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BRAIN DEATH: REVISITING THE RABBINIC OPINIONS IN LIGHT OF CURRENT MEDICAL KNOWLEDGE

The controversy over the legal and ethical status of brain death dates back to the publishing in 1968 of the Harvard Criteria[1] which proposed guidelines to establish a clinical diagnosis of severe and irreversible brain injury. This landmark paper paved the way for a widely acceptable ethical standard to allow harvesting of vital organs from patients whose hearts are still beating.

As readers of *Tradition* are well aware, there has been a sometimes strident controversy about the halakhic acceptability of these standards. On one side is the 1986 ruling of the Israeli Chief Rabbinate[2] that fulfillment of the Harvard Criteria would allow for halakhically acceptable harvesting of vital organs from such patients for their use in transplantation. On the other hand was the position championed by Rabbi Dr. J. David Bleich in these pages[3] and elsewhere, that brain death as medically defined does not fulfill the halakhic definition of death. Major rabbinic figures, such as the late Rabbis Shlomo Zalman Auerbach,[4] Elazar Menahem Shakh[5] and Yitshak Yaakov Weiss[6] as well as Rabbis Shmuel ha-Levi Wosner,[7] Yosef Shalom Elyashiv, Nissim Karelitz,[8] and Eliezer Waldenberg[9] all side with R. Bleich.

Central to the halakhic debate and conspicuously absent from the above-cited authorities is the late Rabbi Moshe Feinstein. It is particularly his views that have engendered so much controversy. A central theme of this paper is to review his responsa, both in light of other halakhic opinions and in light of the medical literature that has appeared since his responsa and the Chief Rabbinate's permissive ruling.

The Chief Rabbinate had cited three sources for their decision. First, the Gemara *(Yoma* 85a) was understood to teach that cessation of breathing defines death. This Gemara was interpreted by the Rabbinate as being completely consistent with the Harvard Criteria for brain death, which lists apnea (cessation of spontaneous respirations) as one

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of the five criteria for brain death.[10] The second source was the opinion of Hatam Sofer[11] that "death is determined according to halakha by the cessation of breathing." These two proofs, however, met with persuasive resistance. Ultimately, the Rabbinate's strongest support derives from two responsa of R. Moshe Feinstein, one of which seemed to conclude that brain death fulfilled the criteria for death and another which explicitly agreed with the Harvard Criteria to determine death.

It is important to note that R. Feinstein had dismissed the idea that apnea is the sole determinant of death. He wrote,

> It is obvious that the nose is not the organ that gives life to a man. Rather the brain and the heart give life. Only it is the nose that . . . is a sign of life rather than giving life. [This is true because] we do not know the heart well, and even more so the brain. Therefore the intent of the verse, "The spirit of life is in the breathing," is not to say the essence of life [is in the breathing, but] rather we see life in the breathing. The Hakham Tsevi says that sometimes it is not possible to hear the heart because it is under the chest and is weakened and it is not possible to know if it is still alive. . . . Rather [breathing] is a more recognizable sign.[12]

He concluded in no uncertain terms that harvesting the heart in such a patient is murder.

However, in a subsequent responsum (a letter to Dr. S. Bundy), R. Feinstein ostensibly changes course entirely. He writes,

> The definition [of brain death] which is referred to as the "Harvard Criteria" is considered really like decapitation . . . whereby the brain is truly rotted. . . . Even if the heart is still alive and able to push for a few more days . . . he is considered dead.[13]

In a more detailed responsum, R. Feinstein, writing to his son-in-law Rabbi Moshe Tendler, says,

> Since you say that distinguished doctors with experience are able to determine by way of dye-injection techniques that there is no connection between the brain and the body, and [as well] the brain has already totally rotted, this is like decapitation.[14, 15]

The primary source for these latter two responsa is a Mishna in *Ohalot* (1:6): "If the head is decapitated, even though the body has pirkus movement, [he is dead]." R. Feinstein concluded that brain death was "like decapitation" and can, therefore, be considered death.

Now, in invoking an analogy to decapitation, the problem of the persistently beating heart in brain dead patients is effectively avoided. It is also unnecessary to argue that apnea is the sole determinant of death. Under more typical circumstances, the halakhic determination of death follows the responsa of Hakham Tsevi and Hatam Sofer, i.e., while the heart still beats, the person is alive. But with decapitation, the criteria are surely different. In an actual case of decapitation, the heart would be expected to continue beating for some length of time, be it seconds or a few short minutes. Does this heartbeat in a decapitated body constitute life? Or is it *pirkus*, the term used in the above-cited Mishna for any residual movement after decapitation? Alternatively, in a hypothetical case of a decapitation where the lungs of this decapitated body could be artificially ventilated and the heart would continue to function, all would agree that such a "viable" body with its heart functioning would be considered *pirkus.*[16] Therefore, it would appear that decapitation is a distinct category of death that is so absolute that *any* sign of life after the decapitation, even something so purposeful as a beating heart, is not life, but *pirkus.*

R. Feinstein was not the only contemporary authority who accepted the idea that, at least conceptually, brain death could be considered a physiologic decapitation. R. Wosner acknowledges that

> If one is found under rubble and his head is crushed and the brain is completely cut up, but the head is still attached to the body, he is considered dead. This is like decapitation. Even if there is quivering [of the body] he is dead.[17]

Another major contemporary *posek*, Rabbi Shlomo Zalman Auerbach, also acknowledged the soundness of this line of reasoning. He writes,

> It is correct that if a brain is completely and absolutely dead, [the person] is considered dead.[18]

However, in practical terms he had doubts that clinical brain death really meant that the brain was "absolutely dead," and he could not agree with the conclusions of R. Feinstein.

The question before us, then, is: how did contemporary *poskim* agree on the theoretical concept of physiologic decapitation, yet come to diametrically opposing conclusions about brain death? It is perhaps no coincidence that this dispute among the contemporary *poskim* seems to mirror an argument in the medical literature on brain death. In order

to understand this problem, it is necessary to review the medical issues involving brain death.

WHOLE-BRAIN DEATH—THE MEDICAL LITERATURE

The Harvard Criteria consist of the following clinical signs: apnea (complete absence of breathing), unresponsiveness, no movements, no reflexes, and a flat electroencephalogram, the latter being desirable to obtain but not necessary. The criteria have changed little over the years.[20] What is not well appreciated, but most important to the halakhic debate, is that the Harvard Criteria were presented only as a working hypothesis. No supporting data whatsoever were brought to prove the claim that the brain was in fact dead when these clinical criteria were met.[21] Rather, it was left to subsequent investigators to confirm or modify the concept. As investigators studied the clinical characteristics of brain death, certain conclusions were made about the nature of brain death. A basic premise of brain death was that imminent demise of the entire body would quickly follow in "hours or days, rather than weeks or months."[22] The proposed cause of imminent demise was that the brain was responsible for maintaining the whole body's homeostasis through a variety of mechanisms and that without brain function, the body would rapidly deteriorate.[23]

Meanwhile, refinements for accurately diagnosing brain death were developed. Chief among these were imaging tests to confirm that there was no blood flow to the brain, either by angiography or by radionuclide scan. When these techniques demonstrated no blood flow to the brain, it was considered strong evidence that clinical brain death meant total destruction of the brain.

However, early on in the era of brain death, data began to emerge that questioned the assertion that the clinical diagnosis of brain death meant the destruction of the whole brain. In an autopsy study of 240 brain dead patients, it was found that 15% showed no abnormality of the brain stem, 16% had normal cerebellums, and necrosis (death) of brain tissue was present in only 20% of cerebellums.[24] While the diencephalons were damaged in almost 85%, it was "often limited to a small hypothalamic infarct or softening probably due to displacement. The most common type of lesion was edema (swelling)." With regards to the cortex, the region most sensitive to anoxic injury, while there was damage in 94% of cases (the inverse is also significant, i.e., in 6% there was no cortical damage),

> The most common lesion was an edematous hemisphere. Less commonly, necrosis, neuronal loss, hemorrhage and infarct were each found in about 15% of cases. . . . The brains of patients living long periods of time frequently had multiple and diffuse lesions of the white matter, but not complete necrosis of the gray matter.

While neuropathologic analysis alone may not be significant because the primary interest is the clinical behavior of these patients, this early autopsy series hinted that those patients fulfilling the diagnosis of brain death actually represented a complex array of injury and did not typically result in complete necrosis (i.e., destruction) of the whole brain.

More problematic to the concept of brain death was a report by Shewmon that some brain dead patients lived for weeks, months, and (rarely) even years with minimal support.[25] He remarked that the reported number of survivors was surely an underestimate because brain death was often a self-fulfilling prophecy given that most patients were either removed from respiratory support or became organ donors. Moreover, the most stable brain dead patients were the best candidates for organ donation, thereby shortening the lives of the patients most likely to survive for the longest periods. This study strongly suggested that some of the homeostatic mechanisms of the brain in brain dead patients may continue to function for long periods. This was also a direct contradiction to the assumption that brain death inevitably leads to rapid systemic demise and death within hours or days. Dr. E.F.M. Wijdicks, a leading authority on brain death, states that there is an expectation that brain dead patients will rapidly deteriorate:

> In many [brain dead patients] progressive deterioration occurs because of profound polyuria and pulmonary edema, recurrent cardiac arrhythmias, intravascular coagulation, the need for increasing doses of dopamine, and possibly thyroid failure. This collapse distinguishes brain death from other comatose states. . . . One should doubt the clinical diagnosis of brain death in a patient whose condition remains stable.[26]

In another article, Wijdicks et al. report that some apneic patients may still have a partially functioning brain stem, manifested by stable blood pressure, since there is likely to be brain stem control of the sympathetic nervous system.[27] Inexplicably, however, neither Wijdicks in his 2001 *New England Journal of Medicine* article[28] on the diagnosis of brain death, nor in any other published criteria of brain death are cessation of autonomic functions of the brain listed as criteria for the diagno-

sis even though evidence of ongoing homeostatic function contradicts the assertion that the whole brain has been destroyed.

Much of the challenge to clinical brain death comes from a robust literature on an intact hypothalamic-pituitary axis in brain dead patients. While abnormalities of temperature regulation manifested as a poikilothermic (lack of temperature regulation) state are sometimes seen, stable temperature regulation indicating a functioning hypothalamus is more the rule. In a comprehensive study of endocrine function in brain dead patients, Gramm et al. reported that thyroid stimulating hormone (TSH—produced by the pituitary gland) was normal in 52% of patients in the first 24 hours, and for those surviving longer than 24 hours, TSH levels were normal in 88% of patients. Serum ACTH (also produced by the pituitary) levels were normal in all patients. They concluded that,

> . . . the onset of brain death in humans is not accompanied by acute endocrine failure. Hormonal depletion . . . subsequent to brain death as assumed by the authors could not be confirmed. With the exception of antidiuretic hormone, no decrease in plasma concentrations to subnormal levels was observed over a three-day study period. The plasma concentration kinetics of the pituitary hormones suggest that . . . there is still some residual function *which presupposes perfusion of the hypothalamic-pituitary neuroendocrine system* sufficient to maintain hormone levels.[29] (Emphasis added)

In a review of the incidence of diabetes insipidus (a deficiency of antidiuretic hormone) in brain death, a wide range of 22% to 100% of patients had no diabetes insipidus.[30] In one study of brain death in children, where 14 of 16 patients did demonstrate diabetes insipidus, two of the 14 had spontaneous recovery of water homeostasis. The authors remarked,

> It is puzzling that diabetes insipidus does not always occur in brain death. . . . *The ongoing vasopressin release would require blood flow to this area which should not occur in complete brain death.* Some patients who meet criteria for brain death may have small areas of residual cerebral blood flow and functioning neurologic tissue. . . . It might raise questions about the meaning of 'complete and irreversible loss of brain function.'[31] (Emphasis added)

In a study of brain dead patients with angiographic confirmation of absent cerebral blood flow, all patients had intact hypothalamic-pitu-

itary function as evidenced by normal serum hormone levels. As formulated by Schrader et al.,

> It is concluded that in brain death some basal parts of the brain may still be perfused despite the fact that angiography indicates circulatory arrest in these areas.[32]

Another potential residual brain function in brain dead patients is maintenance of hemodynamic responses at the time of organ harvesting. In one study, it was found that while anesthesia is not necessarily used for these operations, systemic vascular resistance and cardiac work index both increased and there was a significant tachycardic response. All of these responses indicate an intact autonomic nervous system. The authors acknowledged that

> The physiological basis is not known. Explanations . . . have included spinal vasoconstrictor reflex, reflex spinal stimulation of the adrenal medulla, and *residual brain stem activity.*"[33] (Emphasis added)

In an accompanying editorial, Hill et al. write,

> It is not comfortable to face up to the implications of the tachycardia and hypertensive response to surgery shown by unanesthetized organ donors. . . . Firstly, it must be emphasized that such patients are not *brain* dead, but have been diagnosed as brain *stem* dead. It has been argued . . . that we cannot be sure that major areas of the brain such as the cerebellum, the basal ganglia, or the thalami have irreversibly ceased to function and that clinical diagnosis of "whole brain death" is in this sense a fiction. Second, we cannot always be sure that all brain stem function has ceased. . . . It seems perverse to avoid use of anesthesia which obtunds these responses and anesthesia is indeed included in the protocol for management of beating-heart organ donors in this and other hospitals. The use of anesthesia also removes any lingering doubt over awareness.[34]

Finally, in a review of 500 patients with coma and apnea, it was concluded that "it was not possible to verify that a diagnosis made prior to cardiac arrest by any set or subset of criteria would invariably correlate with a diffusely destroyed brain."[35]

REVISITING THE HALAKHIC DEBATE

The critical questions for a halakhic ruling can be framed as follows: 1) Is physiologic decapitation halakhically considered like physical decapitation and, if so, 2) is brain death medically equivalent to decapitation?

R. Auerbach seems to answer both questions is his responsum on brain death. He states that: 1) The criteria of death have always been that he is still as a stone and there is absolute cessation of breathing and cardiac function. 2) It is correct that if a brain is completely and absolutely destroyed, he is considered dead. 3) The brain is not considered dead unless it is demonstrated that it is *absolute without a doubt, that all of it in its entirety is dead*. 4) In a person that the doctors say is dead but his heart is still beating, it is most sensible that [the continued cardiovascular function] is proof that the brain has not completely died. 5) Therefore, such a person is considered *safek goses, safek met* (possibly alive, possibly dead). 6) Because he falls into the definition of a *safek goses* (a dying but still living person), it is prohibited to [even] move him if it is not for his good [for fear of causing his death, even indirectly].[36] It is clear from this responsum that R. Auerbach accepts the notion that a physiologic decapitation is sufficient to diagnose death. However, in practice, he rejects the conclusion that clinical brain death fulfills the definition of decapitation.

R. Wosner also doubted the accuracy of the assertion that brain death meant complete destruction of the brain. He writes,

> . . . [I]f the heart continues to work without mechanical support for a period of days, there [must] still be a connection preserved between the brain and the heart.[37]

It seems clear from the opinions of these *poskim* and the available medical information that if there is evidence of some physiologic connection between a functioning part of the brain and the body, manifested by such characteristics as stable cardiovascular function, continued neurohormonal homeostasis or intact temperature regulation, then it is obvious that there remains a bodily connection with a partially functioning brain, and it cannot be considered comparable to decapitation.

We now return to the words of R. Feinstein. He writes,

> Since you say that distinguished doctors with experience are able to determine by way of dye-injection techniques that there is no connec-

> tion between the brain and the body and the brain has already rotted completely, this is like decapitation.[38]

He concludes his responsum by adding,

> We must be stringent that even if [there are no neurologic signs of life] and he is not breathing at all . . . there can be no determination of death until a definitive test is performed, and if it is shown that there is a connection between the brain and the body, even if he is not breathing, he is to be supported by mechanical ventilation, even for a long period.[39]

In his letter to Dr. Bundy, he additionally mentions the condition that the heart would only be expected to function for "a few more days," this being evidence that the brain has ceased to function. This parameter is quite consistent with R. Wosner's opinion, as cited above, that if the heart continues to beat indefinitely, there is a doubt about the diagnosis of brain death. With clinical evidence now that some brain dead patients can survive indefinitely with minimal medical support, these conditions are not met.

It becomes clear that R. Feinstein's opinion that brain death is like decapitation was made with very clear conditions: 1) Proof that there is no connection between the brain and the body and 2) the brain has been completely destroyed. We see from current medical information that neither condition is met with the current working definition of brain death. It is remarkable how similar the parameters of R. Feinstein are to those of Rabbis Auerbach and Wosner. His different conclusion was based on medical information that in the course of time has been proven to be incorrect.

CONCLUSIONS

Given the accumulating evidence over a period of almost thirty years that questions the whole-brain theory of death, it is striking that the defense of the theory has been sparse and unconvincing.[40] Perhaps this is because the battle appears to be long since won. Widespread legislation has made brain death a legal fact. Defense of brain death generally has little to do with biological facts. The existence of residual brain function is largely acknowledged, particularly in the ethical literature, but is declared insignificant. Rather, defense of brain death is little more than an advocacy for the cause of organ transplantation recipients. It is based on the nearly unanimous belief that organ donation is a virtue.

Such statements as,

> [The physician] has a duty to society to initiate a sympathetic discussion with relatives so that he may inform them of their opportunity to give healthy organs to benefit and even to restore to an active life the victims of chronic illness[41]

are commonplace. Appeals to sentiment are common, such as referring to organ donation as "a final gift." As well, the thought of returning to the old cardiopulmonary criteria of death is "unthinkable" because it would "preclude organ transplantation."[42] One writer commenting on the evidence of residual brain function remarks that while,

> Indeed [this] creates serious questions about the validity of [clinical brain death as meaning total death of the brain], from a practical standpoint, we cannot turn back the clock on the sensible medical and legal policies developed over the last 30 years. Brain death, both as a medical syndrome and a legal reality is both well-accepted and valid.[43]

In a halakhic context, this utilitarian defense of brain death is inadequate. If organ donors are alive when their organs are harvested, then this fact must be acknowledged and scrutinized. Increasingly, in the secular literature, this dilemma is openly discussed, sometimes with remarkable candor. Kerridge et al. suggest that,

> Rather than redefining those who are 'brain dead' as 'dead,' it may be more honest to acknowledge that such individuals are not dead and that removing their organs is in fact killing them.[44]

However, if it is acknowledged that the whole-brain theory of death is medically incorrect, that there continues to be brain function, and that clinical brain death as is currently defined is not like decapitation, then the halakhic question is changed entirely. No longer is it a question of harvesting organs from the dead. The dilemma we are now faced with consists of two competing mandates: the mandate to save a life, *lo ta'amod al dam re'ekha* (i.e., the prohibition to stand idle while your neighbor's life is endangered, which in our context is a mandate to save the person afflicted with organ failure), versus the prohibition to murder (i.e., organ harvesting from a living person). While a detailed study of this question is beyond the scope of this paper, it is an old and long-ago settled halakhic dilemma which was codified by Rambam almost nine hundred years ago when he said (*Hilkhot Yesodei ha-Torah* 5:7),

> If one is dying from a fatal illness and the doctors tell him he will be healed by something that is forbidden by the Torah, one must do [as he is told]. One must be healed [from a dangerous illness] by all transgressions in the Torah except by idolatry, prohibited sexual relations, and murder. *Even in a place of danger, one cannot be healed by these transgressions. And if he is healed by these he is liable to the punishments by a court as is fitting for the crimes.* (Emphasis added)

While the mandate to preserve life is of great importance in Jewish law, it is nevertheless strictly circumscribed. It is ironic that quite the opposite is the case in the currently accepted secular ethics where organ donation seems to be absolutely virtuous.

NOTES

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1. Report of the ad hoc committee of the Harvard Medical School to examine the definition of brain death. "A definition of irreversible coma," *JAMA* 205:6 (1968): 85-88.
2. "[Brain Death and] Heart transplants: The [Israeli] Chief Rabbinate's Directives," translated and annotated by Yoel Jakobovits, *Tradition* 24:4 (1989): 1-14. (The original Hebrew version can be found in *Sefer Assia*, vol. 6 [Jerusalem: Makhon Schlesinger, 1989], 27-38). They restricted their permission to harvest organs to only those patients who had suffered traumatic, accidental injury:

   > The significance of the requirement of 'traumatic injury' is to restrict the permission of heart donation to donors that are only injured through trauma. These injured patients fulfilling [brain death criteria] are defined halachically as *trefa* [even] if they cannot be defined as dead." (p. 31, n. 26 of the Hebrew version)

   Dr. Mordechai Halperin notes,

   > In spite of the complete certainty of the decision, the Rabbinate chose to limit the permission to trauma patients (*trefa*) in order to strengthen [the decision] and to answer the objections of those who disagree with the decision of the Rabbinate. ("The Legal Significance of the Decision of the Chief Rabbinate of Israel on Heart Transplan-

tation," [in Hebrew] *Sefer Assia*, vol. 7 [Jerusalem: Makhon Schlesinger, 1993], 126).

Sacrificing the life of a *trefa* in order to give another person a cure is itself a highly controversial position, but beyond the scope of this paper. (See Rabbi J. D. Bleich, "Of Cerebral, Respiratory and Cardiac Death," in *Contemporary Halakhic Problems*, vol. IV [New York: Ktav, 1995], p. 333, note 42, for a brief discussion of this).

This, however, does not alter the clear and explicit intention of the Rabbinate's decision that brain death criteria are sufficient to determine death for the purpose of organ donation. See for example their remarks in *Sefer Assia* 6 (1989): 31, item 7a, entitled, "Fulfillment of the conditions to determine *death* based on the above criteria [i.e., brain death criteria]" and p. 33, item 3.1, entitled, "Defining *brain death* (italics added) as complete cessation of brain stem function."

3. R. J. David Bleich, "Of Cerebral, Respiratory, and Cardiac Death," *Tradition* 24:3 (1989): 44-66. Jakobovits notes others who have raised opposition to the Chief Rabbinate's position.
4. Prof. Avraham Steinberg, "Determination of Death: Survey of Viewpoints," [in Hebrew] *Assia* 14 (1994): 5-16.
5. Rabbi Elazar Menahem Shakh, letter originally printed in the Hebrew *Yated Ne'eman*, 12 Kislev, 5747.
6. Rabbi Yitshak Yaakov Weiss, *Minhat Yitshak*, vol. 5 (Jerusalem: Makhon Hatam Sofer, 1975), sections 7-8.
7. R. Shmuel ha-Levi Wosner, *Shevet ha-Levi*, vol. 7 (Bnei Brak: 1990), *Hoshen Mishpat*, chapter 235.
8. Rabbi Nissim Karelitz, letter printed in the Hebrew *Hamodia*, 22 Heshvan, 5747.
9. Rabbi Eliezer Waldenberg, *Tsits Eliezer*, vol. 9 (Jerusalem: 1985), section 46.
10. Apnea as a basis of determining brain death has been much discussed before. Briefly, the Gemara (*Yoma* 85a) discusses a case of a building collapsing on a person on the Sabbath:

> From where does one check [to determine if a person is alive]? One [rabbi] says, until the nose. There are those who say, until the heart . . . . Rav Pappa [states the dispute is regarding a case where] he is checked from the bottom to the top. But from the top down it is not necessary [to check more than the nose], as it is said, 'All in whose nostrils was the breath of the spirit of life' (Genesis 7:22).

Rashi comments here that "if he does not expire air from his nose, [there is a] certainty that he is dead and he is left." Indeed, the halakha is codified by the *Shulhan Arukh* (*Orah Hayyim* 329) saying that if one is found under a rubble and there is no detectable breathing from the nose, one is considered dead. The *Shulhan Arukh* states, "no matter if [the examination] is started from the head or the foot, one must check the breathing." According to those who bring this as a support, apnea seems to be the determinant of death. Since brain death, by definition, is a state of apnea, then it is surely death. However, this interpretation of the Gemara is problematic. Hakham Tsevi (Responsa, 77) writing in the early 18th century rejects this interpretation, stating that breathing is not a *determinant* of death but rather a *sign* of death. In explaining this Gemara, he writes,

> Sometimes life is not recognized in the heart and is recognized in the breath. Rashi agrees that . . . sometimes [there is still life] in the heart, [but] the pulse is not detectable in his heart, i.e., from outside the chest because [the pulse] is weak and the chest [wall] conceals and [it appears absent]. However, the breathing is recognized whenever there is still life in the heart.

In fact, a careful reading of Rashi on this Gemara seems consistent with the understanding that breathing is merely a sign of life and not a determinant of life. Rashi writes that ". . . Sometimes there is no life *detected* in the heart, yet life is detected in the nose." In other words, breathing is more readily detected, but does not determine death to the exclusion of a beating heart. The conclusion of Hakham Tsevi that the heart and not breathing determines death has never been seriously challenged. Contemporary authorities, including R. Feinstein, accept this opinion.

11. Responsa of Hatam Sofer (*Yoreh De'ah* 338). He writes that "they (Hazal) have given us a measure of death. . . . All depends on the breath of the nose." This statement was used by the Chief Rabbinate as a support for their decision. However, they fail to consider a most important subsequent sentence in Hatam Sofer's responsum. He writes that when one is found "to be still as a stone, and there is no pulse, and *after this*, there is no breathing . . . he is dead." It is clear that Hatam Sofer uses the determination of breathing as a stringency, only to be assessed once neurologic and cardiac function have terminated. In other words, absent breathing is only a confirmatory sign of death once the other major signs of death are present. This is completely consistent with the above opinions of Rashi and Hakham Tsevi.
12. *Iggerot Moshe*, *Yoreh De'ah*, part II, chapter 146.
13. R. Moshe Feinstein, Letter to Dr. S. Bundy (dated 1985), reprinted in *Assia* 14 (1994): 25.
14. *Iggerot Moshe*, *Yoreh De'ah*, part III, chapter 132.
15. There are prominent *talmidei hakhamim* who understand that R. Feinstein required "dye-injection techniques" only as a stringency, i.e., these confirmatory tests were only to be used after the heart stopped beating. Specifically cited is R. Feinstein's use of the term, "no signs of life," which may indicate that the heart has stopped beating. However, the Chief Rabbinate (see n. 2) and Prof. Avraham Steinberg (see n. 4) do not understand R. Feinstein's responsum as meaning this. Their arguments seem sound to us. Specifically, when R. Feinstein uses the term (twice) that there are no signs of life, he qualifies this both times by stating that there are no neurologic signs of life and he specifies that he means "coma." Furthermore, as Prof. Steinberg notes, and we are in full agreement with him, dye-injection techniques are *never* used after the heart stops beating. The whole purpose of using cerebral angiography or brain scan is to determine if there is blood flow to the brain in the presence of a beating heart. It would be medically ludicrous to suggest injecting dye into the arterial system in order to determine blood flow to the brain when there is no beating heart. One can only conclude that R. Feinstein's intent was to determine death of the brain in the presence of a beating heart.

16. Personal communication, Rabbi Moshe Shaul Klein, *Dayan*, *Bet Din* of R. Shmuel ha-Levi Wosner.
17. See note 7.
18. See note 4.
19. See note 1.
20. American Academy of Neurology, "Practice parameters for determining brain death in adults," *Neurology* 45 (1995): 1012-1014.
21. Editorial, "Brain Death," *Lancet*, February 14, 1981: 363-365.
22. See note 21. Peter Mcl. Black, "Brain death," *New England Journal of Medicine*, 299:7 (1978): 338-344.
23. James. L. Bernat, Charles. M. Culver and Bernard Gert, "On the definition and criterion of death," *Annals of Internal Medicine* 94: 389-394.
24. A. Earl Walker, Earl L. Diamond, and John Moseley, "The neuropathological findings in irreversible coma," *Journal of Neuropathology and Experimental Neurology* 34 (1975): 295-322.
25. D. Alan Shewmon, "Chronic brain death: meta-analysis and conceptual consequences," *Neurology* 51 (1998): 1538-1545.
26. Eelco F. M. Wijdicks, Letter, "The diagnosis of brain death," *New England Journal of Medicine* 345:8 (2001): 617-618.
27. Eelco F. M. Wijdicks, L.D. Atkinson LD, and H. Okazaki, "Isolated medulla oblongata function after severe traumatic brain injury," *Journal of Neurology, Neurosurgery and Psychiatry* 70 (2001): 127-129.
28. Eelco F. M. Wijdicks, "The diagnosis of brain death," *New England Journal of Medicine* 344:16 (2001): 1215-1221.
29. Hans J. Gramm, Harold Meinhold, Ulrich Bickel, Jurgen Zimmerman, Birgit von Hammerstein, Frieder Keller et al., "Acute endocrine failure after brain death," *Transplantation* 54:5 (1992): 851-857.
30. Robert D. Truog, "Is it time to abandon brain death?" *Hastings Center Review* 27:1 (1997): 29-37.
31. Kristan M. Outwater and Mark A. Rockoff, "Diabetes insipidus accompanying brain death in children," *Neurology* 34 (1984): 143-146.
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