

Ganglion cyst of the wrist treated with electroacupuncture: a case report

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Objective: *To illustrate the clinical management of a ganglion cyst presenting on the right dorsal wrist.*

Clinical Features: *A 38-year-old female complaining of a symptomatic right dorsal wrist ganglion of four years duration.*

Intervention and Outcome: *The patient was treated with high-frequency electroacupuncture in six consecutive treatments over a four week period and reported symptomatic improvement and a decrease in the size of the cyst following therapeutic intervention.*

Conclusion: *Ganglion cysts of the wrist are rather common benign connective tissue masses with variable treatment interventions. Electroacupuncture may be a novel and non-invasive conservative approach for the treatment of ganglion cysts. Further evaluation of the efficacy is warranted.*

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KEY WORDS: ganglion cyst, wrist, electroacupuncture

Objectif : *Présenter le traitement clinique d'un kyste synovial sur la face dorsale du poignet droit.*

Caractéristiques cliniques : *Une femme de 38 ans se plaint d'un kyste ganglionnaire sur la face dorsale du poignet droit, qui est apparu il y a quatre ans.*

Intervention et résultat : *Après six traitements consécutifs par électroacupuncture à haute fréquence sur une période de quatre semaines, la patiente a constaté un soulagement de ses symptômes et une diminution de la taille du kyste.*

Conclusion : *Les kystes ganglionnaires sont des excroissances de tissu conjonctif plutôt fréquentes et bénignes qui se traitent de diverses façons. L'électroacupuncture pourrait constituer un nouveau traitement non effractif. Une évaluation plus approfondie de son efficacité serait justifiée.*

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MOTS CLÉS : kyste ganglionnaire, poignet, électroacupuncture

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Introduction

Ganglia are benign soft tissue masses most commonly encountered in the wrist, but may occur in any joint.^{1,2} Sixty to seventy percent of ganglion cysts within the body are found in the dorsal aspect of the wrist while thirteen to twenty percent of ganglion cysts are found on the volar aspect of the wrist.^{1,2} Dorsal wrist ganglion cysts are the most common soft tissue masses in the hand and wrist.³ Ganglion cysts may affect any age group, but are more common in the twenties to forties, with a greater preponderance in females.²

Ganglion cysts typically originate from connective tissue such as joint capsules and tendon sheaths, and less commonly within bone.¹ Electron microscopy demonstrates the wall of the ganglion to be composed of randomly oriented sheets of collagen, which contain focal areas of mucinous degeneration.¹ Ganglion cysts contain highly viscous fluid comprised mainly of hyaluronic acid and lesser amounts of glucosamine, globulins and albumin.^{1,2,4} The origin of ganglion cysts have not been fully elucidated. Pre-existing intra-articular joint pathology, joint stress leading to mucoid degeneration of adjacent extra-articular connective tissue, and joint stress stimulating mucin secretion by mesenchymal cells are the most commonly warranted theories within the literature.¹

Prevalence is 19% in patients reporting wrist pain and 51% in the asymptomatic population.² Patients seeking care for these cysts generally complain of local pain and tenderness, and less often paresthesia. Volar ganglion cysts may cause pain or paraesthesia from compression of the ulnar or median nerves or their branches, while dorsal ganglion cysts may compress the terminal branches of the posterior interosseous nerve.¹ When pain is present, patients will often consider it to be an annoyance and of lower pain intensity, rather than be debilitating in nature.⁵

The natural history of ganglions is unknown, and few studies of high methodological quality have evaluated the resolution of untreated ganglions. Studies have reported 8-50% spontaneously resolve in adults over approximately 2 years.^{1,5-7} Currently, patients with wrist ganglions are typically educated and reassured regarding the mass and no further intervention is suggested, or they are offered either aspiration, sclerotherapy, or surgical excision.⁸ However, the treatment methods for ganglion cysts have proved inconsistent and variable. It is predicted that aspiration therapy has a success rate of only 30-50%, with a

greater chance of reoccurrence than surgical excision.⁶⁻⁸ Sclerotherapy has also been used for the treatment of ganglion cysts. A lack of success, coupled with potential side effects such as joint damage risk via sheath connections amongst the ganglia and tendon or joint capsules has led to a general abandonment of such injections.⁷

Open surgical excision remains the gold standard for the treatment of ganglion cysts. In 2015, a systematic review by Head and colleagues reported a 76% and 58% reduction in the reoccurrence of ganglion cyst compared with aspiration in randomized controlled trials and cohort studies, respectively.⁸ However, reoccurrence rates ranging from 7-43%^{6,9,10} are cited in the literature and is likely attributed to imperfect excision and surgeon experience^{3,6,9,10}.

This case report illustrates the conservative management of a ganglion cyst of the dorsal wrist using electroacupuncture. The report also outlines epidemiology and pathophysiology of ganglion cysts and management procedures, as well as the theoretical basis and literature application of electroacupuncture.

Case Presentation

A 38 year old female presented to a chiropractic clinic with a symptomatic and prominent dorsal wrist ganglion that was localized to the radial side of the right wrist. She stated the ganglion began insidiously during her second pregnancy four years prior and had remained since. The ganglion had been progressively increasing in size. The ganglion reportedly restricted the patient from numerous activities primarily involving loaded wrist extension. Due to this she was unable to participate in yoga, pilates, as well as certain weight lifting activities including pushups, and any quadruped exercises. The cyst on occasion was also bothersome while carrying her children. The patient had notified her family physician of the cystic mass on multiple occasions over the four years who instructed her it was a ganglion cyst and that no further diagnostic imaging was needed. The patient was also informed by the family physician that there was little that could be done to reduce its size or its symptomatology.

On examination, with observation a very prominent dorsal wrist ganglion was present on the right wrist towards the radial side of the wrist joint. Wrist range of motion was full in extension, radial and lateral deviation, pronation and supination. With wrist flexion, the ganglion



Figure 1.

Cyst appearance at beginning of treatment protocol. The ganglion cyst was located on the dorsal aspect of the right wrist. The cyst was measured at 2.22 cm by 2.22 cm when the patient initially presented at the sports chiropractic clinic. The dashes represent the superior, inferior, medial and lateral borders of the cyst.

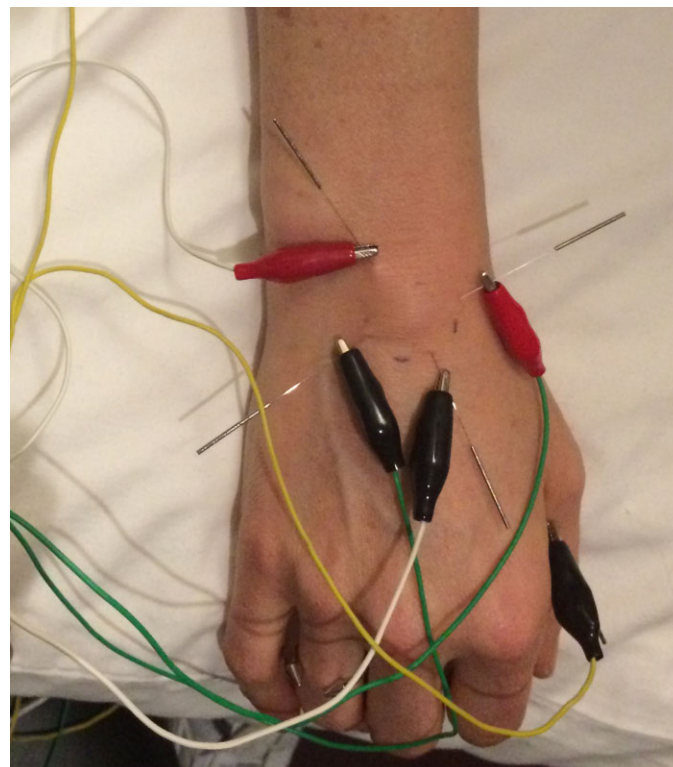


Figure 2.

Electroacupuncture protocol utilized. Four needles were inserted directly into the ganglion cyst, one needle in LI-4 and one needle in LI-11. The needles were set to high frequency stimulation at 210 Hz and the channel intensity was increased to the patient tolerance in each session.

became more prominent and restricted flexion by 10 degrees compared to the left wrist. End range wrist flexion and extension were deemed painful with a numerical pain rating intensity of 4/10. With palpation the ganglion was mobile and soft. Orthopaedic testing of the wrist and surrounding structures consisting of carpal ballottement and instability tests did not produce any positive results. The cyst measured 2.22 cm in height and 2.22 cm in width (Figure 1).

The patient was diagnosed with a ganglion cyst of the wrist and consented to a trial of care of electroacupuncture treatment. At the initial evaluation the patient completed a Patient Rated Wrist Evaluation¹¹ scoring 14/50 on the Pain scale, and 11/50 on the Function scale for a total score of 25/100. The patient also completed a Quick-

dash¹² outcome measure scoring a 31.8 on the disability/symptom score, 25 on the work module (homemaker), and 25 on the sports/performing arts module.

The patient underwent six electroacupuncture treatments over a four week period. During the treatment, six local needles were used (0.25 mm diameter, 40 mm length). Four local needles were inserted directly into the ganglion cyst. One single needle was inserted into Large Intestine-4 (LI-4), which is located on the dorsum of the hand, to the side of the midpoint of the second metacarpal bone, in the adductor pollicis muscle. Another needle was inserted into Large Intestine-11 (LI-11), which is located between the lateral end of the cubital crease and the lateral epicondyle of the humerus. The positive pole (red lead in Figure 2) was attached to the needle at LI-11 at the



Figure 3.

Cyst appearance after 4 treatments with the sports chiropractor, the ganglion cyst was less prominent and decreased in size. The cyst was measured at 1.59 cm by 1.59 cm.



Figure 4.

Cyst Appearance at end of 6 treatments.

elbow and was crossed with the negative pole (black lead in Figure 2) that was attached to the needle at LI-4. For the four needles inserted directly into the ganglion, the positive poles (red lead) were directly crossed with the negative poles (black lead). The needles were set to high frequency stimulation at 210 Hz (Figure 2). The channel intensity was increased to the patient tolerance in each session.

By the fourth treatment, the cyst measured 1.59 cm by 1.59 cm and had a noted decrease in depth (the cyst was flatter and less prominent) (Figure 3). By the end of the sixth visit, the cyst was insignificant size (Figure 4) and required maximal wrist flexion to surface. Active wrist flexion and extension was 0/10 in pain. The patient also reported returning to pilates and yoga and being able to

participate in loaded wrist extension exercises for the first time in four years.

Five days following the final treatment, the patient again completed the Patient Rated Wrist Evaluation¹¹ scoring a 1.5/100, and a Quickdash¹² scoring a 6.8 on the disability/symptom score, and a 0 on both the work module and the sports/performing arts module.

A follow up visit was done approximately two years after the treatment was conducted, which revealed that the cyst had recurred but to a smaller size. The recurrence appeared to be secondary to extension loading exercises at the gym and with pilates training. She has consulted with a plastic surgeon and plans on having the cyst surgically removed.

Discussion

Ganglions are the most common soft tissue masses of the hand and wrist. Sixty to seventy percent of ganglion cysts are found within the dorsal aspect of the wrist and communicate with the joint via a pedicle, which contains a tortuous lumen, connecting the cyst to the underlying joint.¹ This pedicle usually originates at the scapholunate ligament, but may also arise from other sites over the dorsal aspect of the wrist capsule.¹ Thirteen to twenty percent of ganglia are found on the volar aspect of the wrist, arising via a pedicle from the radio scaphoid/scapholunate interval, scaphotrapezial joint, or the metacarpotrapezial joint, in that order of frequency.¹ Approximately ten percent of ganglia in this region are found from a flexor tendon sheath in the hand. Occurrence in other joints as well as intraosseous and intratendinous ganglia are much less common.¹

The pathogenesis of ganglion cysts is largely unknown. The concept that the cyst is a simple herniation of the joint capsule is unlikely due to a lack of synovial lining within the cyst itself. Ganglion cysts also do not appear to have an inflammatory etiology, as demonstrated by studies showing no pericystic inflammatory changes.¹ There are currently three other warranted theories within the literature. In the first, pre-existing joint pathology is hypothesized to be the underlying cause of cyst formation. Joint abnormalities are thought to lead to altered biomechanics, eventual weakening of the capsule, and finally leakage of fluid and cyst formation.¹ However, some authors do not support this theory due to a lack of correlation between this pathology and post cyst recurrence, despite arthroscopic findings confirming the presence of intra-articular joint pathology in 50% of ganglion patients.¹ Alternatively, joint stress may also lead to mucoid degeneration of adjacent extra-articular connective tissue with subsequent fluid accumulation and eventual cyst formation.¹ This theory holds that the cyst and pedicle form a direct connection to the joint only after the genesis of the cyst. Lastly, some authors believe that joint stress may stimulate the secretion of mucin by mesenchymal cells.¹ Most authors believe that ganglion genesis may be a combination of the last two theories, where joint stress may lead to a rent in the joint capsule or mucinous degeneration of extra-articular connective tissue, resulting in fluid (mucin) accumulation. The main cyst is then formed by the coalescence of small pools of mucin and subsequently has a direct connection to the joint.^{1,13}

The clinical presentation of ganglion cysts depends on their size and location.¹⁴ Symptoms include aching in the wrist that may also radiate up the patient's arm, pain with activity or palpation of the mass, decreased range of motion and decreased grip strength. Volar ganglion cysts may also cause paraesthesia from compression of the ulnar or median nerves or their branches.¹ The cause of pain in dorsal wrist ganglia is postulated to be from compression of the terminal branches of the posterior interosseous nerve. However, peripheral nerve symptoms due to ganglion cysts are not considered to be common.¹⁴

The treatment of a ganglion cyst is initially conservative. Non-surgical treatments typically include reassurance of the patient without any intervention or aspiration with or without injection of various substances. The most popular conservative treatment intervention is non-image guided aspiration followed by steroid injection.¹⁰ An aspiration is generally performed to remove fluid from the cyst and promote scar formation to limit future communication with the degenerative joint capsules or tendons. In 1999, Pontious and colleagues⁶ conducted a retrospective study evaluating the treatment of foot and ankle ganglion cysts in three different conservative treatment intervention groups consisting of steroid only, aspiration only, and aspiration with steroid intervention. They found that 62.5% of patients had recurrence or incomplete resolution, with no significant differences in recurrence of the ganglion between conservative treatment types.⁶ Aspiration with steroid injection has not provided any additional efficacy, which may be expected as there is no evidence to support the presence of inflammatory mediators within the acellular cyst.¹ Although reoccurrence rates are generally high, the risks associated with aspiration intervention such as local skin infection and increased pain remains low.³ Aspirations are typically done with no additional imaging, ultrasound has gained widespread acceptance for a variety of musculoskeletal interventions and has been validated as an acceptable method to localize ganglion cysts. Zeidenberg and colleagues¹⁵ investigated the results and patient satisfaction of ultrasound guided aspiration of wrist ganglion cysts. They found that there was a lower overall recurrence rate at 20% (8 of 39 patients) with high patient satisfaction, even in those with recurrence. They suggest that ultrasound guidance would aid in improving patient satisfaction by decreasing the number of punctures and improving accuracy. Future studies

should look at comparing ultrasound guided aspiration with other treatment options such as surgical excision and blind aspiration.¹⁵

Techniques designed to increase inflammation to enhance scarring and closing of the potential space has been used in the past, such as sclerotherapy. However, this procedure is currently not recommended due to the potential damage within the communicating joints and tendons.⁷

Following failed conservative treatment, surgical excision is often recommended for the painful cyst. Open surgical excision offers significantly lower chance of recurrence compared with aspiration in the treatment of wrist ganglions.⁸ However, recurrence rates ranging from 7-43% are cited in the literature and are likely attributed to imperfect and incomplete excision^{6,9,10}. As removal of the of the entire ganglion cyst complex, including cyst, pedicle, and a cuff of the adjacent joint capsule requires thorough excision procedures, surgeon experience also appears to affect recurrence rates. Surgical excision remains the gold standard for treatment of ganglion cysts, however this comes with greater risk when compared to aspiration, which can include complications such as increased pain and stiffness, infection, neuroma, hypertrophic scar, neuropraxia, and vascular damage.^{1,2,5} A recent study by Kim and Lee¹³ also investigated which conditions should be considered to make a successful resection of the entire ganglion complex during open surgical excision of dorsal wrist ganglion cysts. They found that it was difficult to identify the pedicle and its capsular attachment due to a large cyst with severe adhesion to adjacent soft tissues including the joint capsule. Rupturing a cyst on purpose helps to identify the pedicle and minimize capsular loss. A ganglion over the radiolunate joint was most commonly found and excision of the joint capsule over the scapholunate joint without identification of the pedicle and its capsular attachment may result in recurrence. They further add that higher recurrence rates were most likely related to incomplete resection, which were more commonly made in ganglions over uncommon sites.¹³

Patient's perception of cosmetic or malignancy concerns may explain an increased satisfaction following surgical excision regardless of pain resolution. A study by Westbrook and colleagues in 2008 investigated why patients actually seek medical attention for ganglion cysts, they found that 38% of the patients expressed cosmetic

concerns, 28% were concerned about malignancy, and only 26% presented because of pain.⁵ At this time, treatment methods for ganglion cysts provide variable and inconsistent results.

Acupuncture is defined by the World Health Organization (WHO) as "to puncture by needle", however many application techniques exist, including that of electric or electroacupuncture.¹⁶ When performed by a well-trained professional, acupuncture is generally safe with minimal adverse reactions.¹⁶ Acupuncture is also generally considered a simple, cost effective and convenient treatment intervention.¹⁶ Within the WHO acupuncture review of controlled clinical trials, analgesia, protection against infections, and regulation of various physiological functions are considered therapeutic mechanisms.¹⁶

The analgesic efficacy of acupuncture is well documented within controlled clinical trials. Electroacupuncture literature supports the analgesic effects and short-term decreases in pain threshold mediated via humoral factors.^{17,18} These analgesic effects appear to be greater than those following manual acupuncture.¹⁹ As such, the WHO states that acupuncture could "serve as a valuable alternative treatment for many conditions in which modern conventional treatments are unsuccessful"¹⁶.

The treatment of ganglion cysts with electroacupuncture is an innovative approach. In 2006, Tekeoglu and Dogan investigated the utilization of electroacupuncture for the treatment of a ganglion cyst located on the dorsal wrist.²⁰ In this case report, they utilized a two needle acupuncture technique. One needle was inserted through the ganglion towards the wrist joint and the second needle was inserted at Large Intestine-11 (LI-11), which is located over the lateral epicondyle of the elbow. Electrostimulation at a frequency of 5Hz was then applied to the needles and intensity was increased to maximum patient tolerance. This technique was repeated over four treatments in two weeks. After treatment, the cyst rapidly disappeared and there was no recurrence or complaints during the one year follow up period. The authors suggest that the rapid disappearance of the ganglion cyst could be due to natural resolution, fluid leakage, or specific local effects of acupuncture. They also include potential explanations for the improvements which could be due to acute local vasoconstriction and vasodilation from mediator release of bradykinin, acetylcholine, and leukotrienes, or endorphin and corticosteroid release.^{20,21} It

is well known that analgesia induced by electroacupuncture using different frequencies is mediated by different endogenous peptides. Electroacupuncture at low frequencies mainly releases enkephalins and endorphins and at high frequencies, primarily dynorphins.¹⁷

Although ganglion cysts are most commonly found in the dorsum of the hand and wrist, they can occur anywhere in the body. Between 7-11% of all ganglia around the body occur in the foot and ankle area, to which they are the most common soft tissue tumour in this region.^{22,23} Similar to the wrist, the majority of ganglion cysts within this region are located on the dorsum of the foot, with a greater preponderance in females.^{6,22,24,25} In 2013, we presented a case study report on treating a ganglion cyst on the dorsum of the foot using high-frequency electroacupuncture.²¹ We used a four needle protocol (40 mm length, 0.3 mm diameter). A single needle was inserted into Stomach-36 (ST-36), which is located on the anterior aspect of the lower leg, distal to the anterior crest of the tibia within the tibialis anterior musculature. Another needle was inserted into Liver-3 (LR-3), which is located on the dorsum of the foot, between the first and second metatarsals. Two needles were then inserted into the cyst on opposite sides and stimulated for 15 minutes at 5Hz. The patient was treated in four consecutive sessions over four weeks, and reported resolution of the cyst eleven days following therapeutic intervention. In our present study, the patient was treated in six consecutive sessions over four weeks and reported resolution of the cyst five days following the electroacupuncture intervention. Patient follow-up at two years revealed that the cyst had returned but to a smaller size. A potential limitation to this case report is that we cannot definitively conclude that the temporary ganglion cyst resolution in our case was attributed to the acupuncture intervention or spontaneous resolution of time. We hypothesize that our electroacupuncture intervention may have provided improvements through inducing fluid leakage, endogenous neuropeptide release^{20,21}, serotonin release^{26,27}, activating pain inhibitory pathways^{26,28}, and nitric oxide release²⁹. The analgesic effect of our electroacupuncture could be due to the release of endogenous opiates such as dynorphins, which is primarily released with high frequency electroacupuncture.¹⁷ In addition to endogenous opiates, serotonin has also been speculated to play an important role in electroacupuncture analgesia. Tsai and colleagues suggested that electroacupuncture

may induce serotonin release due to the activation of enkephalin-interneurons, which presynaptically inhibit the primary sensory neurons in the spinal cord.^{26,27} Furthermore, serotonin descending pain inhibitory pathways may also be involved. Liu and colleagues found that electroacupuncture could activate serotonergic raphe-spinal neurons in the nucleus raphe magnus, a supraspinal area mediating a negative feedback circuit of pain modulation, thereby inducing analgesia via descending inhibition.^{26,28} Another potential mechanism for the temporary resolution of the cyst could be due to the release of nitric oxide, which is a key regulator of local circulation. Recent studies have found that acupuncture increases the levels of nitric oxide at the treated site, which mediates cutaneous vasodilation and regulates blood flow and volume.²⁹ Future research should further investigate the mechanisms of action of acupuncture on ganglion cysts as well as the utilization of different electroacupuncture protocols to determine if it would fully resolve or reduce the recurrence time of the cyst.

Summary

Ganglions are the most common soft tissue masses of the hand and wrist. The origin of ganglion cysts are not well known and include pre-existing joint pathology, joint stress leading to mucoid degeneration, and joint stress leading to mucin secretion. A wide variety of treatment interventions that have been developed are likely due to its frequent presentation to physicians and medical practitioners and lack of fully satisfactory mode of treatment. Ultimately, treatment selection should be guided by the potential outcomes and complications of each treatment option as well as the patient's symptoms. The ideal treatment intervention should aim to minimize symptoms and recurrence while limiting associated risks. Following subsequent research, electroacupuncture may serve as a safe, cost-effective, and valuable alternative treatment for ganglion cysts.

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