99mTc pentetate

DTPA, Technescan DTPA®, Draximage DTPA®

1. Indications

99mTc-pentetate is approved for:

a) After Intravenous administration:

- dynamic renal scintigraphy for perfusion, function and urinary tract studies.
- measurement of glomerular filtration rate.
- cerebral angiography and brain scanning. As an alternative method when computed tomography and/or magnetic resonance imaging are not available.

b) After inhalation of the nebulized 99mTc pentetate:

- lung ventilation imaging.

c) After oral administration:

- studies of gastro-oesophageal reflux and gastric emptying.

2. Preparation

Approved product, see summary of product characteristics (SmPC).

3. Quality control

Approved product, see summary of product characteristics (SmPC) and the European Pharmacopeia.

4. Interactions

Renography

Several groups of medication have a specific influence on the processing of the radiopharmaceutical by the kidney, for example Angiotensin converting enzyme (ACE) inhibitors and diuretics.

NSAIDs, with diclofenac as mostly investigated drug, show a delay in T_{max} and $T_{1/2}$ for 99mTc-DTPA. This effect on 99mTc-DTPA is greater than with 99mTc-MAG3.

Medications containing aluminum and/or magnesium may cause to receive abnormal glomerular filtration results.

Lung ventilation imaging

A number of drugs used chronically cause pulmonary toxicity. Some of the agents involved, together with their mechanism of action, so far as is it is understood, are listed in table 1.

Table 1. Drugs causing pulmonary interstitial disease with an indication of the mechanism involved

Mechanism of Injury	Drugs Implicated
Diffuse alveolar damage	Bleomycin, busulphan, carmustine, cyclophosphamide, gold salts, mitomycin, and melphalan.
Nonspecific interstitial pneumonia	Amiodarone, carmustine, chlorambucil and methotrexate.
Bronchiolitis obliterans organizing pneumonia	Amiodarone, bleomycin, cyclophosphamide, gold salts, methotrexate, nitrofurantoin, penicillamine and sulfasalazine.
Eosinophilic pneumonia	Nitrofurantoin, nonsteroidal anti-inflammatory drugs, para-aminosalicylic acid, penicillamine and sulfasalazine.
Pulmonary hemorrhage	Anticoagulants, amphotericin B, cyclophosphamide, cytarabine (ara – C) and penicillamine.

Cerebral angiography: Psychotropic drugs increase blood flow in the territory of the external carotid artery. This may lead to the rapid uptake of tracer in the nasopharyngeal area during the arterial and capillary phases (hot nose phenomenon).

5. Adverse reactions

Allegic reactions are rare. Urticarial, facial redness, itchiness, high blood pressure and fever have been reported.

6. Biodistribution & pharmacokinetics

Following its intravenous administration, ^{99m}Tc pentetate rapidly distributes itself throughout the extracellular fluid space from which it is promptly cleared from the body. The mechanism of excretion from the body is by glomerular filtration. A variable percentage of the technetium ^{99m}Tc-pentetate binds to the serum proteins; this ranges from 3,7% following a single injection to approximately 10% if the material is continuously infused. Although the chelate gives useful information on the glomerular filtration rate, the variable percent which is protein bound leads to a measured clearance rate which is lower than that determined with inulin.
The images of the kidneys obtained in the first few minutes after administration of technetium ^{99m}Tc pentetate represent the vascular pool within the kidney.
Subsequent images of the kidneys represent radioactivity which is in the urine of both the collection system and the renal pelvis.

In lung ventilation studies, after inhalation, ^{99m}Tc-pentetate (DTPA) diffuses rapidly from the pulmonary alveoles towards the vascular space where it is diluted. The half-life of

technetium ^{99m}Tc-pentetate (DTPA) in the lungs is slightly less than 1 h.

Following oral administration, technetium (^{99m}Tc) pentetate (DTPA) does not pass through the digestive barrier.

7. Stability

The labeled product has to be used within 8 h after reconstitution. The lyophilized product has to be stored at 15-25°C, the labeled product (Technescan DTPA®) at 2-8°C.

8. Literature

- SmPC Technescan DTPA®.
- Dirlik A, Erinc R et al. Technetium-99m-DTPA aerosol scintigraphy in amiodarone induced pulmonary toxicity in comparison with Ga-67 scintigraphy. Ann Nucl Med 2002;16:477-81.
- Lentle B, Attarowola R et al. Drug-induced changes in radiopharmaceutical biodistributions. The university of New Mexico Health Sciences Center College of Pharmacy, Albuqueque, New Mexico 2004 Volume 11, lesson 4.
- Seham M, Elgazzar AH. Effect of the NSAID Diclofenac on 99mTc MAG3 and 99mTc-DTPA renography. J Necl Med 2013;54:801-6.
- Specht HD, Belsey R, Hanada J. Aluminemic disturbance of Techentium-99m DTPA Renal function measurement. J Nucl Med 1987;28:383-6.