

## CASE REPORT

# Radiofrequency Lesioning as a Treatment of Buerger's Disease

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## SUMMARY

Buerger's disease (also known as thromboangiitis obliterans) is an acute inflammation and thrombosis of arteries and veins of the hands and feet. Various treatment modalities have been tried to control the pathologic process with varying success; including peripheral vasodilator drugs, chemical sympathectomy etc.. Advanced disease leads to necrosis of the peripheral tissues and necessitates repeated amputations. At this stage permanent chemical ablation of the sympathetic chain at the appropriate level is helpful; but it has now been replaced with the new addition of radiofrequency lesioning. We present two cases in which this technique was used with satisfactory results at our pain center.

**Key words:** Buerger's disease, Gangrene, Lumbar sympathectomy, Radio-frequency lesioning.

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## INTRODUCTION

Buerger's disease, an acute inflammation and thrombosis of arteries and veins of the hands and feet. It is strongly associated with use of tobacco products,<sup>1</sup> primarily from smoking, also from smokeless tobacco. There is a recurrent acute and chronic inflammation and thrombosis of arteries and veins of the hands and feet. The main symptom is pain in the affected areas. Ulcerations and gangrene in the extremities are common complications, often resulting in the need for amputation of the involved extremity. Pain control remains the main challenge to our surgical counterparts, for which there has been an increased involvement of anesthesiologists for the last few decades. The management modalities offered by anesthesiologists ranges from nerve blocks, ganglion blocks and neuraxial blocks to the latest introduction of radiofrequency lesioning. We present two case reports in which pain relief was achieved successfully by this method.

## CASE REPORT 1

A 19 years old boy from DI Khan, a known case of Buerger's disease was admitted on 17-9-2008 in south

surgical ward of Mayo Hospital, Lahore with a complaint of severe pain in his right leg. He was scheduled for surgical lumbar sympathectomy but it was decided that he might be given a trial of pain relieving modalities available at Mayo Pain Clinic, hence he was referred to our pain center for pain relief and/or chemical lumbar sympathectomy.

He had a positive past history of right popliteal artery grafting 4 years back, left popliteal artery grafting 1&1/2 years back, below knee amputation of left leg 1 year back and amputation of 3rd, 4th & 5th toes 6 months back.

**USG Doppler (arterial) Rt Leg:** Flow was normal in arteries of his right side including common iliac, internal iliac, external iliac, common femoral and superficial femoral arteries to the level of proximal part of the adductor canal. At the level of origin of the adductor canal, superficial femoral artery was markedly narrowed with diminished flow beyond. Flow in the popliteal artery was markedly diminished. Flow in the anterior tibial artery & posterior tibial artery at the origin was also diminished. Flow in mid

calf in the anterior and posterior tibial arteries at the origin was also diminished and beaded in appearance; and collateral type flow was seen at ankle at dorsalis pedis artery and post tibial artery. Venous system was normal.

**Diagnostic Block:** Diagnostic lumbar sympathectomy block with 0.25% bupivacaine was found positive regarding good pain relief and rise in temperature by about 1.5° F. It prompted us to plan for permanent ablation of his right sympathetic chain.



**Fig 1: Radiofrequency Lesioning for Right Lumbar Sympathectomy:**

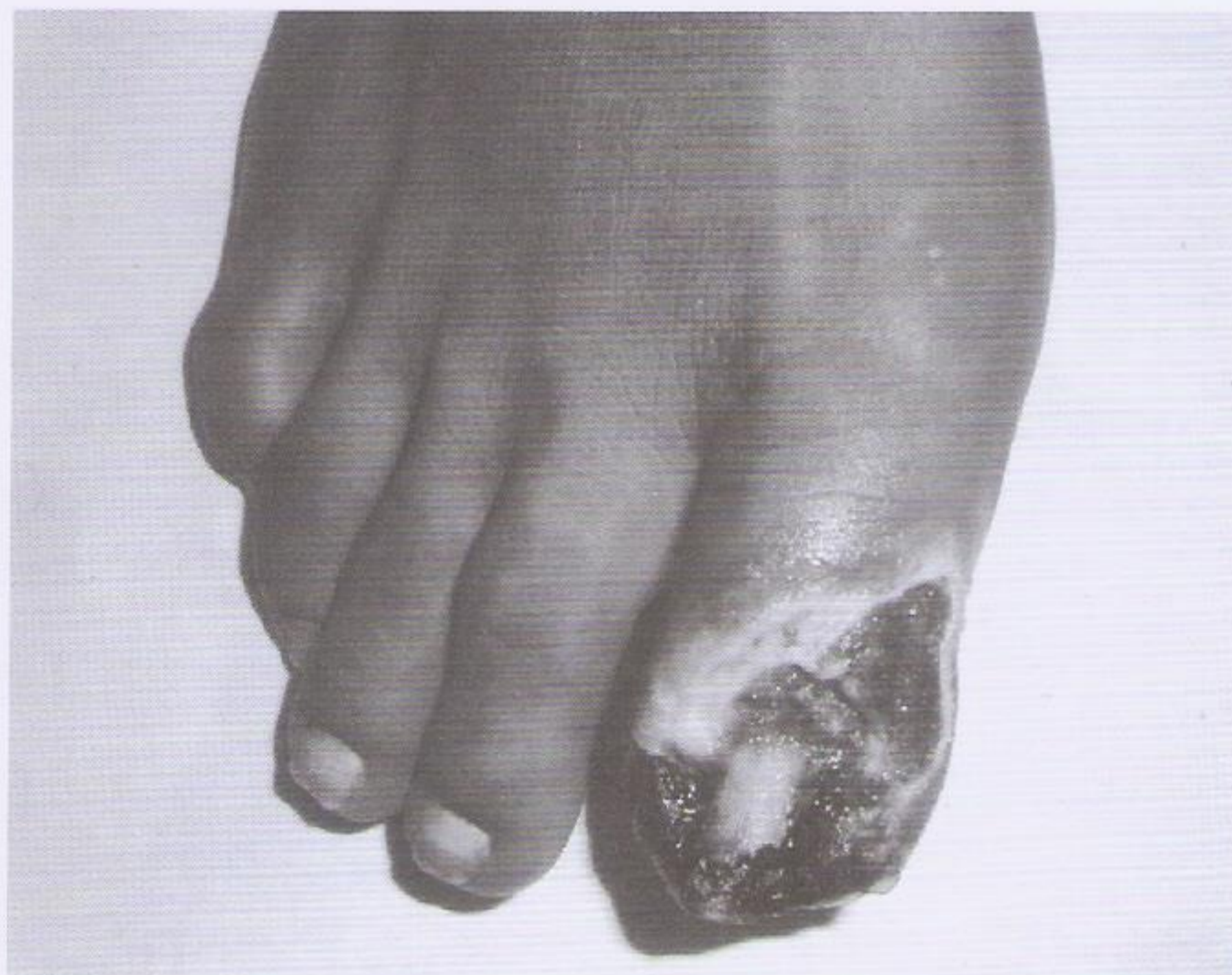
RF lesioning at L2, L3 & L4 levels was performed at 90° C for 90 seconds after sensory & motor stimulation as per protocol. Genitofemoral nerve was saved by readjusting the tip of the RF probe. (Fig 1)

Patient reported a 100% pain relief after the procedure. Although usually it takes upto 2 weeks for the full effect of the RF lesioning, the immediate pain relief was due to local anesthetic effect of Inj. bupivacaine. Patient was discharged after debridement of the toes.

## CASE REPORT 2

A 32 years old male patient was admitted in North Surgical ward of Mayo Hospital Lahore on 24-10-2008 due to black discoloration of his right big toe for one month (Fig 2). He suffered from severe

pain in his right leg with blistering of the big toe for the last seven months, which was later on followed by sloughing and loss of soft tissue. He gave history of having a 200kg cotton bail fallen on his back of right thigh about eight years back. He was smoker from the last eight years and smoked about two packs of cigarettes per day. He was diagnosed as a case of Buerger's disease.



**Fig 2: Gangrenous Rt big toe.**

After relevant history and physical examination a confirmative diagnostic plan was outlined including radio-imaging and diagnostic nerve blocks.

**Triples Imaging:** This imaging test revealed features suggestive of peripheral arterial disease with an organized thrombus in the right femoral artery 6 cm distal to the inguinal ligament.

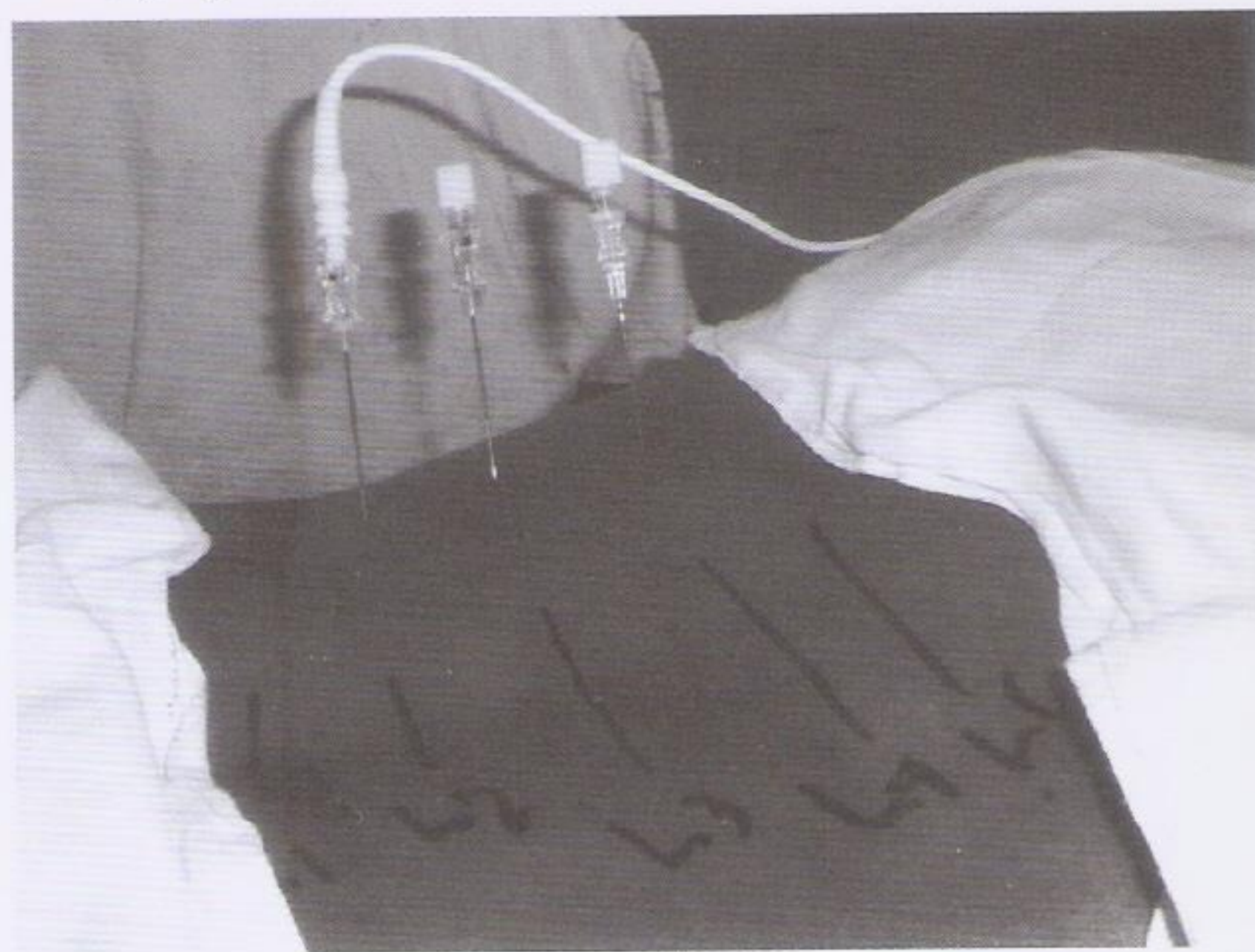
**Peripheral Arteriography:** Arteriography revealed right superficial femoral artery to be normal upto mid thigh. It was occluded in the adductor canal. There was no constriction of popliteal artery. Anterior tibial artery was reconstructed by the collateral vessels at mid foreleg. Distal circulation was noted to be very poor.

**Diagnostic Rt Lumbar Sympathectomy:** It was done on 31 October 2008 under fluoroscopic guidance. A mixture of inj lignocaine 1% and inj bupivacaine 0.25% was used for this purpose. The patient had got excellent pain relief (VAS score 1-2 as

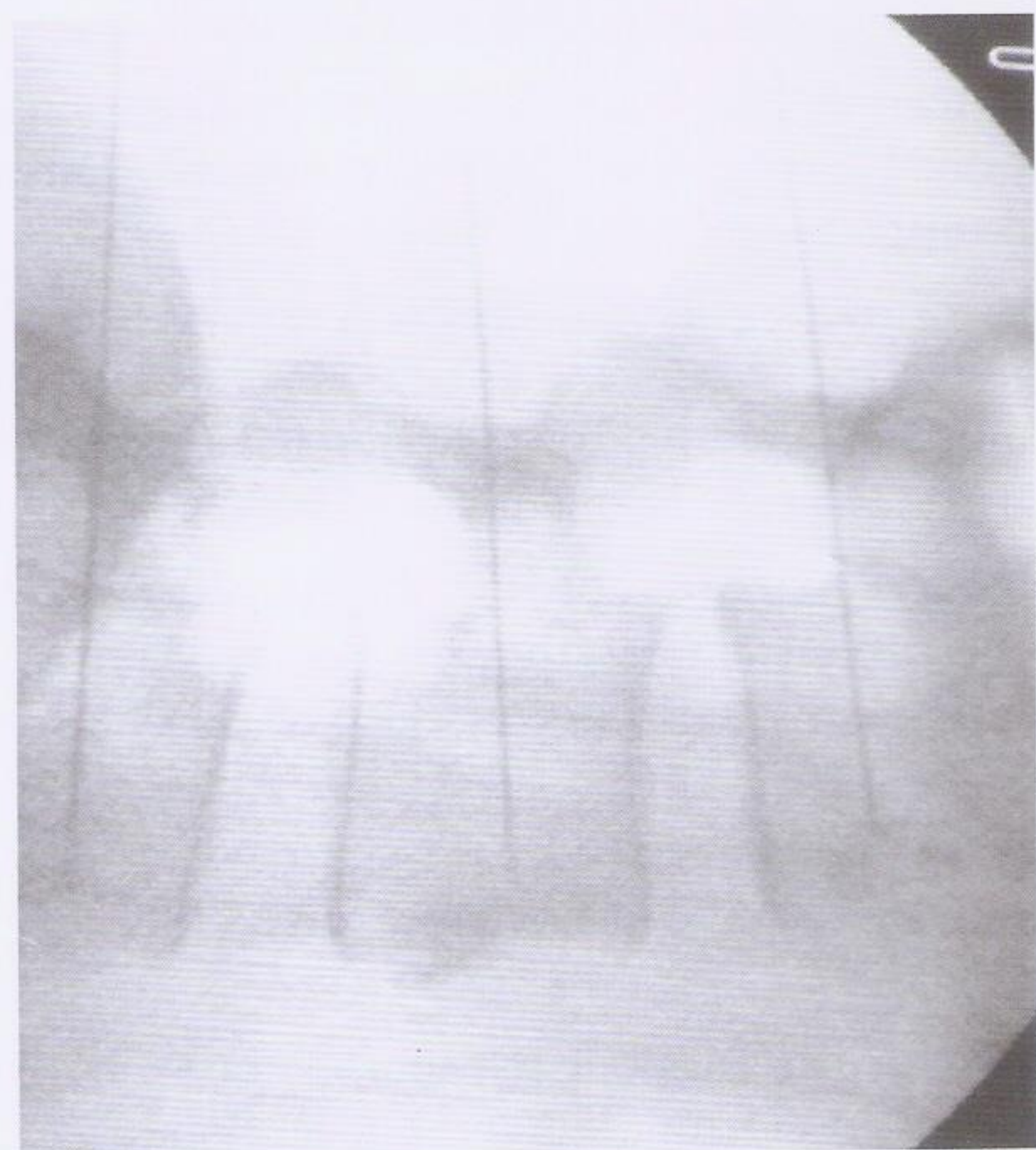
## Radiofrequency Lesioning as a Treatment of Buerger's Disease

compared to 7-8 prior to the block) and leg temperature rose from 78.3° to 82.5° F. A positive diagnostic test was enough to advocate the use of permanent nerve ablation. RF nerve ablation was planned after eleven days.

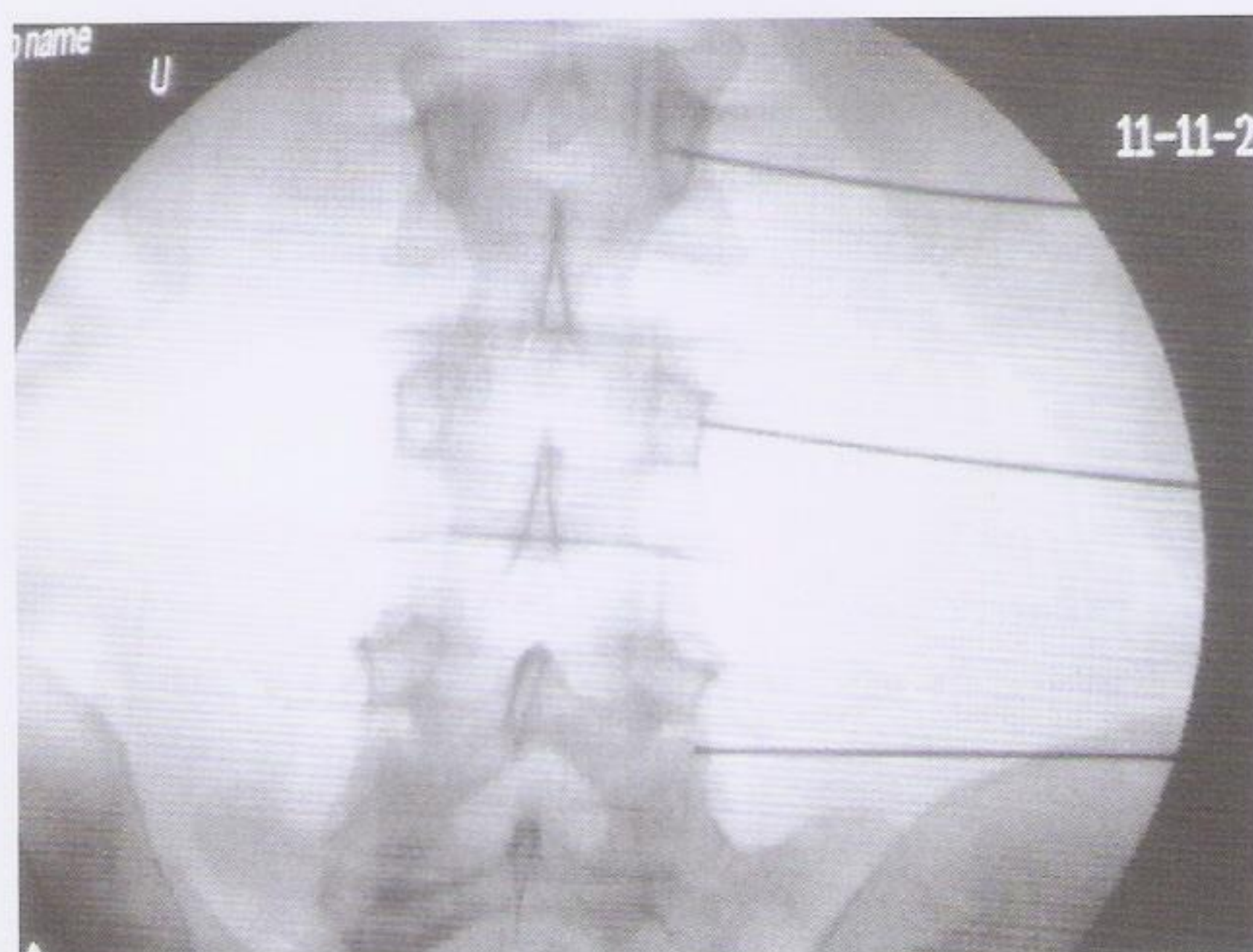
**RF Lesioning:** The procedure was done as per criteria after sensory & motor stimulation, at L2 to L4 level, (Fig 3-5)



**Fig 3: Three RF insulated canulae at L2-4 level.**



**Fig 4: Lateral view; RF canulae at L2-4 level.**



**Fig 5: AP view; RF canulae at L2-4 level.**

He was discharged after debridement of the big toe. His toe recovered fully, the risk of amputation was averted and presently, he is doing his job with a pain free life.

### DISCUSSION

Buerger's disease is an acute inflammation and thrombosis of distal arteries and veins of the limbs. It is strongly associated with use of tobacco products,<sup>1,2</sup> primarily with smoking but also with smokeless tobacco as well as passive smoking<sup>3</sup>. There is a recurrent acute and chronic inflammation and thrombosis of arteries and veins of the hands and feet. The main symptom is pain in the affected areas. A concrete diagnosis of thromboangiitis obliterans is often difficult as it relies heavily on exclusion of the conditions. The commonly followed diagnostic criteria are; age younger than 45 years, current (or recent) history of tobacco use, presence of distal extremity ischemia (indicated by claudication, pain at rest, ischemic ulcers or gangrene) documented by noninvasive vascular testing such as ultrasound, exclusion of other autoimmune diseases, hypercoagulable states, and diabetes mellitus by laboratory tests.

Exclusion of a proximal source of emboli is done by echocardiography and arteriography and consistent arteriographic findings in the clinically involved and noninvolved limbs are helpful<sup>4</sup>. There

are characteristic pathologic findings of acute inflammation and thrombosis (clotting) of arteries and veins of the hands and feet (the lower limbs being more common). The mechanisms underlying Buerger's disease are still largely unknown. It is suspected that immunological reactions play a role<sup>5</sup>.

We can only treat symptoms as there is no treatment for the disease. Cessation of tobacco use may slow any further progression of the disease<sup>2</sup>. Vascular surgery can sometimes be helpful in treating limbs with poor perfusion secondary to this disease<sup>5</sup>. Buerger's is not immediately fatal, but life-shortening. Amputation is common and major amputations (of limbs rather than fingers/ toes) are almost twice as common in patients who continue to smoke. Buerger's is more common among men than women. It is more common in Israel, Japan and India/Pakistan along the "old silk route" than in the United States and Europe<sup>6</sup>. Streptokinase has been proposed as adjuvant therapy in some cases.<sup>7-8</sup>

Chemical lumbar sympathectomy might be undertaken in such cases, but RF lesioning is the latest mode of treatment with some advantages. It has a high safety profile and is associated with less complications which are usually related to the technique of cannulae insertion. Most important advantage of RF lesioning is the sparing of genitofemoral nerve. The tip of RF probe can be readjusted if patient complains of pain in the genitalia/groin<sup>5</sup>.

RF lesioning involves inserting a small insulated electrode with an uninsulated tip through the tissue surrounding the target nerve. The tissue impedes the flow of current in the shape of continuous high-frequency waves of about 1 MHz through the needle, causing the current to be dissipated as heat (Joule heating). Heat is not generated in the electrode tip because the electrode offers minimal resistance to flow, but later on it achieves thermal equilibrium with the entire system. The lesion is spherical around the active tip and progresses only a very small distance beyond the cannula tip.

The heat generated is a function of the amount of current that flows in the region of the electrode

and the resistance of the surrounding tissue. Current flows from the active to the passive electrode, however, because, compared with the active electrode, the passive electrode has much greater surface area and less current density; thus, heating and tissue damage do not usually occur at the passive electrode. Tissue damage is related to the temperature generated; therefore, heating of the active electrode is an important safety feature that allows control of lesion size. The actual tip may not even be incorporated into the lesion, so nerves in contact with the tip may be only partially blocked; furthermore, electrodes placed tangential to the nerve often generate a more effective lesion.

The effect of RF on tissue depends on the temperature generated:

- > 45C, irreversible tissue injury
- between 42 and 45C, temporary neural blockade occurs.
- The larger the lesion, the larger the zone of irreversibility

Conventional stimulation testing consists of sensory testing at 50 Hz up to 1.0 V and motor testing at 2 Hz up to 2.5 V. The discomfort associated with this minimally invasive technique is of limited duration, and most RF lesions can be performed with mild sedation. It is very important to maintain the patient's ability to report his or her experience during sensory and motor testing to maintain safety.

Treatment of pain that occurs in a well-defined and fairly limited anatomic location where one has a clear understanding of the neuroanatomy involved for nociception.

RF can be used in facet joint lesion (medial branch of primary dorsal ramus), lumbar sympathetic chain lesion, lumbar disc lesion, lesion of the communicating ramus and lesion of the dorsal root ganglion.

A prognostic block is advised to assess possible magnitude of response to neuroablation. A series of prognostic blocks using local anaesthetics of different durations as well as a placebo injection may

## Radiofrequency Lesioning as a Treatment of Buerger's Disease

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be useful to determine if the patient exhibits a consistent response.

RF is not completely without side effects or complications. Neurologic deficits from the intended target or near by neural structures, deafferentation pain, neuritis, burn injury at breaks in the needle insulation, hematoma, and infection all have been reported. Thus all RF procedures must be performed under sterile conditions with fluoroscopic guidance. At our centre we routinely employ RF lesioning for lumbar sympathectomy and the results have been very encouraging. We feel that the procedure should be learnt by more anesthetists and pain physicians and the apparatus should be made available at more and more medical centres.

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