

# Clinical Comparative Evaluation of Pain Perception during Infiltration with the CCLAD or Conventional Syringe

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**Abstract- Aim:** The aim of this study was to compare a computer controlled local anesthetic delivery (CCLAD) system with a conventional syringe in terms of the pain of needle insertion and injection during infiltration.

**Material and method:** Sixty patients between the ages of 18 and 45 years requiring local anesthesia for root canal treatment of maxillary posterior teeth were randomly allocated to receive local anesthesia with the CCLAD system (Comfort Control Syringe) or a Conventional syringe (Aspirating Syringe). Lidocaine 2 % with adrenaline (1:80,000) was given as an infiltration. The pain experience during the LA was recorded using a visual analogue score (VAS). Data was analysed using SPSS version 21. VAS scores were summarized as mean/median and standard deviation / interquartile range. As the VAS scale is an ordinal variable, thus inferential statistics were applied using non-parametric test i.e. Wilcoxon test.

**Results:** Mean VAS score used for assessment of pain perception on using Comfort Control Syringe was  $1.50 \pm 0.51$  and for Conventional Syringe group was  $2.37 \pm 0.56$ . The difference between the groups were statistically significant ( $<0.001$ ).

**Conclusion:** Assessment of pain perception during CCLAD system was found to be significantly lower than that found in conventional syringe.

**Index Terms-** CCLAD, Conventional syringe, Pain perception, Visual analogue score

## INTRODUCTION

In dentistry, injection of a local anesthetic is the greatest source of fear and anxiety, especially in children and adolescents, because pain and discomfort are mainly associated with it<sup>1</sup>. In addition, serious anxiety and fear can increase the perception of pain<sup>2,3</sup>. Although local anesthesia aims to eliminate pain during dental procedures, the fear associated with the needle puncture is often considered a reason why the dentist is not visited<sup>1</sup>. Fear and anxiety-related behavior can be a major impediment to dental care and have a negative impact on global health of the patient.<sup>4</sup> Therefore, techniques to reduce pain during injection are urgently needed to prevent patients from avoiding dental

treatment.<sup>5</sup> A useful alternatives in selected cases are the use of general anesthesia, sedation, hypnosis and a host of other behavioral techniques. A study conducted by Hill and Walker<sup>6</sup> evaluated stresses in patients undergoing wisdom teeth extraction and the authors concluded that local anesthesia is the preferred mode of pain control for patients who do not express a strong preference for anesthesia.

There are various ways to relieve pain before dental procedures or the often painful nature of the injection into local anesthesia. Transcutaneous electrical nerve stimulation (TENS),<sup>7</sup> intraoral lidocaine patch and computerized local anesthesia<sup>8</sup> are newly developed methods for pain relief and anxiety in dental patients as alternatives to conventional local anesthesia.

The Comfort Control Syringe (MIDWEST, DENTSPLY) is a computer-controlled anesthetic system with a hand-piece component, enabling the anesthetic solution to be delivered at a constant and slow pressure, potentially below the pain threshold.<sup>9,10</sup>

Pain is commonly measured and described using the visual analog scales (VAS), although this is a useful method for describing the pain experience, the multidimensional nature of this complex stimulus is not evaluated. For this measurement, more sophisticated techniques include the analysis of the sensory, affective and cognitive components of pain, as described in a number of scientific studies.<sup>11-13</sup>

The present study was therefore conducted to evaluate and compare the perception of pain during infiltration with the CCLAD or conventional syringe using visual analog scales. The null hypothesis was that during infiltration with the CCLAD system or conventional syringe there is no difference in the perception of pain.

## MATERIALS AND METHODS:

This study was conducted in the Department of Conservative Dentistry and Endodontics, and institutional ethical clearance was obtained. The patients were explained about the procedure, and informed consent was obtained.

Patients aged between 18 and 45 years in good health undergoing root canal treatment of maxillary and mandibular posterior teeth were included. All the included patients had been clinically diagnosed with irreversible pulpitis. Patient with severe needle

phobia, taking any medication that would alter pain perception, pain on palpation and percussion were excluded.

The patients were randomly divided into two groups of twenty each:

Group I Computer-controlled injection system (Comfort Control Syringe, MIDWEST, DENTSPLY): Local infiltration of lidocaine hydrochloride 2% with adrenaline 1:80,000, marketed in special cartridge, using compatible disposable 30-gauge, 10 mm needles and auto-controlled injection system.

Group II Conventional syringe (Aspirating Syringe, Septodont): Local infiltration of 2% lidocaine hydrochloride with adrenaline 1:80,000, using 30-gauge, 10 mm needle and disposable TS.

The anesthetic solution in all patients was delivered by same operator, to ensure that the results were not influenced by inter-operator variability. Pain perception rating was obtained by using 10 point visual analog scale (VAS) of pain rating. Overall pain was assessed by using a 200 mm horizontal, ungraded visual analog scale onto which patients were asked to place a marking. The left side was marked “no pain” and the right side marked “worst pain imaginable”. A 10 point verbal rating was also used and patients were asked to give a value to their pain experience, zero being “no pain”. Values thus obtained were submitted for statistical analysis.

Data was analysed using SPSS version 21. VAS scores were summarized as mean/median and standard deviation/interquartile range. As the VAS scale is an ordinal variable, thus inferential statistics were applied using non-parametric test i.e. Wilcoxon test. The level of statistical significance was set at 0.05.

**RESULT:**

Table 1 showing mean VAS score and Standard deviation (SD) of Comfort Control Syringe and conventional syringe group.

Mean VAS score used for assessment of pain perception during Comfort Control Syringe application was found to be significantly lower ( $1.50 \pm 0.51$ ) than that found in Conventional Syringe group ( $2.37 \pm 0.56$ ).

**Table 1: Mean VAS score and Standard deviation (SD) of Comfort Control Syringe and conventional syringe group.**

Groups	Mean $\pm$ SD	Median	IOR	P <sup>a</sup> value
Comfort Control Syringe	1.50 $\pm$ 0.51	1.5	1.00	<0.0001, S
Conventional Syringe	2.37 $\pm$ 0.56	2.0	1.00	

S= significant, <sup>a</sup>Wilcoxon test

**DISCUSSION:**

The most common reason for patients not to visit the dentist is dental fear. Dental fear can occur for a variety of reasons, including noise and vibration from tooth cutting devices such as pain during dental treatment and local anesthesia’s irrational fear.

Patients, however, often fear pain caused by anesthetic injections rather than pain caused by dental treatment.<sup>14</sup>

A number of devices have been introduced that can inject local anesthetics into the tissues at a speed set. These “painless anesthetic devices” are collectively referred to as computer-controlled local anesthetic delivery devices (CCLAD). CCLAD also refers collectively to devices that not only slow and maintain injection speed, but also maintain constant speed while taking into account the anatomical characteristics of the injected tissues due to the system’s Infiltration / Nerve block options.<sup>15,16</sup> Currently, the Wand system, Quicksleeper and Comfort Control Syringe are available for this type of device.

In the present study, the null hypothesis was rejected because the perception of pain during infiltration with the Comfort Control Syringe and conventional syringe differed. In this study, a computer- controlled local anesthetic delivery system for infiltration injection before root canal treatment led to a lower mean pain perception level for a group of 30 patients compared to a traditional syringe injected group.<sup>2</sup> This could be because local anesthetic supply systems controlled by the computer deliver local anesthesia at a slowly graduated speed controlled by the equipment. Injection speed is associated with injection discomfort; the faster LA is delivered, the more discomfort is caused. Since computer systems provide the solution slowly, they are expected to provide a comfortable injection process. Some authors say that using the WAND reduced anxiety about dental injection in most patients.<sup>13,17</sup>

Lipp and others<sup>18</sup> suggested that basic information before dental anesthesia could be a useful method to reduce anxiety and improve the confidence of a patient in a dentist or surgeon. Lackey and others concluded that WAND was a viable alternative to traditional local anesthetic administration and reduced fear and anxiety in dental patients with this system.<sup>19</sup> The CCLAD system overcomes the human error when compared to the conventional Local Anesthesia delivery system in terms of controlling the speed of anesthetic delivery in the tissues.

Similar to our study, Dulger and others found a highly significant statistical difference between the VAS values recorded for the two groups with the computer-controlled injected group, with a mean VAS value of 1.08 compared to 2.58 for the traditional syringe injected group.<sup>20</sup> In their comparative clinical study of 50 patients, Hochman and others reported that the WAND was 2 to 3 times less painful than traditional syringe injection and that 48 of 50 patients had a more comfortable WAND injection.<sup>21</sup> They concluded that there was an optimal anesthetic flow rate that minimizes the perception of pain during an injection. In a study carried out by Yenisey to compare pain levels of computer-controlled and conventional anesthesia techniques in the treatment of prosthodontics, it was concluded that the Wand technique reduces pain levels during needle insertion and local anesthesia.<sup>22</sup>

However, there are few studies that show no difference between the computer-assisted injection system and conventional local anesthesia.<sup>23,24</sup> Goodell and others instead found that the use of

a conventional syringe injection technique was superior to the WAND. This study reported reduced pain perception, increased tolerance and reduced dental anxiety after injection when using conventional syringe. It should be noted that this study included predominantly men employed in the military service and that a more randomly selected group could expect different results.<sup>25</sup>

### CONCLUSION

Under limitations of this study it is concluded that the anesthetic solution administered with a CCLAD system reduces pain level significantly when compared to the conventional syringes.

### REFERENCES

1. Palm AM, Kirkegaard U, Poulsen S. The Wand versus traditional injection for mandibular nerve block in children and adolescents: perceived pain and time of onset. *Pediatr Dent* 2004;26(6):481–484.
2. Kuscu O O, Akyuz S. Is it the injection device or the anxiety experienced that causes pain during dental local anaesthesia? *Int J Paediatr Dent* 2008;18(2):139–145.
3. Ram D, Peretz B. Administering local anaesthesia to paediatric dental patients—current status and prospects for the future. *Int J Paediatr Dent* 2002;12(2):80–89.
4. Milgrom P, Coldwell SE, Getz T, Weinstein P, Ramsay DS. Four dimensions of fear of dental injections. *J Am Dent Assoc* 1997;128(6):756–762.
5. Rosenberg ES. A computer-controlled anesthetic delivery system in a periodontal practice: patient satisfaction and acceptance. *J Esthet Restor Dent* 2002;14(1):39–46
6. Hill CM, Walker RV. Salivary cortisol determinations and self-rating scales in the assessment of stress in patients undergoing the extraction of wisdom teeth. *Br Dent J* 2001; 191(9):513-515
7. Quarnstrom F, Libed EN. Electronic anesthesia versus topical anesthesia for the control of injection pain. *Quint Int* 1994;25:713- 6.
8. Friedman MJ, Hochman MN. Using AMSA and P-ASA nerve blocks for esthetic restorative dentistry. *Gen Dent* 2001;49:506-11.

9. Clark TM, Yagiela JA. Advanced techniques and armamentarium for dental local anesthesia. *Dent Clin North Am* 2010; 54(4): 757-768.
10. Versloot J, Veerkamp JSJ, Hoogstraten J. Computerized anesthesia delivery system vs. traditional syringe: comparing pain and pain-related behavior in children. *Eur J Oral Sci* 2005; 113(6): 488-493.
11. Newton JT, Buck DJ. Anxiety and pain measures in dentistry: a guide to their quality and application. *J Am Dent Assoc* 2000; 131:1449-1457.
12. Ramamurty S, Rogers JN. Pain management. Mosby-Year Book Inc, 1993; p 12.
13. Krochak M, Friedman N. Using a precision-metered injection system to minimize dental injection anxiety. *Compend Contin Educ Dent* 1998; 19:137-148
14. Kleinknecht RA, Klepac RK, Alexander LD. Origins and characteristics of fear of dentistry. *J Am Dent Assoc* 1973; 86: 842-8
15. Saloum FS, Baumgartner JC, Marshall G, Tinkle J. A clinical comparison of pain perception to the Wand and a traditional syringe. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000; 89: 691-5.
16. Hochman M, Chiarello D, Hochman CB, Lopatkin R, Pergola S. Computerized local anesthetic delivery vs. traditional syringe technique. Subjective pain response. *N Y State Dent J* 1997; 63: 24-9.
17. Levato C. Giving the Wand a shot. *Dental Practice & Finance*, 1998.
18. Lipp M, Dick W, Daublander M, Bertram M. Different information patterns and their influence on patient anxiety prior to dental local anesthesia. *Dtsch Z Mund Kiefer Gesichtschir* 1991; 15(6):449-457.
19. Lackey AD. An advancement in the delivery of local anesthesia. *Pract Periodontics Aesthet Dent* 1998 Nov-Dec;10(9):1191-4.
20. Dulger O, Koray M, Soley S, Yaltirik M, Williams W, Somturk E, Ogunc N. Evaluating Anxiety and Pain in Patients Receiving a Local Anaesthetic Injection: Traditional Syringe versus a Computer-Controlled Local Anaesthetic Delivery System. *Balk J Stom* 2007; 11:100-104.
21. Hochman MN. Single-tooth anesthesia: pressure-sensing technology provides innovative advancement in

- the field of dental local anesthesia. *Compend Contin Educ Dent* 2007; 28(4):186–193.
22. M. Yenisey. Comparison of the pain levels of computer controlled and conventional anesthesia techniques in prosthodontic treatment. *J Appl Oral Sci* 2009; 17(5): 414–420.
23. Asarch T, Allen K, Petersen B, Beigradi S. Efficacy of a computerized local anaesthesia device in paediatric dentistry. *Pediatr Dent* 1999;2: 421-424.
24. Saloum FS, Baumgartnar JC, Marshall G, Tinkle J. A clinical comparison of pain perception to the Wand and a traditional syringe. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000; 89: 691-695.
25. Goodell GG, Gallagher FJ, Nicoll BK. Comparison of a controlled injection pressure system with a conventional technique. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2000; 90(1):88-94

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