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Transient Renal Hypoperfusion During a Vasovagal Episode

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Objective: Nuclear medicine technologists are often called upon to recognize adverse events during patient imaging and take appropriate actions. A vasovagal episode occurred in a patient who was undergoing upright renal imaging.
Methods: A 39-yr-old female with invasive cervical cancer was undergoing a renal scan as part of her preoperative evaluation prior to an abdominal hysterectomy. One to two minutes after intravenous administration of ^{99m}Tc-MAG3 (10 mCi), the patient became nauseated and lightheaded.
Results: After 15–20 min, the patient's symptoms resolved but a review of the images revealed tracer retention within the kidneys, indicative of decreased renal blood flow. We feel that a severe drop in blood pressure resulted from this patient's vasovagal episode.
Conclusions: The technologist can alleviate the transient hypoperfusion of a vasovagal episode during an imaging procedure, but they must first be aware of the signs and symptoms in order to take the appropriate action.
Key Words: Vasovagal episode, ^{99m}Tc-MAG3, upright imaging.

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Nuclear medicine technologists provide patient care in addition to producing high-quality images. Adverse events are rarely associated with scintigraphy. Technologists need to recognize potential complications and act to avert them. We present a case of a vasovagal episode during a routine preoperative renal scan.

CASE HISTORY

A 39-yr-old normotensive female with invasive cervical cancer was admitted for an abdominal hysterectomy. As part of her preoperative evaluation, a renal scan was obtained. Technetium-99m-MAG3 (10 mCi, 370 MBq) was administered intravenously by venipuncture. The patient was in a sitting position during injection and imaging. One to two minutes after injection, the patient complained of a lightheaded sensation and mild nausea. She was pale and began to sweat profusely. The nuclear medicine technologist lightly supported the patient and imaging continued. After 15–20 min, the patient's symptoms and pallor had resolved, requiring no further support.

Review of the images revealed retention of ^{99m}Tc-MAG3 within the kidneys (Fig. 1) which paralleled the patient's symptoms. As her symptoms resolved, normal renal clearance of the tracer was seen.

DISCUSSION

Vasovagal hypotension results from sudden vasodilatation and inappropriate bradycardia. Pain, severe emotions and physical injury can produce an abrupt drop in central blood pressure primarily through arteriolar dilatation with blood pooling in the skeletal muscles and splanchnic bed. This pooling deprives the heart of the blood volume required to produce adequate cardiac output. When the blood pressure drops, the heart customarily responds with a compensatory rise in cardiac output, mediated predominately by heart rate elevation. Emotional stress or pain can result in neuronal discharge through a major cranial nerve, the Vagus. Stimulation of the Vagus nerve (hence vasovagal) causes a drop in heart rate leading to a further drop in blood pressure (*1*). This hypotension produces hypoperfusion of vital organs, especially the brain and kidneys.

During vasovagal episodes, patients typically feel lightheaded and anxious, as in the present case. Vasoconstriction of the skin in an attempt to raise blood pressure produces a pale appearance. Profuse sweating is often accompanied by gastrointestinal hyperactivity manifesting as nausea and an urge to defecate. As the hypotension progresses, the patient will begin to lose muscular tone and urine output drops precipitously. The patient often expresses a strong desire to lie down. If the attack proceeds further, unconsciousness, cardiac arrhythmia, seizures and even death may result (*2*). As with this patient, the pulse and blood pressure can spontaneously return to normal and eventually symptoms completely disappear.

Vasovagal episodes are not necessarily abnormal. The responsible neuronal pathways are present in everyone and

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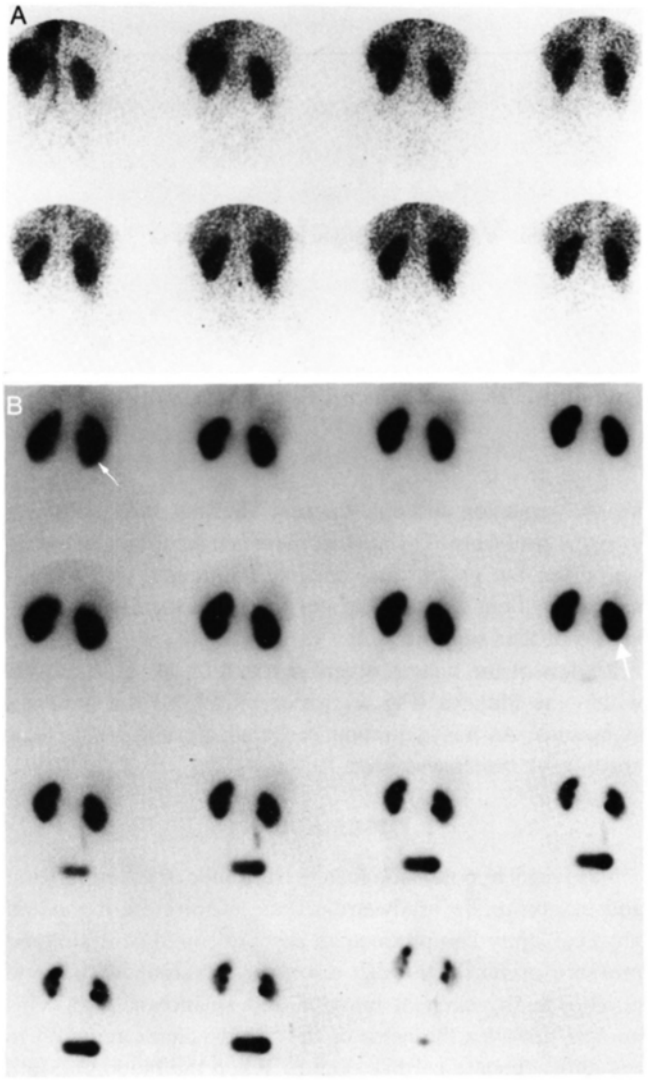


FIGURE 1. A TcMAG3 renal scan in 39-yr-old female performed in a sitting position with posterior imaging. (A) Dynamic images (3 sec per frame). The aorta, kidneys and spleen are seen in the first frame indicative of prompt symmetric renal perfusion immediately after injection. (B) Static images (2 min per frame, starting at 1 min). The initial image (small arrow) reveals excellent radiopharmaceutical extraction but evidence of motion. The next seven images demonstrate persistent tracer retention during the patient's symptoms. By the eighth image (large arrow) renal perfusion has normalized and excretion and transit of TcMAG3 from both kidneys is rapid.

appear more reactive in young, healthy patients. Individual susceptibility varies but a variety of background conditions add to the likelihood of occurrence: fasting, anxiety, an overly warm examination room and upright posture. The technologist can avert or terminate the episode by laying the patient down and elevating the legs to enhance blood return. Even severe symptoms will resolve rapidly and completely if the patient is allowed to remain recumbent (*3*). Even though this patient appeared calm, underlying anxiety regarding upcoming major surgery and concern over invasive carcinoma was likely.

In the supine position, pelvic tumors, as in this patient, will often compress the ureters and lead to pooling of radiotracer in the renal pelvis during scanning. Upright renal imaging enhances radiotracer transit through the renal collecting system, minimizing pooling that might be misinterpreted as true obstruction.

Upright imaging certainly contributed to this patient's hypoperfusion, but immediate transfer to supine imaging would have prevented transient renal hypoperfusion during this vasovagal episode. Renal studies conducted in an upright patient during a vasovagal episode will be abnormal. Without rapid intervention by the technologist, there is a very high probability of the renogram curve also being abnormal and a repeat study will be required.

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