# Epilogue on Extradural Hematoma

This issue contains three contributions dealing with the appearances of epidural hematoma on cerebral radionuclide studies. Each paper makes its point clearly and concisely, and at first glance this subject may seem a pedestrian topic for editorial comment. Nevertheless, a number of points are worthy of discussion. First, a brief explanation of terminology is in order. The perspicacious reader will note the term "extradural" in some of the references cited in the above three papers. This is the standard nomenclature in the British Commonwealth, while "epidural" is standard in the American literature. Insofar as the mixing of Latin and Greek roots in a single word is considered an etymological "no-no", epidural [Greek *epi*, upon; Latin *durus*, hard] should probably be eschewed. Unfortunately, widespread application of this principle would decimate nuclear medicine nomenclature. Early casualties would be "scintigraphy" and "photomultiplier," both of which have mixed Greek and Latin roots. It seems, therefore, that "epidural" and other linguistic chimeras in the nuclear medicine literature are probably here to stay.

The vast majority of extradural hematomas are indistinguishable from subdural hematomas by radionuclide imaging (*1*). The sign of separation of the superior sagittal sinus from the skull, described by Buozas et al. and by Lin in this issue, appears to be the only means of distinguishing the two types of lesion using radionuclide studies. Despite its rarity, this sign is therefore an extremely useful one. The rim sign, unfortunately, provides no basis for differentiation (*1–3*).

Lin draws attention to an interesting characteristic of extradural hematomas at the vertex: the primarily venous nature of the hemorrhage. In this respect extradural hematomas at the vertex appear to constitute a distinct entity since, in sites other than the vertex, they are usually caused by arterial hemorrhage due to laceration of a meningeal artery.

The paper by Zilkha and Irwin raises an important problem: the relative roles of brain scan and contrast angiogram in extradural (and subdural) hematomas. The gross displacement of cerebral vasculature from the inner table of the skull on the dynamic study in the case illustrated by Zilkha and Irwin is diagnostic of a large extracerebral collection. The need for a contrast angiogram in the face of such an unequivocally positive radionuclide study together with a fracture on the skull radiograph must be questioned. It seems appropriate therefore to develop a rational policy concerning the roles of radionuclide and contrast studies in the diagnosis of extradural and subdural hematomas. The following is such a rational approach (although it is not the *only* rational approach):

When the clinical problem is acute, a contrast angiogram is more appropriate than a radionuclide study, and in emergency situations immediate surgery based solely on clinical diagnosis may be necessary. The contrast angiogram is highly sensitive (provided oblique views are taken when standard views are normal) and highly specific.

When the clinical problem is not acute, a radionuclide study is indicated. The radionuclide *static* images are sensitive but nonspecific (*1*). However, if the radionuclide *dynamic* images show displacement of the cerebral vasculature away from the inner table of the skull (as in the case described by Zilkha and Irwin), the radionuclide study is not only sensitive but specific for an extracerebral collection, and a contrast angiogram is unnecessary.

In the absence of this sign, abnormal static images usually indicate the need for contrast angiography to increase diagnostic specificity. If the radionuclide study (including delayed static images) is entirely normal, an extracerebral collection is exceedingly unlikely. In a review of the literature on extradural hematoma (*1*), Cowan and Maynard found that only two patients

out of 19 with proven extradural hematomas had negative scans. One of these two had only lateral views recorded using a "contour scanner" after $^{131}$I-HSA injection (*4*); the other had a scan performed only 20 min after the injection of $^{99m}$Tc-pertechnetate (*5*). In a large study by Brown et al. (*6*) of 5,835 dynamic–static scintigrams (including 23 patients with proven subdural hematoma), no patient with normal dynamic and static images was subsequently found to have a subdural hematoma.

Accordingly, normal radionuclide studies (including dynamic and delayed static images) virtually exclude an extracerebral collection and the patient should be followed clinically without further expensive or invasive procedures. If the clinical picture remains suspicious for an extracerebral collection, a followup radionuclide scan is indicated. If the clinical picture becomes more acute, a contrast angiogram should be performed.

**PETER M. RONAI, M.D., Ph.D.**
**University of Colorado Medical Center**
**Denver, Colorado**

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