-contrast images detected more lesions for Study A and Study B, respectively.

The percentage of patients whose average reader mean score changed by ≤ 0, up to 1, up to 2, and ≥ 2 scoring categories presented in Table 5 is shown in Table 7. The categorical improvement of (≤ 0) represents higher (< 0) or identical ($= 0$) scores for the pre-contrast read, the categories with scores > 0 represent the magnitude of improvement seen for the paired read.

Table 7: Primary Endpoint Visualization Categorical Improvement for Average Reader

	Study A N=336				**Study B N=321**			
Endpoint	**Categorical Improvement (Paired – Pre-Contrast) %**				**Categorical Improvement (Paired – Pre-Contrast) %**			
	≤ 0	$> 0 – < 1$	$1 – < 2$	≥ 2	≤ 0	$> 0 – < 1$	$1 – < 2$	≥ 2
Contrast Enhancement	1	30	55	13	3	6	34	57
Border Delineation	7	73	18	1	5	38	51	5
Internal Morphology	4	79	17	0	5	61	33	1

For both studies, the improvement of visualization endpoints in paired Gadavist images compared to pre-contrast images resulted in improved assessment of normal and abnormal CNS anatomy.

Pediatric Patients
Two studies in 44 pediatrics patients age younger than 2 years and 135 pediatric patients age 2 to less than18 years with CNS and non-CNS lesions supported extrapolation of adult CNS efficacy findings. For example, comparing pre vs paired pre- and post-contrast images, investigators selected the best of four descriptors under the heading, “Visualization of lesion-internal morphology (lesion characterization) or homogeneity of vessel enhancement” for 27/44 (62% = pre) vs 43/44 (98% = paired) MR images from patients age 0 to less than 2 years and 106/135 (78% = pre) vs 108/135 (80% = paired) MR images from patients age 2 to less than 18 years.

14.2 MRI of the Breast

Patients with recently diagnosed breast cancer were enrolled in two identical clinical trials to evaluate the ability of Gadavist to assess the presence and extent of malignant breast disease prior to surgery. Patients underwent non-contrast breast MRI (BMR) prior to Gadavist (0.1 mmol/kg) breast MRI. BMR images and Gadavist BMR (combined contrast plus non-contrast) images were independently evaluated in each study by three readers blinded to clinical information. In separate reading sessions the BMR images and Gadavist BMR images were also interpreted together with X-ray mammography images (XRM).

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The studies evaluated 787 patients: Study 1 enrolled 390 women with an average age of 56 years, 74% were white, 25% Asian, 0.5% black, and 0.5% other; Study 2 enrolled 396 women and 1 man with an average age of 57 years, 71% were white, 24% Asian, 3% black, and 2% other.

The readers assessed 5 regions per breast for the presence of malignancy using each reading modality. The readings were compared to an independent standard of truth (SoT) consisting of histopathology for all regions where excisions were made and tissue evaluated. XRM plus ultrasound was used for all other regions.

The assessment of malignant disease was performed using a region based within-subject sensitivity. Sensitivity for each reading modality was defined as the mean of the percentage of malignant breast regions correctly interpreted for each subject. The within-subject sensitivity of Gadavist BMR was superior to that of BMR. The lower bound of the 95% Confidence Interval (CI) for the difference in within-subject sensitivity ranged from 19% to 42% for Study 1 and from 12% to 27% for Study 2. The within-subject sensitivity for Gadavist BMR and BMR as well as for Gadavist BMR plus XRM and BMR plus XRM is presented in Table 8.

Table 8: Sensitivity of Gadavist BMR for Detection of Malignant Breast Disease

Study 1					**Study 2**				
Sensitivity (%) N=388 Patients					**Sensitivity (%) N=390 Patients**				
Reader	BMR	BMR + XRM	Gadavist BMR	Gadavist BMR +XRM	Reader	BMR	BMR + XRM	Gadavist BMR	Gadavist BMR +XRM
1	37	71	83	84	4	73	83	87	90
2	49	76	80	83	5	57	81	89	90
3	63	75	87	87	6	55	80	86	88

Specificity was defined as the percentage of non-malignant breasts correctly identified as non-malignant. The lower limit of the 95% confidence interval for specificity of Gadavist BMR was greater than 80% for 5 of 6 readers. (Table 9)

Table 9: Specificity of Gadavist BMR in Non-Malignant Breasts

Study 1			**Study 2**		
Specificity (%) N=372 Patients			**Specificity (%) N=367 Patients**		
Reader	Gadavist BMR	Lower Limit 95% CI	Reader	Gadavist BMR	Lower Limit 95% CI
1	86	82	4	92	89
2	95	93	5	84	80
3	89	85	6	83	79

Three additional readers in each study read XRM alone. For these readers over both studies, sensitivity ranged from 68% to 73% and specificity in non-malignant breasts ranged from 86% to 94%.

In breasts with malignancy, a false positive detection rate was calculated as the percentage of subjects for which the readers assessed a region as malignant which could not be verified by SoT. The false positive detection rates for Gadavist BMR ranged from 39% to 53% (95% CI Upper Bounds ranged from 44% to 58%).

16 HOW SUPPLIED/STORAGE AND HANDLING

16.1 How Supplied

Gadavist is a sterile, clear and colorless to pale yellow solution containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol gadobutrol) per mL. Gadavist is supplied in the following sizes:

Single-Dose Vials

2 mL single-dose vials, rubber stoppered in cartons of 3, Boxes of 15	(NDC 50419-325-37)
7.5 mL single-dose vials, rubber stoppered in cartons of 10, Boxes of 20	(NDC 50419-325-11)
10 mL single-dose vials, rubber stoppered, in cartons of 10, Boxes of 20	(NDC 50419-325-12)
15 mL single-dose vials, rubber stoppered, in cartons of 10, Boxes of 20	(NDC 50419-325-13)

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Single-Dose Pre-Filled Syringes

7.5 mL single-dose pre-filled disposable syringes, Boxes of 5	(NDC 50419-325-27)
10 mL single-dose pre-filled disposable syringes, Boxes of 5	(NDC 50419-325-28)
15 mL single-dose pre-filled disposable syringes, Boxes of 5	(NDC 50419-325-29)

16.2 Storage and Handling

Store at 25°C (77°F); excursions permitted to 15–30°C (59–86°F) [see USP Controlled Room Temperature].

Should freezing occur, Gadavist should be brought to room temperature before use. If allowed to stand at room temperature, Gadavist should return to a clear and colorless to pale yellow solution. Visually inspect Gadavist for particulate matter and discoloration prior to administration. Do not use the solution if it is discolored, if particulate matter is present or if the container appears damaged.

17 PATIENT COUNSELING INFORMATION

Nephrogenic Systemic Fibrosis

Instruct patients to inform their physician if they:

- Have a history of kidney disease and/or liver disease, or
- Have recently received a GBCA

GBCAs increase the risk of NSF among patients with impaired elimination of drugs. To counsel patients at risk of NSF:

- Describe the clinical manifestation of NSF
- Describe procedures to screen for the detection of renal impairment

Instruct the patients to contact their physician if they develop signs or symptoms of NSF following Gadavist administration, such as burning, itching, swelling, scaling, hardening and tightening of the skin; red or dark patches on the skin; stiffness in joints with trouble moving, bending or straightening the arms, hands, legs or feet; pain in the hip bones or ribs; or muscle weakness.

Common Adverse Reactions

Inform patients that they may experience:

- Reactions along the venous injection site, such as mild and transient burning or pain or feeling of warmth or coldness at the injection site
- Side effects of headache, nausea, abnormal taste and feeling hot

General Precautions

Instruct patients receiving Gadavist to inform their physician if they:

- Are pregnant or breastfeeding
- Have a history of allergic reaction to contrast media, bronchial asthma or allergic respiratory disorder,

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Manufactured for:

Bayer HealthCare

Bayer HealthCare Pharmaceuticals Inc.
Whippany, NJ 07981

Manufactured in Germany

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HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use GADAVIST safely and effectively. See full prescribing information for GADAVIST.

GADAVIST (gadobutrol) injection, for intravenous use
Initial U.S. Approval: 2011

PHARMACY BULK PACKAGE
NOT FOR DIRECT INFUSION

WARNING: NEPHROGENIC SYSTEMIC FIBROSIS (NSF)
See full prescribing information for complete boxed warning

Gadolinium-based contrast agents (GBCAs) increase the risk for NSF among patients with impaired elimination of the drugs. Avoid use of GBCAs in these patients unless the diagnostic information is essential and not available with non-contrasted MRI or other modalities.

- **The risk for NSF appears highest among patients with:**
  - **Chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2), or**
  - **Acute kidney injury.**
- **Screen patients for acute kidney injury and other conditions that may reduce renal function. For patients at risk for chronically reduced renal function (for example, age >60 years, hypertension or diabetes), estimate the glomerular filtration rate (GFR) through laboratory testing (5.1).**

----------RECENT MAJOR CHANGES----------

Indications and Usage, MRI of the CNS (1.1)	12/2014
Indications and Usage, MRI of the Breast (1.2)	6/2014
Dosage and Administration, Recommended Dose (2.1)	12/2014
Warnings and Precautions, Overestimation of Extent of Malignant Disease in MRI of the Breast (5.5)	6/2014

----------INDICATIONS AND USAGE----------

Gadavist is a gadolinium-based contrast agent indicated for use with magnetic resonance imaging (MRI):

- To detect and visualize areas with disrupted blood brain barrier (BBB) and/or abnormal vascularity of the central nervous system in adult and pediatric patients (including term neonates) (1.1)
- To assess the presence and extent of malignant breast disease (1.2)

----------DOSAGE AND ADMINISTRATION----------

- Recommended dose for adults and pediatric patients (including term neonates) is 0.1 mL/kg body weight (2.1)
- Administer as an intravenous bolus injection (2.2)
- Follow injection with a normal saline flush (2.2)

----------DOSAGE FORMS AND STRENGTHS----------

Gadavist injection contains 604.72 mg gadobutrol/mL (equivalent to 1 mmol gadobutrol/mL (3)

----------CONTRAINDICATIONS----------

History of severe hypersensitivity reaction to Gadavist (4)

----------WARNINGS AND PRECAUTIONS----------

- Nephrogenic Systemic Fibrosis has occurred in patients with impaired elimination of GBCAs. Higher than recommended dosing or repeated dosing appears to increase the risk (5.1)
- Anaphylactic and other hypersensitivity reactions with cardiovascular, respiratory or cutaneous manifestations, ranging from mild to severe, including death, have occurred. Monitor patients closely during and after administration of Gadavist (5.2)

----------ADVERSE REACTIONS----------

Most common adverse reactions (incidence ≥ 0.5%) are headache, nausea, and dizziness (6.1)

To report SUSPECTED ADVERSE REACTIONS, contact Bayer HealthCare Pharmaceuticals Inc. at 1-888-842-2937 or FDA at 1-800-FDA-1088 or *www.fda.gov/medwatch*

See 17 for PATIENT COUNSELING INFORMATION

Revised: 12/2014

FULL PRESCRIBING INFORMATION: CONTENTS*

*Sections or subsections omitted from the full prescribing information are not listed

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FULL PRESCRIBING INFORMATION

WARNING: NEPHROGENIC SYSTEMIC FIBROSIS (NSF)

Gadolinium-based contrast agents (GBCAs) increase the risk for NSF among patients with impaired elimination of the drugs. Avoid use of GBCAs in these patients unless the diagnostic information is essential and not available with non-contrasted MRI or other modalities. NSF may result in fatal or debilitating fibrosis affecting the skin, muscle and internal organs.

- **The risk for NSF appears highest among patients with:**
  - **Chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2), or**
  - **Acute kidney injury.**
- **Screen patients for acute kidney injury and other conditions that may reduce renal function. For patients at risk for chronically reduced renal function (for example, age > 60 years, hypertension or diabetes), estimate the glomerular filtration rate (GFR) through laboratory testing.**
- **For patients at highest risk for NSF, do not exceed the recommended Gadavist dose and allow a sufficient period of time for elimination of the drug from the body prior to any re-administration *[see Warnings and Precautions (5.1)]*.**

1 INDICATIONS AND USAGE

1.1 Magnetic Resonance Imaging (MRI) of the Central Nervous System (CNS)

Gadavist is indicated for use with magnetic resonance imaging (MRI) in adult and pediatric patients (including term neonates) to detect and visualize areas with disrupted blood brain barrier (BBB) and/or abnormal vascularity of the central nervous system.

1.2 MRI of the Breast

Gadavist is indicated for use with MRI to assess the presence and extent of malignant breast disease.

2 DOSAGE AND ADMINISTRATION

2.1 Recommended Dose

The recommended dose of Gadavist for adult and pediatric patients (including term neonates) is 0.1 mL/kg body weight (0.1 mmol/kg). Refer to Table 1 to determine the volume to be administered.

Table 1: Volume of Gadavist Injection by Body Weight

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Body Weight		Volume to be Administered, mL
lb	kg	
5.5	2.5	0.25
11	5	0.5
22	10	1
33	15	1.5
44	20	2
55	25	2.5
66	30	3
77	35	3.5
88	40	4
99	45	4.5
110	50	5
132	60	6
154	70	7
176	80	8
198	90	9
220	100	10
242	110	11
264	120	12
286	130	13
308	140	14

2.2 Administration Guidelines

- Gadavist is formulated at a higher concentration (1 mmol/mL) compared to certain other gadolinium based contrast agents, resulting in a lower volume of administration. Closely examine Table 1 to determine the volume to be administered.
- Use sterile technique when preparing and administering Gadavist.
- Administer Gadavist as an intravenous bolus injection, manually or by power injector, at a flow rate of approximately 2 mL/second.
- Follow Gadavist injection with a normal saline flush to ensure complete administration of the contrast.
- Contrast-enhanced MRI can commence immediately following contrast administration.

2.3 Drug Handling

- Visually inspect Gadavist for particulate matter and discoloration prior to administration. Do not use the solution if it is discolored, if particulate matter is present or if the container appears damaged.
- Do not mix Gadavist with other medications and do not administer Gadavist in the same intravenous line simultaneously with other medications because of the potential for chemical incompatibility.
- Instructions of the device manufacturer must be followed.

Pharmacy Bulk Package Preparation

- Pharmacy Bulk Packages are not for use in direct intravenous infusions.
- After the Pharmacy Bulk Package has been opened, Gadavist remains stable for 24 hours at 20–25°C (68–77°F).
- The Pharmacy Bulk Package contains many single doses and is used with an appropriate transfer device for filling empty sterile syringes.
- The transfer of Gadavist from the Pharmacy Bulk Package must be performed in an aseptic work area, such as a laminar flow hood, using aseptic technique.

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- Once the Pharmacy Bulk Package is punctured, it should not be removed from the aseptic work area during the entire 24 hour period of use.
- IV tubing and syringes used to administer Gadavist must be discarded at the conclusion of the radiological examination.
- The contents of the Pharmacy Bulk Package after initial puncture should be used within 24 hours. Discard any unused portion in accordance with regulations dealing with the disposal of such materials.

3 DOSAGE FORMS AND STRENGTHS

Gadavist is a sterile, clear, and colorless to pale yellow solution for injection containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol gadobutrol/ mL).

4 CONTRAINDICATIONS

Gadavist is contraindicated in patients with history of severe hypersensitivity reactions to Gadavist.

5 WARNINGS AND PRECAUTIONS

5.1 Nephrogenic Systemic Fibrosis

Gadolinium-based contrast agents (GBCAs) increase the risk for nephrogenic systemic fibrosis (NSF) among patients with impaired elimination of the drugs. Avoid use of GBCAs among these patients unless the diagnostic information is essential and not available with non-contrast MRI or other modalities. The GBCA-associated NSF risk appears highest for patients with chronic, severe kidney disease (GFR < 30 mL/min/1.73m^2) as well as patients with acute kidney injury. The risk appears lower for patients with chronic, moderate kidney disease (GFR 30 to 59 mL/min/1.73m^2) and little, if any, for patients with chronic, mild kidney disease (GFR 60 to 89 mL/min/1.73m^2). NSF may result in fatal or debilitating fibrosis affecting the skin, muscle and internal organs. Report any diagnosis of NSF following Gadavist administration to Bayer Healthcare (1-888-842-2937) or FDA (1-800-FDA-1088 or www.fda.gov/medwatch).

Screen patients for acute kidney injury and other conditions that may reduce renal function. Features of acute kidney injury consist of rapid (over hours to days) and usually reversible decrease in kidney function, commonly in the setting of surgery, severe infection, injury or drug-induced kidney toxicity. Serum creatinine levels and estimated GFR may not reliably assess renal function in the setting of acute kidney injury. For patients at risk for chronically reduced renal function (for example, age > 60 years, diabetes mellitus or chronic hypertension), estimate the GFR through laboratory testing.

Among the factors that may increase the risk for NSF are repeated or higher than recommended doses of a GBCA and degree of renal impairment at the time of exposure. Record the specific GBCA and the dose administered to a patient. For patients at highest risk for NSF, do not exceed the recommended Gadavist dose and allow a sufficient period of time for elimination of the drug prior to re-administration. For patients receiving hemodialysis, consider the prompt initiation of hemodialysis following the administration of a GBCA in order to enhance the contrast agent's elimination *[see Use in Specific Populations (8.6) and Clinical Pharmacology (12.3)]*. The usefulness of hemodialysis in the prevention of NSF is unknown *[see Clinical Pharmacology (12.3).*

5.2 Hypersensitivity Reactions

Anaphylactic and other hypersensitivity reactions with cardiovascular, respiratory or cutaneous manifestations, ranging from mild to severe, including death, have uncommonly occurred following Gadavist administration *[see Adverse Reactions (6)]*.

- Before Gadavist administration, assess all patients for any history of a reaction to contrast media, bronchial asthma and/or allergic disorders. These patients may have an increased risk for a hypersensitivity reaction to Gadavist.
- Administer Gadavist only in situations where trained personnel and therapies are promptly available for the treatment of hypersensitivity reactions, including personnel trained in resuscitation.

Most hypersensitivity reactions to Gadavist have occurred within half an hour after administration. Delayed reactions can occur up to several days after administration. Observe patients for signs and symptoms of hypersensitivity reactions during and following Gadavist administration.

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5.3 Acute Kidney Injury

In patients with chronic renal impairment, acute kidney injury sometimes requiring dialysis has been observed with the use of some GBCAs. Do not exceed the recommended dose; the risk of acute kidney injury may increase with higher than recommended doses.

5.4 Extravasation and Injection Site Reactions

Ensure catheter and venous patency before the injection of Gadavist. Extravasation into tissues during Gadavist administration may result in moderate irritation *[see Nonclinical Toxicology (13.2)]*.

5.5 Overestimation of Extent of Malignant Disease in MRI of the Breast

Gadavist MRI of the breast overestimated the histologically confirmed extent of malignancy in the diseased breast in up to 50% of the patients *[see Clinical Studies (14.2)]*.

6 ADVERSE REACTIONS

The following serious adverse reactions are discussed elsewhere in labeling:

- Nephrogenic Systemic Fibrosis (NSF) *[see Boxed Warning and Warnings and Precautions (5.1)]*.
- Hypersensitivity reactions *[see Contraindications (4) and Warnings and Precautions (5.2)]*.

6.1 Clinical Trials Experience

Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in clinical practice.

The adverse reactions described in this section reflect Gadavist exposure in 6,330 subjects (including 184 pediatric patients, ages 0 to 17 years) with the majority receiving the recommended dose. Approximately 50% of the subjects were male and the ethnic distribution was 60% Caucasian, 30% Asian, 6% Hispanic, 2% Black, and 3% patients of other ethnic groups. The average age was 55 years (range from1 week to 93 years).

Overall, approximately 4% of subjects reported one or more adverse reactions during a follow-up period that ranged from 24 hours to 7 days after Gadavist administration.

Adverse reactions associated with the use of Gadavist were usually mild to moderate in severity and transient in nature.

Table 2 lists adverse reactions that occurred in ≥ 0.1% subjects who received Gadavist.

Table 2: Adverse Reactions

Reaction	**Rate (%) n=6330**
Headache	1.5
Nausea	1.2
Dizziness	0.5
Dysgeusia	0.4
Feeling Hot	0.4
Injection site reactions	0.4
Vomiting	0.4
Rash (includes generalized, macular, papular, pruritic)	0.3
Pruritus (includes generalized)	0.2
Erythema	0.2
Hypersensitivity/Anaphylactoid*	0.1
Dyspnea	0.1
Paresthesia	0.1

*Hypersensitivity/anaphylactoid reaction may occur with one or more of the following adverse reactions: for example, hypotension, urticaria, face edema, eyelid edema, flushing

Adverse reactions that occurred with a frequency of < 0.1% in subjects who received Gadavist include: loss of consciousness, convulsion, parosmia, tachycardia, palpitation, dry mouth, malaise and feeling cold.

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6.2 Postmarketing Experience

The following additional adverse reactions have been reported during postmarketing use of Gadavist. Because these reactions are reported voluntarily from a population of uncertain size, it is not possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

- Cardiac arrest
- Nephrogenic Systemic Fibrosis (NSF)
- Hypersensitivity reactions (anaphylactic shock, circulatory collapse, respiratory arrest, pulmonary edema, bronchospasm, cyanosis, oropharyngeal swelling, laryngeal edema, blood pressure increased, chest pain, angioedema, conjunctivitis, hyperhidrosis, cough, sneezing, burning sensation, and pallor) *[see Warnings and Precautions (5.2)]*

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category C

Risk Summary

There are no adequate and well-controlled studies of Gadavist in pregnant women. GBCAs cross the human placenta. Limited human data on exposure to GBCAs during pregnancy does not show adverse effects in exposed neonates. Animal reproductive studies were conducted (see Animal Data). Embryolethality but no teratogenic effects were observed in monkeys, rabbits and rats. Use Gadavist during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Animal Data

Embryolethality was observed when gadobutrol was administered intravenously to monkeys during organogenesis at doses 8 times the recommended single human dose (based on body surface area); gadobutrol was not maternally toxic or teratogenic at this dose. Embryolethality and retardation of embryonal development also occurred in pregnant rats receiving maternally toxic doses of gadobutrol (≥ 7.5 mmol/kg body weight; equivalent to12 times the human dose based on body surface area) and in pregnant rabbits (≥ 2.5 mmol/kg body weight; equivalent to 8 times the recommended human dose based on body surface area). In rabbits, this finding occurred without evidence of pronounced maternal toxicity and with minimal placental transfer (0.01% of the administered dose detected in the fetuses).

Gadavist was not teratogenic when given intravenously to monkeys during organogenesis at doses up to 8 times the recommended single human dose (based on body surface area) but was embryolethal at that dose. Because pregnant animals received repeated daily doses of Gadavist, their overall exposure was significantly higher than that achieved with the standard single dose administered to humans.

8.3 Nursing Mothers

It is not known whether Gadavist is present in human milk. However, reports on use of other GBCAs indicate that 0.01 to 0.04% of the maternal gadolinium dose is present in breast milk and there is limited GBCA gastrointestinal absorption in the breast-fed infant. In rat lactation studies, gadobutrol was present in milk in amounts less than 0.1% of the dose intravenously administered and the gastrointestinal absorption is poor (approximately 5% of the dose orally administered was excreted in the urine). In lactating rats receiving 0.5 mmol/kg of intravenous [^{153}Gd]-gadobutrol, 0.01% of the total administered radioactivity was transferred to the pup via maternal milk, within 3 hours after administration.

A lactating woman may consider interrupting breastfeeding and pumping and discarding breast milk up to18 hours after Gadavist administration in order to minimize exposure to a breastfed infant.

8.4 Pediatric Use

The safety and effectiveness of Gadavist have been established in pediatric patients born at 37 weeks gestation or later based on imaging and pharmacokinetic data in 138 patients ages 2 to 17 years and 44 patients ages 0 to less than 2 years and extrapolation from adult data. The frequency, type, and severity of adverse reactions in pediatric patients were similar to adverse reactions in adults *[see Adverse Reactions (6.1)]*. No dose adjustment according to age is necessary in pediatric patients *[see Dosage and Administration (2.1), Clinical Pharmacology (12.3), and Clinical Studies (14.1)]*. The safety and effectiveness of Gadavist have not been established in premature infants.

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NSF Risk

No case of NSF associated with Gadavist or any other GBCA has been identified in pediatric patients ages 6 years and younger. Pharmacokinetic studies suggest that clearance of Gadavist is similar in pediatric patients and adults, including pediatric patients age younger than 2 years. No increased risk factor for NSF has been identified in juvenile animal studies of gadobutrol. Normal estimated GFR (eGFR) is around 30 mL/min/1.73m^2 at birth and increases to mature levels around 1 year of age, reflecting growth in both glomerular function and relative body surface area. Clinical studies in pediatric patients younger than 1 year of age have been conducted in patients with the following minimum eGFR: 31 mL/min/1.73m^2 (age 2 to 7 days), 38 mL/min/1.73m^2 (age 8 to 28 days), 62 mL/min/1.73m^2 (age 1 to 6 months), and 83 mL/min/1.73m^2 (age 6 to 12 months).

Juvenile Animal Data

Single and repeat-dose toxicity studies in neonatal and juvenile rats did not reveal findings suggestive of a specific risk for use in pediatric patients including term neonates and infants.

8.5 Geriatric Use

In clinical studies of Gadavist, 1,377 patients were 65 years of age and over, while 104 patients were 80 years of age and over. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients. In general, use of Gadavist in elderly patients should be cautious, reflecting the greater frequency of impaired renal function and concomitant disease or other drug therapy. No dose adjustment according to age is necessary in this population.

8.6 Renal Impairment

Prior to administration of Gadavist, screen all patients for renal dysfunction by obtaining a history and/or laboratory tests *[see Warnings and Precautions (5.1)]*. No dosage adjustment is recommended for patients with renal impairment.

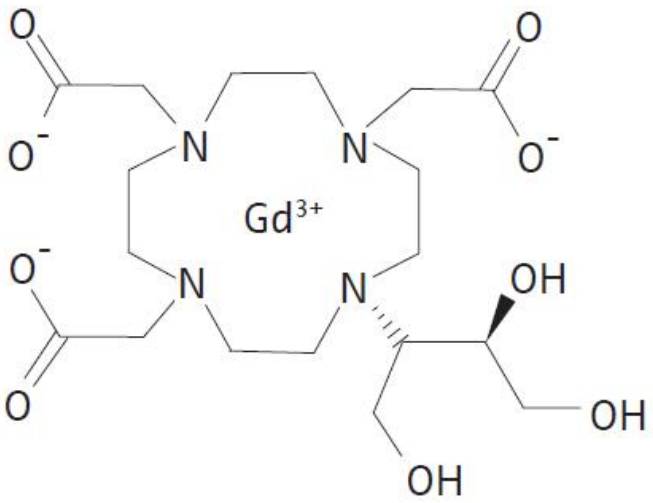
Gadavist can be removed from the body by hemodialysis *[see Warnings and Precautions (5.1) and Clinical Pharmacology (12.3)]*.

10 OVERDOSAGE

The maximum dose of Gadavist tested in healthy volunteers, 1.5 mL/kg body weight (1.5 mmol/kg; 15 times the recommended dose), was tolerated in a manner similar to lower doses. Gadavist can be removed by hemodialysis *[see Use in Specific Populations (8.6) and Clinical Pharmacology (12.3)]*.

11 DESCRIPTION

Gadavist (gadobutrol) injection is a paramagnetic macrocyclic contrast agent administered for magnetic resonance imaging. The chemical name for gadobutrol is 10–[(1SR,2RS)–2,3–dihydroxy–1–hydroxymethylpropyl]–1,4,7,10–tetraazacyclododecane–1,4,7–triacetic acid, gadolinium complex. Gadobutrol has a molecular formula of $C_{18}H_{31}GdN_4O_9$ and a molecular weight of 604.72.



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Gadavist is a sterile, clear, colorless to pale yellow solution containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol/mL) as the active ingredient and the excipients calcobutrol sodium, trometamol, hydrochloric acid (for pH adjustment) and water for injection. Gadavist contains no preservatives.

The main physicochemical properties of Gadavist (1 mmol/mL solution for injection) are listed below:

Density (g/mL at 37°C)	1.3
Osmolarity at 37°C (mOsm/L solution)	1117
Osmolality at 37°C (mOsm/kg H_2O)	1603
Viscosity at 37°C (mPa·s)	4.96
pH	6.6–8

The thermodynamic stability constants for gadobutrol (log Ktherm and log Kcond at pH 7.4) are 21.8 and 15.3, respectively.

12 CLINICAL PHARMACOLOGY

12.1 Mechanism of Action

In MRI, visualization of normal and pathological tissue depends in part on variations in the radiofrequency signal intensity that occurs with:

- Differences in proton density
- Differences of the spin-lattice or longitudinal relaxation times (T_1)
- Differences in the spin-spin or transverse relaxation time (T_2)

When placed in a magnetic field, Gadavist shortens the T_1 and T_2 relaxation times. The extent of decrease of T_1 and T_2 relaxation times, and therefore the amount of signal enhancement obtained from Gadavist, is based upon several factors including the concentration of Gadavist in the tissue, the field strength of the MRI system, and the relative ratio of the longitudinal and transverse relaxation times. At the recommended dose, the T_1 shortening effect is observed with greatest sensitivity in T_1-weighted magnetic resonance sequences. In T_2*-weighted sequences the induction of local magnetic field inhomogeneities by the large magnetic moment of gadolinium and at high concentrations (during bolus injection) leads to a signal decrease.

12.2 Pharmacodynamics

Gadavist leads to distinct shortening of the relaxation times even in low concentrations. At pH 7, 37°C and 1.5 T, the relaxivity (r_1) - determined from the influence on the relaxation times (T_1) of protons in plasma - is 5.2 L/(mmol·sec) and the relaxivity (r_2) - determined from the influence on the relaxation times (T_2) - is 6.1 L/(mmol·sec). These relaxivities display only slight dependence on the strength of the magnetic field. The T_1 shortening effect of paramagnetic contrast agents is dependent on concentration and r_1 relaxivity (see Table 3). This may improve tissue visualization.

Table 3: Relaxivity (r_1) of Gadolinium Chelates at 1.5 T

Gadolinium-Chelate	**r_1 (L·mmol^{-1}·s^{-1})**
Gadobenate	6.3
Gadobutrol	5.2
Gadodiamide	4.3
Gadofosveset	16
Gadopentetate	4.1
Gadoterate	3.6
Gadoteridol	4.1
Gadoversetamide	4.7

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Gadoxetate	6.9

r_1 relaxivity in plasma at 37°C

Compared to 0.5 molar gadolinium-based contrast agents, the higher concentration of Gadavist results in half the volume of administration and a more compact contrast bolus.

Gadavist is a highly water-soluble, extremely hydrophilic compound with a partition coefficient between n-butanol and buffer at pH 7.6 of about 0.006.

12.3 Pharmacokinetics

Distribution
After intravenous administration, gadobutrol is rapidly distributed in the extracellular space. After a gadobutrol dose of 0.1 mmol/kg body weight, an average level of 0.59 mmol gadobutrol/L was measured in plasma 2 minutes after the injection and 0.3 mmol gadobutrol/L 60 minutes after the injection. Gadobutrol does not display any particular protein binding. In rats, gadobutrol does not penetrate the intact blood-brain barrier.

Metabolism
Gadobutrol is not metabolized.

Elimination
Values for AUC, body weight normalized plasma clearance and half-life are given in Table 4, below.

Gadobutrol is excreted in an unchanged form via the kidneys. In healthy subjects, renal clearance of gadobutrol is 1.1 to 1.7 mL/(min·kg) and thus comparable to the renal clearance of inulin, confirming that gadobutrol is eliminated by glomerular filtration.

Within two hours after intravenous administration more than 50% and within 12 hours more than 90% of the given dose is eliminated via the urine. Extra-renal elimination is negligible.

Specific Populations
Gender
Gender has no clinically relevant effect on the pharmacokinetics of gadobutrol.

Geriatric
A single IV dose of 0.1 mmol/kg Gadavist was administered to 15 elderly and 16 non-elderly subjects. AUC was slightly higher and clearance slightly lower in elderly subjects as compared to non-elderly subjects *[see Use in Specific Populations (8.5)]*.

Pediatric
The pharmacokinetics of gadobutrol were evaluated in two studies in a total of 130 patients age 2 to less than 18 years and in 43 patients less than 2 years of age (including term neonates). Patients received a single intravenous dose of 0.1 mmol/kg of Gadavist. The pharmacokinetic profile of gadobutrol in pediatric patients is similar to that in adults, resulting in similar values for AUC, body weight normalized plasma clearance, as well as elimination half-life. Approximately 99% (median value) of the dose was recovered in urine within 6 hours (this information was derived from the 2 to less than 18 year old age group).

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Table 4: Pharmacokinetics by Age Group (Median [Range])

	0 to < 2 years N=43	2 to 6 years N=45	7 to 11 years N=39	12 to < 18 years N=46	Adults N=93
AUC (µmolxh/L)	781 [513, 1891]	846 [412, 1331]	1025 [623, 2285]	1237 [946, 2211]	1072 [667, 1992]
CL (L/h/kg)	0.128 [0.053, 0.195]	0.119 [0.080, 0.215]	0.099 [0.043, 0.165]	0.081 [0.046, 0.103]	0.094 [0.051, 0.150]
t1/2 (h)	2.91 [1.60, 12.4]	1.91 [1.04, 2.70]	1.66 [0.91, 2.71]	1.68 [1.31, 2.48]	1.80 [1.20, 6.55]
C20 (µmol/L)	367 [280, 427]	421 [369, 673]	462 [392, 760]	511 [387, 1077]	441 [281, 829]

Renal Impairment

In patients with impaired renal function, the serum half-life of gadobutrol is prolonged and correlated with the reduction in creatinine clearance.

After intravenous injection of 0.1 mmol gadobutrol/kg body weight, the elimination half-life was 5.8 ± 2.4 hours in mild to moderately impaired patients ($80 > CL_{CR} > 30$ mL/min) and 17.6 ± 6.2 hours in severely impaired patients not on dialysis ($CL_{CR} < 30$ mL/min). The mean AUC of gadobutrol in patients with normal renal function was 1.1 ± 0.1 mmol·h/L, compared to 4.0 ± 1.8 mmol·h/L in patients with mild to moderate renal impairment and 11.5 ± 4.3 mmol·h/L in patients with severe renal impairment.

Complete recovery in the urine was seen in patients with mild or moderate renal impairment within 72 hours. In patients with severely impaired renal function about 80% of the administered dose was recovered in the urine within 5 days.

For patients receiving hemodialysis, physicians may consider the prompt initiation of hemodialysis following the administration of Gadavist in order to enhance the contrast agent's elimination. Sixty-eight percent (68%) of gadobutrol is removed from the body after the first dialysis, 94% after the second dialysis, and 98% after the third dialysis session. *[See Warnings and Precautions (5.1) and Use in Specific Populations (8.6)]*.

13 NONCLINICAL TOXICOLOGY

13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

No carcinogenicity studies of gadobutrol have been conducted.

Gadobutrol was not mutagenic in *in vitro* reverse mutation tests in bacteria, in the HGPRT (hypoxanthine-guanine phosphoribosyl transferase) test using cultured Chinese hamster V79 cells, or in chromosome aberration tests in human peripheral blood lymphocytes, and was negative in an *in vivo* micronucleus test in mice after intravenous injection of 0.5 mmol/kg.

Gadobutrol had no effect on fertility and general reproductive performance of male and female rats when given in doses 12.2 times the human equivalent dose (based on body surface area).

13.2 Animal Toxicology and/or Pharmacology

Local intolerance reactions, including moderate irritation associated with infiltration of inflammatory cells was observed after paravenous administration to rabbits, suggesting the possibility of occurrence of local irritation if the contrast medium leaks around veins in a clinical setting *[see Warnings and Precautions (5.4)]*.

14 CLINICAL STUDIES

14.1 MRI of the CNS

Patients referred for MRI of the central nervous system with contrast were enrolled in two clinical trials that evaluated the visualization characteristics of lesions. In both studies, patients underwent a baseline, pre-contrast MRI prior to administration of Gadavist at a dose of 0.1 mmol/kg, followed by a post-contrast MRI. In study A, patients also underwent an MRI before and after the administration of gadoteridol. The studies were designed to demonstrate superiority of Gadavist MRI to non-contrast MRI for lesion visualization. For both studies, pre-contrast and pre-plus-post contrast

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images (paired images) were independently evaluated by three readers for contrast enhancement and border delineation using a scale of 1 to 4, and for internal morphology using a scale of 1 to 3 (Table 5). Lesion counting was also performed to demonstrate non-inferiority of paired Gadavist image sets to pre-contrast MRI. Readers were blinded to clinical information.

Table 5: Primary Endpoint Visualization Scoring System

Score	Visualization Characteristics		
	Contrast Enhancement	**Border Delineation**	**Internal Morphology**
1	None	None	Poorly visible
2	Weak	Moderate	Moderately visible
3	Clear	Clear but incomplete	Sufficiently visible
4	Clear and bright	Clear and complete	N/A

Efficacy was determined in 657 subjects. The average age was 49 years (range 18 to 85 years) and 42% were male. The ethnic representations were 39% Caucasian, 4% Black, 16% Hispanic, 38% Asian, and 3% of other ethnic groups.

Table 6 shows a comparison of visualization results between paired images and pre-contrast images. Gadavist provided a statistically significant improvement for each of the three lesion visualization parameters when averaged across three independent readers for each study.

Table 6: Visualization Endpoint Results of Central Nervous System Adult MRI Studies with 0.1 mmol/kg Gadavist

Endpoint	Study A N=336			Study B N=321		
	Pre-contrast	Paired	Difference*	Pre-contrast	Paired	Difference
Contrast Enhancement	0.97	2.26	1.29^	0.93	2.86	1.94^
Border Delineation	1.98	2.58	0.60^	1.92	2.94	1.02^
Internal Morphology	1.32	1.93	0.60^	1.57	2.35	0.78^
Average # Lesions Detected	8.08	8.25	0.17**	2.65	2.97	0.32^^

* Difference of means = (paired mean) – (pre-contrast mean)
^ $p<0.001$
^^ Met noninferiority margin of -0.35
** Did not meet noninferiority margin of -0.35

Performances of Gadavist and gadoteridol for visualization parameters were similar. Regarding the number of lesions detected, study B met the prespecified noninferiority margin of -0.35 for paired read versus pre-contrast read while in Study A, Gadavist and gadoteridol did not.

For the visualization endpoints contrast enhancement, border delineation, and internal morphology, the percentage of patients scoring higher for paired images compared to pre-contrast images ranged from 93% to 99% for Study A, and 95% to 97% for Study B. For both studies, the mean number of lesions detected on paired images exceeded that of the pre-contrast images; 37% for Study A and 24% for Study B. There were 29% and 11% of subjects in which the pre-contrast images detected more lesions for Study A and Study B, respectively.

The percentage of patients whose average reader mean score changed by ≤ 0, up to 1, up to 2, and ≥ 2 scoring categories presented in Table 5 is shown in Table 7. The categorical improvement of (≤ 0) represents higher (< 0) or identical ($= 0$) scores for the pre-contrast read, the categories with scores > 0 represent the magnitude of improvement seen for the paired read.

Table 7: Primary Endpoint Visualization Categorical Improvement for Average Reader

	Study A N=336	Study B N=321

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Endpoint	Categorical Improvement (Paired – Pre-Contrast) %				Categorical Improvement (Paired – Pre-Contrast) %			
	≤ 0	> 0 – < 1	1 – < 2	≥ 2	≤ 0	> 0 – < 1	1 – < 2	≥ 2
Contrast Enhancement	1	30	55	13	3	6	34	57
Border Delineation	7	73	18	1	5	38	51	5
Internal Morphology	4	79	17	0	5	61	33	1

For both studies, the improvement of visualization endpoints in paired Gadavist images compared to pre-contrast images resulted in improved assessment of normal and abnormal CNS anatomy.

Pediatric Patients

Two studies in 44 pediatrics patients age younger than 2 years and 135 pediatric patients age 2 to less than18 years with CNS and non-CNS lesions supported extrapolation of adult CNS efficacy findings. For example, comparing pre vs paired pre- and post-contrast images, investigators selected the best of four descriptors under the heading, "Visualization of lesion-internal morphology (lesion characterization) or homogeneity of vessel enhancement" for 27/44 (62% = pre) vs 43/44 (98% = paired) MR images from patients age 0 to less than 2 years and 106/135 (78% = pre) vs 108/135 (80% = paired) MR images from patients age 2 to less than 18 years.

14.2 MRI of the Breast

Patients with recently diagnosed breast cancer were enrolled in two identical clinical trials to evaluate the ability of Gadavist to assess the presence and extent of malignant breast disease prior to surgery. Patients underwent non-contrast breast MRI (BMR) prior to Gadavist (0.1 mmol/kg) breast MRI. BMR images and Gadavist BMR (combined contrast plus non-contrast) images were independently evaluated in each study by three readers blinded to clinical information. In separate reading sessions the BMR images and Gadavist BMR images were also interpreted together with X-ray mammography images (XRM).

The studies evaluated 787 patients: Study 1 enrolled 390 women with an average age of 56 years, 74% were white, 25% Asian, 0.5% black, and 0.5% other; Study 2 enrolled 396 women and 1 man with an average age of 57 years, 71% were white, 24% Asian, 3% black, and 2% other.

The readers assessed 5 regions per breast for the presence of malignancy using each reading modality. The readings were compared to an independent standard of truth (SoT) consisting of histopathology for all regions where excisions were made and tissue evaluated. XRM plus ultrasound was used for all other regions.

The assessment of malignant disease was performed using a region based within-subject sensitivity. Sensitivity for each reading modality was defined as the mean of the percentage of malignant breast regions correctly interpreted for each subject. The within-subject sensitivity of Gadavist BMR was superior to that of BMR. The lower bound of the 95% Confidence Interval (CI) for the difference in within-subject sensitivity ranged from 19% to 42% for Study 1 and from 12% to 27% for Study 2. The within-subject sensitivity for Gadavist BMR and BMR as well as for Gadavist BMR plus XRM and BMR plus XRM is presented in Table 8.

Table 8: Sensitivity of Gadavist BMR for Detection of Malignant Breast Disease

Study 1 Sensitivity (%) N=388 Patients					Study 2 Sensitivity (%) N=390 Patients				
Reader	BMR	BMR + XRM	Gadavist BMR	Gadavist BMR +XRM	Reader	BMR	BMR + XRM	Gadavist BMR	Gadavist BMR +XRM
1	37	71	83	84	4	73	83	87	90
2	49	76	80	83	5	57	81	89	90
3	63	75	87	87	6	55	80	86	88

Specificity was defined as the percentage of non-malignant breasts correctly identified as non-malignant. The lower limit of the 95% confidence interval for specificity of Gadavist BMR was greater than 80% for 5 of 6 readers. (Table 9)

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Table 9: Specificity of Gadavist BMR in Non-Malignant Breasts

Study 1			Study 2		
Specificity (%) N=372 Patients			Specificity (%) N=367 Patients		
Reader	Gadavist BMR	Lower Limit 95% CI	Reader	Gadavist BMR	Lower Limit 95% CI
1	86	82	4	92	89
2	95	93	5	84	80
3	89	85	6	83	79

Three additional readers in each study read XRM alone. For these readers over both studies, sensitivity ranged from 68% to 73% and specificity in non-malignant breasts ranged from 86% to 94%.

In breasts with malignancy, a false positive detection rate was calculated as the percentage of subjects for which the readers assessed a region as malignant which could not be verified by SoT. The false positive detection rates for Gadavist BMR ranged from 39% to 53% (95% CI Upper Bounds ranged from 44% to 58%).

16 HOW SUPPLIED/STORAGE AND HANDLING

16.1 How Supplied

Gadavist is a sterile, clear and colorless to pale yellow solution containing 604.72 mg gadobutrol per mL (equivalent to 1 mmol gadobutrol) per mL. Gadavist is supplied in the following sizes:

30 mL Pharmacy Bulk Package, rubber stoppered in cartons of 5, Boxes of 10 (NDC 50419-325-14)

65 mL Pharmacy Bulk Package, rubber stoppered, Boxes of 10 (NDC 50419-325-15)

16.2 Storage and Handling

Store at 25°C (77°F); excursions permitted to 15–30°C (59–86°F) [see USP Controlled Room Temperature].

Should freezing occur, Gadavist should be brought to room temperature before use. If allowed to stand at room temperature, Gadavist should return to a clear and colorless to pale yellow solution. Visually inspect Gadavist for particulate matter and discoloration prior to administration. Do not use the solution if it is discolored, if particulate matter is present or if the container appears damaged.

17 PATIENT COUNSELING INFORMATION

Nephrogenic Systemic Fibrosis

Instruct patients to inform their physician if they:

- Have a history of kidney disease and/or liver disease, or
- Have recently received a GBCA

GBCAs increase the risk of NSF among patients with impaired elimination of drugs. To counsel patients at risk of NSF:

- Describe the clinical manifestation of NSF
- Describe procedures to screen for the detection of renal impairment

Instruct the patients to contact their physician if they develop signs or symptoms of NSF following Gadavist administration, such as burning, itching, swelling, scaling, hardening and tightening of the skin; red or dark patches on the skin; stiffness in joints with trouble moving, bending or straightening the arms, hands, legs or feet; pain in the hip bones or ribs; or muscle weakness.

Common Adverse Reactions

Inform patients that they may experience:

- Reactions along the venous injection site, such as mild and transient burning or pain or feeling of warmth or coldness at the injection site
- Side effects of headache, nausea, abnormal taste and feeling hot

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General Precautions

Instruct patients receiving Gadavist to inform their physician if they:

- Are pregnant or breastfeeding
- Have a history of allergic reaction to contrast media, bronchial asthma or allergic respiratory disorder,

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