Supraorbital/Supratrochlear Nerve blocks: Clinical Significance of the Superior and Anterior Approaches

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Introduction

Hair restoration is one of the commonest cosmetic surgery procedure in men [1]. The procedure is performed under local anaesthesia. Many of the patients are anxious about the degree of pain to be expected during and after the surgery. The pain of the local anaesthetic agent is dependent on various factors like needle gauge, composition, temperature, pH, speed of injection, anatomical structure/area etc. Various maneuvers are used to decrease the pain during the administration of local anaesthesia like vibration anaesthesia, Cryotherapy etc [2-4]. With the introduction of newer drugs for local anaesthesia, the safety is increased.

Peripheral nerve blocks constitute a major tool in the armamentarium in the office-based cosmetic surgery procedures. Supraorbital (SO) and supratrochlear (ST) nerve are the terminal branches of the frontal nerve [5]. These nerves supply mainly the skin of the forehead. These nerve blocks are beneficial in many procedures. The SO/ST nerve block during hair transplant surgery decreases the severity of the pain for recipient site injections. Their blockade is beneficial in treating disorders like trigeminal neuralgia, migraine etc [6,7]. These nerve blocks also result in significant decrease in the need of additional analgesics and opioids [8]. The SO/ST nerves collectively provide sensory innervation to the forehead and frontal scalp as well as to the vertex (Figure 1). The anatomical details and variations of these nerves is very essential for a proper anaesthesia.

The supraorbital (SO) nerve emerges from the supraorbital foramen or notch. The foramen or notch is located about 27 mm lateral to the glabellar midline. However, the distance varies if different races [9,10]. The nerve divides into medial and lateral branches. Similarly supratrochlear (ST) nerve emerges through supraorbital notch about 17 mm from glabellar midline. It follows one of the four courses i.e., Ia (ST nerve emerges independently from SO nerve as a single nerve through Corrugator Supercilli muscle), Ib (ST emerges independently from SO nerve and bifurcates into 2 branches prior to entering the Corrugator Supercilli muscle), IIa (ST nerve emerges from SO notch with SO nerve and passes through Corrugator Supercillimuscle as a single nerve), and IIb (ST emerges from SO notch with SO nerve and bifurcates into 2 branches prior to entering the Corrugator Supercillimuscle) [11].

There are two techniques to accomplish SO/ST nerve block, i.e., anterior and superior. In superior approach, the needle is inserted from the cephalic side in such a way that the tip of the needle is felt at SO foramen by the palpating finger of the physician’s other hand. Whereas in the anterior approach, the physician stands on the side of the patient and the needle is directed towards the midline. The following study was undertaken to compare the pain levels of anterior and superior approaches.

Materials and Methods

The study was conducted in 30 patients undergoing SO/ST nerve clock for hair restoration surgery. The patients undergoing 1st session were included. The informed consent was taken. All the injections were administered by the surgeon. A 3ml syringe with 30G needle was used containing 1% Xylocaine with adrenalin is 1:100,000 dilution. Separate needle was used for each side.
Superior approach

The needle was introduced about 2 cm above the SO foramen palpated. About 0.5 ml of the anaesthetic solution was injected. The needle was advanced caudally till the tip was felt at the foramen and 0.5 ml was injected here. The needle was withdrawn slightly and directed laterally injecting about 1.0 ml in a ‘fanning out’ way. The needle was again withdrawn and directed medially injecting about 1.0 ml. This technique encompassed all the possible branches of the SO/ST nerves (Figure 2).

Figure 2: Superior approach for supraorbital/supratrochlear nerve block.

Anterior approach

The SO foramen was palpated and the needle was inserted from the front side of the patient. Care was taken not to puncture the SO nerve. About 1.0 ml was injected here. The needle was withdrawn and 1.0 ml was injected on medical and 1.0 ml on lateral side (Figure 3). At the end of the procedure, the patients were asked to rate the pain according to the Wong Baker Faces Pain Scale [12] (Figure 4). The patients were also asked to give their feedback on the choice of technique for the next time. The data was analyzed statistically by Mann-Whitney’s U-test (using the Easy Statistics Calculator©, version 1.2.0, Saitama, Japan, copyright 2016).

Figure 3: Anterior approach for supraorbital and supratrochlear nerve block.

Figure 4: Wong Baker Faces Pain Scale©.

Results

A total of 35 patients were included in the study. The mean age was 33.4 years (range; 18 to 56). The mean pain score was 4.14 in anterior approach whereas 2.85 in superior approach (Table 1). About 31.4% of the patients were smokers. The pain score in smokers vs non-smokers was 4.09 vs 2.82 in anterior approach respectively. Where as in superior approach, the mean score was 4.27 vs 2.86 in smokers and non-smokers respectively. About 20% patients were anxious about the anterior approach that the needle may hit the eyeball. About 71.4% of the patients voted for superior approach on both sides for the next time.

Table 1: Statistical Analysis.

| Statistical Analysis | Anterior Approach | Superior Approach |
|----------------------|-------------------|-------------------|
| Mean                 | 4.142857          | 2.857143          |
| SEM                  | 0.1553113         | 0.1885052         |
| SD(n)=0.93021834     | SD(n)=1.0991648   |
| n=35                 | n=35              |
| R1=1603.5            | R2=881.5          |
| Zo=4.383447          | P=0.0000122 (2 tails) |
| (Corrected for the same rank) | Zo=4.02403393 | P=0.000022 (2 tails) |

Discussion

The role of SO/ST nerve block is well established in plastic surgery. It is routinely performed for the management of different kinds of headaches like tension headache, chronic headaches, migraine etc [6,7]. It is also the mainstay of regional anaesthesia in office-based cosmetic surgery procedures like hair restoration procedure [13]. To carry out a successful SO/ST nerve block, the relevant anatomy is of utmost importance which helps to locate the nerves and block them.

The sensory innervation of the face is supplied by trigeminal nerve which has five branches. The frontal nerve enters the orbit via superior orbital fissure and passes anteriorly beneath the periosteum of roof of the orbit. The frontal nerve gives off a larger lateral branch, the supraorbital nerve, and a smaller medial, supratrochlear nerve. The SO nerve exits the SO foramen or notch along the superior rim of orbit, accompanied by the artery and vein. In the notch or foramen, SO nerve gives off branches which supply mucosal membrane of frontal sinus and filaments which supply upper eyelid. Above the rim, SO nerve divides into superficial and deep branches.

The medical (superficial) branch passes over the frontalis muscle and divides into multiple smaller branches with cephalic distribution towards the hairline. It provides sensory innervation to the forehead skin and anterior scalp as far as the vertex. The deep branch (latera0 runs deep in the frontalis across lateral forehead between galeaaponeurotican pericranium. It provides sensory innervation to underlying periosteum and frontal parietal scalp. The ST nerve is the branch of the frontal
nerve and supplies sensory innervation to the bridge of the nose, medical part of upper eyelid and medial forehead. Usually ST nerve is located about 17mm from midline and SO nerve at 27 mm from midline.

The two approaches for SO/ST nerve block are well-established. The current study is first of its kind to compare the differences in terms of pain and patients’ anxiety. The superior approach was found to be clinically/statistically significant (p<0.5). There are many factors which influence the experience of pain perceived by patient but the technique of SO/ST nerve block remained one of the significant factors. The visualization of watching the injection near the eyeball probably resulted in high level of anxiety in anterior approach.

The study by Chang et al described the pain of SO/ST nerve block to be between 1 and 2 (out of 10) whereas in the present study, the average pain score was 4.4 (out of 10) [14]. In another study, the average pain score was 3.9 (out of 10) and 6.8 9 out of 10) in SO/ST nerve block with and without the use of topical anaesthetic cream [15]. In another study, the mean score also remained 3.86 [16]. In these two studies, the anterior approach was used for administering SO/ST nerve block. In the present study, the pain score was found to be doubled in anterior approach as compared to the superior approach. The pain of superior approach remained 2.85.

Distraction during the administration of local anaesthesia injection plays a very important role [4,17]. In the present study, all the injections were administered by the surgeon. The needle gauge, room temperature and environment were kept the same in all the patients. The speed of the injection was kept slow and maintained by the surgeon to a very slow in all the patients. The Wong Baker Faces pain scale was used for rating as the scale gives the opportunity to the patients to express how they feel as it has a well established reliability and validity even in children [18,19].

Conclusion

The superior approach for administration of supraorbital/supratrochlear nerve block proved to be better approach as far as the patient’s anxiety about the injections is concerned. It also proved to be less painful.

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