

DECOMPRESSION SURGERY FOR RELIEF OF PERIPHERAL NERVE PAIN

This is a compilation of several articles from professional journals that have been simplified to be more easily understood.

The study peripheral nerve compression began in earnest in the late 1980's with a number of researchers, among which was A. Lee Dellon, M.D. who is a professor of Plastic Surgery and Neurosurgery at Johns Hopkins University Medical School. As a result of his research, Dr. Dellon has published over 100 papers on the subject of peripheral nerve entrapment.

As the nerve leaves the spinal cord to innervate the remainder of the body, they are required to pass around and through the bones, muscles, ligaments and tendons of the extremities in order to reach their ultimate destinations. In doing so, there are areas of the body where these nerves must pass through very small canals or tunnels. Two of these important tunnels are in the wrist: the carpal tunnel; and in the ankle, the tarsal tunnel. It is in these two areas that the nerves leading to the hands and the feet become trapped and compressed, causing the symptoms of numbness, weakness, tingling and burning pain. Our concern is the tarsal tunnel on the inside of the ankle and in some cases the Anterior Tarsal Tunnel on the front of the ankle.

HOW DO THESE NERVES BECOME COMPRESSED?

As the nerves pass through these very small tunnels, there are a number of reasons why they can become compressed. Sometimes injuries and surgery to repair ankle injuries can cause scar tissue in the area of the tunnels. Even

repeated ankle sprains over a life time can cause Tarsal Tunnel Syndrome. More recently, studies have shown that some of the agents used in chemotherapy treatment (Cisplatin and Taxol) are also causative agents in peripheral neuropathy. The vast majority of peripheral neuropathy that we treat however, is the result of diabetes. This is what is addressed in this paper.

In diabetes, there are three causative principal that lead to the compression of the nerves as they pass through these restricted tunnels.

1. In a diabetic with elevated sugar levels; even though they are in good control, the sugar is attracted to the nerve. In the nerve, the sugar is metabolically changed into a substance called Sorbitol. Sorbitol is a substance that attracts water and therefore the nerve becomes larger in volume (swollen) because of this.
2. As the nerve becomes swollen within the small tunnel, the increased external pressure causes a decreased blood flow to the nerve causing what is called ischemia. As the nerve does to have it's normal blood supply, the consequences is the perception of paresthesias. This is the feeling of tingling, burning and then numbness over a period of time. If this is prolonged, some death of the nerve will occur.

3. Lastly, there is within the nerve a “flowing” of protein that is used to repair and rebuild damage done to nerves with injuries and daily living. This has been given the name of axoplasmic flow. When there is a compression of the nerve as we have described, there is a decrease or slowing of this transport of proteins and thus the nerve is unable to repair itself. When this happens, the nerve becomes hardened and is unable to slide back and forth within in the tunnel as we walk. This causes further damage.

This was first demonstrated in studies on rats and then later on humans. This is largely the work of Dr. Dellon at Johns Hopkins.

With these studies and conclusions, Dr. Dellon postulated that if he could somehow make the tunnel larger, then the nerve could expand and the symptoms and the nerve damage would be resolved.

The second contribution that Dr. Dellon made in his study of the tarsal tunnel was that there was more than one tunnel as we formally thought and as I was taught in medical school. He now calls it the Tarsal Tunnels. When I was trained in surgery back in the 1970’s and 80’s, we were taught how to release just one of the tunnels because the other tunnels had yet to be discovered. As a result of this, the results of the surgery were not that great. With the discovery of the other tunnels and

the development by Dr. Dellon of a surgical procedure to decompress all of the tunnels, the results have skyrocketed.

We now know and it has been published in many papers that if a patient has a positive tinels sign (tingling when the nerve is trapped) and the nerves are decompressed; there is a 90% chance that the pain will be resolved and sensation will return. A nerve will regenerate at a rate of about 1mm per day.

Dr. Dellon also has several studies where diabetic patients had the nerves decompressed on one leg and not the other. In almost every instance, the leg that was decompressed did not have any ulcerations or amputations while the leg that was not decompressed went on to have ulcerate and in several cases amputation was necessary.

HOW DO WE DECOMPRESS THE NERVES?

Fortunately this is a procedure that can be done in the Ford Center for Foot Surgery. It is a procedure that is done with Intravenous Sedation and a regional block anesthetic. Thus you are comfortable and unaware during the procedure but you are not under a general anesthetic.

Because we are working with the nerves that are very small, the surgery is done under magnification so that I do not do damage to any of the small branches of the nerves. There are also some very large arteries next to the nerves that we do not want to damage.

Once you are sedated and all of the preparations are made, an incision is made on the inside of your ankle area. This incision begins just above the ankle bone and extends down to the sole of the foot. It is approximately 4 inches long. As the incision is deepened, all of the little “bleeders” are cauterized so that there will not be a post op hematoma form. The band of tissue that covers the tarsal tunnel is then located and the “roof” of the tunnel is removed. Often times when we do this, we will see the nerve actually expand. A second deep incision is then made and the branch of the nerve that goes to the heel is located and that tunnel is opened as well. We then move to the foot where the large nerve (posterior tibial) branches into two nerves that go into the bottom of the foot. These two tunnels were what was discovered by Dr. Dellon. These two tunnels are the most difficult to decompress but are the two tunnels where the nerve is the most often entrapped. Once these tunnels are located, the roof of the tunnel is removed and the “septum” that divides the tunnel into two tunnels is removed. This then allows these branches to pass down to the bottom of the foot uncompressed.

If you also have an entrapment on the top of the foot, there will be a second incision there as well.

WHAT CAN I EXPECT AFTER THE SURGERY?

The two most significant complications from this surgery are infection and formation of scar tissue. We do everything possible to prevent infection. At the time of surgery you will be given an antibiotic in your IV. We then give you an oral antibiotic to take for 5 days following surgery. The most important thing in preventing infection is that you keep your foot dry for at least two weeks or until we tell you that you can get it wet. The second complication is the formation of scar tissue within the wound. After the surgery you will be told that you must move the ankle around several times every hour for the first week. This is critical! While we must protect the incision and allow normal healing, we must keep the inside tissue moving so that “adhesions” will not form.

As far as pain is concerned; since the surgery is a “soft tissue” procedure, there is little pain from the surgery itself. There may be pain in the form of increased tingling, some “shock like” symptoms that we call “zingers” and other unexplained pains. These pains are good and indicate that nerves are coming alive and regenerating. You will have pain medication if you need it for these pains. Generally, some sensation will return immediately. This will probably be in the

form of being able to feel your feet being tickled. As the days and weeks pass, more and more feeling will return. With that, you will have an increase in your balance. Studies have shown that it can take up to a year for the nerve to complete its healing. During that time, we will be testing you periodically to see how the nerves are responding. For those of you who are diabetic, it is imperative that during the healing period you work very hard to maintain good control of your sugars.

We are delighted to be able to serve you, it is our goal to make this a pleasant experience and to do all that we can to help regain the feeling in your feet and prevent the terrible problems that can happen when this is not treated.

If you have any questions after you read this, we will be happy to answer them.