

Research Article

Clinical significance of Vibration Anesthesia on reducing pain of Ring-Block (Subcutaneous Injections) in the patients undergoing Hair Restoration Surgery

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Introduction

Pain is a complex phenomenon which is unpleasant. Different cosmetic procedures are associated with varying degrees of pain. Various modalities are adopted to decrease the severity of pain. The commonly used is the administration of analgesics (opioid or non-steroidal). The pain is carried to the brain by pain fibres. There are various theories about the pain [1,2]. Many attempts have been undertaken to find the modalities which decrease the perception of pain by the brain. The famous 'gate theory' was proposed in 1965 by Melzack et al. [3]. It was proposed that the pain experience can be reduced by the activation of nerve fibres that conduct non-toxic stimuli. The theory suggested that the stimulation of larger diameter fibres (A-beta) can close a neural 'gate' to nociceptive signals and can reduce the perception of the pain. The 'gate' is proposed to lie within the spinal cord/brainstem and inhibits the transmission of nociceptive action potentials to higher centres in the central nervous system [4]. The "post-synaptic inhibitory and facilitatory mechanism" provide a basis for explaining the pain reducing strategies such as rubbing the painful area or applying cold or vibration to decrease the perception of the pain. Various topical irritants used in a few 'magic' creams also work on the same principle.

Every effort is made to decrease the perception of pain in cosmetic surgery procedures especially hair restoration. A surgeon who can perform a hair restoration without pain has an edge over his competitors. The potential patients undergoing hair restoration are very anxious about the pain level to be perceived during the procedure. Vibration anaesthesia is becoming increasingly used in hair restoration to decrease pain perception. Various recent studies have demonstrated the effective use of vibrations to decrease the pain of local anaesthesia injections [5,7]. The pain of the injection has basically two components; the first is the actual needle prick and second is the discomfort felt due to the tissue stretch by the local anaesthetic drugs [8].

The following study was conducted to compare the pain level of ring block in the patients undergoing hair restoration with and without the use of vibration.

Materials and Methods

The study was undertaken in a private hair restoration center in adult patients undergoing 1st session of hair transplant surgery. Written informed consent was

obtained from all the patients were given detailed per-operative consultation about the procedure, injection and outcome. First generation cephalosporins and diazepam 10 mg were given orally about 15 minutes before the procedure. The patients underwent strip harvest technique or follicular unit extraction. The scalp on the forehead was divided into 2 halves from midline. Each side was assigned to one of the injection techniques A or B randomly. The decision about the first technique was also undertaken randomly. The solution injected on each side contained 20ml of 2% Xylocaine, 0.5 ml of adrenaline and 40ml of normal saline. A separate syringe with 30°G needle was used on each side.

Injection technique A (without vibration)

The 1st injection was given in the midline and directed towards the ear. The 2nd injection was given at the junction of upper border of temporal with the frontal hairline. All the later injections were administered alternatively. First a weal of local anaesthetic was raised injection about 0.5 ml of the solution. The next injection was given at the end of the weal (Figure 1). In each prick, 0.5 ml of the solution was injected.

Injection technique B (with vibration)

First of all, the vibrator was started and placed over the site for about 3-5 seconds before the injection. The needle was inserted slowly and about 0.5 ml of the solution was injected in the midline. The 2nd injection was given at the junction of upper border of temporal with the frontal hairline using the vibrator (Figure 2). The rest of the injections were carried out alternatively through the weal produced of the previous injection. The injections were administered by the first author therefore the speed of injection was kept constant in all the patients. At the end of the injections on each side, the patient was asked about the level of pain according to the Wong Baker Faces Pain Scale (Figure 3) [9]. All the data was then analyzed statistically using 'Stats tester' © version 2.0.1, 2016-17, BMP Group, Saitama, Japan.

Results

Twenty-five patients were included in the study. The mean age of the patients was 34.52 years (range, 24-52 years). The average pain score without vibration was 4.56 (range, 1-8) whereas the average pain score with vibrator was 2.96 (range, 1-5). Majority of the patients (44%) undergoing injections without vibrator had score '5' or '6' whereas majority (60%) had score '3' or '4' with the vibrator (Table 1). About 44% of the patients were smokers. The average pain score in non-smokers was 4.14 without vibrator and 2.57 with vibrator. The average pain score in smokers was 5.09 without vibrator and 3.45 with vibrator ($p < 0.05$).



Figure 1: Injection technique without vibrator.



Figure 2: Injection technique with vibrator.

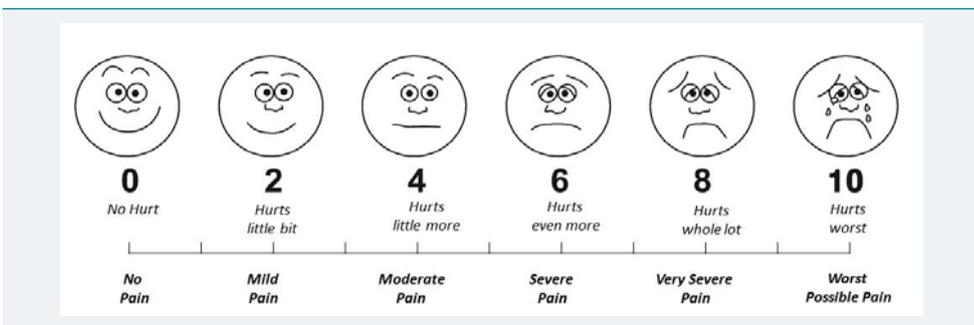


Figure 3: Wong Bakers Faces Pain Scale.

Table 1: Patients' data.

S. No.	Age	Score without Vibrator	Score with Vibrator	Co-morbid condition
1	25	5	3	Non-Smoker
2	27	6	4	Non-Smoker
3	31	4	1	Non-Smoker
4	33	2	1	Non-Smoker
5	39	4	3	Non-Smoker
6	39	6	3	Non-Smoker
7	36	3	2	Non-Smoker
8	52	2	2	Non-Smoker
9	36	4	2	Non-Smoker
10	34	3	1	Smoker
11	29	4	3	Non-Smoker
12	26	6	4	Smoker
13	30	5	3	Smoker
14	32	5	4	Smoker
15	32	6	3	Smoker
16	35	6	4	Smoker
17	37	5	4	Smoker
18	41	6	4	Non-Smoker
19	44	1	2	Smoker
20	33	8	5	Non-Smoker
21	31	4	3	Non-Smoker
22	35	3	3	Smoker
23	40	3	3	Smoker
24	28	7	5	Smoker
25	38	6	2	Smoker

Discussion

Pain is an important factor in hair restoration surgery. The potential patients are anxious about the degree of pain to be expected during the surgery. There are multiple factors which are associated with the degree of pain. The needle gauge (length and diameter), bolus of the drug injected, the anatomic areas, the composition of the local anaesthetic, temperature, pH etc, all are significant factors. The pain sensation is transmitted by two main types of fibres (myelinated A-delta fibres and type C fibres). The touch sensation is carried by A-beta fibres. The 'gate' theory of pain postulated that there is an interaction between pain fibres and touch fibres input at the spinal cord level and a non-painful stimulus can block the transmission of a painful stimulus [3]. The vibration also stimulates the mechanoreceptors and primary nerve endings of the muscle spindle too [10,11]. The stimulus which reaches the brain first is perceived first [3]. Various studies have been mentioned in which vibration anaesthesia has been used to reduce the pain, however there are a few studies which also describe its use in hair restoration surgery [12,13].

The vibrations applied before the noxious stimulus (like injection) reduces the intensity of the pain perceived by the brain. We also used vibration about 3-5 seconds before the injection was given. The local anaesthetic injection has 2 components. The 1st component of actual 'needle prick' is blocked but the vibrations applied [8]. The 2nd component of pain is due to the injection of anaesthetic drug and is dependent on various factors like composition, the volume, temperature, pH and speed of injection. This component of pain can also be reduced by the vibrations as it massages the local area and helps in the fluid dissolution into the surrounding tissues. The audible sounds produced by the vibrator also helps to divert the attention of the patient. The size of the needle and the injection speed influence the severity of pain perceived by the patients.

The use of vibration just before the injection reduces the pain as shown in many other studies [14,15]. In the current studies the average pain score was 4.56 without the use of vibrator and 2.96 with the vibrator ($p < 0.05$). We also postulate that the vibration applied just prior to the injection needle, actually divert the attention of the patient as well as helps to reduce the degree of pain felt. In another study by the author, the average pain score of supraorbital/supratrochlear (SO/ST) nerve block was 4.6 without the vibrator and 2.4 with the vibrator which are comparable to the results of the current study. Moreover, the comparison of both the studies also revealed that there was almost no clinically significant difference of pain between two techniques. It also ruled out the belief by many surgeons that the SO/ST nerve blocks are very much painful than the ring block or subcutaneous injections (4.56 in subcutaneous ring block injections vs 4.6 in SO/ST nerve block without vibration anaesthesia and 2.96 in subcutaneous ring block injections vs 2.4 in SO/ST nerve blocks with vibrations applied). The same observation was also seen in another study by the author [16]. The current study indicates that the vibration can reduce the pain of the injection dramatically.

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