

## Module 4 – SCI Biology Part I: How an SCI Causes Loss of Function

### Factors that Determine Functional Outcomes

Each SCI is different, because all of the factors we have described in this module have an impact on which parts of the body are affected, and how much they are affected.

The location of the primary injury determines which parts of the body **may** lose sensation or movement because, as we have already learned, different regions of the spinal cord communicate with different parts of the body.

But the severity of the primary injury affects **how much** sensation and/or movement are lost. If the spinal cord is either cut or severely compressed, all nerve signaling is interrupted, resulting in a “complete” injury, meaning there is a complete loss of feeling and “motor function,” meaning muscle function, below the injury. If the spinal cord is less damaged, the loss of feeling and motor function can range from minimal to severe; these types of injury are called “incomplete” because not all feeling and function are lost.

In addition, because the nerves are arranged into distinct and separate sensory and motor regions of the spinal cord, it is possible that only sensory function, only motor function, or both will be affected.

The location and severity of the primary injury also affect how much damage occurs during the secondary injury.

The biology that underpins the phases of an SCI also plays an important role in determining functional outcomes. The damage that occurs during the subacute phase is responsible for much of the loss of function following an SCI. And the loss of function caused during the subacute phase influences the types and severity of secondary complications experienced during the chronic phase.

The American Spinal Cord Injury Association (ASIA) uses five classifications to describe the extent of spinal cord injury:

A complete injury is classified as ASIA A, which is an SCI that results in no feeling or function below the injury. Incomplete injuries are divided into

- ASIA B, where there is some feeling below the injury, but no ability to control movement;
- ASIA C, where there is feeling or movement in less than half the body below the injury;

- ASIA D, where there is feeling or movement in more than half the body; or
- ASIA E, where there is feeling and movement throughout the body.

Type of SCI	Classification	Description of extent of SCI
Complete	ASIA A	No feeling or function below the injury.
Incomplete	ASIA B	Some feeling below the injury but no ability to control movement.
Incomplete	ASIA C	Feeling or movement in less than half the body below the injury.
Incomplete	ASIA D	Feeling or movement in more than half the body below the injury.
Incomplete	ASIA E	Feeling and movement throughout the body.

These differences are important in research for many reasons. For example:

- Treatment results and side effects may be different in people whose injuries are different from each other.
- The location and severity of the injury a person has can affect their ability to participate in a research study. We will discuss this further in the module on Addressing Historical Challenges in SCI Research.
- The outcomes that are most important to a person with one type of SCI may be different from what is most important to someone with another type of SCI.

This is why it is important for research advocates who are helping to develop research projects to represent the entire SCI community, and not just those who have injuries similar to their own or their loved ones’.