

## Dacryoscintigraphy: A Pictorial Essay

### Abstract

Dacryoscintigraphy is a noninvasive, simple, easy to perform imaging modality used in the evaluation of epiphora. However, it is an infrequently done study in nuclear medicine departments. A standardized protocol and a systematic interpretation of the scans help in answering the queries of the clinicians in cases of epiphora. We have attempted to build a pictorial essay of the various findings detected on dacryoscintigraphy.

**Keywords:** *Dacryoscintigraphy, epiphora, nasolacrimal duct*

### Introduction

Imaging the nasolacrimal system with use of radiopharmaceuticals, in other words, dacryoscintigraphy is an underutilized tool in the present-day nuclear medicine department.

Of the few nuclear medicine departments that perform the procedure, there are differences in the protocol followed, the use of collimators, and the use of radiopharmaceuticals. The indications for the procedure are evaluation of epiphora,<sup>[1]</sup> detection of subclinical lacrimal duct obstruction, appropriate patient selection for surgery,<sup>[2]</sup> and evaluating the success of dacryocystorhinostomy.<sup>[2]</sup> It is contraindicated in acute infective and allergic conditions of the eye. The small size of the structures of the nasolacrimal system is a major limitation. As compared to dacryocystography, the radiation exposure involved is about 100 times lower.<sup>[3,4]</sup> It has a distinct advantage over the syringing/saccharin test<sup>[5]</sup> in being noninvasive.<sup>[3]</sup> As there is no instrumentation of canaliculi or administration of contrast/saline under high pressure, false-negative and false-positive<sup>[3,5]</sup> results are avoided.

The standard protocol that we followed involved the use of Tc-99 m sulfur colloid in a dose of 50–100 microCi/10 µl<sup>[3,5]</sup> with the use of low-energy high-resolution collimator and images acquired immediately, postinstillation of normal saline drops and postblowing of the nose.<sup>[6]</sup>

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A systematic interpretation of the various sequences helps arrive at the etiology of epiphora.

### Dacryoscintigraphy interpretation in patients presenting with epiphora

#### *To demonstrate normal flow through the nasolacrimal system*

A case of dacryocystorhinostomy on the left side in a 26-year-old male patient.

#### Findings

Drainage of tracer into the nasal cavity within the first 15-min postinstillation of radiopharmaceutical is considered normal.

The left eye reveals flow of tracer to the medial canthus region with accumulation of tracer there. There is no drainage of tracer into the nasal cavity.

The right eye reveals flow of tracer into the lacrimal sac, nasolacrimal duct (NLD), and drainage into the inferior meatus of the nose, all within the first 15-min postinstillation of Tc-99 m sulfur colloid, which is considered as normal [Figure 1].<sup>[5,7]</sup>

#### Interpretation

- Failed dacryocystorhinostomy on the left side
- Normal tear flow in the right eye.

#### *To evaluate cause of epiphora in spite of a bilaterally normal syringing test*

A 61-year-old female patient had a history of trauma to eyes approximately 2 months back. She had complaints of watering from the right eye for 2 months. Syringing revealed the passage of saline downward into the nasal cavity bilaterally.

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## Findings

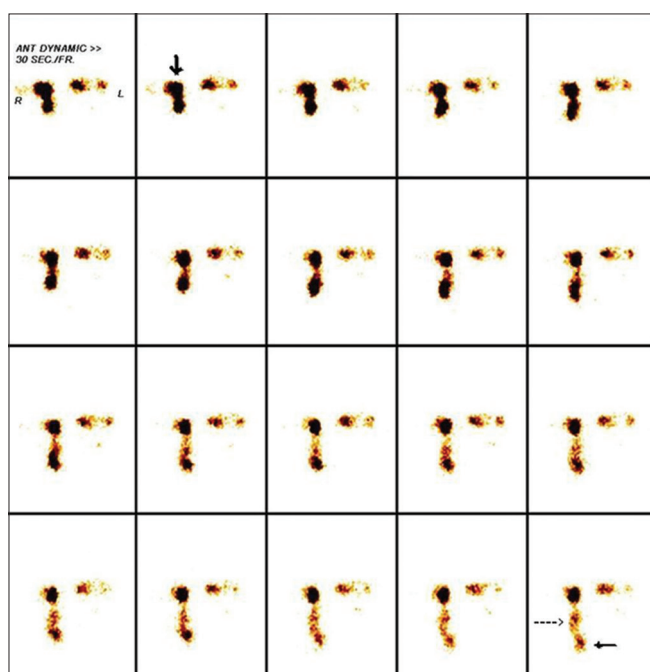
The right eye reveals flow of tracer into the proximal NLD in immediate images. However, there is drainage into the inferior meatus of nose noted only in the images acquired postblowing of the nose.

The left eye reveals partial flow of tracer into the inferior meatus of the nose in the immediate images. There is persistent partial tracer stasis in the region of medial canthus noted in the delayed images [Figure 2a-c].

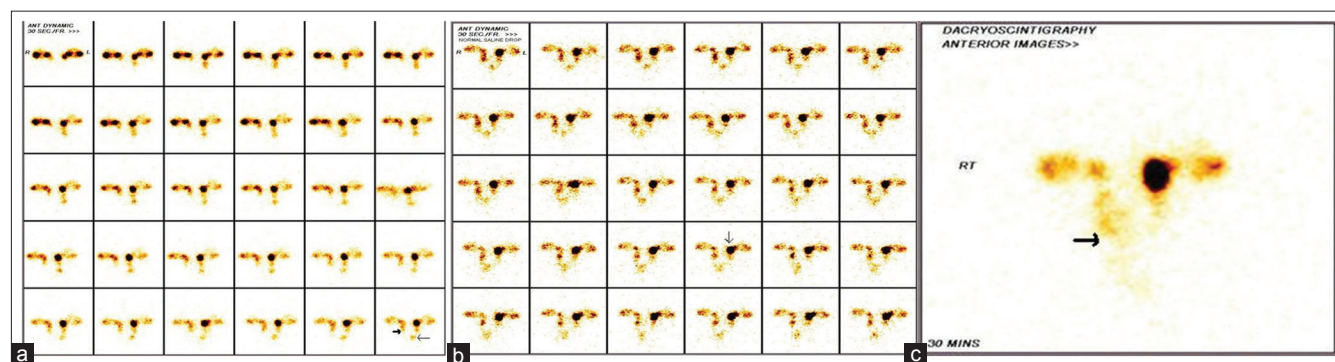
## Interpretation

Intraductal delay right eye with some inflammation at the lower end of NLD, which is relieved by nose blowing.

Partial functional impedance left eye.



**Figure 1:** Dacryoscintigraphy reveals drainage of tracer into the lacrimal sac (bold black arrow), nasolacrimal duct (hyphenated arrow), and inferior meatus of nose (black arrow) from the right eye. There is no drainage of tracer into the nasal cavity from the left eye



**Figure 2:** (a) Immediate dynamic images of dacryoscintigraphy reveal drainage of tracer into the proximal nasolacrimal duct on the right side (bold black arrow). Partial drainage of tracer from the left eye into inferior meatus of the nose is noted (black arrow), (b and c) Dacryoscintigraphy images acquired postblowing of nose reveal flow of tracer from the right eye into inferior meatus of nose (bold black arrow). Persistent partial tracer stasis noted in the region of medial canthus of the left eye (black arrow)

The word “functional impedance” is used as an anatomic obstruction which is ruled out by the syringing test.<sup>[8]</sup> Hence, the finding of syringing test forms an important history in the interpretation of dacryoscintigraphy.

## Epiphora since childhood

A 4.5-year-old female patient, a case of right-sided dacryocystitis. She has had complaints of right-sided epiphora since childhood.

## Findings and Interpretation

The right eye reveals drainage of tracer into the NLD only in the image acquired postblowing of nose. This could be due to two reasons, either local inflammation at the NLD or resistance offered by the valves of the nasolacrimal system. Since this patient has had complaints since childhood, the symptoms are likely to be secondary to resistance offered by valves.

The left eye reveals drainage of tracer into the left NLD in immediate images. However, there is drainage into the inferior meatus of nose noted in the image acquired postblowing of nose. As the patient is asymptomatic on the left side, scan features are likely to represent local inflammation at the lower end of the left NLD [Figure 3a-c].

## Bilateral epiphora, abnormal syringing test

A 64-year-old male patient with complaints of bilateral epiphora for 6–8 months.

There was no passage of saline detected on the syringing test bilaterally.

As there has been no passage of saline on the syringing test, there is likely to be an anatomic obstruction; however, the level of obstruction is to be detected.<sup>[5]</sup>

## Findings

In the right eye, there is flow of tracer to the medial canthus region. However, the delayed images indicate that there is no flow of tracer into the lacrimal sac.

In the left eye, there is flow of tracer to the medial canthus region and lacrimal sac. However, there is no drainage into the NLD [Figure 4a-c].

*Interpretation*

- PRESAC delay right eye
- PREDUCTAL delay left eye.

*Epiphora in old age*

A 59-year-old female diabetic and hypertensive patient presented with bilateral epiphora for 3–4 years.

*Findings and Interpretation*

There is pooling of tracer noted in the orbits bilaterally [Figure 5a and b].

This could be due to either failure of tear flow mechanism in the eyes or laxity of eyelids.

In this case, in view of the age of the patient and comorbidities, scan features are likely to be secondary to eyelid laxity.

*To evaluate dacryocystorhinostomy on one side and epiphora on the other side*

A 61-year-old male patient had presented with left lacrimal fossa abscess with dacryocystitis. At that time,

syringing test had allowed passage of saline in the right eye. He underwent dacryocystorhinostomy on left side.

*Findings and interpretation*

The left eye reveals flow of tracer to the medial canthus region. However, there is no drainage of tracer into the left NLD. Hence, we conclude that the dacryocystorhinostomy on the left side has failed.

On the right side, we have an important clinical history of the syringing test allowing passage of saline. Hence, there is no anatomical obstruction noted on the right side.

Flow of tracer is noted to the right lacrimal sac. However, there is no drainage of tracer noted into the right NLD. This is a case of preductal delay. In view of the finding of syringing test, it is secondary to functional impedance on the right side [Figure 6a-c].

The word “impedance” is preferred by the ophthalmologists instead of “obstruction,” when the syringing test has allowed passage of saline.<sup>[8]</sup>

It is important to note that there is no transit of tracer into the NLDs bilaterally in patient V and patient VI. However, patient VI differs in having the flow of tracer to the medial canthus region on right side, hence changing the interpretation of the scans.

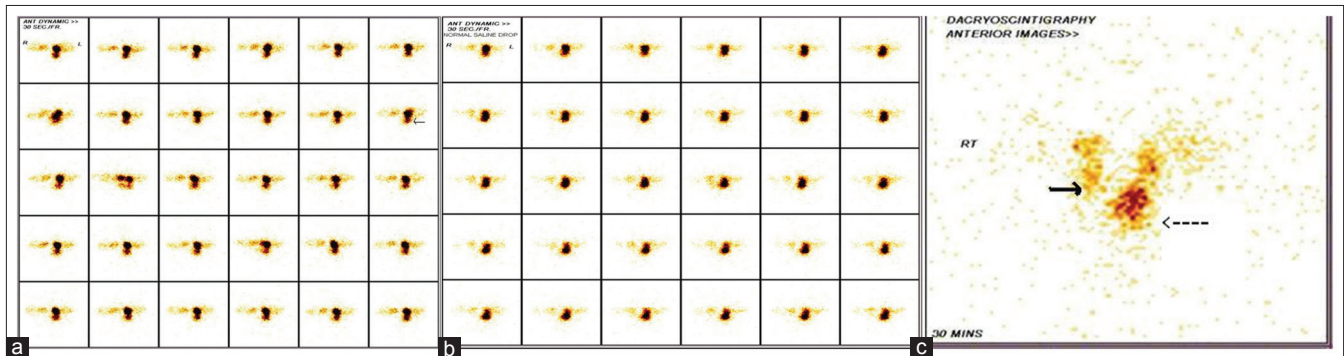


Figure 3: (a) Immediate dynamic images of dacryoscintigraphy reveal flow of tracer into left nasolacrimal duct (black arrow), (b) there is no significant change in drainage observed after administration of normal saline drop, (c) images acquired after blowing of nose reveal flow of tracer into the nasolacrimal duct on the right (bold black arrow) and into the inferior nasal meatus on left (hyphenated arrow)

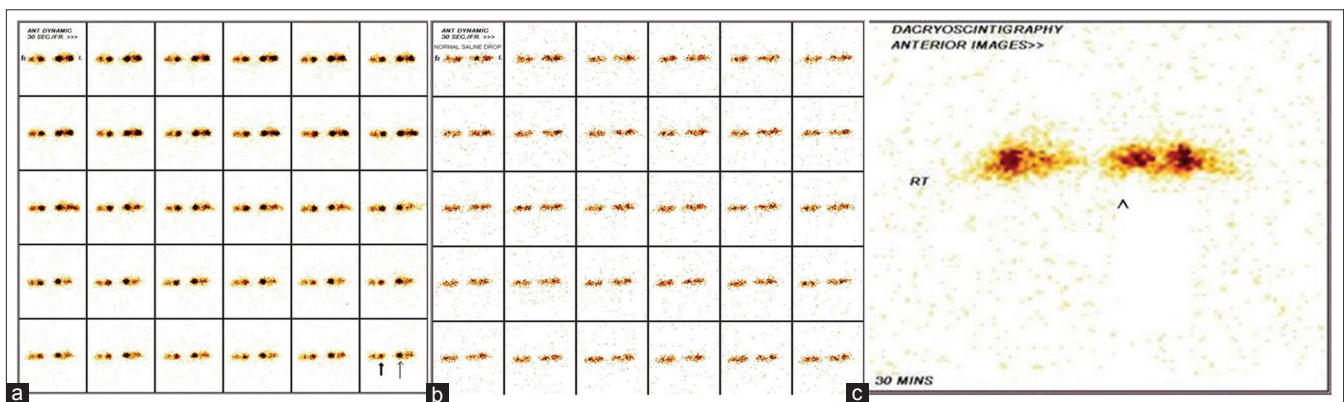


Figure 4: (a) Immediate dynamic images of dacryoscintigraphy reveal flow of tracer to the region of medial canthus bilaterally (arrows), (b) after administration of normal saline drops, no significant change in drainage of tracer is noted bilaterally, (c) delayed images reveal flow of tracer into the left lacrimal sac (arrowhead)

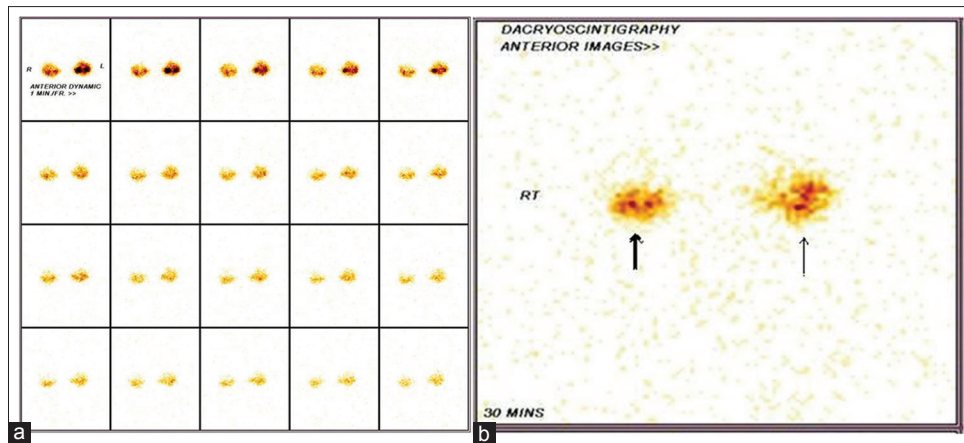


Figure 5: (a and b) Dacryoscintigraphy images reveal pooling of tracer in the orbits bilaterally (arrows)

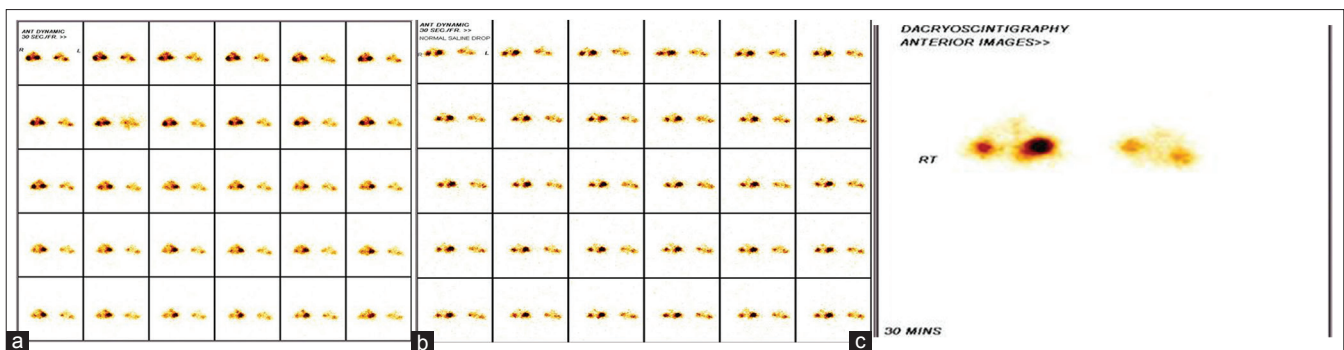


Figure 6: (a) Dacryoscintigraphy images reveal drainage of tracer into the lacrimal sac bilaterally; however, there is no drainage of tracer into the nasolacrimal duct bilaterally. There is a minor difference in the radioactivity administered in both eyes, causing a minor difference in intensity of tracer to start with. As scan progresses, the difference in intensity of radiotracer in the two eyes increases as more tracer is flowing out of left eye and soaked out with tissue paper, (b) dacryoscintigraphy images reveal drainage of tracer into the lacrimal sac bilaterally; however there is no drainage of tracer into the nasolacrimal duct bilaterally, (c) dacryoscintigraphy images reveal no drainage of tracer into the nasolacrimal duct bilaterally

## Conclusion

Dacryoscintigraphy is a simple noninvasive and physiological assessment of the nasolacrimal system. A standardized protocol and systematic interpretation would help us identify the cause of epiphora and ascertain the success of surgical procedures performed if any.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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## Conflicts of interest

There are no conflicts of interest.

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