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Influence of Using Computerized Control Local Anesthetic Delivery System (CCLAD) the Wand Compared to Traditional Syringe on Child Emotion and Pain: A Review

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Abstract: ***Introduction: Pain and trauma in a child's dental extraction experience can have psychological and traumatic consequences that will carry over into adulthood. Early experiences that do not cause trauma when extracting primary teeth are very important to provide a positive experience for children so that it can support the success of the next extraction treatment. The Computerized Control Local Anesthetics Delivery System (CCLAD) was first introduced in the field of dentistry in 1997 as an alternative to traditional syringe use. One of its trademarks is The Wand. Purpose: The purpose of this article is to review the effect of injections using CCLAD The Wand compared to traditional syringes on children's pain and emotions. Literature Review: The Wand is a CCLAD designed to improve ergonomics and accuracy of dental syringe placement. Anesthetic flow is controlled by a computer so it is constant. The Wand is one instrument that can be used to create a positive experience in children by controlling and minimizing pain when injecting. Conclusion: CCLAD The Wand can be used as an alternative to the use of instruments compared to traditional syringes. During extraction procedures that aim to control the child's pain and emotions during local anesthetic injection.***

Keywords: The Wand, Traditional syringe, pain, emotion, injection, extraction, children

1. Introduction

According to the *International Association For The Study of Pain*, pain is an unpleasant sensory and emotional and subjective experience caused by tissue damage or threats that resemble the damage. Pain is the body's protective mechanism against tissue damage and past experience can affect pain in children. Emotion is the result of a person's perception of changes that occur in the body in response to various stimuli that come from outside. A person's emotions will be shown by physiological (pulse) and psychological (behavioral) changes. Emotions can be measured through changes in expression and physiology. Physical pain can cause unpleasant emotions. At this time children will be sensitive, have feelings of fear, anxiety and worry that will increase their emotions.[3,7,10,11,18,19]

According to Hurlock, based on observations in the clinic, dental care that can cause pain in children is during the procedure of local anesthetic injection prior to dental extraction. Extraction of primary teeth is often carried out in children aged 6-12 years when experiencing mixed dentition, early experience is very important in this age group; Hurlock's research results showed that experiences and memories in childhood, though vague, are so influential that they leave an indelible impression on the child.[10]

A pleasant initial experience that does not cause trauma during extraction of primary teeth is important to provide positive experiences for children so that they can support the success of subsequent extraction treatments. Surveys show that dental extraction experiences in childhood can carry over into adulthood and affect a person's attitude towards dentists and their ability to receive dental care in adulthood.[5,9]

In general, dentists use traditional syringes for injections which are conventional local anesthetic instruments with the operator's fingers need to control the flow of anesthetics and the movement of needles simultaneously during injection. The operator cannot control both activities simultaneously so that they can cause pain.[14]

Along with the development of science and technology, many new discoveries to find a local anesthetic tool that is more comfortable for patients. In recent years, many have been promoted by the Computerized Control Local Anesthetic Delivery System (CCLAD), an anesthetic device that is controlled by a computer, one of which is the trademark of The Wand. In Indonesia, this tool has not been widely used by most dentists.[3,4,7,10,11,14,18,19]

The Wand is a Computerized Control Local Anesthestic Delivery System (CCLAD), which is a computer anesthetic tool, with an ergonomically designed handpiece. The operator can place the needle properly and drain the anesthetics slowly and at constant speed with foot control, so as to reduce pain. Research on children's pain in injections using The Wand and traditional syringe shows that The Wand significantly results in lower pain behavior than traditional syringe. This article contains information from a variety of literature regarding the effects of injections using The Wand and traditional syringe on

children's pain and emotions.[1,14]

2. Literature Review

The Computerized Control Local Anesthetic Delivery System (CCLAD) was first introduced in dentistry in 1997.[21] One of its trademarks is The Wand. The Wand is produced by Milestone Scientific, Inc., Livingstone, New Jersey, is a CCLAD that is designed to improve the ergonomics and accuracy of dental syringe placement. The system allows the dentist to manipulate the placement of the needle precisely and drain the anesthetics through foot control. *Handpiece* that is light and held like a ballpoint pen causes an increase in tactile senses and control compared to traditional syringes. The anesthetic flow is controlled by the computer so that it is constant.[21] The operator focuses on the insertion and position of the needle, while The Wand® device will flow the anesthetics at a constant speed.[13,14,16,24,25]

The Wand consists of 1 unit in which there is a precise step-engine pump and microprocessor, a foot pedal, a standard anesthetic cartridge with a plastic holder for the cartridge holder, a handpiece with a section to attach a needle and a hose that connects with the cartridge, then the unit has a number numbers to indicate ready work mode, anesthetic volume and on/off aspiration mode (The Wand *Instruction book*). Anesthetized volume flowed has an accurate volume ratio (flow rate) and accurate pressure on the surface of the tissue even though it is injected in high density tissues such as the palate and periodontal ligament.[21,24,25]

Figure 1: The Wand device

The results of Allen and colleagues' conclusions that The Wand is an alternative instrument in the procedure of local anesthetic injection that can create positive experiences in children to control pain. Negative experiences that are painful can cause trauma in children and will carry over into adulthood. Past experiences can affect pain in children.[1]

At this time there are methods to measure pain in children. Pain can be measured through self-reported measurements such as faces scale, behavior measurement with behavioral rating scale and physiologically with pulse measurement.[11, 27]

Wong baker faces pain rating scale is a simple method for measuring pain in children from the age of 3 years. Health professionals can use varied instructions with minimal explanation. This scale is easy to use, so many researchers use it and children more easily understand.[28.] Pain is subjective, therefore self-report is the most valid measurement of pain. Behavioral and physiological measurements are self-supporting measures.[11,12,19,22,.] Emotions are divided into two large groups, they are pleasant and unpleasant emotions, by looking at the facial expressions of pain from the Wong Baker face pain rating scale. Based on Universals and Cultural Differences in Facial Expression of Emotion according to Paul Ekman the angle of the lips depicts pleasant and unpleasant emotions. Pleasant emotions are depicted with the corners of the lips drawn upward or straight, while unpleasant emotions are described with the corners of the lips drawn downward.

Behavioral scale as an objective measurement of pain and can be used as a support for self-report measurement.[11,22] *FLACC Scale* (*Face, Legs, Activity, Cry, Consolability)* is one of the behavioral scales used to support self report measurement results. This scale is measured objectively by observing the face, feet, activity, crying and comfort of the child. According to the Canadian Dental Association (2002), to assess pain, even one measurement cannot be used singly and the results can vary, so it is recommended to use a self-report pain measurement (Wong Baker face pain rating scale), behavioral scale and physiological (pulse) using an electric digital sphygmomanometer.[19]

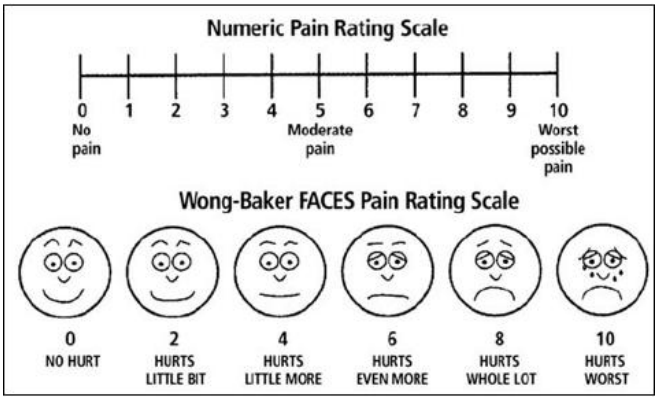

Figure 2: Wong Baker *Faces Pain Rating Scale*

FLACC scale (Face, Legs, Cry, Activity Consolability scale)	Score
Face 0- No particular expression or smile 1- Occasional grimace or frown, withdrawn, disinterested 2- Frequent to constant frown, quivering chin, clenched jaw	
Legs 0- Normal position or relaxed 1- Uneasy, restless, tense 2- Kicking or legs drawn up	
Activity 0- Lying quietly, normal position, moves easily 1- Squirming, shifting back and forth, tense 2- Arched, rigid, or jerking	
Cry 0- No cry (awake or asleep) 1- Moans or whimpers; occasional complaint 2- Crying steadily, screams or sobs, frequent complaints	
Consolability 0- Content, relaxed 1- Reassured by occasional touching, hugging, or being talked to; distractile 2- Difficult to console or comfort	
Total score (0-10)	

Figure 3: FLACC Scale
(Face, Legs, Activity, Cry, Consolability)

Figure 4: Electric digital sphygmomanometer

3. Discussion

Based on research conducted by Suriadi, 2006 which measures the positive experience of The Wand injection of child pain and emotions in subsequent injections with traditional syringe, in children aged 6-12 years who have never been injected and first injections using The Wand then in injections next using traditional syringe, the results show that the first injection using The Wand can provide positive experiences for children about the pain caused by injection, so that subsequent injections using traditional syringe do not cause strong emotional upheavals, this can be seen from changes in pain perception and behavior but it is still within the mild pain limit, and the change in pulse rate does not surge.[23]

Based on research conducted by Kumar, 2015 in a randomized controlled trial with a subject of 120 children aged 7-12 years who received injections with conventional cartridge and CCLAD syringes at two sequential visits, the results showed that there were no statistical differences in pain response ($p = 0.164$) and the feeling of discomfort that was seen ($p = 0.120$) between conventional syringes and CCLAD during the first visit even though the last showed injection with CCLAD gave a lower pain response score. However, during the second visit there was a significant increase in pain response ($p = 0.004$) and discomfort ($p = 0.006$) in the conventional syringe group with an increase in heart rate. Injections with CCLAD produce lower pain ratings and provide a more comfortable feeling compared to using conventional syringes in children regardless of the order of visit.[24]

Based on research conducted by Rosenberg, 2001 on 150 random samples of patients who received local anesthesia with CCLAD, the results showed that 71.4% of patients felt more comfortable injecting with CCLAD compared to traditional syringe due to several factors that influence, including the level of anxiety and pain minimal, non-frightening instrument appearance, and minimal tingling or numbness in the facial area that is often associated with oral anesthetic injection procedures. Only 0.5% of the sample showed dissatisfaction in obtaining injection with CCLAD.[21] When the operator used traditional syringes such as metallic aspirating cartridge syringe, the pressure exerted on the surface of the tissue when the injection procedure was inconsistent and constant, resulting in flow rate and local anesthetic fluid pressure at the network depends on each operator's individual strengths and the agility of each operator and the force exerted by the operator during the injection procedure, so it cannot be controlled accurately.[21]

The use of CCLAD provides patient comfort compared to traditional syringe because it has a controlled flow rate and pressure and is regulated by a microprocessor computer and an electronic drive machine to drain the local anesthetic fluid slowly and has a stable constant speed and is connected to foot pedals and disposable handpieces made of lightweight plastic material which allows the operator to hold it stably like holding a ballpoint and produce good control when penetrating a needle.[29,31]

In the research of Hochman et al. conducted on test animals, it was observed that local inflammatory wounds that occur due to side effects of injection with CCLAD, found inflammatory wounds were limited to the first 24 hours after injection and after 7 days all inflammatory wounds healed and the periodontal ligament appeared normal again.[29]

According to Gibson et al, 2000 there is a relationship between the behavior of children when receiving local anesthetic injections using CCLAD The Wand compared to traditional syringe, it is the appearance of disturbing behavior when children are given local anesthetic injections with conventional traditional syringe. This can also be seen when research conducted by Sculean, et al 2004 who compared the use of CCLAD with AMSA techniques in patients who received non-surgical periodontal therapy (scaling, root planning) and gave significant results.[30]

Based on the 2015 Kumar Santosh research on 50 dentists who participated in controlled clinical studies, they received standardized syringe manual injection and The Wand CCLAD in the palatal area. 48 Samples (96%) chose CCLAD injection because the perception of pain felt was reduced by two to three times compared to when receiving injection with a standard manual syringe.[31,32]

4. Conclusion

CCLAD The Wand is an effective alternative to the use of instruments during local anesthetic injection procedures aimed at minimizing children's pain and emotions compared to traditional traditional syringe.

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