

Clinical Summarization Report

A Pain Management
Treatment Perspective

Electroanalgesia for Knee PAIN: The NeuroMed Delivery System in Clinical Practice

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Introduction

Knee pain can vary widely depending on the underlying cause, but it generally refers to any discomfort, soreness, or pain experienced in or around the knee joint. This type of pain can range from mild and temporary to severe and chronic. Here's a breakdown of what knee pain can feel like and the factors that contribute to it:

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Types of Knee Pain Sensations:

1. Sharp or Stabbing Pain:

- This type of pain is usually sudden and intense. It can occur during certain movements, like bending or straightening the knee, or when applying weight to the joint. Sharp pain is often associated with injuries like ligament tears, cartilage damage, or fractures.

2. Achy or Dull Pain:

- This is more of a constant, low-level discomfort. It can be caused by conditions like osteoarthritis, tendonitis, or bursitis. Achy knee pain is often felt after prolonged activity or at rest, especially in the morning or after a period of inactivity.

3. Burning Sensation:

- A burning feeling in the knee can sometimes indicate nerve involvement or irritation. Conditions like patellar tendinitis, which affects the tendon that connects the kneecap to the shin, can cause this type of discomfort.

4. Swelling and Stiffness:

- Along with pain, knee swelling and stiffness can occur. The knee may feel tight or difficult to bend or straighten fully. Swelling is often a result of inflammation caused by injury, overuse, or arthritis.

5. Clicking or Popping Sounds:

- Some people with knee pain hear or feel clicking or popping noises when moving their knee. This can be a sign of cartilage damage, meniscal tears, or joint instability.

6. Instability or Weakness:

- Knee pain can sometimes cause a feeling of weakness or instability, making it feel as though the knee might "give out" or buckle when walking or standing. This could be a sign of ligament damage or muscle imbalances around the knee joint.

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Common Causes of Knee Pain:

1. **Osteoarthritis:**

- The most common cause of knee pain in older adults. It occurs when the cartilage in the knee joint breaks down, leading to bone-on-bone contact. This results in pain, swelling, and stiffness, especially after activity or in the morning.

2. **Ligament Injuries:**

- Tears or sprains of the **anterior cruciate ligament (ACL)**, **posterior cruciate ligament (PCL)**, **medial collateral ligament (MCL)**, or **lateral collateral ligament (LCL)** can cause knee pain. These injuries typically occur from sports or sudden twists or impacts.

3. **Meniscus Tears:**

- The meniscus is cartilage that cushions the knee joint. A tear can cause sharp pain, swelling, and difficulty moving the knee. This injury is often due to twisting or pivoting movements.

4. **Patellar Tendinitis (Jumper's Knee):**

- Inflammation of the tendon connecting the kneecap to the shinbone. This type of pain is common in athletes, especially those who jump or run frequently.

5. **Bursitis:**

- Inflammation of the small fluid-filled sacs (bursae) around the knee can cause pain, swelling, and redness. This condition is usually caused by repetitive pressure or friction on the knee.

6. **Runner's Knee (Patellofemoral Pain Syndrome):**

- Pain around the kneecap, often caused by overuse, improper alignment, or muscle imbalances. This condition can cause aching, swelling, and discomfort while walking, running, or climbing stairs.

7. **Knee Fractures or Dislocations:**

- A fracture or dislocation of the bones around the knee (such as the patella or femur) can cause immediate and severe pain, often associated with swelling, bruising, and an inability to move the joint.

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Treating Knee pain, specifically through techniques like **Transcutaneous Electrical Nerve Stimulation (TENS)**, **interferential current (IFC)** therapy or **Electroanalgesia**. It works by applying electrical currents to the skin near the affected knee joint using Vaso Cup electrodes, and this has several mechanisms of action that can provide pain relief:

1. Pain Gate Theory

- The electrical impulses from electroanalgesia can stimulate the sensory nerves in the area where the electrodes are placed. This stimulation "closes the pain gate" at the spinal cord level, making it harder for pain signals from the knee to travel to the brain. Essentially, the brain gets distracted by the electrical signals and doesn't perceive the pain as intensely.

2. Endorphin Release

- Electrical stimulation can trigger the release of **endorphins**, which are natural pain-relieving chemicals produced by the body. Endorphins bind to opioid receptors in the brain, which helps reduce pain perception in the knee. This can be especially beneficial for chronic or acute knee pain.

3. Muscle Relaxation

- Knee pain is often linked with muscle spasms or tension, especially around the joint. Electroanalgesia can help to relax these muscles by stimulating them in a rhythmic or patterned manner. Relaxed muscles around the knee can relieve pressure on the joint and alleviate pain.

4. Improved Blood Circulation

- Electrical stimulation improves blood circulation in the area where the electrodes are placed. Increased circulation brings more oxygen and nutrients to the tissues while helping to flush out metabolic waste products. This can speed up recovery, reduce inflammation, and contribute to pain relief by helping the body heal the tissues around the knee joint.

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5. Reduction of Inflammation

- While electroanalgesia's primary function is pain relief, improved circulation and the modulation of local inflammatory processes can help reduce inflammation in the knee. The stimulation can promote lymphatic drainage, helping reduce swelling and promoting a reduction in the inflammatory response in the knee joint.

6. Inhibition of Pain Transmission

- The electrical impulses may also inhibit the transmission of pain signals along the nerves by interfering with the normal activity of pain-carrying nerve fibers. The pain signals may be blocked or altered before reaching the brain.

Electroanalgesia can also help reduce inflammation and relieve knee pain through several mechanisms that influence the body's inflammatory response. While its primary focus is pain management, there are indirect effects that can help with inflammation as well. Here's how it works:

1. Improved Blood Circulation:

- One of the key effects of electroanalgesia is the improvement of blood flow in the treated area. Enhanced circulation allows for better oxygenation and nutrient delivery to tissues, which can speed up the healing process and help reduce inflammation.
- By increasing the flow of blood, it helps remove metabolic waste products and inflammatory mediators that have built up in the tissues around the knee joint, reducing swelling and inflammation.

2. Reduction of Muscle Spasm:

- In cases of knee pain, muscle spasms around the joint can exacerbate inflammation. Electroanalgesia with IF can help relax these muscles, which reduces the tension and pressure on the knee joint, allowing the body to focus more on healing the injured area and reducing inflammation.

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3. Release of Endorphins:

- Electrical stimulation has been shown to promote the release of endorphins, the body's natural pain-relieving chemicals. These endorphins not only block pain signals but may also have anti-inflammatory effects, helping to modulate the body's immune response and reduce inflammation.

4. Modulation of Pro-Inflammatory Cytokines:

- Some studies suggest that electrical stimulation can influence the production of certain pro-inflammatory cytokines (molecules that promote inflammation). By altering the balance of these cytokines, electroanalgesia may reduce the inflammatory process in tissues around the knee.

5. Activation of Lymphatic Drainage:

- The electrical impulses can also stimulate lymphatic drainage. This system is crucial for removing excess fluids from tissues, and better lymphatic drainage can help reduce swelling and the inflammatory response in the knee.

Using Electroanalgesia which with treatments like **Transcutaneous Electrical Nerve Stimulation (TENS)** and **Interferential Current (IFC) Therapy**, offers several advantages over conventional therapies for knee pain, especially in terms of its non-invasive, drug-free nature and ability to provide targeted, customizable treatment. Here are the key benefits:

1. Non-Invasive and Drug-Free

- **Electroanalgesia** is a non-invasive treatment that doesn't require medications or surgeries. This makes it an appealing option for individuals who want to avoid potential side effects of pain medications, such as **NSAIDs** (nonsteroidal anti-inflammatory drugs) or opioids, especially for long-term management.
- It can also be used in conjunction with other therapies without interfering with them, providing an additional, complementary approach to knee pain management.

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2. Immediate Pain Relief

- Electroanalgesia can often provide **immediate relief** from knee pain. The electrical stimulation helps block pain signals and can induce the release of natural pain-relieving chemicals (endorphins), which results in quicker pain reduction compared to oral pain medications, which may take longer to act.

3. Targeted Treatment

- Electroanalgesia can be precisely applied to the specific area of the knee where the pain is localized, allowing for **targeted pain relief**. This is different from medications that might have systemic effects throughout the body, and physical therapies that might require more generalized treatment.

4. Reduced Risk of Side Effects

- Since electroanalgesia does not involve drugs, it carries a **lower risk of side effects** than conventional therapies like pain medications or corticosteroid injections. For example, long-term use of oral painkillers can lead to gastrointestinal issues, kidney damage, or increased risk of heart problems.
- With **TENS** and **IFC**, side effects are minimal, and most people can tolerate the treatment with few risks, especially when used correctly.

5. Chronic Pain Management

- Electroanalgesia is particularly effective for **chronic knee pain**, such as pain caused by osteoarthritis or tendonitis. Unlike medications that may only provide temporary relief, **electroanalgesia** can be used regularly to manage persistent pain without the risk of developing tolerance or dependency, which can happen with pain medication.

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6. Muscle Relaxation and Spasm Reduction

- In addition to pain relief, electroanalgesia can help **relax muscles around the knee joint**. This can be especially beneficial for those suffering from knee pain caused by muscle spasms or stiffness. The electrical stimulation can directly influence muscle fibers, reducing tension and improving flexibility.
- This is an advantage over conventional therapies, such as stretching or massage, which may not always target the underlying cause of muscle tightness as directly.

7. Improved Blood Circulation

- Electroanalgesia promotes **better blood circulation** to the knee joint by stimulating blood flow. This can accelerate tissue healing, reduce inflammation, and support recovery after an injury or surgery.
- Conventional therapies like ice or compression may help manage inflammation but don't have the same effect on long-term circulation improvement as electroanalgesia.

8. Convenience and Accessibility

- **Portable electroanalgesia devices** (such as home TENS units) are convenient and can be used in the comfort of your own home, offering more flexibility than conventional therapies, which might require appointments, clinic visits, or extended treatments.
- This makes it a more **cost-effective** option over time for those needing ongoing pain management.

9. Adjunct to Physical Therapy

- Electroanalgesia can complement **physical therapy** by helping manage pain during exercises, making it easier for individuals to participate in rehab activities. This improves overall therapy effectiveness, especially in cases where knee pain is limiting the patient's ability to engage in full rehabilitation.

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10. Reduced Dependency on Injections and Surgery

- For individuals with chronic knee pain or those who do not want to pursue surgical interventions, electroanalgesia offers a **less invasive alternative** to treatments like corticosteroid injections or joint surgeries, which can carry risks, costs, and recovery times.

Summary of Advantages:

- **Non-invasive and drug-free:** No need for medications or surgery.
- **Immediate pain relief:** Can provide faster pain relief compared to oral medications.
- **Targeted:** Directly targets pain at the knee without affecting the rest of the body.
- **Fewer side effects:** Safer than long-term use of painkillers.
- **Chronic pain management:** Suitable for long-term knee pain relief without dependency issues.
- **Muscle relaxation:** Helps reduce muscle spasms around the knee.
- **Improved circulation:** Supports healing by improving blood flow.
- **Convenient and accessible:** Can be used at home, making it a more flexible and cost-effective option.
- **Adjunct to physical therapy:** Can enhance the effectiveness of rehabilitation exercises.
- **Avoids injections/surgery:** A non-invasive option for managing knee pain without resorting to injections or surgery.

Overall, **electroanalgesia** offers a range of advantages over conventional therapies, especially for individuals who are looking for a drug-free, customizable, and non-invasive solution to manage knee pain effectively.

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This chart below visually highlights how **electroanalgesia** compares to traditional treatments like medication and physical therapy in terms of key factors. Let me know if you would like to dive deeper into any specific aspect!

Feature	Electroanalgesia	Conventional Therapies
Invasiveness	Non-invasive, no need for surgery or injections	May involve injections (e.g., corticosteroids) or surgery
Drug-Free	Yes, no medication required	Typically requires medication (NSAIDs, opioids, etc.)
Immediate Pain Relief	Provides quick pain relief	Pain relief may take longer (especially for oral meds)
Side Effects	Minimal side effects	Potential side effects (e.g., gastrointestinal issues, kidney damage from long-term medication use)
Chronic Pain Management	Suitable for long-term use without dependency	Long-term use of medications can lead to dependency or tolerance
Muscle Relaxation	Helps relax muscles around the knee	May require additional treatments like stretching or massage
Circulation Improvement	Stimulates blood circulation to promote healing	Does not directly improve circulation
Convenience and Accessibility	Portable devices for home use, easy to apply	Requires appointments, medications, or physical therapy sessions
Cost-Effectiveness	Cost-effective for long-term use	Ongoing costs for medications, injections, or surgeries
Use During Rehabilitation	Can complement physical therapy	Often requires rest, injections, or pain management during rehab
Risk of Dependency	No risk of dependency or tolerance	Potential risk of addiction to pain medications

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Cost Advantages

Let's compare the costs of electroanalgesia (EA) for treating knee pain

1. Electroanalgesia (EA)

- High-Frequency Energy

Costs

- Clinic-Based Sessions: \$75–\$150 per session

Pros & Cons

- ✓ Lower long-term costs
- ✓ Non-invasive, drug-free treatment
- ✓ Few side effects
- ✗ Varied efficacy (not always a permanent solution)

2. Conventional Therapies

This includes:

- Physical Therapy (PT)
- Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)
- Corticosteroid Injections
- Hyaluronic Acid Injections
- Opioid or Prescription Pain Medications

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Costs

- Physical Therapy: \$50–\$150 per session (~\$1,000–\$3,000 per year)
- NSAIDs: \$10–\$50/month (\$120–\$600 per year)
- Corticosteroid Injections: \$100–\$300 per injection (typically 2–4 per year = \$200–\$1,200 annually)
- Hyaluronic Acid Injections: \$500–\$1,500 per injection (1–2 per year = \$500–\$3,000 annually)
- Opioids or Pain Medications: \$50–\$200/month (\$600–\$2,400 per year)

Total Annual Cost Estimate: \$1,000–\$6,000+

(depending on treatment type and insurance coverage)

Pros & Cons

- ✓ Backed by clinical evidence for pain relief
- ✓ More options available based on severity
- ✗ Higher ongoing costs (especially injections and PT)
- ✗ Possible side effects (GI issues with NSAIDs, risks with opioids)

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Cost Comparison Summary

Treatment Type	Estimated Annual Cost
Electroanalgesia	\$1,000 - \$3,000
Physical Therapy	\$1,000 - \$3,000
NSAIDs/Medications	\$120 - \$2,400
Corticosteroid Injections	\$200 - \$1,200
Hyaluronic Acid Injections	\$500 - \$3,000

Key Takeaways

- EA is generally cheaper in the long run
- Conventional treatments may offer more robust pain relief, particularly in severe cases.
- Combination approaches (e.g., EA + PT or EA + NSAIDs) may provide the best cost-benefit balance.

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Implementation of Electroanalgesia in Clinical Practice for Knee Pain

Electroanalgesia can be an effective treatment modality for knee pain, especially when used as part of a comprehensive pain management plan. To implement electroanalgesia in a clinical setting for knee pain, certain steps and considerations should be followed to ensure its safe and effective use.

Here's a structured approach for **implementing electroanalgesia in clinical practice**:

1. Patient Assessment and Selection

- **Evaluate the cause of knee pain:** Before using electroanalgesia, the clinician must assess the patient's condition thoroughly. This includes understanding the underlying cause of knee pain (e.g., osteoarthritis, ligament injuries, tendinitis, bursitis, etc.).
- **Consider patient factors:** Ensure the patient is an appropriate candidate for electroanalgesia. This includes checking for any contraindications such as **pacemakers**, **pregnancy**, or **skin conditions** at the application site.
- **Assess pain level and chronicity:** Electroanalgesia can be particularly effective for **chronic pain**, but it is also useful for acute pain. Assess the severity and nature of the pain to tailor the treatment approach.

2. Training and Education

- **Educate the patient:** It's crucial to educate patients on how electroanalgesia works, its benefits, and how it can complement other treatments for knee pain. This increases patient confidence and cooperation.

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- **Teach correct usage:** If the patient is prescribed a **home TENS unit**, ensure they understand how to set up the device, apply the electrodes properly, and adjust the intensity. Demonstrate the proper settings and safety guidelines (e.g., never place electrodes on broken skin, keep the device clean, and adjust settings gradually).
- **Set expectations:** Discuss the expected outcomes of electroanalgesia therapy, including how long it may take to notice pain relief, the frequency of treatments, and whether the therapy is intended for short-term or long-term use

3. Monitor and Adjust Treatment

- **Regular follow-ups:** Check on the patient's progress regularly to ensure that they are benefiting from the treatment. Track pain levels, functional improvements, and any potential side effects (e.g., skin irritation or discomfort from electrode placement).
- **Adjust parameters:** If the patient reports little to no relief, treatment parameters may need to be adjusted. This could involve increasing the intensity, changing the electrode placement, or adjusting the frequency and duration of sessions.
- **Complement with other therapies:** Electroanalgesia should often be used alongside other treatments such as physical therapy, strengthening exercises, or anti-inflammatory medications for a holistic approach to managing knee pain.

4. Documentation and Treatment Progress

- **Record progress:** Document the patient's response to electroanalgesia treatment, including pain levels, mobility, and any changes in symptoms. This helps to track treatment effectiveness and make data-driven adjustments.
- **Reassess if needed:** If the knee pain persists or worsens despite electroanalgesia, reassess the patient's diagnosis, consider additional treatment options, or refer them for more advanced interventions like injections or surgery if indicated.

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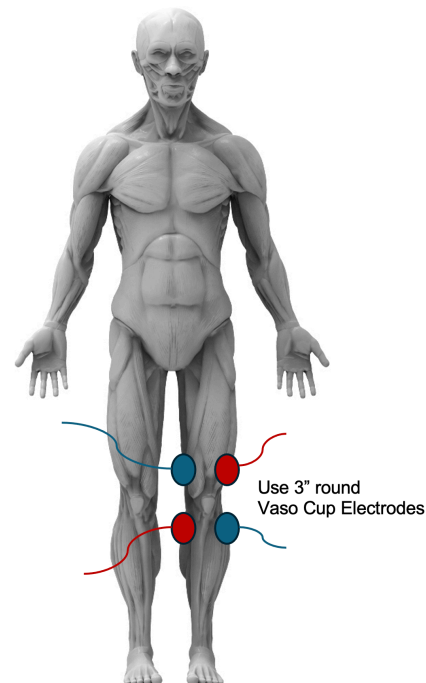
5. Contraindications and Precautions

- **Contraindications:** Ensure that patients do not have contraindications to electrical stimulation, such as:
 - **Pacemakers** or other implanted electronic devices.
 - **Pregnancy** (especially in the abdominal or lower back area).
 - **Broken skin** or open wounds.
- **Precautions:** Patients with certain health conditions (e.g., epilepsy, deep vein thrombosis, or severe cardiovascular issues) should use electroanalgesia with caution and under direct supervision of a healthcare provider.

The **implementation of electroanalgesia in clinical practice** for knee pain offers a safe, effective, and non-invasive treatment option that can significantly reduce pain and improve the quality of life for patients. By tailoring the therapy to individual patient needs and combining it with other complementary treatments like physical therapy or medications, healthcare providers can create a more holistic and personalized approach to knee pain management. Proper training, monitoring, and patient education are key to achieving the best outcomes with electroanalgesia.

Treatment Protocol

- Session Duration: Typically, 25 min
- Frequency: 2–3 sessions per week for 8–12 weeks
- Maintenance Therapy: As needed for long-term symptom management



Knee PAIN Pad Placement:

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Conclusion

Electroanalgesia offers several significant advantages over conventional therapies for knee pain, making it a valuable tool in managing both acute and chronic discomfort. Key benefits include its **non-invasive nature, drug-free approach, and minimal side effects**, making it an attractive option for individuals who wish to avoid medications or surgery. Additionally, electroanalgesia provides **immediate pain relief**, helps with **muscle relaxation**, and improves **blood circulation**, all of which contribute to better long-term knee health and recovery.

Unlike conventional treatments, which may come with risks like **dependency on pain medications** or the need for **repeated injections**, electroanalgesia can be used regularly without these concerns. It's also **cost-effective** and **convenient**, as it can be done at home with portable devices, reducing the need for frequent clinic visits or long-term drug use.

Ultimately, **electroanalgesia** can serve as a complementary or alternative option for managing knee pain, particularly for individuals looking for a **non-invasive, safe, and effective** solution to enhance their overall treatment plan. However, it's always recommended to consult with a healthcare professional to ensure it's the right approach for your specific condition.

For more information, Contact us:

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Electroanalgesia (EA) device is known as the NeuroMed Electroanalgesic Delivery System with the
MATRIX System software 1/1.0 Email: info@NeuroMedinc.com