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FINDING COMFORT –A COMPARATIVE & AN OBJECTIVE EVALUATION OF PAIN IN VISUALLY IMPAIRED CHILDREN

Dental Science

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ABSTRACT

Background: Pain is the common cause of needle phobia. Many advanced techniques help in reducing the pain factor.
Objectives: To evaluate the efficacy of vibraject versus pre-cooling of anaesthetic site with ice stick and conventional injection technique.
Materials and Methods: 45 visually impaired children aged 6-13 years requiring dental treatment under local anaesthesia were selected and randomly divided into 3 groups of 15 each:
Group 1- procedure was done with Vibraject™
Group 2- pre-cooling the anaesthetic site with ice stick
Group 3- local anaesthesia using a conventional method
Readings of various physiological parameters were assessed and recorded before, during & after the procedure by pulse oximetry & compared between vibraject, conventional & ice stick method.
Results: Statistically significant result was obtained for Vibraject in comparison with ice stick and conventional technique.
Conclusion: Vibraject proved to be better technique for child patients with needle phobia.

KEYWORDS

Pain, needle, phobia, visually impaired

INTRODUCTION:

Dental anxiety and fear are a matter of concern for the pedodontist while treating child patient. The use of local anesthetic injections is one of the most anxiety-provoking procedures in children. In order to overcome this, many advanced techniques like small vibrating device for injection technique and also precooling the site of injection helps in reducing the pain factor.

Studies conducted on these newer methods gave contradictory results. The contradiction has given a possibility of the fact that phobia or anxiety may build up in children due to the 'sight of needle'. Hence this study was conducted on visually challenged children to understand the main cause of anxiety i.e. visual perception or pain perception.

Objectives:

Aim of this study was to evaluate the efficacy of Vibraject vs pre-cooled anaesthetic site with ice-stick & conventional injection technique in visually challenged children.

MATERIALS AND METHODS:

45 visually impaired children (completely blind) from age 6 to 13 years were selected from Sajeevi blind school, Navanagar, Bagalkot, Karnataka. An approval from the ethical committee of the institution was obtained before starting the study. A detailed informed written consent was also obtained from the patient, parents or guardian and the teacher in charge. The present study was conducted as a randomized, three-center, single-blinded (the investigator assessing various physiological parameters was unaware of the technique of anaesthetic delivery) clinical trial.

Inclusion criteria

Visually impaired children aged between 6 & 13 years, who never had an unpleasant medical or dental experience and who were requiring dental treatment with LA were chosen. All the patients were cooperative (Frankl's rating scales III and IV).

Exclusion criteria

Subjects with allergies, systemic diseases, intellectual disability, psychiatric disorders, and dental abscesses or fistulas in the procedure site were excluded.

Study design: 45 visually impaired children aged between 6 to 13 years requiring dental treatment under local anaesthesia were selected and randomly divided into 3 groups of 15 each.

Group 1- procedure was done with Vibraject™
Group 2- pre-cooling the anaesthetic site with ice stick
Group 3- local anaesthesia using a conventional method

Readings of various physiological parameters were assessed and recorded before, during & after the procedure by pulse oximetry & compared between vibraject, conventional & ice stick method.

Figure.1: Vibraject with syringe

The local anaesthesia was administered using Vibraject™ (ITL Dental, 31 Peters Canyon, Irvine, CA). Physiologic parameters (heart rate, oxygen saturation, pulse rate) were recorded with pulse oximeter before, during, and after the injection.

Figure.2: Patient being explained about Vibraject

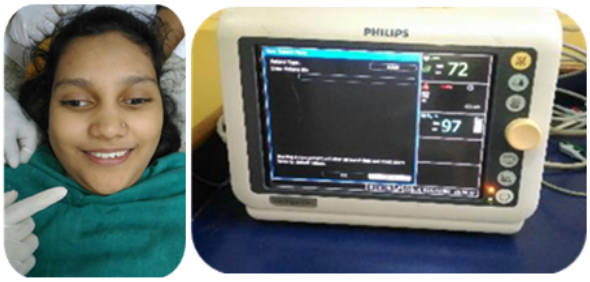


Figure.3, 4: Happy patient after anaesthesia, Pulse oximetry

Figure.5: Ice stick

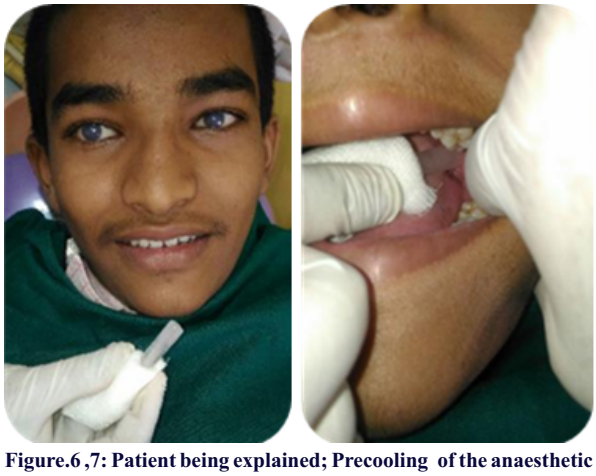


Figure.6 ,7: Patient being explained; Precooling of the anaesthetic site

Figure.8: Pulse oximetry

Before administering LA, one ice stick was used for numbing or cooling the anaesthetic site. LA was administered using conventional syringe technique. Heart rate, pulse rate, and oxygen saturation were recorded using a pulse oximeter before, during, and after the injection.

Figure.9, 10: Conventional syringe, Administering LA

Figure.11: Pulse oximetry

Local anaesthesia was administered using conventional syringe technique. Heart rate, pulse rate, and oxygen saturation were recorded using a pulse oximeter before, during, and after the injection.

RESULTS:

Significant differences in the physiological parameters were observed between the three techniques at various time intervals. Comparison of pulse rate and heart rate between conventional syringe, Vibraject and pre cooling anaesthetic site showed a significant difference ($P < 0.05$) and Vibraject was found to be superior to other two methods. Changes in oxygen saturation were non-significant, because the time period was very short for such variation. Graphical representation of heart rate, pulse rate and oxygen saturation is shown in Graphs respectively.

Table 1.Comparison of heart rate between the study groups during the procedure

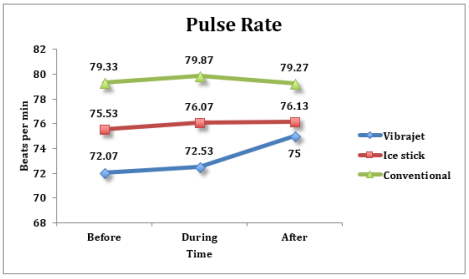
PR	Groups	N	Mean	SD	Min.	Max	Anova p-value
	Vibraject	15	72.53	6.31	54	80	0.03 (S)
During	Ice stick	15	76.07	6.26	64	86	0.12(NS)
	Conventional	15	79.87	8.50	68	95	0.16(NS)

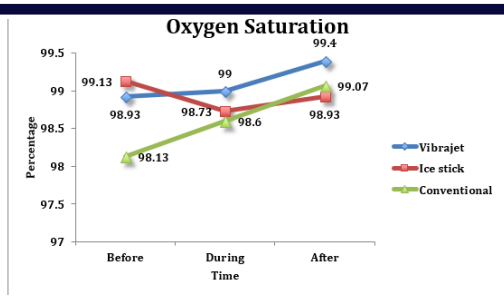
Table 2. Comparison of pulse rate between the study groups during the procedure

HR	Groups	N	Mean	SD	Min.	Max	Anova p-value
	Vibraject	15	87.67	10.13	74	109	0.05 (S)
During	Ice stick	15	91.00	11.73	77	121	0.19(NS)
	Conventional	15	95.80	15.47	76	124	0.22(NS)

Table 3. Comparison of oxygen saturation between the study groups during the procedure

HR	Groups	N	Mean	SD	Min.	Max	Anova P-value
	Vibraject	15	87.67	10.13	74	109	0.05 (S)
During	Ice stick	15	91.00	11.73	77	121	0.19(NS)
	Conventional	15	95.80	15.47	76	124	0.22(NS)





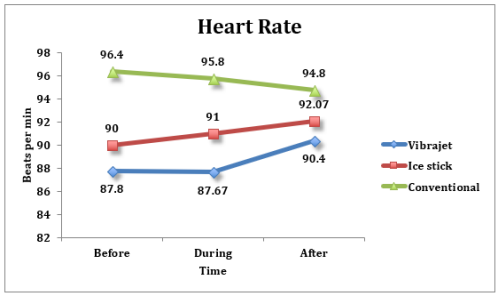


Figure.12, 13, 14: Graphical representation of oxygen saturation, pulse rate and heart rate

DISCUSSION:

Pain is fundamental to human existence. It has shaped our evolution, and aids our ability to avoid dangerous hazards [1][2]. The experience of pain is complex, as reflected by its definition as "an unpleasant sensory and emotional experience, associated with actual or potential tissue damage [3]."

Pain is a common experience during childhood. All children encounter "everyday" pain associated with minor bumps and bruises, and many endure pain resulting from serious injuries, diseases and other health conditions requiring medical as well as dental care [4].

Needle phobia is an extreme fear of medical procedures involving injections or needles. For most people who have this fear, it develops around age 4 or 5 with a bad immunization experience.

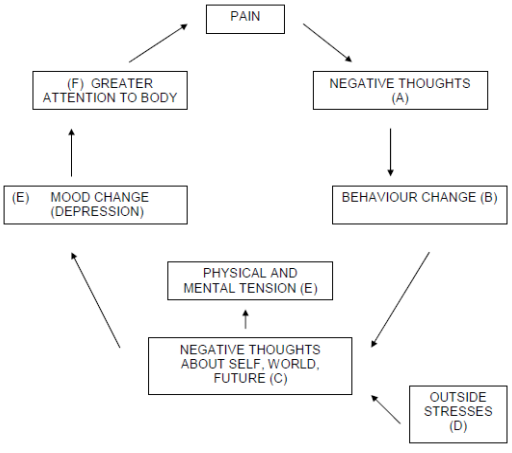


Figure.15: Affects of pain

Pain is closely related to our thoughts and behaviour. The following diagram shows how pain can lead to changes in behaviour and mood. According to figure.13:

Pain can cause miserable "negative" thoughts which might lead to a **behaviour change** of some sort. One of two things tends to happen:

(1) Children reduce their activity levels so that they not only stop doing things like various school activities but also withdraw from socialising with their peer groups.

(2) Or children push themselves to finish tasks given in hand. They easily give up on the things that they enjoy doing because they no longer have the time or energy to do them.

Both types of behaviour change result in people giving up the things that they enjoy most. With less positive things happening in our life, not surprisingly we may start to think about ourselves and about our life in general in a more negative way.

(C) Such negative ways of thinking easily become general and soon automatic resulting in becoming depressed and tense, both physically and mentally. Mood changes are likely to make them feel physically worse, by making them pay greater attention to their bodies which can open pain gates.

'Fear of pain & what we do about it may be more disabling than pain itself' (Waddell et al., 1993)[5]. Fear and anxiety often occur together but these terms are not interchangeable. Even though symptoms typically overlap, a person's experience with these emotions differs based on their context. *Fear* relates to a known or understood threat, whereas *anxiety* follows from an unknown or poorly defined threat[6].

In case of fear we know what we are afraid of, we can see the threat has faced it before and in case of anxiety it is unknown fear. Anxiety can be related to the peer pressure. So in case of fear child is actually scared but in case of anxiety child is afraid yet would do it anyway if supported and guided well. Thus the visually impaired patients who never had any unpleasant experience with dental or medical treatment were chosen for this study.

Fear, anxiety and pain are interrelated [7]. The most common dental complaint is pain. It accounts for more than 80%of all dental visits [8]. Patients may experience an overwhelming amount of anxiety and apprehension in anticipation of pain.

Children experience pain and exhibit variability in the expression of pain and that inadequate pain management is very necessary for successful and high quality dental treatment.

Inhibition of pain transmission

The **gate control theory of pain** asserts that non-painful input closes the nerve "gates" to painful input, which prevents pain sensation from travelling to the central nervous system. Therefore, stimulation by non-noxious input is able to suppress pain. Here the non- noxious stimulus is vibration.

Pain causes elevation of blood pressure & pulse rate by two basic mechanisms that may simultaneously operate. Pain signals the central nervous system via Sympathetic/ Autonomic stimulation or Adrenal gland release of adrenalin causing hypertension and tachycardia.

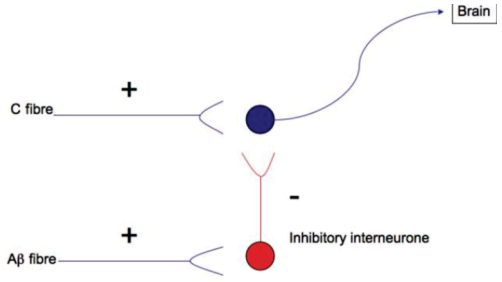


Figure.16:Gate control theory of pain

The sympathetic (autonomic) nervous system is stimulated by electrical **pain** signals that reach the central nervous system.Heart rate increases during pain. Noxious stimuli and the resulting pain affect the activity of the sympathetic nervous system. The sympathetic activation pattern is characterized by an instantaneous defence behavior with piloerection, sweat secretion, increases in heart rate, blood pressure, cardiac output, and blood flow in skeletal muscles and corresponding blood flow reductions in skin, kidneys, and splanchnic region (Janig, 1985, 1995). In the presence of **pain**, tissue **oxygen saturation** is further reduced by hypovolemia. Thus, **pain** must be considered when evaluating tissue **oxygen saturation** and perfusion index as markers of hypovolemia in trauma patients.

Many people are anxious of the dental injection itself. Several devices have been manufactured to aid in the reduction of pain perception with the dental injection. One such device is the VibraJect®, which, according to manufacturer claims to decrease pain perception during

the administration of dental anesthesia.VibraJect®, LLC (USA) was first introduced in 1995. It's a small vibrating dental injection attachment device. The device has a clip bracket that gets easily attached to most kind of dental injections and has a small motor that adapts to the clip bracket. This attaches to the needle which causes vibrationso slightly. The clip bracket is autoclavable hence preventing cross contamination between patients. The vibraject works on Gate-Control theory which states that pain and noxious sensation (touch, pressure, and vibrations) are carried to brain via thin and large diameter nerve fibers through dorsal horn of spinal cord that acts as a 'gate' which allows large fiber activity to reach the brain if its intensity is relatively high than thin fiber activity. So as a result if intensity of vibration or other noxious stimulus is more than pain intensity, the perception of pain is blocked by dorsal grey horn of spinal cord.

Another recommended method to relieve the pain of injection is cooling of the injection site. This technique has been used in sprains, burns, fractures, bruises, insect bites, and sports injuries. In several studies, ice has been used to relieve pain from a local anaesthetic injection, control postoperative pain, and prevent edema.

CONCLUSION:

Based on observations of this study, Vibraject provides less pain while giving local anaesthetic injections in comparison to the conventional injection technique in clinical dental procedures in children of 8-14 years of age. The role of physiological parameters in pain perception was inconclusive. Pre-cooling of the injection site before infiltration anaesthesia is an easy, reliable and effective technique with no additional cost and was found to reduce discomfort and facilitate clinical management.

FUTURE SCOPE:

Techniques which enhance the behavioral response in children should be considered for a better pediatric dental practice. Future research should involve well-controlled efforts to develop and evaluate other techniques or devices that can reduce the pain of injection and which require minimal time.

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