



Report on a case series investigating a neurostimulation device for the treatment of pain and improvement of mobility and function following elbow surgery



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ARTICLE INFO

Keywords:

Neurostimulation
Elbow surgery
Acute pain
Mobility

ABSTRACT

A group of seven patients received neurostimulation (Stimpod) post-tennis or golfer's elbow surgery as their sole treatment to relieve acute post-operative pain, improve mobility and function. Patients undergoing the above-mentioned surgery have had chronic pain with and without neuropathic symptoms for a prolonged period. There is usually severe injury with active inflammatory processes due to the surgery. It was thought that treating these patients aggressively early post-operatively may expedite pain relief and the healing process.

Method: After their surgery, seven patients were given neurostimulation for three treatments of 20 min each on the brachial plexus during the 10 days before the splint was removed. This was followed by 6 treatments, twice weekly of 20 min each after the splint was removed. At each of these treatments 5-min stimulation were administered to four areas: the nerve supply (1) superior and (2) inferior to the elbow and (3 and 4) on either end of the wound. Patients were evaluated for pain with the visual analogue scale, movements of flexion and extension measured with a goniometer, strength and flexibility with a 12-movement activity scale, status of the wound and satisfaction with treatment, mobility and function. These measures were re-evaluated telephonically at one, three and six months after the last treatment.

Results: Significant pain relief was achieved by all of the seven patients before the splint was removed at the 4th treatment. Pain relief, range of movement and function was greatly improved at the final (9th) treatment by six of the seven patients and this was maintained with nearly full improvement of the above parameters for most of the participants at one month after the last treatment. Two patients had to have re-operation due to requiring more extensive surgery in the one patient and falling and injuring the original surgical site in the other patient. At three and six months after the last treatment full improvement in all the parameters above was maintained in the remaining five patients who also had excellent wound healing and satisfaction with their treatment, mobility and function.

Conclusion: It appears that the neurostimulation (Stimpod) has the capacity to improve acute post-surgical pain and reduce pain, improve mobility, function and stimulate wound healing once the splint was removed. This treatment is relatively cost effective, is non-invasive and of short duration. Positive effects were all maintained at 6 months.

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1. Background

Patients undergoing epicondylitis surgery whether medial or lateral have had chronic elbow pain for a prolonged period often of many months to a year in some cases that has been unresponsive to conservative measures.

Although epicondylitis is a common condition in the arm due to physical overload, the prevalence of definitive lateral epicondylitis was 1.3% and that of medial epicondylitis was 0.4% according to a study in Finland (between 2000 and 2001). The prevalence did not differ between men and women and was highest in subjects aged 45–54 years [1,5]. Prior to surgery these patients have usually had non-surgical treatment and conservative care that includes decreased activity, ice, non-steroidal anti-inflammatory medications, muscle strengthening [2] and these modalities usually help most people. Recalcitrant cases may require cortisone injections that demonstrate the best conservative treatment for lateral

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epicondylitis [3] but provides only short-term benefits in medial epicondylitis [4].

Lateral epicondylitis, also known as “tennis elbow,” is an overuse syndrome of the common extensor tendon, predominantly affecting the extensor carpi radialis brevis. Patients complain of poorly defined pain located over the lateral elbow that is typically exacerbated by activities requiring wrist extension and/or wrist supination against resistance. There will often be pain in the morning as well as after any period of time that the elbow has been held in a flexed position [5].

Medial epicondylitis is a clinical entity characterized by pain in the medial aspect of the elbow and dysfunction induced by degenerative changes in the origin of the flexor-pronator muscle mass. The accumulated pathological evidence suggests that the process is associated with fibrillary degeneration of collagen and angiofibroblastic hyperplasia at the origin of the flexor-pronator muscle mass, microfragmentation or tears of the tendon, accumulation of vascular granulation tissue and tendinous necrosis, all of which are also accompanied by a secondary inflammatory reaction [6].

Non-operative treatment has been deemed highly successful, yet the few prospective reports available suggest that symptoms frequently persist or recur. Operative treatment is indicated for debilitating pain that is diagnosed after the exclusion of other pathologic causes for pain and that persists in spite of a well-managed non-operative regimen spanning a minimum of 6 months. The surgical technique involves excision of the pathologic portion of the tendon, repair of the resulting defect, and reattachment of the origin to the lateral or medial epicondyle. Surgical treatment results in a high degree of subjective relief, although objective strength deficits may persist [7].

During the last decade, increased attention has been paid to persistent pain complaints after almost any surgical operation with reported incidences ranging between 5% and 50% [8]. The International Association for the Study of Pain defines post-surgical pain as persistent pain after surgery of greater than three months duration [9].

Persistent post-surgical pain syndromes (PPSP) have been considered neuropathic [8] and a strong association is reported between PPSP and sensory abnormalities [10]; however, there is evidence that mechanisms other than nerve injury such as inflammation, central sensitization or a combination of these may play a role. It is important to elucidate whether persistent pain is due to surgical injury of the nerves, ongoing inflammatory processes, injury to the somatic or visceral structures or other causes [11].

Most of those patients that elected to have the surgery for the elbow in these case reports had chronic pain before surgery with or without neuropathic symptoms. It was thought that treating the acute post-operative pain aggressively early by blocking pain, improving wound healing and improving strength may have some impact on post-surgical pain.

If the patients in this case series elect to have the elbow surgery after 3–6 months of conservative care they are operated on the medial or lateral epicondyle. The procedures enumerated herein were given to the author by the orthopaedic surgeon performing the surgery.

The tendon of the extensor carpi radialis brevis is incised on the lateral aspect for tennis elbow and on the medial side, the common flexor origin is incised and any necrotic tendon is removed. A debridement of the epicondyle is performed on each side if necessary depending whether it is a tennis or a golfer's elbow. The patients are then placed into a back slab for 1 week or 10 days. This procedure will involve a certain amount of trauma to both soft tissue and bone and usually there is considerable pain from the intra-operative procedure that is usually ameliorated with anti-inflammatory and analgesic medication. Different types of these medications may be recommended as more suitable for different

individuals. Some of these patients may continue to have post-operative pain that could develop into a persistent post-operative pain syndrome with neuropathic elements. These symptoms may include burning, shooting and or sharp pain, hyperaesthesia on the wound site and may also produce electric shocks, tingling and paraesthesia [9] along the radial or ulna nerve distribution with prolonged limitation of movement and decreased strength in the forearm.

Recently a newly developed non-invasive pulsed radio frequency device (NI-PRF known as Stimpod or NMS 460) has been used to relieve neuropathic symptoms, improve nociceptive pain and increase mobility by decreasing muscle spasm, improving nerve conduction and thereby improving muscle control. It has also been observed that wound healing improves.

This device has been used in Europe and the United Kingdom with rapid effects occurring within 3–6 treatments even in intractable pain states for many patients since 2009. It has been investigated and used clinically in South Africa for the past 5 years and it has indeed relieved neuropathic symptoms and improved mobility and strength in many patients with varied conditions including intractable pain states [12].

The purpose of this study was to test this device as the only treatment provided for these patients receiving elbow surgery. It was thought that a population of patients requiring tennis or golfer's elbow surgical repair may be investigated to determine if a non-interventional pulsed radio frequency device alone could provide: (i) relief for the acute post-operative stage, (ii) assist with wound healing, (iii) improve range of motion and strength and have an effect on post-operative pain.

2. Literature review

Many attempts have been made to prevent post-operative pain with preemptive analgesia that may include intra-articular opioid injections or adjuvant pharmacological approaches without consistent clinical research findings [13].

The highest prevalence of PPSP was found after thoracic and breast surgery (34.5% and 31.0%), followed by THA/TKR and iliac crest bone harvest (19.8% and 18.7%); similar PPSP prevalences were found after prostatectomy (14%), gynaecologic surgery (13.7%), abdominal surgery (11%), mandibular osteotomy (10%), and donor nephrectomy (9.6%); the lowest PPSP was reported with groin hernia repair (7%) and varicose vein surgery (4.7%) [14].

The pathogenic mechanisms are multiple and can be grouped into preoperative, intra-operative and post-operative factors. This type of persistent post-operative pain (PPSP) is understood to be iatrogenic and could be prevented by identification of the mechanisms and risk factors although the underlying aetiology still remains unclear [15].

In evaluating electrical currents for post-surgical pain, according to a meta-analysis of transcutaneous electrical nerve stimulation (TENS) there was a reduction of post-operative analgesic consumption with assessment of the optimal treatment parameters [16].

Johnson reported some good quality systematic reviews on TENS that suggest that TENS is effective for musculoskeletal and post-operative pain [17].

TENS treatment was shown to be ineffective when used alone in severe post-thoracotomy pain (i.e. posterolateral thoracotomy incision), but useful as an adjunct to other medications in moderate post-thoracotomy pain (i.e. muscle sparing thoracotomy incision) and very effective as the sole pain-control treatment in patients experiencing mild post-thoracotomy pain (i.e. video-assisted thoracoscopy incision) but not in severe pain post-thoracotomy pain [18]. Hence, current evidence shows TENS associated with post-operative medications to be safe and effective in alleviating

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