

# Self-Report of Pain in Children Treated According to the Atraumatic Restorative Treatment and the Conventional Restorative Treatment – A Pilot Study

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**Objective:** To compare the level of pain among children treated according to the Atraumatic Restorative Treatment (ART) and the Conventional Restorative Treatment (CRT). **Study design:** Forty children of both genders, 4-to 7-years old, presenting Class I cavitated dentin lesions in primary molars were randomly allocated to 2 groups. One group (CRT) received conventional restorative treatment using rotary instruments, while in the other one (ART) hand instruments were used to perform the restorations. All children were treated by the same operator. A high-viscosity glass-ionomer cement (Fuji IX) was used to restore the teeth in both groups. Children's pain was measured at the end of the first restorative treatment session using the Wong-Baker FACES Pain Rating Scale (dependent variable). Age, gender, treatment time and treatment group were independent variables. ANOVA and ANCOVA tests were used to analyze the data. **Results:** The CRT procedure took longer than the ART procedure ( $p < 0.001$ ). Children from the ART group reported less pain than those from the CRT group ( $p = 0.0037$ ). Four year olds reported more pain than 5-to 7-year olds ( $p < 0.0001$ ) in both groups. **Conclusions:** Restorations placed using ART were less time consuming, children felt less pain when the ART approach was used, and younger children (4-years) reported more pain than the older ones for both restorative treatments.

**Keywords:** Atraumatic Restorative Treatment (ART), faces scale, pain

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## INTRODUCTION

Pain is frequently associated to dental treatment, especially in pediatric dentistry. It can be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. However, many people report pain in the absence of tissue damage or any likely pathophysiological cause; usually this happens for psychological reasons.<sup>1</sup>

In dentistry, the administration of local anesthesia is, in some cases, perceived as the only painful part of the dental

treatment<sup>2</sup> and it has been reported a factor in avoiding dental care.<sup>3</sup> Furthermore the sound and vibration of a bur has been experienced and explained as pain.<sup>4</sup>

Over the last two decades, a new philosophy that recommends a more conservative approach to manage carious lesions has emerged – Minimum Intervention Dentistry.<sup>5</sup> One of the treatments following this recommendation is the Atraumatic Restorative Treatment (ART), that is said to cause little or no pain to the patient.<sup>6</sup>

ART consists of removing decayed tooth tissues using only hand instruments and restoring the cleaned cavity with an adhesive material, frequently a high-viscosity glass ionomer cement.<sup>6</sup> Reasons for the virtual absence of pain experienced with ART include the fact that local anesthesia is hardly needed,<sup>4,7-9</sup> and the absence of rotary instruments that minimizes patient's anxiety and discomfort.<sup>10</sup> ART is being considered an excellent introduction to dental care and can help to overcome the pain related to the use of the drill and local anesthesia.<sup>11</sup> Due to these advantages, the use of ART in daily dental practice has been propagated.<sup>7,11,12</sup>

Studies assessing pain or discomfort related to ART report that this approach is more patient-friendly when compared to other restorative treatments.<sup>4,8-10,13</sup> However, they differ concerning the methodology used to assess the level of pain.

Different instruments have been developed aimed to

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measure pain related to the dental treatment.<sup>14,15</sup> Among them, are faces scales which became the most popular approach to elicit children's self-reports of pain.<sup>15</sup> These scales had been proven to be more appropriate for use with younger children than the scales that are based on numbers, colors or words.<sup>16,17</sup> In the present pilot investigation the "Wong-Baker FACES Pain Rating Scale" (Wong-Baker) was selected as it was especially developed to evaluate pain in young children that still have difficulty to express their emotions and feelings,<sup>16,17</sup> and as it had not been used frequently whilst it was considered the best faces scale to assess pain in medical, but not dental, treatment according to a systematic review.<sup>15</sup>

This study aims to test the hypothesis that children will experience less pain when treated with ART than with the conventional restorative treatment (CRT).

## MATERIAL AND METHOD

### Study design

The present randomized controlled clinical trial was carried out in the Pediatric Dentistry Clinic of the Brazilian Dental Association in Brasília, Brazil. Ethical approval was obtained from the Research Ethics Committee of the Brasília Medicine School (056/2006). Children's parents or guardians received and signed the individual informed consent form containing information about the research and the treatment approaches.

Children were selected from those attending the dental clinic of the Brazilian Dental Association. The study inclusion criterion was having at least one carious lesion involving the occlusal surface of primary molars without pulp involvement and without pain. The children were randomly allocated to a test and control group using a series of computer generated random numbers.

### Treatment procedures

The control group was treated according to the conventional restorative treatment (CRT) that was performed under local anesthesia and rubber dam protection using rotary equipment. Cavity cleaning was restricted to removing all carious tissues in enamel and dentine using the drill. The test group was treated according to the ART guidelines using hand instruments only.<sup>6</sup> The restorative material used for both approaches was the high-viscosity glass ionomer cement, - Fuji IX (GC®, Japan), which was hand mixed by a trained dental assistant according to the manufacturers' instruction. Both groups were treated in the dental clinic of the Brazilian Dental Association by one and the same operator without the presence of a parent in the treatment room.

### Evaluation

The Wong-Baker FACES Pain Rating Scale (Wong-Baker) consists of 6 pictures representing feelings ranging from "no pain" to "extreme pain" (Figure 1). The originators of the scale suggest that the operator describes the scale to the children, mentioning that each face is for a person who

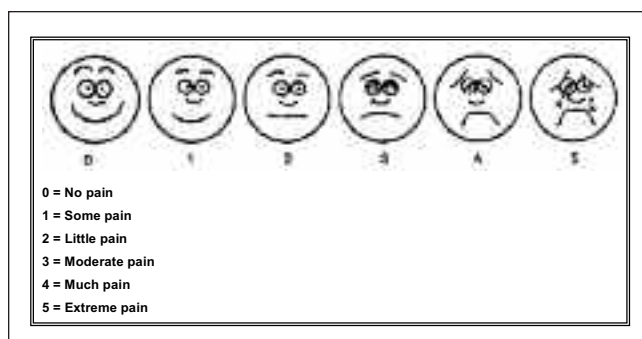


Figure 1. Wong-Baker FACES Pain Rating Scale

feels happy because (s)he has no pain (hurt) or sad because (s)he has some or a lot of pain.<sup>16,17</sup> At the end of the first restorative treatment session, the assistant showed the scale to the children without mentioning the word pain. The children were asked to point to the picture that best described their feelings regarding the treatment they just received.

Treatment time was recorded by the dental assistant from the beginning of procedure (when the dentist first lift the instruments) until the restoration was concluded (bite adjustment), using a stopwatch.

### Statistical analysis

The dependent variable was the Wong-Baker score while the independent variables were age, gender, treatment group and treatment time. Because of the skewness of the data, the Wong-Baker was recoded into 3 categories (score 0, 1 and  $\geq 2$ ). ANOVA was used to analyze the effects and interactions of three independent variables (age, gender and treatment group) in one model. As the treatment time between ART and CRT groups differed statistically significantly, an ANCOVA with treatment time as co-variable was carried out on the dependent variable. The statistically significant level was set at 5%.

## RESULTS

The sample consisted of 40 children (21 boys and 19 girls) with a mean age of 5.3 years (SD=1.2) ranging from 4-to 7-years.

ANCOVA test did not show an effect of treatment time on each of the treatment groups. The ANOVA test showed an age and treatment effect but no interactions on the recoded Wong-Baker scores. Four year olds were statistically significantly more anxious than 5-to 7-year olds ( $p < 0.0001$ ). Children treated using ART felt statistically significantly less pain than those treated using CRT ( $p = 0.0037$ ). The time needed to treat children using ART was statistically significantly shorter than for those children treated by CRT ( $p < 0.001$ ).

Table 1 shows the treatment time by treatment group, Table 2 shows the mean Wong-Baker scores by treatment group and age, and Table 3 shows the frequency distribution of Wong-Baker scores by age.

**Table 1.** Time (minutes) required for restorations' placement in the Atraumatic Restorative Treatment (ART) and Conventional Restorative Treatment (CRT)

Treatment	Minimum	Maximum	Average	SD
ART	10	30	19.0*	4.8
CRT	25	45	33.5*	5.9

\*p&lt;0.001

**Table 2.** Mean and standard deviation (SD) of Wong-Baker FACES Pain Rating Scale scores by treatment group and age.

N=number of children; ART=Atraumatic Restorative Treatment; CRT=Conventional Restorative Treatment

Treatment group	Age (yrs)					
	4			5-7		
	Mean	SD	N	Mean	SD	N
ART	1.7	2.0	7	0.2	0.4	13
CRT	2.5	1.2	6	0.9	1.3	14

**Table 3.** Frequency distribution of Wong-Baker FACES Pain Rating Scale scores according to treatment group and age

ART = Atraumatic Restorative Treatment, CRT = Conventional Restorative Treatment

Treatment / Age (yrs)		No(%)	Some(%)	Little(%)	Moderate(%)	Much(%)	Extreme(%)
ART	4	30	42	-	-	14	14
	5	50	50	-	-	-	-
	6	100	-	-	-	-	-
	7	100	-	-	-	-	-
CRT	4	-	18	50	-	32	-
	5	50	32	-	-	-	18
	6	-	100	-	-	-	-
	7	75	25	-	-	-	-

## DISCUSSION

There are few literature reports that investigated the patient feelings related to the ART in comparison to CRT. Some studies assessed pain through simple questions or more elaborated questionnaires.<sup>4,8,18,19</sup> Schriks and van Amerongen<sup>10</sup> assessed discomfort through the Venham Picture Test, which was also used by Topaloglu-Ak *et al.*<sup>20</sup> to evaluate dental anxiety. The Venham Picture Test was developed to assess dental anxiety, and its originators recommend that this scale must be applied at the beginning of each dental visit.<sup>14</sup> As the aim of the present investigation was to assess self-reporting pain related to ART and CRT, the Wong-Baker FACES Pain Rating Scale was chosen. According to Chambers *et al.*,<sup>15</sup> after comparing different faces scales for the measurement of pediatric pain the conclusion was that the majority of children and parents preferred the scale by Wong and Baker.

Despite the advantages presented above, the scale has some limitations. The major one refers to the "no pain" face being represented by a smiling face, what can result in higher pain ratings when compared to scales with neutral "no pain" faces.<sup>15</sup> In the present study, it was observed that the youngest children (4-year-olds) had some difficulty to understand the task and seemed to be confused with so many options presented in the scale. For example, score 5 – "extreme pain" was only selected by those who really cried during the operative procedure. What about those who felt a lot of pain but did not cry? Apparently, they did not select the face number 5, once the tears are more connected to the cry itself than to the pain intensity.

Another issue to be addressed is the dental anxiety level as a confounding factor for the pain reports. In this study, the youngest children reported more pain in both treatment

groups, with significant difference in the answers given by the 4 and 5-to 7-years-old children. This fact can be related to level of dental anxiety presented by the children prior to the treatment session, as according to Vassend *et al.*<sup>21</sup> dental anxiety is significantly related to pain reports. Although Newton and Buck<sup>22</sup> affirmed that children do not have a fully developed ability to recognize manifestations of anxiety, it is known that young children are usually more apprehensive than older ones.<sup>23</sup> Therefore, the best strategy to eliminate this potential bias should be measuring the level of dental anxiety before the treatment session, and the intensity of pain immediately after the treatment is finished.

The ART approach presents some advantages in relation to conventional treatments. It is said to reduce the occurrence of pain and discomfort and the need for local anesthesia.<sup>18</sup> These advantages justify the indication of the ART approach for young children who are affected by dentin carious lesions, once needle-related procedures are a common source of pain and distress for children.<sup>24</sup> However, there are few reports comparing pain experienced during ART and conventional treatment approaches, especially in pre-school children.<sup>13</sup> In addition, two other aspects must be highlighted: 1) the restoration procedures in the different studies conducted with the objective to assess pain or discomfort were performed by more than one operator, what can influence the children's behavior pattern and 2) the way conventional treatment is defined. Although it is established that adhesive materials, such as glass-ionomer, should be preferable to be used with the rubber dam protection,<sup>25</sup> there is no study in which ART and conventional restorations placed under this condition have been compared.

The results of the present investigation showed that chil-

dren from the ART group reported less pain than those from the CRT group. This was expected, because administering local anesthesia and placing rubber dam was part of the protocol for the CRT procedure. Even in studies where ART was compared to the traditional approach without dental injections, the same findings were observed.<sup>10</sup> In a previous study, van de Hoef and van Amerongen<sup>26</sup> demonstrated that local anesthesia had no influence on discomfort during treatment when ART and CRT were performed with and without local anesthesia. However, their results referred to differences on behavior during “deep dentin excavation” and “start of restoration,” whereas body movement was associated to discomfort. The moment in which the local anesthesia was administered was not taken into account.

The ART restorations took less time to be completed than the conventional ones. This finding can initially cause some surprise, once previous studies have shown an increase on time required for the ART approach.<sup>9,27</sup> This difference can be explained as in the present study the CRT was conducted with the use of the rubber dam and local anesthesia. Additionally, it should be considered that the total time for the whole procedure was recorded, from the moment the operator lift the instruments until bite adjustment, not only the time for cavity preparation and restoration placement. In accordance with our results, Lin *et al.*<sup>13</sup> affirm that the use of the routine technology (drill and slow hand piece) for cavity preparation and carious tissues removal can take more time than the ART approach in cases where a lot of necrotic tissue need to be removed. They concluded that ART could have been better accepted by pre-school children because it was faster than the traditional approach.

In the present study, the four year olds reported more pain for both treatment approaches. However, this finding could be influenced by their young age, so it is not possible to state that they really felt pain. As the assistant did not mention the word pain when describing the scale to the children and based on their behaviour observation, it is possible that the chosen Wong-Baker score was not only related to pain, but also to any sort of discomfort felt during the restorative procedures. It means that children who are not in pain are not necessarily happy.

Taking into account the arguments discussed above the recommendation would be to repeat the study on a larger number of individuals to confirm the results of this pilot study.

## CONCLUSIONS

The children felt less pain when the restorations were performed by the ART approach;

The youngest children reported more pain in both treatment groups;

ART was less time consuming than the conventional restorative treatment.

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