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Single Photon Emission Computed Tomography or SPECT of the brain is a very well established method in the evaluation of traumatic brain injury. Individuals attempting to discredit brain SPECT often cite long outdated reviews from 1996 by the Brain Imaging Council of the Society of Nuclear Medicine and the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology, which did not sanction widespread use of brain SPECT. Updates to those reviews by D.B. Davalos et al of Yale University concluded in reviewing literature from years 1966 to 2000 "...that SPECT may be a useful tool in the detection of MTBI (minor traumatic brain injury) and in treatment planning" (Davalos, 2002).

While Davalos et al indicated a "lack of consensus regarding SPECT's sensitivity", subsequent research comparing brain SPECT to other methods has repeatedly verified that it is not only sensitive but generally more sensitive than other available methods, particularly x-ray Computerized Tomography (CT) or Magnetic Resonance Imaging (MRI). In one of the largest series (228 patients) of brain trauma patients studied up to 2000, H.H. Abu-Judeh et al from New York University found brain SPECT sensitive and useful even for mild to moderate brain trauma without loss of consciousness. Furthermore, the Tel Aviv University found brain SPECT useful even in the emergency evaluation of brain trauma patients with amnesia (Lorberboym M, 2002). At the University of Pennsylvania Medical Center, E.M. Umile et al found that mild traumatic brain injury often involved the medial temporal lobe, which was demonstrated on SPECT (Umile, 2002) and also verified with Positron Emission Tomography (PET). Since the temporal lobes are felt to be key foci for epileptic seizures, it was not surprising that L. Mazzini et al found a very high correlation of  $p < 0.004$  between temporal lobe perfusion abnormality on brain SPECT and post-traumatic epilepsy (Mazzini 2003). The group from Tel Aviv University also discovered that sensitivity of brain SPECT for minor trauma could be enhanced using perfusion-stimulated (with acetazolamide in their case) studies (Barkai, 2004), a standard method which H.T. Pretorius has also employed since 1990. By 2006, D. Pavel et al concluded that: "A very strong case can be made for the routine use of Brain SPECT in TBI. Indeed it can provide a detailed evaluation of multiple functional consequences after TBI and is thus capable of supplementing the clinical evaluation and tailoring the therapeutic strategies needed. In so doing it also provides significant additional information beyond that available from MRI/CT." (Pavel, 2006).

The extent of brain SPECT use in brain trauma patients is remarkable in that even minor and infrequent abnormalities, such as loss of the sense of smell (anosmia), which is generally not detected on MRI, are clearly demonstrable by brain SPECT as shown by N.M. Mann et al at the University of Connecticut (Mann 2006). In fact, in a review of state of the art neuroradiological investigations for mild traumatic brain injury, D. Plantier concluded that functional imaging techniques such as functional MRI, PET, or SPECT were necessary and that SPECT was the most available (Plantier, 2006). Essentially the same conclusion was reached by H.G. Belanger et al in their review of

recent neuroimaging techniques which pointed out the correlation of such studies (including brain SPECT) with clinical outcomes. (Belanger, 2007).

As a final point, it is of interest to realize that the use of brain SPECT in traumatic brain injury is not restricted to patients with mild to moderate injury but can also be applied and is very useful (Smrca, 2002) in patients with severe trauma, even that producing herniation of the brain, generally recognized as a life threatening condition. This brief summary provides highlights of a large volume of literally thousands of publications regarding appropriate use of brain SPECT in patients with traumatic brain injury. While it is necessary to have well standardized protocols and experienced interpreters for optimal results, it is clear that brain SPECT is one of the most reliable and in fact principal methods for the medical evaluation of patients with traumatic brain injury. The author's (H.T. Pretorius, M.D.) experience with the method involves well over 2000 patient studies over more than twenty years and certainly agrees with the use of brain SPECT as a mainstay in the evaluation of traumatic brain injury.

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