474 Disorders Caused by Venomous Snakebites and Marine Animal Exposures

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This chapter outlines general principles for the evaluation and management of victims of envenomation and poisoning by venomous snakes and marine animals. Because the incidence of serious bites and stings is relatively low in developed nations, there is a paucity of relevant clinical research; as a result, therapeutic decision making often is based on anecdotal information.

VENOMOUS SNAKEBITE

EPIDEMIOLOGY

The venomous snakes of the world belong to the families Viperidae (subfamily Viperinae: Old World vipers; subfamily Crotalinae: New World and Asian pit vipers), Elapidae (including cobras, coral snakes, sea snakes, kraits, and all Australian venomous snakes), Lamprophiidae (subfamily Atractaspidinae: burrowing asps), and Colubridae (a large family in which most species are nonvenomous and only a few are dangerously toxic to humans). Most snakebites occur in developing countries with temperate and tropical climates in which populations subsist on agriculture and fishing. Recent estimates indicate that somewhere between 1.2 million and 5.5 million snakebites occur worldwide each year, with 421,000–1,841,000 envenomations and 20,000–94,000 deaths. Such wide-ranging estimates reflect the challenges of collecting accurate data in the regions most affected by venomous snakes; many victims do not seek hospital treatment, and reporting and record keeping are generally poor.

SNAKE ANATOMY/IDENTIFICATION

The typical snake venom delivery apparatus consists of bilateral venom glands situated below and behind the eyes and connected by ducts to hollow anterior maxillary fangs. In viperids (vipers and pit vipers), these fangs are long and highly mobile; they are retracted against the roof of the mouth when the snake is at rest and brought to an upright position for a strike. In elapids, the fangs are smaller and are relatively fixed in an erect position. Approximately 20% of pit viper bites and higher percentages of other snakebites (up to 75% for sea snakes) are "dry" bites, meaning no venom is released. Significant envenomation probably occurs in ~50% of all venomous snakebites.

Differentiation of venomous from nonvenomous snake species can be difficult. Viperids are characterized by somewhat triangular heads (a feature shared with many harmless snakes), elliptical pupils (also seen in some nonvenomous snakes, such as boas and pythons), enlarged maxillary fangs, and, in pit vipers, heat-sensing pits (foveal organs) on each side of the head that assist with locating prey and aiming strikes. The New World rattlesnakes possess a series of interlocking keratin plates (the rattle) on the tip of the tail that emits a buzzing sound when the snake rapidly vibrates its tail; this sound serves as a warning signal to perceived threats. Identifying venomous snakes by color pattern is notoriously misleading, as many harmless snakes have color patterns that closely mimic those of venomous snakes found in the same region.

VENOMS AND CLINICAL MANIFESTATIONS

Snake venoms are highly variable and complex mixtures of enzymes, low-molecular-weight polypeptides, glycoproteins, and other constituents. Among the deleterious components are hemorrhagins that promote vascular leakage and cause both local and systemic bleeding.