

False Positive Brain Scans From Extracranial Contamination with ^{99m}Tc Technetium¹

Richard L. Witcofski, M.S.² T. J. Roper, M.D. and C. D. Maynard, M.D.³

Winston-Salem, No. Carolina

One of the major advantages of the brain scan in the neurological workup is the small percentage of false-positive scans. Within the last several months a large number of institutions have begun to utilize ^{99m}Tc pertechnetate in brain scanning. This material has obvious advantages which have been enumerated (2,3). However, since ^{99m}Tc pertechnetate is concentrated by the gastric mucosa and the salivary glands (1,3), artefactual false-positive scans from extracranial contamination by these secretion products are a possibility.

The pertechnetate is eluted from the ^{99}Mo generator with a normal saline wash solution. The eluate may be administered orally to the fasting patient or autoclaved (2) and injected intravenously. It is the common practice to begin scanning approximately one hour postadministration.

In 385 ^{99m}Tc brain scans (280 by oral administration and 105 by intravenous injection) four instances of extracranial contamination occurred. Three of these artefacts occurred after oral administration and one after intravenous injection.

The three cases of contamination after oral dosage were as follows: the first was a comatose 45-year-old male with an area of increased midline activity on the anterior view which on the lateral view extended beyond the confines of the skull and was obviously contamination; the second was a 39-year-old female with an "abnormal" left lateral scan in the temporal region (the anterior view showed the radioactivity to be extracranial); and the third was an 8-year-old boy with an abnormal area of radioactivity on the lateral view which was beyond the scalp activity on the posterior (monitoring proved the presence of contamination on the sheet beneath his head). Thus, multiple projections,

¹Partially supported by NIH Grant No. CRT-5069.

²Department of Radiology, Bowman Gray School of Medicine, Winston-Salem, N. C.

³Trainee of the American Cancer Society

both laterals and either the anterior or posterior, demonstrated the apparent abnormality to be contamination in these three instances.

The case of extracranial contamination after intravenous injection is shown in Figs. 1 and 2. The patient was an 18-month-old male with a history of hydrocephalus and a tumor of the lateral ventricle which was thought to have been removed at surgery. The initial ^{99m}Tc brain scan (Fig. 1) shows a distinct area of abnormal activity at the level of the tentorium on the lateral view and peripherally on the left in the posterior projection. Since the position of this "lesion" did not fit the clinical impression, and because of the peripheral position on the posterior, we were somewhat suspicious. A small amount of hair clipped from this region was quite radioactive compared to hair from other areas. A repeat scan the following day (Fig. 2) was entirely normal. Thus, even after intravenous injection, ^{99m}Tc is still potentially capable of producing

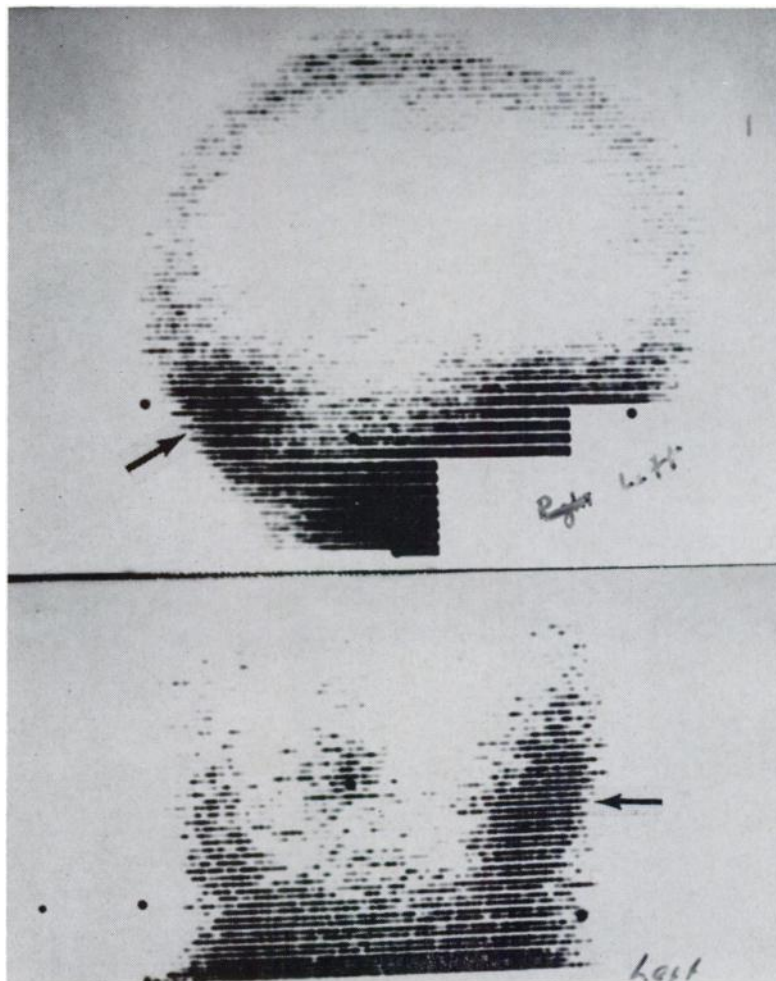


Fig. 1. Left lateral and posterior views of ^{99m}Tc brain scan showing abnormal concentrations of radioactivity after intravenous injection (18-month-old male).

false-positive scans due to extracranial contamination from salivary and gastric secretions. In this instance, multiple views failed to demonstrate this as extracranial contamination. Further, we have been able to produce similar artefacts by placing saliva on patient's heads after intravenous injection.

There would appear to be no sure method of preventing this difficulty at the present time. In our experience, it appears to be more likely to occur with: (1) oral administration, (2) in comatose patients (in particular those who are nauseated), and (3) in children. In attempting to reduce the possibility of such artefacts the following precautions may be of help: (1) prevent the patient from spreading saliva with his hands, (2) not using linens or towels which have been in contact with the patient prior to scanning, (3) changing the linen under the head between each view, (4) to begin scanning very soon after

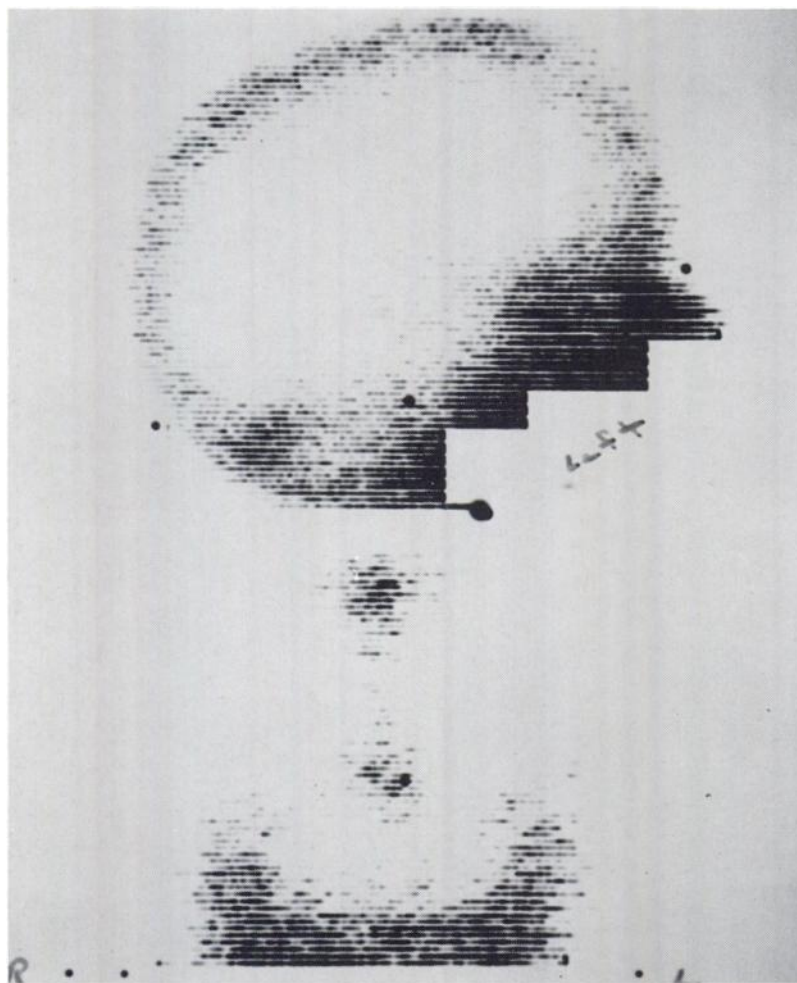


Fig. 2. Left lateral and posterior views on the same 18-month-old male (see Fig. 1) repeated with intravenous ^{99m}Tc 24 hours after previous scan. The extracranial contamination is no longer present and the scan is normal.

the intravenous injection (the count rates are dropping rapidly during this period which makes the scanning difficult), and (5) large oral doses of potassium perchlorate.

SUMMARY AND CONCLUSIONS

Four cases of extracranial ^{99m}Tc contamination are discussed. Three resulted after oral and one after intravenous administration. Similar artefacts have been intentionally produced by placing saliva on patient's heads. There would appear to be a greater possibility of a false-positive scan with the oral dose, however, due to concentration by the salivary glands and gastric mucosa, it cannot always be circumvented with the intravenous technique.

REFERENCES

1. HARPER, P. B., BECK, R., CHARLESTON, D. AND LATHROP, K. A.: Optimization of a scanning method using Tc-99m. *Nucleonics*. **22**:50, 1964.
2. MCAFEE, J. G., FUEGER, G. F., STERN, H. S., WAGNER, H. N., JR. AND MIGITA, T.: Tc-99m pertechnetate for brain scanning. *J. Nuc. Med.* **5**:811, 1964.
3. WITCOFSKI, R. L., MAYNARD, C. D. AND MESCHAN, I.: The utilization of Tc-99m in brain scanning. *J. Nuc. Med.* **6**:121, 1965.