main a member of the TMA, because we are committed to making a difference for you and we care about you!

We are going to remain the TMA; it may become a vestigial name reflecting the state of medical understanding in the early 21st century. For now, I’m not paid enough to be motivated to think of a new name and then change it on every publication we currently produce, not to mention the work Jim would have to do on the web site. So, read TM, think neuro-immunologic.

The Transverse Myelitis Association advocates for people who have transverse myelitis, recurrent transverse myelitis and recurrent optic neuritis or Devic’s Disease; recurrent optic neuritis; and acute disseminating encephalomyelitis or ADEM – and their loved ones and caregivers.

Please take good care of yourselves and each other.

The TMA does not endorse any of the medications, treatments or products reported in this newsletter. This information is intended only to keep you informed. We strongly advise that you check any drugs or treatments mentioned with your physician.

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eral nervous system and travel to different muscle groups in the arms, legs or other structures to facilitate movement. Going in the other direction, the spinal cord collects information from the periphery (e.g., skin, bones, internal organs) by receiving sensory nerve fibers (part of the peripheral nervous system) that connect with nerve cells inside and outside of the spinal cord. These nerve cells branch into nerve fibers that carry sensory information from the spinal cord to centers in the brain in charge of learning about the periphery of our body and are called ascending information. Both ascending and descending information travel in specific ascending pathways and descending pathways that are like highways with millions of nerve fibers going up and down.

Figure 1
A skull and spine
B The spinal cord is inside of the spinal column. Three major segments of the cord are identified: cervical, thoracic and lumbar.
C Projection of segments of the cervical cord to detail the most important components, the gray and white matter, dorsal and ventral roots and the dorsal root ganglia.
D Diagram with the main component of the spinal cord: dorsal and ventral horns of the gray matter and the dorsal and ventral roots.

Figure 2 Ascending Pathways (Sensory Function)
1 Information from nerves in the periphery (e.g., skin, muscles) arrives into the dorsal root ganglion and goes to the spinal cord.
2 Nerve fibers connect with neurons in the posterior (dorsal) horn of the spinal cord.
3 Information from neurons in the dorsal horn is distributed to ascending pathways.
4 Ascending pathways in the posterior and lateral region of the spinal cord travel to the brain carrying sensory information.

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Cord and those that innervate the legs and genitalia originate in the lumbo-sacral region. Centrally located in the spinal cord and surrounded by white matter is the gray matter. This is a butterfly-like structure in which millions of nerve cells, neurons, are located. Neurons play important roles as controllers of motor or sensory function. All information coming down from the brain through the descending tracts (motor function) end in specialized nerve cells called motor neurons. The motor neurons serve as motor engines for the different muscles and structures in the periphery. Motor neuron cells generate motor nerves and are a part of the peripheral nervous system that connects the spinal cord with the periphery. The majority of the motor neurons in the spinal cord are located in the most anterior portion of the cord called the ventral area. These motor neurons are organized along the spinal cord in groups that serve specific regions of the periphery. Information coming from the periphery to the spinal cord is also highly organized. Sensory nerves that carry information from the periphery (i.e., skin, bowel, bladder) to the spinal cord enter the gray matter and are specifically located in the posterior region of the gray matter or dorsal region. From there, these sensory nerve cells give rise to nerve fibers that carry information to the sensory centers of the brain. This information travels to the brain in the white matter in ascending pathways.

So, in summary, two major topographical compartments are found in the spinal cord: the gray matter that contains the nerve cells and the white matter that contains the ascending and descending pathways.

The red matter is ... blood!

There is really no red matter, but like all organs in the body, blood is important for the spinal cord. The blood supply for the spinal cord is an important factor for normal function. Blood vessels originating from other brain blood vessels supply the cervical and thoracic cord and a tiny blood vessel originating from an intra-abdominal arterial branch facilitates the blood supply to the lower thoracic and lumbar-sacral cord (Figure 1).

So, what can go wrong in this well organized scenario?

Many factors may disturb the stability in the spinal cord. The extent, magnitude and quality of this instability are variable. These factors may be extrinsic to the cord or may come from structures surrounding the cord, as in spinal trauma when bone fractures or herniated discs damage the cord by compression or disruption of the structure. Other factors may be intrinsic or originate inside the cord. This is what happens in many cases of TM. These intrinsic factors may originate from problems affecting the blood supply or from inflammatory changes resulting from infections, and the reaction generated by the immune system of the body.

The meaning of terms: Myelitis or Myelopathy? ... a fire or drowning?

More than a hundred years ago, French and British physicians observed and described TM for the first time ... the first Sherlock Holmes involved in the investigation of this problem. When the first pathology studies came out, a common observation in the structure of the spinal cord was a segmental and localized destruction of the tissues. It was often described as “spinal cord softening” or “transverse myelitis,” meaning that a segment of the cord was completely transected. The term “transverse myelitis” survived many years and is still the widely used medical term for this condition. The real situation is that in many cases TM is neither transverse nor myelitis. As the word defines, transverse means “being across or set crosswise.” The reality is that the “crime” does not, in all cases, occur across the entire structure of the spinal cord. In a majority of patients with TM, the injury or lesion occurs only in well delineated areas that may involve part of the cord, either the white matter or gray matter or both. When we...
observe complete transection of the cord, we then have patients with a fulminant disruption of cord function. This is the reason some patients and also physicians talk about a “partial” transverse myelitis or “incomplete” transverse myelitis to define the extent of the structural damage of the cord.

Now, the other problem in the definition is what myelitis means in TM. As a pathology term, everything that ends with -itis means inflammation. For example, encephalitis means inflammation of the brain. Ophthalmitis means inflammation of the eye. Hepatitis means inflammation of the liver. So, myelitis would mean inflammation of the spinal cord. But again, the reality is that not all cases of TM are myelitis; not all problems are caused by inflammation of the cord. To explain this situation, I need to name the two major “criminals” involved in the “crime” against the spinal cord in TM. One of them is the itis or, as I explained, the inflammation of the cord. The other one is a well known criminal … and the name is….. Well, there is no well established name, but we know that this criminal resembles the famous stroke of the brain or stroke of the heart that attacks many other patients. Yes, in many patients with TM, the criminal is a stroke of the cord. Since the term transverse myelitis has been with us for many years, it is now difficult to modify the term. In many instances, we would prefer to call the problem Myelopathy instead of Myelitis to mean that there has been a “…-pathy” of the spinal cord or, in more accurate terms, a damage or injury to the cord. As I said before, many of these words are just medical terms with no real meaning for patients, where the consequences of “TM” are the same regardless of the cause of the problem. But since we are talking about the pathology of TM, it is much better to set things straight.

**Lets learn about the criminals!**

There are two major gangs of criminals in TM. One big gang is the itis gang. The other I will call the bloody gang. We now know that the -itis gang produces inflammation of the cord and subsequently damages and destroys focal areas. These are the real myelitis cases. The bloody gang targets blood supply to the cord either by a stroke of the cord occluding blood vessels or via malformed blood vessels or by attacking blood vessels supplying different areas of the spinal cord. To understand how these gangs operate take a look at Figure 3.

One branch (itis) is associated with direct infection of the spinal cord produced by viruses, bacteria, fungi or parasites. This can affect any region of the spinal cord: cervical, thoracic
or lumbosacral. The extent of the attack and damage to the cord is variable and depends on the type of organism involved. Some parasites, such as those that cause schistosomiasis and cisticercosis, and viruses, such as herpes, belong to this gang. The main crime occurs when these organisms invade the spinal cord producing focal damage to the cord by triggering inflammation and destruction of the white matter, gray matter or both. The inflammation may spread like wild fire along the cord or may remain localized. The acute clinical presentation depends on the extent and magnitude of the inflammatory reaction mediated by white blood cells and proteins from the bloodstream.

The postinfectious branch is formed by “friendly fire” from our immune system. The body’s defense mechanism, our immune system, is comprised of two lines, proteins called immunoglobulins that try to neutralize the infective agent and white blood cells that also attack the infective agent or produce substances to neutralize the infection. In the majority of cases, our immune system triumphs, defending our body from diverse types of infections. But in few cases, they mistakenly attack parts of the nervous system. Our immune system self attacks and damages parts of the spinal cord or brain. Immunoglobulins or white cells, generated against the spinal cord weeks or months after infections, such as gastroenteritis or upper respiratory infections, trigger additional inflammatory chain reactions that damage the structure of the cord. As in the case of direct infection of the cord, the inflammation can spread along the cord or may remain localized.

The third well known branch is comprised of a group of systemic autoimmune disorders in which the immune system turns against the body it is defending. Some known disorders include Systemic Lupus Erythematosus, a disorder in which autoantibodies are excessively produced. Others, such as multiple sclerosis, a neurological disease associated with autoimmunity, is frequently of concern when patients are diagnosed with transverse myelitis. In many of the autoimmune disorders, damage to the blood vessels and subsequent injury to the white or gray matter structures of the cord are the main cause of the problem.

No blood … no function!

The no-itis “bloody” gang is, of course, associated with blood. The blood supply to the spinal cord is fundamental to its function. Any disturbance produced to the blood supply of the cord may have deleterious consequences and is a major concern when evaluating patients with transverse myelopathy (oops, this is pathy rather than itis!). The “bloody” gang may have different faces. One face is malformation. Abnormal and malformed blood vessels form dysfunctional blood vessels called arteriovenous malformations, which are associated with decreased blood supply to the cord and injury to the white or gray matter structures. Another face is clogged pipes, in which blood vessels supplying the cord get occluded by arteriosclerosis, clots or injury produced by herniated discs or masses external to the cord. In many patients, the attack is quite fast, leaving behind a lot of spinal cord damage. Occasionally, the face of this gang may turn “bloody” due to hemorrhages inside the cord.

Why the identification of the criminal’s last name is important!

The criminal investigation or the pathological investigation is just the search for the reason why? and how? Understanding the criminal gang involved, itis (inflammation) or non-it is (non-inflammation or pathy), is the first approach for an adequate treatment in TM patients. That is the reason we jump to do more investigation, such as the use of imaging by magnetic resonance or studies of the cerebrospinal fluid. These “searches” help clarify whether the suspect is part of the gang itis or bloody and help identify treatment modalities. One example of this concern is when patients are identified as having transverse myelitis, it is believed that use of corticosteroids may improve the inflammation. Of course, when the problem is transverse myelopathy, things may turn out to be more difficult and complicated. The reason for the complication, no it is, no inflammation, no response to corticosteroids (or at least, that it is what we believe)!

How to clarify the pathology of TM?

The gang names are important to understanding TM and its consequences. Different approaches of investigation, imaging by MRI, spinal fluid studies or blood testing, facilitate some answers to questions. Occasionally, the use of “biopsies” or tissue sampling for microscopic examination is required. All of these studies are not superfluous, they are necessary to our understanding this condition and how to treat its consequences. After assessment and identification of the sources of the problem, the next step is to evaluate the magnitude of the problem or, in other words, how much damage was done and what we need to do for improvement.

Next: How the pathology determines the presence or absence of symptoms? Why do I have pain months after my TM?