STELLATE GANGLION BLOCK FOR THE IMMEDIATE TREATMENT OF FROSTBITE OF UPPER LIMB

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ABSTRACT

Objective: The purpose of performing early sympathectomy at high altitude was to get relief of vasoconstriction of frostbitten part so that the progression of the disease might be arrested immediately.

Study Design: Descriptive Interventional Study.

Place and Duration of Study: This study was done in Northern area from December 1997 to December 1998.

Patients and Methods: In this interventional clinical trial, 23 young soldiers who were the victims of frostbite of upper extremity, were given stellate ganglion block with local anesthetic at army field hospital Goma, situated at altitude of 10,800 feet. All the patients were referred back from the posts at forward areas in high mountains, during one year (Dec 1997-Dec 1998).

Results: The results of the study were very encouraging. Patients having mild to moderate form of disease recovered fully whereas disease progression was arrested in patients with severe form and later on they required less reconstructive surgery.

Conclusion: The results noted in this study mandate the purpose of more research in this field so that the morbidity caused by the frostbite may be further decreased.

Keywords: Frostbite, stellate ganglion block, early regional sympathectomy.

INTRODUCTION

Frostbite is a disastrous disease of high altitude. It usually affects the distal parts of the extremities or exposed parts of the face such as ears, nose, chin and cheeks. It results from severe environmental cold exposure or direct contact with a very cold object. It can be classified into first, second, third and fourth degree according to the depth of tissue injury.

As our armed forces are fighting war in the highest battle field of the world, they are exposed to the adversaries of environment during military operations. Frostbite in this area is a commonly encountered medical problem, which in some cases has resulted in life long morbidity.

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Various methods are being used to treat the frostbite. Most important is slow re-warming of frostbitten part in water bath heated to 40-42 Celsius for several minutes [1]. Some medical professionals have tried anti-sludge therapy by haemodilution with colloids and subcutaneous injection of Arwin (Snake venom enzyme) to improve microcirculation of the affected part. Some have tried intra–arterial injection of acetylcholine to relieve vasoconstriction and pain. In World War –II Russians were said to have good results with local infiltration of Novocain at the periphery of the frostbitten area [2]. Also defense and therapy against infection is an important factor in the treatment of frostbite.

Early regional sympathectomy (with in 36-72 hours) has been reported to protect

against the sequelae of frostbite [3]. Chemical sympathectomy of upper limb can be produced by infiltrating local anesthetic around ipsilateral stellate ganglion. Indications for stellate ganglion block include reflex sympathetic dystrophy of the upper extremity, Raynard's syndrome, herpes zoster of the face and neck, hyperhidrosis of the neck and pain in upper extremity due to arterial insufficiency [4]. Pain due to arterial insufficiency can be treated with stellate ganglion block but this is not effective for the pain due to venous insufficiency [5]. The most frequent indication is to release vascular tone, as pointed out by Winnie [6] that postganglionic sympathetic fibers travel with the somatic nerves of the brachial plexus and are distributed from them to the vessels supplying vasoconstrictor impulses to the whole limb. Keeping in mind the beneficial effects of stellate ganglion block on vasoconstriction, which is the possible cause of the frostbite of upper extremity, this study was performed in Northern areas of Pakistan. The aim was to improve further the existing methods used for the treatment of frostbite.

PATIENTS AND METHODS

This descriptive interventional study was carried out at Army Field Hospital located in district Gangche of Northern Areas about 180 KM away from Skardu near Siachen glacier during one year (Dec 1997 – Dec 1998). A total of 23 patients were included in the study. All the patients were young males (21-38 years of age) having frostbite of fingers ranging from first to fourth degree. All the patients were healthy and fit and were referred from the posts at forward areas in high mountains.

Informed consent was taken from every patient and the procedure was explained before performing the stellate ganglion block. The procedure was done in the operation theatre where all resuscitative measures, including the facility of positive pressure ventilation, were available. After proper preparation and under aseptic conditions, with the patient in supine position, stellate ganglion was blocked with 10-12 ml of 0.25% bupivacain, using paratracheal approach [7]. Patients were monitored for signs of a sympathetic block. An increase in temperature (1-3 degree Celsius) of the affected extremity was noted soon after the block. Afterwards signs of Horner syndrome (ipsilateral meiosis, ptosis and nasal congestion) were seen [8]. After the procedure every patient was allowed to recover in the recovery room for one hour, to safeguard the complications as convulsions, hoarseness, paralysis of phrenic nerve or total spinal block [9]. Five patients were having frostbite of both upper extremities. In them block on second extremity was applied six hours after the first. In all patients injections were repeated on daily basis [10]. A total of 3-5 injections were given to every patient. In the ward patients were kept warm and well hydrated [11].

RESULTS

After sympathectomy by stellate ganglion block patients felt warmth and a sense of well being in the extremity. Pain and oedema of frostbitten part were decreased remarkably. Seventeen patients who were having frostbite of first or second degree, recovered fully. In remaining six patients progression of disease was arrested and demarcation line appeared in 2-3 days. On follow up these patients also responded well to conservative treatment. Only two patients required amputation of terminal phalynges of 2-3 fingers.

No serious side effects were noted, except transient hoarseness of voice in four patients which was due to the blockade of recurrent laryngeal nerve. Other post-frostbite complications, such as complex regional pain syndrome (CRPS), were not noted in any of the patients.

DISCUSSION

The pathophysiology of frostbite involves freezing of tissue with intracellular ice crystal formation and micro-vascular occlusion on exposure to intense cold [12]. It is thought that frostbite is partly caused by the immediate effect of cold on the walls of blood vessels and partly by a vasoconstrictional reflex running over the central nervous system. That's why patients having vasospastic disorders are more prone to get frostbite [13].

One of the principles of clinical treatment of frostbite is the activation of capillary area, of the affected part. In the past activation of capillary area was tried by different methods. One was medicinal dilatation of arterioles using vasculoactive substances such as acetylcholine or ronicol. In second method improvement of blood flow of the area was achieved by antisludge therapy such as infusion of colloid solutions. In a recent study conducted by Iqbal Khan et al in Azad Kashmir [14] good results were achieved by giving intra-arterial lignocain into the local feeding vessel to release arteriolar spasm in patients having frostbite of extremities. Activation of capillary area can also be achieved by interruption of sympathetic trunk by stellate ganglion block for upper extremity and lumber sympathetic block for lower extremity. Blockade of stellate ganglion which is in fact cervicothoracic ganglion in human beings, has primarily been used in the treatment of sympathetic dystrophy of upper extremity and for getting increased blood flow to the area having arterial insufficiency as in the Raynard's syndrome [15].

Malmqvist, Bengtsson and Sorensen noted in a study [5] that early regional sympathectomy in case of frostbite brings about the decreased pain, a considerable oedema reduction , a significant drop in the rate of infection and early appearance of the demarcation line on sympathectomised extremity [4].

In our study we performed medicinal sympathectomy by stellate ganglion block for the treatment of frostbite of upper limb in a hospital located at high altitude, so near to the occurrence of the disease. In the past this modality of treatment was never tried at this altitude. By doing so we achieved some significant objectives. First, the block was applied as early as possible so it proved beneficial to arrest the progression of the disease. Secondly, later on there was less requirement of amputation of fingers, as compared to the previous studies [16] and also not a single post-frostbite complication occurred in any of these patients. By early sympathectomy we also achieved decreased or total absence of pain perception of the frostbitten part which ensured painless transport of the patients to the base hospital. Although there was a greater chance of having complications of stellate ganglion block at high altitude yet in our study we came across very few of them. The reason might be the fact that the blocks were performed with great care and having confidence in mind that all resuscitative measures were available at the field hospital.

CONCLUSION

Although the incidence of frostbite has greatly decreased by adopting preventive measures, still it is a major hazard of high altitude. The results of sympathectomy by stellate ganglion block as observed in this study are very encouraging and have shown significant decrease in the morbidity caused by the frostbite of upper extremity. For this purpose more research in this field is required and every anesthesiologist posted to army field hospitals of Northern areas may be encouraged to perform stellate ganglion block on every person having frostbite of upper extremity.

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