

Analysis of the Clinical Effect of Carisolv Minimally Invasive Gel in the Treatment of Pediatric Dental Caries

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Abstract: *Objective:* To study the clinical effect of Carisolv minimally invasive gel in the treatment of pediatric dental caries and its effect on pain. *Methods:* The research subjects of this paper were 113 cases of pediatric caries admitted to the hospital from April 2021 to April 2023, which were divided into two groups by the randomized table method. The control group ($n = 56$) received the traditional dental drilling treatment method, and the observation group ($n = 57$) applied Carisolv minimally invasive gel for treatment. The pain sensitivity and clinical efficacy as well as the emotions and adherence of the children were compared between the two groups. *Results:* The emotional score (ES) of children in the observation group was significantly lower than that of the control group, and the Frankl Adherence Scale score was significantly higher than that of the control group, $P < 0.05$; the pain sensitivity of children in the observation group was better than that of the control group, and the total clinical efficacy rate of children in the observation group was significantly higher than that of the control group, $P < 0.05$. *Conclusion:* Carisolv minimally invasive gel has considerable efficacy in the treatment of pediatric caries, and it can alleviate pain and improve children's emotional state and adherence to the program. Thus, it is suitable for wide clinical applications.

Keywords: Carisolv minimally invasive gel; Pediatric caries; Pain sensitivity; Clinical efficacy; Adherence; Emotion

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1. Introduction

Pediatric dental caries is a common oral disease that, if left untreated, can cause serious harm to children's oral and general health. This disease can cause damage to children's tooth structure, affecting their chewing function and pronunciation ability, and even impacting the normal nutritional intake and growth and development; dental caries can lead to tooth pain and sensitivity, affecting children's quality of life and mental health^[1]. In addition, if pediatric caries is not treated promptly, it may lead to the spread of caries infection to the pulp and the surrounding tissues of the teeth, triggering serious oral infectious diseases, such as pulpitis and apical periapical inflammation, threatening the children's health^[2]. Therefore, timely and effective treatment of pediatric dental caries is extremely important. Carisolv minimally invasive gel is a new treatment for pediatric caries, which can

maximize the protection of healthy tissues of the affected teeth and reduce children's discomfort and pain^[3]. In this paper, we will discuss the clinical effects of Carisolv minimally invasive gel in the treatment of pediatric dental caries and the effect on pain.

2. General information and methods

2.1. General information

In this paper, 113 cases of children with dental caries admitted to the hospital from April 2021 to April 2023 were selected as observation subjects, and they were divided by the randomized numerical table method into the control group (56 cases) and the observation group (57 cases). In the control group, there were 22 male and 34 female children, with a mean age of 5.43 ± 0.69 years, a mean disease duration of 1.18 ± 0.26 years, and a mean caries area of 4.15 ± 0.36 mm². The observation group had 25 male and 32 female children, with a mean age of 5.68 ± 0.75 years, a mean disease duration of 1.34 ± 0.41 years, and a mean caries area of 4.31 ± 0.46 mm². Compared with the data presented in the study, the difference between the two groups of children with dental caries was small, $P > 0.05$.

Inclusion criteria were caries hole diameter of more than 1 mm, no pain history; caries with World Health Organization caries examination and diagnostic criteria; a sense of pain in teeth when contact with cold water, hot water, cold air, hot air, or sweet and sour food; can cooperate with the treatment operation.

Exclusion criteria included patients with abnormal function of important organs; patients with oral inflammation-related manifestations; patients with abnormal intellectual development or mental state; patients with congenital diseases.

2.2. Methods

The children included in the control group were treated with the traditional dental drilling method, helping the children lie on their backs on the treatment chair, rinsing their mouths with lukewarm water, removing the decayed areas of the children's teeth and oral decay through the high-speed rotary needles and the slow machine, and then carrying out the oral cleaning work, grinding out the decayed areas of the cavities; subsequently, cleaning the children's mouths with lukewarm water to check the removal of decayed tissues, determining the complete removal of decayed tissues, and then applying wet wipes to the children for disinfection, and using the light-curing resin to fill and seal the carious cavities.

In the observation group, Carisolv minimally invasive gel was applied, the children were helped to lie on their backs on the treatment chair, and the affected teeth and the adjacent teeth were cleaned. The Carisolv gel was used to fill the caries cavity, and the gel was left in place for 30 seconds or more to ensure complete infiltration of the gel. The carious part of the cavity was removed and scraped and the decayed material was removed, the carious tissue was completely removed, and the residual gel was sucked out; the cavity was repeatedly removed and scraped, and then repeatedly cleaned with disinfectant cotton balls until the carious part was completely removed, the mouth and the cavity were rinsed with lukewarm water, and the conventional wet wipes were applied. After disinfection, the light-curing resin was used to fill and seal the carious cavity.

2.3. Observation indexes

- (1) Statistics on the emotional state and adherence of children with dental caries in the treatment process of the two groups were obtained using the emotional score (ES), with a score range of 0–10 points, with lower scores representing better emotional state; and the Frankl Adherence Scale, with a full score of 4 points, with higher scores representing higher adherence^[4].

- (2) The pain sensitivity of the children in the two groups was analyzed by applying the Wong-Baker Faces Pain Rating Scale method; level 1: a pleasant expression on the face (no pain); level 2: a smile on the face (mild pain); level 3: a frown and other uncomfortable manifestations (moderate pain); and level 4: an expression of the desire to cry, or even a manifestation of tears, crying resistance, etc. (severe pain) ^[5].
- (3) The clinical efficacy between the groups was observed, expressed by the total clinical effectiveness rate (the sum of highly effective and effective); highly effective: after the smooth end of the therapeutic operation, the children's tooth pain, pressure, and swelling completely disappeared after treatment, the fillings were stable and intact, the appearance of the fillings was good and did not affect the function of mastication; effective: the relevant symptoms in post-treatment showed improvement in the fillings, the fillings were good in appearance and the fillings were more stable; ineffective: the relevant symptoms did not disappear or even further aggravated, and the filler had loosened, falling off, and other manifestations ^[6].

2.4. Statistical processing

SPSS23.0 was used for data analysis, the involved metric information that met the normal distribution was presented as mean \pm standard deviation (SD), and analyzed by the *t*-test; the involved count data was presented as %, and analyzed by the χ^2 test or rank sum test. The criterion for determining the statistical significance of the differences between the data was $P < 0.05$.

3. Results

3.1. Comparison of emotional state and adherence between groups

As shown in **Table 1**, the ES score value of the children with dental caries in the observation group was significantly lower compared with that of the control group, and their Frankl Adherence Scale score value was significantly higher compared with that of the control group, $P < 0.05$.

Table 1. Comparison of emotional state and adherence of children with dental caries in the two groups (score)

Group	ES score	Frankl Adherence Scale score
Control group ($n = 56$)	5.38 \pm 0.29	1.08 \pm 0.22
Observation group ($n = 57$)	4.15 \pm 0.21	3.35 \pm 0.46
<i>t</i>	25.857	33.367
<i>P</i>	0.001	0.001

3.2. Comparison of pain sensitivity between groups

As presented in **Table 2**, the pain sensitivity of children with dental caries in the observation group was significantly better compared to the control group, $P < 0.05$.

Table 2. Comparison of pain sensitivity of children with dental caries in two groups [n (%)]

Group	<i>n</i>	Level 1	Level 2	Level 3	Level 4
Control group	56	11 (19.64)	28 (50.00)	15 (26.79)	2 (3.57)
Observation group	57	19 (33.33)	30 (52.63)	8 (14.04)	0 (0.00)
<i>Z</i>	-		2.131		
<i>P</i>	-		0.033		

3.3. Comparison of clinical efficacy between groups

Analyzing the data in **Table 3**, the total clinical effectiveness rate of the children with dental caries in the observation group was significantly higher compared with the control group, $P < 0.05$.

Table 3. Comparison of the clinical efficacy of children with dental caries in the two groups (n , %)

Group	n	Highly effective	Effective	Ineffective	Total clinical effectiveness rate
Control group	56	16	32	8	85.71
Observation group	57	21	34	2	96.49
χ^2	-	-	-	-	4.067
P	-	-	-	-	0.044

4. Discussion

Pediatric dental caries is a common oral disease that occurs on the surface of children's teeth as a result of bacterial action, leading to the gradual destruction of dental tissues [7]. Excessive consumption of sugary foods and beverages (especially sticky sugary foods), poor oral hygiene habits, uneven tooth surface depressions, and weak enamel can increase the opportunity for bacterial growth and increase the risk of dental caries. Dental caries can lead to impaired dental function, affecting children's normal chewing and digestion, which in turn impacts the body's absorption and utilization of nutrients; at the same time, dental caries can contribute to tooth sensitivity, leading to pain symptoms, which has a serious adverse impact on children's quality of life, sleep, and mood; in addition, if dental caries is not treated promptly, it may lead to the spread of infection to the pulp and the surrounding tissues, leading to endodontic infection, periapical infection, and other serious infectious diseases, which can pose a serious threat to the life and health of children. For this reason, timely and effective prevention and treatment of pediatric caries is essential.

Dental drilling is a traditional method of treating pediatric caries, which can completely remove the decayed part of the tooth, prevent further development of caries, and protect the surrounding healthy tooth tissues; for severe caries lesions, dental drilling can effectively repair the damaged tooth structure and restore the function and aesthetics of the teeth. However, dental drilling requires partial removal of the carious tooth, which may damage the surrounding healthy tooth tissues, affecting the structure and function of the tooth [8]; at the same time, the use of drills and other instruments in the treatment process may lead to pain and discomfort, making the treatment more difficult; in addition, dental drilling usually requires multiple treatments to complete the restoration of dental caries, which makes the treatment process more complicated, and requires a high degree of patience and cooperation from the child.

Carisolv minimally invasive gel has remarkable clinical results in the treatment of pediatric caries. Through the action of the gel, it can effectively remove the caries lesions, repair the damaged tooth tissues, and restore the function and aesthetics of the teeth. Clinical studies have shown that [9], Carisolv minimally invasive gel has a high success rate in the treatment of pediatric caries, and the therapeutic effect is stable and long-lasting. Due to the minimally invasive technique, there is no need to use traditional dental drills and pliers, which reduces the damage to the teeth and oral tissues and reduces the pain during the treatment process. In addition, Carisolv minimally invasive gel itself has analgesic and anti-inflammatory effects, which can effectively alleviate the patient's sense of pain, reduce the child's resistance, and improve the degree of cooperation.

The results of this study showed that the ES score of the observation group was significantly lower than that of the control group, the Frankl Adherence Scale score was significantly higher than that of the control group, and the pain sensitivity was significantly better than that of the control group, which suggests that Carisolv minimally invasive gel can be used in the clinical treatment of pediatric dental caries to effectively alleviate the sense of pain of the children, reduce the nervousness, anxiety, and resistance caused by the treatment operation, and improve the degree of cooperation. The reason for this is that the minimally invasive technique of Carisolv minimally invasive gel, which eliminates the need for traditional dental drills and pliers, causes less damage to the child's teeth and oral tissues and reduces pain during treatment. Compared with the traditional treatment method, the minimally invasive technique can treat caries more gently and alleviate pain. In addition, Carisolv minimally invasive gel has certain ingredients with analgesic effects, which can relieve pain and reduce discomfort during the treatment process, so that the child can better cooperate with the treatment and improve the treatment effect. In addition, Carisolv minimally invasive gel has a rapid therapeutic effect and a shorter operation time, which shortens the treatment process and reduces the pain of the children. In the study, the total clinical effectiveness rate of the observation group was significantly higher than that of the control group, suggesting that Carisolv minimally invasive gel can significantly treat pediatric caries. The reason is that the gel can effectively remove the caries lesions, repair the damaged tissues, prevent the recurrence of the disease, and prolong the duration of the therapeutic effect; at the same time, possessing multiple functions, Carisolv minimally invasive gel can be used in the treatment of oral ulcers, gingivitis, and other oral diseases, meeting the needs of the children's oral health and improving the comprehensiveness of the treatment.

5. Conclusion

In conclusion, Carisolv minimally invasive gel shows good clinical effects in the treatment of pediatric dental caries and has a certain effect on reducing pain, which is suitable for further promotion and application in future clinical practice.

Disclosure statement

The author declares no conflict of interest.

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