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## Heart of Darkness

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## Heart of Darkness

For me, the word “evil” is somewhat of an abstraction. Having led a protected life, one of only a few occasions on which I have seen something resembling evil was when the Twin Towers fell on September 11th. Evil is the intent of harm and deliberate violation of basic moral and ethical codes. Evil is now woven into our culture, something that, in recent times, probably became more apparent (and popular) when President Reagan called the Soviets “evil” and, later, with Mr. Bush extending this concept to the “axis of evil.” Invasion and domination by conquering forces are explicitly evil, as we have learned by how the Spanish (and we Americans) treated our native populations in the Americas. *Heart of Darkness* by Joseph Conrad recounts the evils that Belgians brought upon the Congo (the same story, transposed to our involvement in Vietnam, was used by Francis Ford Coppola in *Apocalypse Now*). Conrad implied that darkness lies in all of our hearts and that we are all capable of evil.

Evil loomed over all of us during the cold war (but without overtly manifesting itself) and is now omnipresent in popular culture. Actor Mike Myers ridiculed it when he portrayed Dr. Evil in the silly Austin Powers movies. Evil is a mostly male behavior and a rite of passage in many groups (ie, gangs) and societies. The concept of evil is inseparable from religion; the forces of good and evil are always at battle with each other, particularly in our Western beliefs. Evil is human, and when we perceive some animal acts as such, it is just a projection of our own morals. In his book, *Evil: An Investigation*,<sup>1</sup> Lance Morrow speaks of micro and macro evil using as examples rape and genocide, respectively. Although evil resides in all of us, most well-balanced individuals control their urges and nothing comes of it. Evil can creep inadvertently into someone, as William Peter Blatty showed us in his book (and, later, in the movie directed by William Friedkin), *The Exorcist*. Evil can be highly efficient and bureaucratic, as with the Nazis or the Soviet Gulags or the killing of the Congolese by King Leopold II of Belgium (again portrayed in *Heart of Darkness*).

The word “evil” was probably coined during the Middle Ages from the Old English “yfel” and/or the German “ubil.” The common idea behind these 2 words is that of transgression.<sup>2</sup> Many think that the idea of evil—as we now interpret it—was first mentioned in the Bible (*Genesis* 2:18), in which the Lord says, “It is not good for the man to be alone. I will make a helper suitable for him.”<sup>3</sup> It is the idea of being alone that is evil, perhaps because if there is no other person who can check our evil thoughts, then nothing may prevent us from doing harm. In classic Greek philosophy, Plato had many opinions regarding evil and its relationship to ignorance, false words, and indifference to the public good.<sup>4</sup> Moral absolutists tell us that good and evil are fixed concepts. Amoralists or moral nihilists, such as Machiavelli and Stalin, claim that evil does not exist. Between these extremes, one finds the moral relativists who claim that evil is directly linked to local culture. Others consider that people are not evil and that the term applies only to their acts. Islam does not recognize evil in the same way traditional Judeo-Christian theology does. All reli-

gions that began in Mesopotamia and adjacent territories, however, recognize evil in the form of Satan (Judaism = ha-Satan, Christianity = devil, and Islam = Shaitan). Satan was the chief of the fallen angels, that is, angels who were banished from Heaven and sent to earth to tempt man into committing evil. Lucifer (meaning “the shining one”) is the most distinguished one and appeared after the fifth century of the Common Era. In the Quran, Iblis plays the role of Lucifer. But it does not matter who or what tempts us into evil—its results can be spun off in different ways according to circumstances and, nowadays, according to the media. But, as Mr. Morrow says in his book, you can dress evil as ethnic, political, psychiatric, and other excuses but it is still...just evil in costume.

Evil can be reduced to a person or group of persons. When studied with brain imaging, evil individuals have smaller amygdala volumes than controls.<sup>5</sup> Evil individuals clearly display antisocial behavior. Antisocial individuals have a significantly increased incidence of cavum septum pellucidum.<sup>6</sup> A study suggests that the presence of this cavum may reflect maldevelopment of the limbic system. To us in neuroradiology, it may be difficult to relate such a common anatomic variation with such extreme behavioral aberrations, but recent genetic studies start to shed some light on what is going on in the evil brain. Absence of a gene that encodes for monoamine oxidase A has been reported in antisocial human behavior.<sup>7</sup> Animal models that allow for temporary manipulation of this gene show that after turning it back on, the aggressive animals revert to normal behavior.<sup>8</sup> Studies have shown that up to 7 genes may be responsible for aggressive and antisocial behavior in humans. These observations are supported by studies of twins who, independent from their rearing, show genetic influences related to antisocial and aggressive behaviors. Raine et al<sup>9</sup> showed that antisocial individuals have an 11% reduction in prefrontal gray matter volume compared with controls. These same authors and other investigators have shown that violent offenders have reduced glucose metabolism on PET in the same brain areas.<sup>10</sup> Prefrontal damage leads to developmental sociopathy rather than acquired sociopathy. Developmental sociopathy is closely associated with impaired moral reasoning and judgment.<sup>10</sup> Patients with lesions in the orbitofrontal cortex display a behavior characterized by lack of concern with the consequences of their acts, and aggressive individuals show less uptake of glucose on PET in those same regions. fMRI demonstrates abnormal activation of the same areas in impulsive individuals. The temporal lobes are equally affected, showing abnormal volumes, abnormal cerebral perfusion on SPECT, and reduced glucose metabolism on PET.<sup>10</sup> Reduced activation on fMRI studies also has been demonstrated, though less consistently, in the parietal lobes and cingulate gyri of antisocial individuals.<sup>10</sup>

If evil is related to morality, where is the brain’s moral center? Multiple studies show activation of the prefrontal cortex when making moral decisions. Using nuclear imaging and fMRI, individuals have been studied while viewing pictures depicting moral and immoral violations.<sup>10</sup> All showed activity changes in the prefrontal cortex and, less consistently, in the posterior cingulate, amygdala, and anterior temporal regions. Moral judgments are directly related to emotion rather than reasoning and cognition. Antisocial individuals have the ability to reason between what is wrong or right but cannot apply

it to their own behavior. Thus, they know, but lack a feeling for, what is moral. In them, the prefrontal cortex and amygdala do not work well. These areas are implicated in self-appraisal, self-reflection, self-perception, and insight. We know that in illegal drug use, child abuse, and child neglect, the prefrontal cortex and the limbic system suffer irreversible changes. If criminals are intellectually capable of distinguishing right from wrong, but are unable to emotionally control it, the argument of “not guilty by reason of insanity” seems to fall flat. Here is where medicine intersects law and the discipline of “neuroethics” was born.

Martha J. Farah, from the University of Pennsylvania, is considered, by many, as the “mother” of neuroethics.<sup>11</sup> This new discipline addresses ethical issues within the neurosciences. What should be interesting to us is that neuroethics concerns fMRI and other methods of brain imaging. “Brain privacy” may be easily violated by imaging, as information obtained may be the result of a study designed for other purposes. Lie detection has been used in court, and something called “brain fingerprinting” is now considered an adequate method of screening for terrorists\* and is accepted in court.<sup>12</sup> “Brainotyping” reveals that certain individuals are predisposed to violent crimes, pessimism, risk aversion, unconscious racial attitudes, and even differences in sexual attraction! Of course, the media would have you believe that a scan can be done and, presto, you know an individual’s personality. This is infinitely more complex and requires intense psychiatric evaluations.

Because individuals with aggressive and antisocial behaviors tend to demonstrate relatively specific localizations of abnormal brain morphology and function, it seems that disconnecting these areas or modulating their functions may result in behavioral changes and, hopefully, improvement. Contemporary psychosurgery began in the mid-1930s by disconnecting the prefrontal cortex by leucotomy. For neuroradiologists, it is important to remember that the “inventor” of cerebral angiography, Edgaz Moniz, received the Nobel Prize not for angiography but for his work on frontal lobotomies, either mechanical or by alcohol ablation. In the 1950s, the use of lobotomy was replaced by chlorpromazine.<sup>13</sup> Limbic leucotomy seems to have beneficial effects in cases of self-mutilation and repeated assaultive behavior. Today, psychosurgery is a well-recognized field and procedures commonly involve ablations, which are permanent compared with the more flexible neuromodulation via stimulators. The benefit of stimulation is that it can be turned off, if needed. How neuromodulation can be used in criminals is a matter of speculation.

Are we, as a society, more evil than ever before? If hate is a measure of evil, we are certainly heading that way. The definition of the word hate includes extreme hostility toward some-

thing or someone we dislike. Hate can be verbal, as in hate speech, or physical, as in hate crime. In February 2011, the Southern Poverty Law Center issued a report stating that there are now over 1000 hate groups in the United States (more than ever before).<sup>14</sup> Most of these individuals hate their government, as they feel that it is depriving them of freedom. Hate groups are generally involved in violent criminal acts. Because we need to defend ourselves from evil, what could be more logical than buying a gun? On the same week as the previous report was made public, the state of Texas seemed poised to pass a law permitting concealed weapons on university campuses.<sup>15</sup>

The evidence supports the notion that evil is increasing and, as neuroradiologists, we may be called upon to assess it with our sophisticated imaging techniques. After all, it seems that darkness does not reside in the heart but rather in specific locations in the brain.

\*Factoid: After the French revolution, Robespierre was in charge of the “reign of terror.” During this time, thousands were killed by his supporters, who were known as “terrorists.” Thus, terrorists are persons who instill fear and kill indiscriminately (basically, evil individuals).

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