

# Cryoneurolysis of Genitofemoral Neuralgia: A Case Report

Khaja J Khan<sup>1</sup>, Anil Kumar<sup>2</sup>, Gautam Das<sup>3</sup>

## ABSTRACT

Cryoneurolysis by means of using low temperatures reversibly ablates the nerves and provides good analgesia. The duration varies from few months to 1 year. Genitofemoral neuralgia is mainly an iatrogenic neuropathy. With growing knowledge and technique, ultrasound-guided cryoneurolysis of the genitofemoral nerve is a safe and effective measure to treat genitofemoral neuralgia. We are reporting a case of successful cryoablation of the genitofemoral nerve using ultrasound in a patient with chronic inguinal pain after vulvectomy for vulvar cancer extending to the anorectal sphincter. After surgery, the patient was suffering from burning pain around the upper and medial side of the thigh. This was not getting relieved by oral analgesics. The verbal response scale (VRS) was still 8 on analgesics. So, we decided to go for cryoneurolysis of the genitofemoral nerve.

**Keywords:** Cryoablation, Cryoneurolysis, Genitofemoral neuralgia, Ultrasound.

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## INTRODUCTION

Genitofemoral neuralgia is a chronic pain distributed along the sensory distribution of the genitofemoral nerve.<sup>1-3</sup> This neuropathy is characterized by paraesthesia, burning pain over the upper medial aspect of the thigh and the genitalia. It usually occurs after a surgery in the inguinal region. Nerve entrapments within the scar tissue or fibrous adhesions are likely to cause neuropathic pain and paresthesias.<sup>4-6</sup> In some patients, assuming a recumbent position and flexion of the hip relieves pain while walking and hip extension causes pain.<sup>3</sup> For any type of neuropathic pain, the recommended treatment is chemical neurolysis or neuroablation. Ultrasonography helps in the precise location of the target nerves for lesioning.

Cryoablation is preferred for neuropathic pain originating from relatively small nerve fibers.<sup>7</sup> There are various proposed theories by which cryoneurolysis acts. One of the most widely accepted theory is that cryoablation leads to cell death by the freezing through the metallic probe, cooled by the rapid expansion of pressurized gas.<sup>7,8</sup> The freezing process first manifests in extracellular space causing an osmotic gradient to form, which leads to cell shrinkage.<sup>7,8</sup> As the freezing process continues, formation of intracellular ice crystals directly damages organelles.<sup>8</sup> Similar mechanisms result in vascular injury, inducing a coagulative cascade and eventual ischemia-mediated cell damage.<sup>8</sup> During the thaw phase of these procedures, water rushes into previously shrunken cells, causing them to burst.<sup>8</sup>

Ablation zone tissues also incur damage through interspersed apoptosis and inflammatory injury.<sup>8-11</sup>

Cryoablation has been found to damage nerves specifically via ice crystal-mediated vasa vasorum damage and endoneural edema, Wallerian degeneration, direct injury to axons, and dissolution of microtubules resulting in cessation of axonal transport.<sup>12-15</sup> The end result of neuronal damage is decreased pain sensation (Figs 1 and 2).

## CASE DESCRIPTION

A 46-year-old female patient presented to Daradia Hospital with complains of pain in the groin on both sides with verbal response scale (VRS) = 8. She was having constant bilateral pain since last 1 month after the surgery. Pain was burning in character, which aggravates during hip movement and walking. That's why her daily activities were restricted. She had a previous history of modified

<sup>1-3</sup>Department of Pain Medicine, Daradia Pain Hospital, Kolkata, West Bengal, India

**Corresponding Author:** Khaja J Khan, Department of Pain Medicine, Daradia Pain Hospital, Kolkata, West Bengal, India, Phone: +91 9008497791, e-mail: khaja.javed.khan@gmail.com

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radical vulvectomy with permanent colostomy for carcinoma vulva extending to the anorectal sphincter. There is also a history of chemotherapy and radiotherapy for the same prior to surgery. On examination, two scars were present in the inguinal region on both sides extending from the anterior superior iliac spine to the pubic tubercle. Edematous swelling of the vulva with increased temperature and tenderness over the inguinal region was present. Hip extension was painful. There was no motor loss and reflexes were normal.

By history and clinical examination, the patient was diagnosed to be a case of genitofemoral neuralgia due to nerve entrapment. She was on oral analgesics like paracetamol and tramadol but did not have any pain relief.

Initially, we performed the ultrasound-guided diagnostic bilateral genitofemoral nerve field block with the help of 1% lignocaine, which gives an immediate pain relief and it lasted for 2 hours. In the second setting after proper counseling, cryoablation of bilateral genitofemoral nerves was done with the help of ultrasound.

To block the genital branch of the genitofemoral nerve, the ultrasound probe was placed parallel and 1.25 cm above the inguinal ligament scanning over the external iliac artery and the vein. At this location, the probe was tilted slightly cephalad to visualize the inferior epigastric artery that emerges medially from the external iliac artery. The deep inguinal ring starts just lateral to the inferior epigastric artery. After getting sensory stimulation, we ablated the nerve with the help of a cryoprobe.

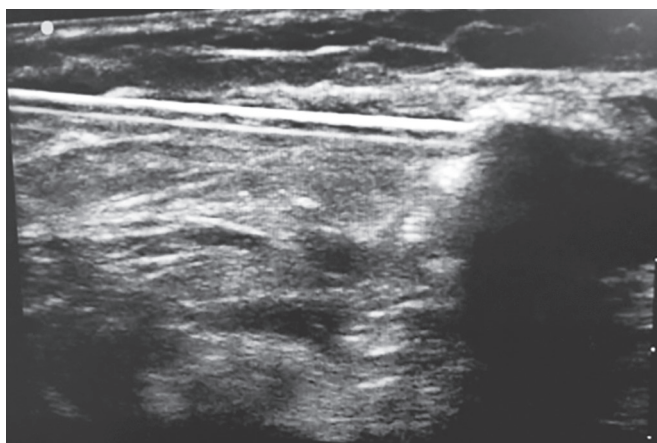


Fig. 1: Cryoneurolysis of the right side

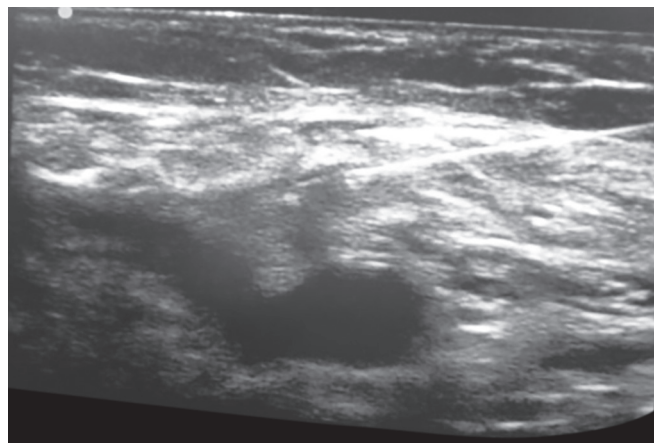


Fig. 2: Cryoneurolysis of the left side

To block the femoral branch, our target location was superficial and lateral to the femoral artery, caudal to the inguinal ligament. The skin was anesthetized with 1% lignocaine and a 14-gauge angiocatheter needle was introduced using an in-plane technique to the target area. Because in females there is no motor branch, sensory electrical stimulation was done at 50 Hz, 0.6 V, which reproduced the patient's usual pain. After that she received two cycles of cryoablation at  $-78^{\circ}\text{C}$  for 3 minutes freezing time and 1 minute of defrosting time under ultrasound guidance with a 14-gauge cryoprobe. Carbon dioxide ( $\text{CO}_2$ ) was used as the gas for this procedure.

Bilaterally, both of these nerves were blocked. Since last 3 months, the patient is having a VRS of 2 and is under regular follow-up.

## DISCUSSION

For cryoneurolysis of the nerve, precise knowledge of anatomical distribution of the nerve is required. The genitofemoral nerve originates from L1 and L2 ventral rami within the psoas muscle,<sup>2</sup> pierces the psoas muscle at the medial border emerging at the L3/L4 level, descends, and passes posterior to the ureter where it bifurcates into two branches, genital and femoral.<sup>2</sup> The femoral branch courses lateral to the external iliac artery and travels beneath the inguinal ligament where it pierces the fascia lata to travel into the femoral sheath. In the femoral sheath, the nerve remains lateral to the femoral artery.<sup>2</sup> This branch supplies cutaneous sensation to the anterior aspect of the upper thigh, along the region of the femoral triangle.<sup>16</sup>

The genital branch of the genitofemoral nerve (GFN) continues along the psoas major toward the deep inguinal ring.<sup>2</sup> In males, the genital branch supplies motor innervations to the cremaster muscle. It travels with the spermatic cord to the base of the scrotum giving off sensory innervations to the spermatic cord, scrotum, and adjacent thigh.<sup>2,16-18</sup> In females, the genital branch provides sensory innervations to the labia majora and the mons pubis by traveling along the round ligament through the deep inguinal ring.<sup>2,18</sup> Deep or internal inguinal ring is located just above the midpoint of the inguinal ligament and lateral to the inferior epigastric vessels.<sup>12</sup>

Ultrasound helps in precise location of the peripheral nerve without any harmful radiation.<sup>19</sup> Cryoneurolysis is a minimally invasive technique with immediate pain relief.<sup>11</sup> In this case,

cryoablation was chosen over radiofrequency ablation for several reasons—relatively thinner size of the peripheral nerve, its superficial location, the fact that it was a sensory nerve, and cryoablation provides intermediate duration of neurolysis.<sup>20</sup> Benefit of cryoablation over radiofrequency ablation is that with cryoablation, the axons and myelin sheaths are lysed (Wallerian degeneration), but the epineurium and perineurium remain intact, which facilitates successful nerve regeneration.<sup>4</sup> The affected axons are unlikely to form neuromas, often associated with traumatic, surgical, and thermal lesions that interrupt the perineurium and the epineurium.<sup>21</sup> The contact surface area of a cryoablation probe on larger nerves provides more complete neurolysis than pulsed radiofrequency.<sup>22</sup> Furthermore, cryoablation provides immediate analgesia in the affected area while there is a delay of up to a week with radiofrequency.

## CONCLUSION

Cryoneurolysis is one of the efficacious therapeutic options for neuropathic pain of sensory and mixed nerves. It has shown an excellent result in entrapment neuropathies without any relevant side effects.

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