Clinical outcomes of surgical decompression of the Common Peroneal nerve (CPN), Superficial Peroneal nerve (SPN), Deep Peroneal nerve (DPN), and Tarsal Tunnel (TT) release in the diabetic and non-diabetic population

Bethesda Hospital East
BAPTIST HEALTH SOUTH FLORIDA

Gostich, Sarah DPM; Bowles, Perez, Julio DPM; Ashley DPM, FACFAS; Kinmon, Kyle DPM, FACFAS, Ortiz, Julio DPM, FACFAS

1 First Year Resident Physician, Bethesda Health Foot and Ankle, Boynton Beach, FL; 2; Second Year Resident Physician, Bethesda Health Foot and Ankle, Boynton Beach 3; Director of Education & Attending Foot and Ankle Surgeon, Bethesda Health Foot and Ankle, Boynton Beach, FL, 4; Residency Director, Bethesda Health Foot and Ankle Surgical Residency, Boynton Beach, FL; 5;Attending Foot and Ankle Surgeon, Bethesda Health Foot and Ankle, Boynton Beach, FL

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STATEMENT OF PURPOSE

Peripheral neuropathy is a debilitating problem that can causes severe pain and reduction in quality of life. The purpose of this study is to analyze subjective clinical outcomes, such as pain and overall quality of life after undergoing surgical decompression of the Common Peroneal nerve, Superficial Peroneal nerve, Deep Peroneal nerve, and Tarsal Tunnel release.

METHODOLOGY

A retrospective study was performed on 20 patients who underwent surgical nerve decompression of the Common Peroneal nerve, Superficial Peroneal nerve, Deep Peroneal nerve, and Tarsal Tunnel release. Of the pts, 7 were non-diabetics and 13 were diabetics with peripheral neuropathy. The surgical procedure was performed by the same two surgeons, authors KK and AB, at Bethesda Hospital East between April 2018 and August 2019. Of the twenty patients who were identified, 6 non-diabetic and 9 diabetic patients met our inclusion criteria. Inclusion criteria included:

1) Maintain a HgA1C of < 7% throughout the post-operative course
2) Follow up for minimal 20 weeks postoperatively

One of the 7 non-diabetic patients did not have a minimum follow-up of 20 weeks. Three of the diabetic patients did not maintain a HgA1C of < 7% and one of the diabetic patients did not have a minimum follow-up of 20 weeks. Patient pain and overall quality of life was subjectively analyzed prior to the surgical nerve decompression of the Common Peroneal nerve, Superficial Peroneal nerve, Deep Peroneal nerve, and Tarsal Tunnel release compared with post-op follow-up at twenty weeks. Pain and quality of life were rated as significant improvement, improvement, no improvement, or worse.

PROCEDURE

General anesthesia was performed by anesthesia services. The lower extremity was prepped in the usual aseptic technique and a thigh tourniquet was applied.

Common Peroneal Nerve Decompression: Knee was flexed, CPN identified around the fibular neck. Incision made with #15 blade approximately 4 cm in length obliquely at a 40 degree angle to the long axis of the fibula. Incision was carried down to the level of the superficial fascia using curved metz and finger for blunt dissection. The Superficial fascia was carefully cut along the course of the incision with the metz scissors, Small tenotomies and atraumatic pickups were used to dissect the soft tissue and fibers around the CPN nerve. The CPN was clearly identified and freed from all of its soft tissue attachments proximally and distally. The back end of the pickups were used to protect the nerve proximally as dissect fibrous bands and also distally beneath the deep fascia distally. A T-fasciotomy was performed in the deep fascia with tenotomy scissors (deep to the peroneal longus muscle belly) and care was taken to avoid cutting any muscle innervation nerve fibers or muscle belly . An army navy was used to grab all the muscle belly to protect this area. No constrictive bands could be palpated.

Superficial Peroneal Nerve Decompression: Attention was directed to the lateral right leg approximately 10 - 12 cm proximal to the distal tip of the fibula. **A** #15 blade was used to make a linear incision, 4cm in length. Curved metz were used to spread through subcutaneous tissue down to the level of the superficial fascia. The SPN was identified where it pierces the fascia from deep to superficial. The back of the pick ups were used to isolate the nerve posterior, and the curved metz were run proximal and anterior creating a fasciotomy. It was ensured that the SPN was free from all soft tissue attachments

PROCEDURES CONTINUED

Deep Peroneal Nerve Decompression: Attention was directed to the dorsum of the foot. The EHL tendon was palpated at the base of the 1st metatarsal and the most proximal aspect of the 1st Intermetatarsal space was palpated. A Small 2cm linear longitudinal incision placed in the proximal 1st Intermetatarsal space. Blunt dissection was carried with a mosquito hemostat down to the EHL. The Hallux was put through ROM along with the Distal phalanx of hallux through ROM to identify the EHL. Blunt dissection was carried laterally and the EHB was identified. The hallux was again put through ROM to identify it is the EHB tendon. The EHB was grasped with a hemostat and transected, 1cm of the EHB tendon was removed. A hemostat was placed in the proximal 1st intermetatarsal space and opened to release any soft tissue constrictions

Tarsal Tunnel Release: The medial malleolus and navicular tuberosity were marked out. 3 tunnels were drawn for the LPN, MPN and Medial calcaneal branch, starting form the navicular tuberosity. A 1cm incision was made posterior to the distal tip of the medial malleolus obliquely toward the medial plantar nerve tunnel (The middle tunnel) 4cm in length with a #15 blade. Blunt dissect with tenotomy scissors was carried down through the subcutaneous tissue. The Posterior tibial nerve was followed and released from constriction proximally with curved metz. The posterior tibial nerve was followed distally to and the 3 specific branches were identified and freed from the septa with scissors as far distal as possible. The medial calcaneal branch was followed distally and at its enters the abductor hallucis deep fascia perform. A T-fasciotomy was performed, avoiding cutting the muscle belly. The medial and plantar nerve tunnels were identified. Hemostat were placed in each tunnel. The fibrous tissue were dissected around the distal entrances and opened with the hemostats to free any adhesions. The inter tunnel septum between the medial and lateral plantar nerves was identified and the proximal portion of the septa was removed.

RESULTS

Of the two patient populations, none relayed quality of life or pain to be worse. 8 diabetics said they had significant improvement of quality of life, 7 diabetics said they had significant improvement in pain and 1 diabetic said they had improvement in pain. 1 diabetic said they had no improvement in pain or quality of life. 5 non-diabetic patients said they had both significant improvement in pain and quality of life. 1 non-diabetic said that had no improvement in pain or quality of life. 88% of diabetics and 83% of diabetic said they had significant improvement or improvement in both pain and quality of life following the surgical nerve decompression.

Figure: Significant Improvement (SI), Improvement (I), No Improvement (NO)

DISCUSSION & CONCLUSION

The Double Crush Phenomenon is the idea that presence of nerve irritation at a proximal location of the nerve can cause entrapment of the nerve at another location along the path of that nerve. Dellon established a double-crush model for diabetic patients suffering from peripheral neuropathy. The first crush is that DM causes deficient axoplasmic flow and increased endoneurial water content, making the nerve more susceptible to entrapment. The second crush is that the edematous nerve is entrapped at anatomically narrow sites.

Peripheral nerve decompression is a viable surgical option for patients suffering from debilitating peripheral neuropathy caused by nerve entrapment. If performed by an experienced surgeon, there is very little down side to the procedure and minimal recovery time. It is concluded that surgical decompression of Common Peroneal nerve, Superficial Peroneal nerve, Deep Peroneal nerve, and Tarsal Tunnel release showed significant improvement of pain and quality of life in non-diabetic and diabetic patients suffering from peripheral neuropathy.

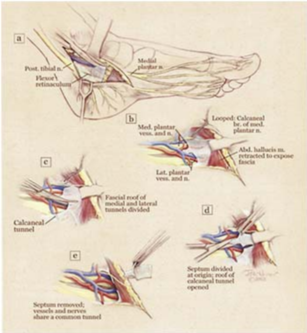

Image 1: Illustration depicting Dellon's nerve decompression

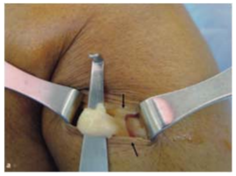

Image 2: Neurolysis of the CPN

Image 3: Neurolysis of SPN

Image 4: Neurolysis of the DPN

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