In this volume violence refers to acts, or threats, of force resulting in personal injury or destruction of property to compel action against one’s will. Aggression is a wider concept that includes violence and also encompasses self-protective behavior in which physical force or the threat of force is used to satisfy vital needs or to protect one’s physical or psychological integrity. Violence has socially sanctioned forms such as capital punishment, injury during the course of resisting arrest, and killing during military operations. It also has illegitimate forms such as assault, battery, rape, and murder. In 1999 in the United States, excluding murder and non-negligent manslaughter, there were over 7 million violent crimes committed (assessed from a survey of 78,000 residents in 43,000 housing units). Police reports of murder and non-negligent manslaughter in 1999 totaled 12,658. Violent behavior is of two types: impulsive or explosive—often unprovoked—and premeditated or predatory. This chapter reviews the role of neuropsychiatric factors in the etiology of unsanctioned violent behavior and provides a differential diagnosis of neurological disorders to be considered in the violent individual.

An acceptable definition of violence has not been universally accepted because violence is not a unitary concept. Violence is not a diagnosis or even a clinical syndrome in the usual sense; it is a complex behavior and, as such, is not likely to have a single determinant. Genetic, social, educational, cultural, economic, neurological, metabolic, and situational factors frequently interact and reinforce each other to produce violent behavior. An individual from a lower socioeconomic background may grow up in a violent household and sustain brain injury from child abuse, and later commit violent acts while intoxicated. Which factors are most important in this caldron of contributing ingredients? In most cases it will be impossible to do more than identify the final precipitating circumstances.

The importance of seeking neurological components in violent behavior is twofold: 1) neurological factors can easily be overlooked in a psychologically minded milieu in which clinicians are most attuned to the influence of early childhood experiences on adult behavior; and 2) detection of neurological factors may offer treatment alternatives that will go unexplored if the brain disorder is undiscovered.

Animal models have been widely used to investigate the neurobiologic basis of aggressive behavior. These studies have been particularly useful in delineating anatomic regions of the brain most likely to be involved in mediating violent behavior and have identified the limbic system as the most important anatomic substrate of violence and aggression. The greater extent of intraspecies violence and interindividual cruelty among
humans, however, clearly separates human behavior from that of other animals and limits the applicability of animal research to the understanding of human violence.

Two general approaches have been used to study the neurology of human violence. In the first, violent offenders have been investigated to determine whether they have evidence of neurological dysfunction that might have contributed to their violent behavior. In the second, violent behavior ensuing in the course of known neurological disorders is observed and studied. The results of each of these approaches are reviewed, and the latter is further divided into violent behavior directed at others and violent self-destructive behavior. Recent studies using functional imaging to explore the neural systems subserving reactions to, and evocations of, fear and violence in normal controls have implicated regions similar to those found dysfunctional in impulsive violent criminals. These preliminary findings, along with studies evaluating aggression in dementia patients, will be reviewed to highlight a common neuronal system underlying violence and aggression across health and disease. Finally, an approach to the evaluation and treatment of the violent individual is outlined.

Several types of EEG abnormalities have been found in violent offenders: generalized slowing, focal slowing, and epileptiform abnormalities. Williams noted that when focal abnormalities were present they were most likely to be located in the temporal and frontal lobes. Wong et al. also found a higher incidence of focal abnormalities in a subgroup with the highest violence scores (30.7% focal abnormalities and 20% temporal abnormalities in the high-violent group versus 7.2% and 2.4% in the low-violence group). Pillmann et al. found a lower prevalence (9%) of focal abnormalities in a more general population of 222 defendants referred for psychiatric evaluation regardless of the degree of violent acts.

Interpretation of these findings is fraught with difficulty. A small percentage of the patients (0–15%) have epilepsy. As discussed later in this chapter, violence as an ictal event is rare, and it is unlikely that many of the violent acts are ictal in nature. The EEG alterations may reflect non-epileptic central nervous system (CNS) changes relevant to the violent behavior. The presence of lesions within the limbic system can lead to personality alterations that may in turn lead to antisocial behavior. Head trauma also produces frontal and temporal lesions, reduces the threshold of impulsive behavior and violence, and may be reflected in EEG abnormalities. Despite the difficulty in drawing direct inferences from these data, the EEG findings indicate that brain dysfunction is common among violent offenders and that, in many cases, the limbic system is the site of neurological abnormality.

**NEUROLOGICAL ABNORMALITIES IN VIOLENT CRIMINALS**

**Electroencephalographic Abnormalities**

The most thoroughly studied parameter of neurological dysfunction in violent individuals is the electroencephalogram (EEG). Studies that assessed EEG abnormalities in prison inmates and patients with antisocial behavior have found an increased frequency of EEG changes in violent populations. Antisocial and criminal populations studied had EEG abnormalities in 24%–78% of individuals. Electroencephalographic changes were found to be more common in subjects who had committed violent acts than in those associated with nonviolent crimes and were more frequent in those with repeated violence than in those who had committed isolated violent acts. When the violence had no apparent motive, there was also an increased chance of finding an EEG abnormality, compared to when violence had been provoked. No specific relationship has been found between the type of EEG abnormality and characteristics of the crime, nor between EEG changes and degree of violence committed. However, when continued violence is monitored within an institution, a left frontal abnormality on EEG appears to correlate with the frequency of ongoing violent incidents.

Functional imaging studies of murderers may underscore variable brain abnormalities, depending on the type of violent acts committed by the murderer. If the murder was an impulsive act, a greater orbitofrontal metabolic defect has been found in perpetrators’ scans than in normal controls, while a greater dorsolateral frontal defect has been found in predatory murderers’ scans. This differential pattern of functional defects between the two classes of violent acts, impulsive versus predatory, may underscore differential system dysfunction subserving violent behavior. Because head trauma in prisoners is common, it is problematic to extrapolate regional brain abnormalities identified from cross-sectional studies of inmates to models of the neuropsychiatry of violence in humans. Evidence of a common brain system being involved across health and various diseases will strengthen any proposed model of the anatomy of a complex behavior. This is the case with violence and aggression.
In normal individuals who were asked to recall prior life events to evoke anger and anxiety while viewing affect-appropriate faces, the left lateral orbitofrontal cortex and bilateral temporal poles were found to be significantly more perfused in a H215O positron emission tomography (PET) activation study than under neutral conditions.8 When anger was compared to anxiety, significantly greater perfusion in the left orbitofrontal cortex was found. In other studies that exposed normal subjects to threatening images or words, orbitofrontal9,10 or amygdalar functional correlates have been found.11,12 In aggressive patients with dementia, left temporal polar and dorsolateral frontal perfusion defects were found, compared to nonaggressive
patients (see Fig. 24.1);[13] also, an increase in the pathological burden of neurofibrillary tangles in the orbitofrontal cortex and anterior cingulate distinguished aggressive Alzheimer's disease patients from nonaggressive patients.[14]

**Neuropsychological Assessment**

Neuropsychological testing of criminal subjects has produced variable results, but there is a tendency for such patients to perform more poorly than matched control subjects. Performance on tests assessing frontal lobe function is often preferentially compromised.[15]

**Neurological Abnormalities**

Examination of violent delinquents and patients with impulsive character disorders reveals an increased incidence of neurological soft signs indicative of nonlocalizing neurological dysfunction.[15]

### TABLE 24.1. Neuropsychiatric Differential Diagnosis of Violent Behavior

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epilepsy</td>
<td>Attention-deficit disorder in adults</td>
</tr>
<tr>
<td>Intact, postictal, interictal</td>
<td>XYY genotype (?)</td>
</tr>
<tr>
<td>Episodic dyscontrol syndrome</td>
<td>Idiopathic psychiatric disorders</td>
</tr>
<tr>
<td>Frontal lobe syndromes</td>
<td>Nonpsychotic disturbances</td>
</tr>
<tr>
<td>Traumatic injuries</td>
<td>Personality disorders</td>
</tr>
<tr>
<td>Neoplasms</td>
<td>Antisocial personality</td>
</tr>
<tr>
<td>Degenerative dementias</td>
<td>Borderline personality</td>
</tr>
<tr>
<td>Mental retardation</td>
<td>Paranoid personality</td>
</tr>
<tr>
<td>Hypothalamic–limbic rage syndrome</td>
<td>Explosive disorders</td>
</tr>
<tr>
<td>Metabolic disorders</td>
<td>Intermittent</td>
</tr>
<tr>
<td>Acute confusional states</td>
<td>Isolated</td>
</tr>
<tr>
<td>Endocrine dysfunction</td>
<td>Paraphilia</td>
</tr>
<tr>
<td>Premenstrual dysphoric disorder</td>
<td>Sexual sadism</td>
</tr>
<tr>
<td>Testosterone excess</td>
<td>Childhood disorders</td>
</tr>
<tr>
<td>Toxic disorders</td>
<td>Conduct disorder</td>
</tr>
<tr>
<td>Ethanol, phencyclidine, LSD, barbiturates, etc.</td>
<td>Psychotic disturbances</td>
</tr>
<tr>
<td>Neurological delusional syndromes</td>
<td>Mania</td>
</tr>
<tr>
<td></td>
<td>Schizophrenia</td>
</tr>
<tr>
<td></td>
<td>Paranoid disorders</td>
</tr>
<tr>
<td></td>
<td>Depression</td>
</tr>
</tbody>
</table>

**NEUROPSYCHIATRIC DISORDERS WITH VIOLENT BEHAVIOR**

Various neuropsychiatric disorders have been associated with violent behavior (Table 24.1). Most of the attention has focused on the possible association between epilepsy and violence, but a number of other disorders have produced violence and must be considered in the differential diagnosis of violent behavior.

**Epilepsy**

Behavioral disturbances occurring in epileptic patients may occur during the ictal, postictal, and interictal period (Chapter 21). Likewise, violence may occur during any of these periods, and any violent act committed by epileptic patients must be considered in relation to this behavioral framework.

Many unresolved areas of controversy exist regarding the relationship of epilepsy to criminal behavior and violence. The principal questions include the following: Is violence more common among epileptics than non-epileptics? Can violence occur as an ictal manifestation? Does violence occur with abnormal frequency during the interictal period in epileptics? If so, what are the determinants of interictal violence? Is violence more common with one type of epilepsy (e.g., temporal lobe epilepsy) than another (e.g., idiopathic epilepsy)? Unambiguous answers to these questions are not yet available, but tentative conclusions can be drawn from existing information.

The question regarding the prevalence of violent behavior among epileptics has been approached by investigating the frequency of violent acts in populations of epileptics (such as those attending seizure clinics) or determining the frequency of epilepsy among violent individuals. Although studies of the first type demonstrate that violence is uncommon in epilepsy, the latter technique has generally yielded results suggesting that epilepsy is two to four times more common among prison inmates than in the general population.[16, 17]

If violence and antisocial behavior are more common among epileptics, do they occur during the ictal, postictal, or interictal period? This question has been the
subject of heated debate. Rare cases of serious offenses, including murder, have been reported to have occurred during epileptic seizures or at least during a seizure-related amnesic period that could have been in either the ictal or immediate postictal period.\textsuperscript{18,19} Despite occasional reports of ictal violence, recordings of epileptic patients during ictal periods have shown that behavioral activity occurring as part of a seizure is usually brief, stereotyped, undirected, poorly organized, and unlikely to account for goal-directed violence.\textsuperscript{20,21} The current consensus suggests that although interpersonal injury could occur during an epileptic attack manifested by psychomotor automatisms, such activity is unpremeditated, usually poorly structured, and easily redirected. The greatest danger is during the postictal confusional period, when the actions of others may be misinterpreted and a more organized attack may occur.

If aggression is increased in epilepsy and is rare during ictal episodes, when does the violence occur? As noted above, violence may occur during the postictal confusional period, but most episodes of violence appear to occur during the interictal period and are related to behavioral and psychiatric alterations occurring interictally (Chapter 21). Although a few investigators have found equal rates of violence among patients with generalized and temporal lobe epilepsy, most have found violence to be more common among patients with the latter.\textsuperscript{22,23} The observation that violence is more common among patients with left than right temporal lesions emphasizes the potential importance of anatomic factors in determining the occurrence of violence in the interictal period.

Several interpretations have been offered for the observations concerning interictal violence in epileptics. Stevens and Hermann\textsuperscript{22} suggest that basal forebrain damage gives rise to both seizures and behavioral alterations and that the two consequences are behaviorally independent. Similarly, Triem and Delgado-Escueta\textsuperscript{23} point out that interictal violence is most common in young, intellectually impaired men with histories of psychiatric abnormalities and long-standing, severe epilepsy. In such cases, the associated neurological and psychiatric abnormalities may be responsible for the violent behavior. Violence may be a learned behavior occurring in response to the adverse educational and social circumstances of the epileptic. Lewis et al.\textsuperscript{24} suggest that the violence is associated with paranoid and hallucinatory symptoms occurring in the epileptic and is a product of the psychosis occasionally associated with epilepsy. It seems likely that all these factors as well as others (anticonvulsant intoxication, economic, and cultural influences) play varying roles in each epileptic patient manifesting aggressive behavior.

**Episodic Dyscontrol Syndrome**

The episodic dyscontrol syndrome was described in 1970 by Mark and Ervin\textsuperscript{25} as a constellation of the following behaviors: (1) a history of physical assault, especially wife and child beating; (2) pathologic intoxication (violent behavior following ingestion of small amounts of alcohol); (3) impulsive sexual behavior, often including sexual assault; and (4) a history of many traffic violations and automobile accidents stemming from impulsive and reckless driving. They cited a number of patients with temporal lobe epilepsy with the symptom complex and argued that the dyscontrol syndrome was a product of limbic system dysfunction and that many of the patients manifesting the syndrome improved markedly when treated with anticonvulsants. Similarly, Monroe\textsuperscript{26} suggested that episodic disinhibition of action with violent behavior could be a product of epilepsy or of “epileptoid” loss of control of instinctual drives or impulses. In addition, there was a continuum of increasing dynamic and diminishing neurological determinants of violence as one moved from epilepsy to instinct and impulse dyscontrol to acting out. The principal feature that distinguishes patients with episodic dyscontrol from patients with sociopathic personality disorders is that the violent activity is isolated and infrequent, not in conjunction with an overall pattern of malevolence.

Despite these contributions, the nosologic validity of the episodic dyscontrol syndrome as a distinct diagnostic entity is controversial. As discussed previously, violent activity is uncommon as an ictal manifestation in epileptics, and the violence of those with episodic dyscontrol syndrome is likely to be an ictal manifestation in only a very small percentage of cases. In addition, in many patients with episodic dyscontrol, social and environmental factors play an important part in determining or triggering the violence. The episodic dyscontrol syndrome thus might be viewed as a nonspecific syndrome of violence with many possible contributing etiologic factors. The more primitive and disorganized and the more distinctly episodic the behavior is, the more likely it is that acquired neurological factors are playing a significant role. Occasionally, recognition of the syndrome will lead to the discovery of previously undiagnosed epilepsy, and in some cases where epilepsy is equivocally present, an empirical trial with anticonvulsants may be warranted.

**Frontal Lobe Syndromes**

Explosive violence may be a component of the behavioral change that follows damage to the frontal lobe.
Violent behavior may either accompany orbitofrontal injury, as a manifestation of disinhibition and lack of the usual restraints on antisocial impulses, or may occur with dorsolateral injuries, after which the patient manifests brief outbursts of violence in response to trivial irritations. Attacks of explosive rage that follow head trauma are more likely to be a product of the frontal lobe damage that commonly accompanies traumatic head injury. Frontal lobe involvement is also common in dementia and mental retardation and may account for the occasional acts of violence or aggressive behavior reported in these syndromes. Neuropsychologic investigations of criminals have revealed a subgroup with deficits consistent with frontal lobe dysfunction. This finding suggests that in some cases of idiopathic violent behavior, occipital frontal lobe dysfunction secondary to head trauma or delayed maturation may be a contributing factor.

**Hypothalamic–Limbic Rage Syndromes**

The violence associated with orbitofrontal injury can be partially attributed to involvement of limbic structures and disruption of the role of the limbic system in emotional modulation. Similarly, involvement of limbic structures of the hypothalamus by a variety of pathological processes has also produced intermittent rage behavior. The violence usually occurs in response to provocation, but the stimulus may be minimal. The rage behavior is often combined with amnesia, hyperphagia, and other evidence of hypothalamic dysfunction. In most cases the syndrome results from neoplastic invasion of the hypothalamus. The importance of the role played by hypothalamic structures in violent behavior is also attested to by the success of hypothalatomy in the treatment of some types of violent behavior.

**Metabolic Disorders**

Metabolic factors contribute to violent behavior in two general circumstances: acute confusional states and disorders of endocrine function. Acute confusional states are reviewed in Chapter 11, and violence can be a manifestation of any of the metabolic disturbances discussed there. The violence is usually poorly organized and undirected when it is a manifestation of confusion and impaired judgment but may result in serious injury. Hill and colleagues recorded a case of matricide occurring during a hypoglycemic episode.

Two types of endocrine alteration have been shown to contribute to violent behavior: 1) perimenstrual states, and 2) elevated testosterone levels. D’Orban and Dalloton found that 44% of 50 women charged with violent crimes committed their offenses during the perimenstrual period and that there was a significant lack of offenses during the ovulation and post-ovulation phases of the menstrual cycle.

Although results have not always been consistent, several studies have indicated correlations between measures of aggression and serum testosterone levels. Significantly elevated levels have been found in violent rapists and prisoners with histories of violent and aggressive crimes. The levels of testosterone were rarely beyond the range of normal; as a group, violent offenders had significantly higher levels than did non-violent offenders. Similarly, testosterone levels in violent females were also elevated when compared with control populations. The principal role of endocrine factors appears to be to lower the threshold for, and thus increase the likelihood of, violence in predisposed individuals, although prolonged exposure to elevated testosterone levels may have effects on personality development as well.

**Toxic Disorders**

Alcohol is the intoxicant most commonly used by individuals involved in violent crime. Violence may occur during a period of intoxication with impaired judgment, during an alcoholic blackout (Chapter 22) for which the patient is amnesic, or as part of the syndrome of pathological intoxication. In the latter, chaotic disturbed behavior, often with violent outbursts, occurs following ingestion of small amounts of alcohol. The patient is completely or partially amnesic for the period of the aberrant behavior, and delusions, hallucinations, anxiety, or fear may occur during the episode. In some cases, alcohol withdrawal may be an activating agent for preexisting epileptic abnormalities, and the ensuing violence may be ictal or postictal in origin.

Among the many other intoxicants used, violence is particularly likely with phencyclidine (PCP) ingestion but may also occur after use of LSD, psilocybin, stimulants, anticholinergics, and sedative-hypnotics. Violence has also been reported as a manifestation of neuroleptic-induced akathisia.

**Neurological Delusional Syndromes**

Delusions are a frequent manifestation of neurological disease. In dementing illnesses they are simple, loosely held, and transient, whereas in diseases affecting subcortical structures they tend to be more elaborate, rigid, and chronic (Chapter 12). Paranoid ideation and per-
secutary fears are the most common manifestations of delusional thought, and action on delusional beliefs leading to violent activity is an unfortunate but frequent product of persecutory delusions.

Attention-Deficit Disorder in Adults

Attention-deficit disorder in children is manifest by attentional impairment, impulsivity, and nearly constant restless activity while awake. Follow-up studies of these children as they reach adolescence and adulthood reveal that an unusually large number are involved in delinquent behavior or develop sociopathic or explosive personality disturbances. Physical hyperactivity rarely persists beyond childhood, but attentional disturbances continue, and behavioral improvement may follow administration of stimulants even in the adult patient.

Depression and low self-esteem resulting from the poor academic performance and poor social adjustment of hyperactive children are usually invoked as the explanations for sociopathic behavior, but a neurobiologic contribution from the underlying brain disturbance also seems likely.

XYY Genotype

Surveys of criminal populations have revealed an increased incidence of inmates with an XYY genotype and led to the suggestion that XYY individuals were more likely to be violent and aggressive than individuals with normal karyotypes. Further studies, however, have failed to confirm the possibility that XYY patients are at increased risk for violent behavior or suggest that the risk is minimal. Genotype XYY individuals do not have elevated testosterone levels, but they tend to be of lower intelligence and to be more mentally immature and impulsive—factors that may contribute to aggressive activity. Until more information is obtained, the possible role of the XYY genotype in determining violent behavior remains unresolved.

Idiopathic Psychiatric Disorders

A number of idiopathic psychiatric disorders can give rise to violent behavior. They can usefully be divided into psychotic disorders in which the aggression is in response to a delusional belief and those that are nonpsychotic. Among the latter, personality disorders account for the majority of violent actions, but violence may be a manifestation of intermittent or isolated explosive disorders, sexual sadism, or childhood conduct disorders. The personality disturbance most likely to produce repeated violence as a habitual behavioral style is the antisocial personality. Such personalities are characterized by the onset before age 15 of a disorder that, when fully evident, includes the inability to sustain a job, failure to adhere to the law and social norms of behavior, inability to provide consistent parenting or maintain enduring close personal relationships, irritability and aggressiveness, failure to honor financial obligations, and lack of forethought, poor judgment, and recklessness (Chapter 15). The antisocial personality pattern is most marked in late adolescence and early adulthood and tends to be ameliorated with age. In addition to the antisocial personality, violence is common among individuals with borderline and paranoid personality disorders.

Explosive disorders are disturbances of impulse control in which an individual has a discrete episode of aggressiveness with property destruction or assault. There is an absence of generalized impulsivity, aggressiveness, or sociopathic behavior between episodes. The violence is usually out of proportion to the precipitating stimulus and may occur more than once (intermittent explosive disorder) or be confined to a single episode. This behavior is similar to the episodic dyscontrol syndrome, and explosive patients must be carefully evaluated for neurological determinants of their behavior.

Violence may also be a product of certain disturbances of sexual behavior, particularly sexual sadism. Sadism is a paraphilic disturbance in which sexual excitement is achieved by humiliating or injuring either a nonconsenting or a consenting partner (Chapter 23). Violence is not a common consequence of psychosis, and few psychotic individuals commit acts of violence. Under specific circumstances, however, psychotic ideation, particularly paranoid thinking, can lead to organized acts of aggression directed at presumed persecutors. Such actions may occur in any of the psychoses but have been found most commonly among patients with schizophrenia, women felons with affective disorders, and geriatric patients with late-onset paranoid delusional disorders. The importance of recognizing the psychotic origin of violent behavior stems from the readiness with which some of these disorders respond to neuroleptic medication.

NEUROPSYCHIATRIC DISORDERS WITH SELF-DESTRUCTIVE BEHAVIOR

Self-destructive behavior may occur along with violence directed at others in any of the syndromes presented in the preceding sections. In a few disorders, however, self-inflicted injury may occur as a prominent or even
TABLE 24.2. Neuropsychiatric Disorders with Self-mutilative Behavior

<table>
<thead>
<tr>
<th>Neurological Disorders</th>
<th>Idiopathic Psychiatric Disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental retardation</td>
<td>Borderline personality disorder</td>
</tr>
<tr>
<td>Autism</td>
<td>Schizophrenia</td>
</tr>
<tr>
<td>Lesch-Nyhan syndrome</td>
<td>Depression</td>
</tr>
<tr>
<td>Gilles de la Tourette</td>
<td>Obsessive-compulsive disorder</td>
</tr>
<tr>
<td>syndrome</td>
<td></td>
</tr>
<tr>
<td>Chorea-acanthocytosis</td>
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</table>

as the dominant behavioral disorder (Table 24.2). In children with mental retardation or autism, self-injury may occur in the course of head banging or other bizarre activities. In the Lesch-Nyhan syndrome (an X-linked disease characterized by overproduction of uric acid, deficiency of hypoxanthine-guanine phosphoribosyl-transferase, mental retardation, spasticity, and choreoathetosis), the afflicted children engage in self-mutilative behavior and are generally aggressive. The aggression often appears to be one manifestation of a compulsive disorder. Likewise, self-harm may occur as a result of one of the irresistible compulsive urges that occur in some patients with Gilles de la Tourette syndrome. Some Gilles de la Tourette patients sustain significant ocular trauma as a result of compulsive striking of the eyes. Another neurological syndrome in which self-injury may be prominent is choreoacanthocytosis, which is manifested by a choreiform disorder resembling Huntington’s disease, and studies of peripheral blood show a significant number of acanthocytes among red blood cells. Tongue and lip biting is often an early and prominent expression of the choreic syndrome.

Idiopathic psychiatric disorders that may produce conspicuous self-injury behaviors include borderline personality, obsessive-compulsive disorders with self-mutilation rituals, schizophrenia, and depression.

The most important principle involved in the evaluation of the violent individual is that violent behavior is rarely the result of a single circumstance. Rather, violent behavior is the result of neurological, toxic, characterological, social, and situational factors that conspire at a point in time to produce a violent act. An adequate evaluation and any hope of successful treatment thus depend on a thorough investigation of all possible contributing elements. The psychiatric interview will assess childhood, social, occupational, and educational experiences as well as determining current behaviors indicative of psychosis, affective disorder, character disorder, or other psychiatric disturbance. The neurological history should include inquiries regarding birth trauma, head injury, encephalitis, meningitis, systemic illnesses, drug or alcohol ingestion, and any evidence of seizure like phenomena. The bedside mental status examination (Chapter 3) may help in identifying frontal lobe dysfunction, and formal neuropsychological assessment will determine the intellectual capacity of the patient. The elementary physical and neurological examinations will help in identifying systemic diseases or focal neurological deficits. In cases where violence has occurred as an isolated, ego-alien act or cannot be completely recalled by the patient, an EEG should be obtained to search for epileptiform abnormalities. Nasopharyngeal or sphenoidal electrodes and sleep deprivation prior to obtaining the recording may increase the likelihood of discovering an existing EEG abnormality. Structural and functional brain imaging are an integral part of the evaluation of any patient with findings suggestive of brain disease. Laboratory assays of urine and blood may help in identifying metabolic disorders or the presence of toxic substances. In some cases, even after completion of a thorough evaluation, there is insufficient evidence to establish a definitive diagnosis or to determine the relative importance of factors contributing to the violent behavior. In these patients, empirical trials of the treatments discussed in the next section may aid not only in controlling the aggression but also in determining its etiology.

TREATMENT OF THE VIOLENT INDIVIDUAL

Whereas many violent individuals are remanded to the criminal justice system and managed through incarceration and involuntary vocational rehabilitation, others are referred to the mental health establishment for pharmacotherapy, behavior modification, psychotherapy, or, rarely, psychosurgery. Violence is a behavioral complex, not a single distinctive diagnostic entity; therefore, any treatment attempt must be individualized, and most treatment regimens are multifaceted. When an underlying disease process (systemic illness producing a confusional state, epilepsy, schizophrenia, etc.) is detected, treatment can be directed toward re-
solving the specific etiologic condition. In many cases, however, the cause of the violence will not be straightforward and treatment may involve any of a number of pharmacologic agents as well as behavioral therapy and/or psychotherapy.

**Pharmacotherapy**

Table 24.3 summarizes the pharmacological agents commonly used in the treatment of violent individuals and lists the principal disorders in which they have been used with some success.

- **Anticonvulsants** The rare cases in which violence is an ictal manifestation are obviously best managed by reducing the number of seizures. Since ictal violence occurs almost exclusively in complex-partial seizures, the anticonvulsants most likely to be successful are carbamazepine or phenytoin (Chapter 21). Phenobarbital sometimes produces irritability and disinhibition and may increase the likelihood of violence in the epileptic. Violence occurring in the postictal confusional state will also be decreased if the number of seizures can be limited. Anticonvulsants have also been used successfully in the management of the episodic dyscontrol syndrome. Carbamazepine and phenytoin have both been reported to decrease the number of violent outbursts.\(^{42}\) Anticonvulsants may also ameliorate the chronic aggressiveness and outbursts of violence occurring in some chronically psychotic patients.

- **Propranolol** Propranolol, a β-adrenergic receptor blocking agent, has been noted to decrease bel-

<table>
<thead>
<tr>
<th>Agents</th>
<th>Violent Disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticonvulsants</td>
<td>Epilepsy (ictal, postictal); episodic dyscontrol syndrome; paroxysmal rage behavior</td>
</tr>
<tr>
<td>Propranolol</td>
<td>Neurological disorders (post-traumatic encephalopathy, mental retardation, etc.) with unprovoked violence</td>
</tr>
<tr>
<td>Mood stabilizing agents</td>
<td>Personality disorders with violence; recurrent unprovoked violence; mania with violence</td>
</tr>
<tr>
<td>Methylphenidate</td>
<td>Antisocial personality disorders (with history of attention-deficit syndrome)</td>
</tr>
<tr>
<td>Antiandrogens</td>
<td>Sexual violence; intractable violence in males</td>
</tr>
<tr>
<td>Progesterone</td>
<td>Premenstrual violence</td>
</tr>
<tr>
<td>Anxiolytics</td>
<td>Anxiety-related irritability and aggression (occasional paradoxical reaction reported)</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>Psychosis-related violence</td>
</tr>
<tr>
<td>Antidepressants</td>
<td>Depression-related violence</td>
</tr>
</tbody>
</table>

ligerent behavior as well as rage attacks in post-traumatic states, Alzheimer’s disease, mental retardation, and schizophrenia.\(^{43,44}\) Dosages necessary for the control of violence have been in the range of 100–500 mg/day. The drug should be used with caution in those with a history of congestive heart failure, asthma, diabetes, or depression.

- **Lithium and Mood Stabilizing Agents** Lithium and other mood stabilizing agents have been used with success in the management of violence in aggressive criminals, character disorders, and children manifesting explosive anger and hostility. In some patients the violence may be an atypical manifestation of an underlying mood disorder, whereas in others these agents appear to act independently of their antimanic effects. Dosages have been the same as those used in the treatment of manic-depressive illness (Chapter 14).

- **Methylphenidate** Attention-deficit disorder, as noted earlier, may persist into adulthood and predispose to antisocial personality disorders with violent behavior. Prescribing stimulants to this population entails a significant risk of abuse of the drugs, but in some cases improvement in behavior and reduction of violence have followed administration of methylphenidate or amphetamines.\(^{45}\) In closely controlled circumstances, stimulant administration may be a viable therapeutic alternative for adults with persistent or acquired attention-deficit disorders.

- **Hormonal Agents** Antiandrogens such as medroxyprogesterone acetate, leuproide, and cypro-
terone acetate diminish sexual preoccupations in the paraphilias and improve self-control of aggressive sexual impulses.46 These agents have also been reported to diminish interictal violence in temporal lobe epileptics and in patients exhibiting idiopathic chronic assaultedness. In the latter conditions, aberrant sexual impulses are not necessarily present, and the antivio- lence potential of antiandrogens does not appear to be specific for sexually related aggressiveness. Progesterone has been used to limit premenstrual aggression.

- **Anxiolytics** The use of anxiolytics in the management of aggression is controversial. Like alcohol, anxiolytics have the potential for disinhibiting antisocial impulses, and, indeed, paradoxical rage reactions and increased hostility have occasionally been reported following administration of anxiolytics. Most investigators, however, have noted an improvement in aggressive impulses with anxiolytics.

- **Antipsychotics and Antidepressants** Antipsychotics and antidepressants have a role in the treatment of violence when the aggression is the result of psychosis or depression.

- **Behavioral Therapy** The potential excesses of behavioral conditioning in the treatment of violent individuals have been dramatically portrayed by Anthony Burgess in his novel, *A Clockwork Orange*.47 When properly used, however, behavioral therapies can increase the patient's repertoire of adaptive skills, allow increased control of maladaptive responses, and decrease the number of violent outbursts. In selected cases, behavior therapy can offer an important therapeutic dimension to the treatment and management of violent patients.

- **Psychosurgery** Psychosurgery is now rarely used in treatment of aggressive behavior but may be considered in some extreme cases where aggression is unmanageable and all other treatment modalities have failed. The two procedures that have relatively high success rates in the amelioration of violent behavior are bilateral amygdalotomy and posterior hypothalamotomy.48,49

REFERENCES