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ROLE OF STELLATE GANGLION BLOCK AS A TRATMENT MODALITY IN A PATIENT WITH SUDDEN SENSORINEURAL HEARING LOSS – A CASE REPORT

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ABSTRACT In consideration to our new adaptive lifestyles, Sensorineural hearing loss is becoming a condition with increased incidence that more people are seeking help for .It is a condition that can be identified with the help of audiometry and treated accordingly by medical means. In this study we would like to share the perioperative management of a patient with sudden sensorineural hearing loss which was managed by performing a regional block procedure, namely stellate ganglion block

KEYWORDS :

INTRODUCTION

Sudden sensorineural hearing loss is an acute hearing loss, also frequently known as sudden deafness involving the inner ear. It is an unexplained, rapid loss of hearing either all at once or over a few days. Sudden deafness frequently occurs close to a 72 hour window, with the most common cause being idiopathic in nature(1). The prognosis for hearing recovery depends largely upon the severity of the hearing loss. Probable causes of sudden sensorineural hearing loss can be neoplastic, infectious, autoimmune, neurologic, metabolic, vascular diseases, ototoxic drugs or trauma, but most of cases are idiopathic. People with sudden sensorineural hearing loss often discover the hearing loss upon waking up in the morning. Others first notice it when they try to use the deafened ear, such as when they use a phone. Still others notice a loud, alarming "pop" just before their hearing disappears. People with sudden deafness may also notice one or more of these symptoms, namely, a feeling of ear fullness, dizziness, or a ringing in their ears, such as tinnitus. Such people end up having great levels of anxiety and depression due to severe or profound hearing impairment. Hearing impairment along with tinnitus and vetigo has a very strong negative effect on the quality of life of such individuals. Such people with hearing impairment receive extended audiological rehabilitation today, including technical and psychosocial efforts (2)(3) Immediate intervention with appropriate measures can prove to be very helpful to the patient and greatly improves their quality of life.

Various treatment modalities are available for treating sudden sensorineural hearing loss. The methods can be either conservative or interventional. Conservative approaches may be chosen based on the predicted aetiology which include oral steroids , intravenous steroids , antiviral therapy (if the cause is suspected to be infective in nature) , hemodiluting agents, mineral and vitamin or herbal therapies , providing hyperbaric oxygen to the patient or injecting batroxobin which is known to be a fibrinolytic. Interventional strategies include intratympanic steroids or providing a sympathetic plexus blockade by means of stellate ganglion block. Although steroids and hyperbaric oxygen therapy was considered the mainstay of treatment , it is soon becoming obsolete because of its increasing side effects such as headache , nausea , fatigue , sensation of ear fullness or increased ear pressure. With administration of steroids, a negative response to a glucocorticoid is possible by means of down regulation of genes which play an essential role in immune reactions causing immunosuppression. The main challenges in the administration of drugs systemically and not locally, is the presence of the blood–labyrinthine barrier in the inner ear and low local vascularization(4) Coming to the intratympanic steroid approach , the administration has two barriers, namely, the presence of round and oval window and the clearance of steroid through the Eustachian tube(5). Hyperbaric oxygen therapy was once known to be the mainstay of treatment of sudden sensorineaural hearing loss as it was thought to increase the blood circulation and oxygenation in the inner ear (6) but it had its own limitations of being expensive , less accessible , producing oxygen toxicity, causing barotrauma to the middle ear and the possibility of pulmonary edema. In the auditory system, the sympathetic nervous system regulates the cochlear blood flow , influences and hair cells and also modulates the cochlear efferent system . Noradrenaline in the central auditory pathway is also an important mediator for auditory cortex activity. In pathological conditions the sympathetic nervous system is associated with many hearing disorders. (7)The role of stellate ganglion block in the treatment of sudden sensorineural hearing loss is that it causes sympathetic blockade of the cervical plexus which there by causes vasodilatation and hence improves inner ear circulation and cochlear blood flow.

There are various approaches to block the stellate ganglion which include surface landmark guided technique , fluoroscopy guided technique , or the use of an ultrasound(8). Fluoroscopy-guided technique there is better bony delineation and has a disadvantage of not visualising the surrounding structures such as vertebral artery, dome of pleura and oesophagus. These shortcomings can be overcome by using USG as one can easily view the soft tissues, anatomic variations of cervical and vertebral arteries and other pathological conditions(9). Ultrasound guided techniques have two approaches. One is the anterior approach and the other is the lateral approach. In the anterior approach, the needle lies closer to the ganglion but the risk of pneumothorax and vertebral artery injury is higher. Considering these facts approaching the stellate ganglion laterally at the C_6 level under USG appears to be the safer technique. we decided to provide the block at the C_6 level by lateral (gofelds) approach using USG and fluoroscopy. (10) Gofelds approach is a hybrid method , which is a combination of both fluoroscopy and USG approach . Gofeld et al have proved that the cervical sympathetic chain is superficial to prevertebral fascia. when the drug is injected accurately under USG guidance , it spreads from C_4 to T_1, therefore blocking the stellate ganglion irrespective of the level of entry. It is also known to have lesser side effects and since it is given at the level of C6 vertebrae , it is safer by means of avoiding any injury to the vertebral artery .

Case Description

A 20 year old female presented to the hospital with sudden loss of hearing on the right side that occurred post blunt trauma to the right side of her neck while travelling in a bus. She presented with unilateral (right sided) hearing loss with a persistent ringing sound in her right ear. The patient also had a constant unilateral, right sided headache. She had no known allergies and no known co-morbidities. On examination, her heart rate was 98 beats per minute, blood pressure was 110/80 mmHg, spo2- 99% on room air and respiratory rate was 18 per minute. Both pupils were equally reacting to light, both upper limb motor and sensory functions intact. Upper limb reflexes intact. Further, her blood investigation showed an Hb – 11mg%, platelet – 2.4 L, bleeding time and clotting time of 2'55" minutes and 5'04" minutes respectively, INR – 1.09. Renal function tests showed urea – 19mg/dl and creatinine of 0.9mg/dl. Serum sodium – 138mmol/L and potassium of 4.2mmol/L. On pure tone audiometry – she was seen to have normal air and bone conduction in her left ear. In the right ear, air conduction was normal whereas, bone conduction test showed a

decremented response on the graph (figure 1)

Patient was posted for right sided stellate ganglion block. The procedure was explained to the patient and pre procedural consents were obtained. Patient was fasted for 6 hours prior to the procedure. The block was performed in the operation theatre with minimal mandatory monitoring and by an experienced anaesthesiologist, under USG guidance with a 15 MHz probe and fluoroscopy (C-arm) guidance. Intravenous access was obtained with a 20 G cannula on the left forearm. Patient was sedated with 100mcg of fentanyl and 1mg of midazolam intravenously. Oxygen was administered to the patient with nasal cannula at a flow rate of 3 L/ min Patient was positioned in supine with a head extended and neck turned to the opposite side (tilted to the left).A linear probe with a frequency of 10 – 15 MHz was used. Probe was placed on the neck at the level of cricoid cartilage and a scout scan was performed. The following structures were visualised – C6 tubercle (Chassaignac's tubercle), carotid artery, internal jugular vein, longus coli muscle , thyroid gland and trachea (figure 2) . Under local infiltration , the needle was advanced from lateral to medial. Needle entry was between carotid artery and C6 tubercle using in-plane technique .Needle was advanced until longus coli muscle was reached . Needle was placed between longismus colli muscle and the prevertebral fascia . Correct placement of needle was checked by giving 1ml of the dye and confirming using fluoroscopy , the subfacial spread of dye till T1. After which the remaining drug was deposited in place. The block was performed using 7 ml of 1% lignocaine plus 40mg of triamcinolone .The drug was deposited in incremental doses after repeated aspirations (figure 3).After block was performed , the patient was kept in the post anaesthesia care unit for observation . The patient did not develop any adverse reactions. Patient showed symptomatic improvement. Post block audiometry was performed the next day , which showed improvement in the bone conduction.(figure 4) Patient was subsequently followed up and discharged on day 3 post procedure

DISCUSSION

The aim of this procedure is to block the cervical sympathetic plexus so as to provide improved internal ear circulation and also to alleviate the pain .The stellate ganglion extends from the transverse process of C7 vertebra to the neck of the first rib upwards. Stellate ganglion is a star shaped ganglion formed by the fusion of inferior cervical ganglion and the first thorasic ganglion(11) .It provides sympathetic supply to the upper limb , head , neck and heart. Sympathetic fibers arise from pre ganglionic neurons of anterolateral grey horn , of the first few thoracic segments. They exit the spinal cord through the corresponding nerve root and reach the sympathetic ganglia through white rami communicates. It provides Postganglionic sympathetic fibers to the upper limb through -C7,8 and T1, and Pre ganglionic Sympathetic fibers to head and neck, traverse to superior and middle cervical ganglia. It is located medial or posterior to the vertebral artery close to the dome of the pleura.Its relations are - Anteriorly -carotid artery, vertebral artery(C7) ; Medially -esophagus, trachea, thyroid gland, longismus colli muscle and recurrent laryngeal nerve ; Laterally - anterior scalene muscle ; Posteriorly –Transverse process. For the above mentioned supply of the stellate ganglion, the block can be used for varied purposes like, Complex regional pain syndrome I&II,Vasculopathies- acute and chronic vasculopathies ,Arteriospasm after embolectomy or inadvertant intraarterial thiopentone injection ,Raynaud's phenomenon, systemic sclerosis ,Herpes zoster,Intractable angina,Head and neck malignancy,Phantom limb syndrome,sudden hearing loss,hyperhydrosis of upper limb, Bells palsy ,cardiac arrhythmias, qunine poisoning, hot flashes and vascular headache. (12) In a study conducted by olaf haug et al, 56 patients, treated with stellate ganglion block for idiopathic sudden sensorineural hearing loss, were compared with 20 patients of similar diagnosis who were treated by other means. 70% of the stellate-ganglion-block-treated patients achieved substantial hearing improvement(13) Yoshikazu et al, conducted a retrospective study of 49 patients who received stellate ganglion block and 496 patients who received only conservative therapy, for treatment of sudden hearing loss. 48% showed improvement in hearing.(14) In a study by woong kim et al 44 patients with sudden sensorineural hearing loss were treated with stellate ganglion block,8 patients (18.2%) showed complete recovery, 9 patients (20.5%) partial recovery and 16 patients (36.4%) slight improvement by pure tone gain.(15) These results showed a relative superiority of stellate ganglion block to other therapeutic regimens. From the studies done by Matsumotos and Malmqvist et al., it is clear that the block carried out at the level of C_6 was producing a successful sympathetic block of the head/neck with sparing of the upper limb as compared to the block done at C7.(16) The ideal location for performing the Stellate ganglion block is in the subfascial plane which is superficial to the longus colli muscle. This can be identified only under USG.we performed the stellate ganglion block by this technique in which the stellate ganglion was safely accessed via the lateral approach at the C_6 level with USG guidance.An improvement in the symptoms and better hearing by means of improvement of bone conduction in PTA was observed and our patient showed complete recovery from the hearing loss.

Some of the patients complain of presence of lump in the throat, which can be transient. There might also be persistent foreign body sensation, which is could be due to the blockade of the external laryngeal nerve or recurrent laryngeal nerve resulting from the local anaesthetic spread. Accidental oesophageal puncture or pneumothorax or spillage of drug resulting in the phrenic nerve block are also some other complications. Hoarseness could also be present due to a retropharyngeal haematoma caused by the block.(8) Our patient did not develop any of the above mentioned complications.

CONCLUSION

Based on the block performed there has been significant improvement in the hearing of the patient , both clinically and based on audiometry . Hence we would like to conclude that stellate ganglion block is proving to be successful in treating sensorineural hearing loss when performed safely and effectively

Figure 1 – Pre Block Pure Tone Audiometry

Figure 2 – Pre Block Usg

Figure 3 - Post Bolck Usg

Figure 4 - Pure Tone Audiometry Post Block

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