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The use of mind mapping in health education in extended care for children with caries

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Abstract

Objective: To investigate the application of mind mapping-based health education in extended care for children with caries.

Methods: This was a prospective study of 159 eligible children with caries. Participants were randomly assigned to an observation group and a control group, and received extended health education and guidance. Patients in the observation group received health education with mind mapping. In the third month after the first visit, a questionnaire survey was conducted to assess knowledge of extended caries diagnosis and treatment in children and their parents. Children also underwent a bacterial plaque test.

Results: Caries knowledge was significantly greater in the observation group than in the control group. There was no significant between-group difference in debris index on the bacterial plaque test. The observation group had a significantly greater number of follow-up visits in 12 months than the control group.

Conclusions: Mind mapping was effective in the implementation of extended care. Mind mapping information was more accessible to children and their parents, increasing their compliance with health education. Thus, mind mapping is an appropriate health education tool for use in extended care for children with caries.

Keywords

Mind mapping, health education, extended care, paediatric caries, China, survey, bacterial plaque test

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Introduction

Dental caries is the most common chronic oral disease. It affects 2.4 billion people worldwide who have on average 2.11 decayed, missing or filled teeth.[1] Dental caries affects patient quality of life socially and economically.[2] Dental caries in children is a global issue. Many children develop caries early in their lives, and subsequently develop further caries and sepsis with age.[2]

Prevention of childhood caries requires a multifactorial and multiagency approach that includes the provision of health education. Oral health educational intervention is a cost-effective tool to improve population oral health and has been successful in many developing and developed countries.[3,4] Previous studies indicate that extended care health education can help children and their parents to establish correct oral behavioural habits and reduce the incidence of caries.[5–7] Ye and Li[8] found that the effect of extended care is influenced by patient participation. Clinical nursing staffs have focused on combining extended care health education measures with patient participation.[9–11]

Recent studies have shown that mind mapping tools increase the effect of guidance for patients.[12,13] Mind mapping is a technique developed by Buzan and others[14] in which information is presented diagrammatically using key words and images exploded from a central idea in a format that aids cognitive processing. Mind maps focus on meaning rather than on grammar and semantics, and so may be more accessible to less able readers.[13]

The study aim was to investigate the use of mind mapping-based health education in extended care for children with caries.

Methods and materials

This study was conducted in accordance with the Declaration of Helsinki and approved by the ethics committee of the Hospital of Stomatology, Jilin University. Written informed consent was obtained from participants' guardians.

Patient population

This was a prospective study. A total of 159 children diagnosed with caries in the Department of Pediatric Dental Therapy, Jilin University, from January 2017 to October 2017 were enrolled using stratified randomized grouping. Inclusion criteria were as follows: meeting the diagnostic criteria for caries;[15,16] parents of the children had Bachelor's degrees or above (non-medical specialty); no verbal barriers to communication; voluntary study participation; residing in the local area and no difficulty in attending follow-up visits. Exclusion criteria were as follows: caries-predisposing factors such as enamel hypoplasia; presence of systemic diseases; currently undergoing occlusal induction therapy; inability to complete the test course in time; poor coordination during the evaluation.

Research methods

Both groups received extended care diagnosis and treatment measures.[15] Children in both groups received theoretical and practical lessons, including theoretical information about caries and methods of brushing. The observation group received health education using mind mapping. To design the mind maps, a research group was set up comprising eight members: a physician group (one chief physician, one attending physician and one medical graduate student) and a care group (one deputy chief senior nurse, one supervisory nurse and three nurses). The requirements of the patients were investigated and the contents of childhood caries health education were summarized and analysed. Mindjet management mind mapping software

(MINDMATER, Yitu, Shenzhen, China) was then used to construct the mind maps,[17,18] which consisted of six modules: caries-related factors, instructions for diagnosis and treatment, changing dietary habits, oral hygiene maintenance, professional protection from caries and regular oral examination (Figures 1–3). Each module included several branched refined module contents. The preliminary mind mapping of health knowledge about childhood caries was further revised under the guidance of medical and nursing experts in child caries. A final version of the mind map was then constructed, printed and plastic-encapsulated.

Children in the observation group were provided with plastic-encapsulated mind

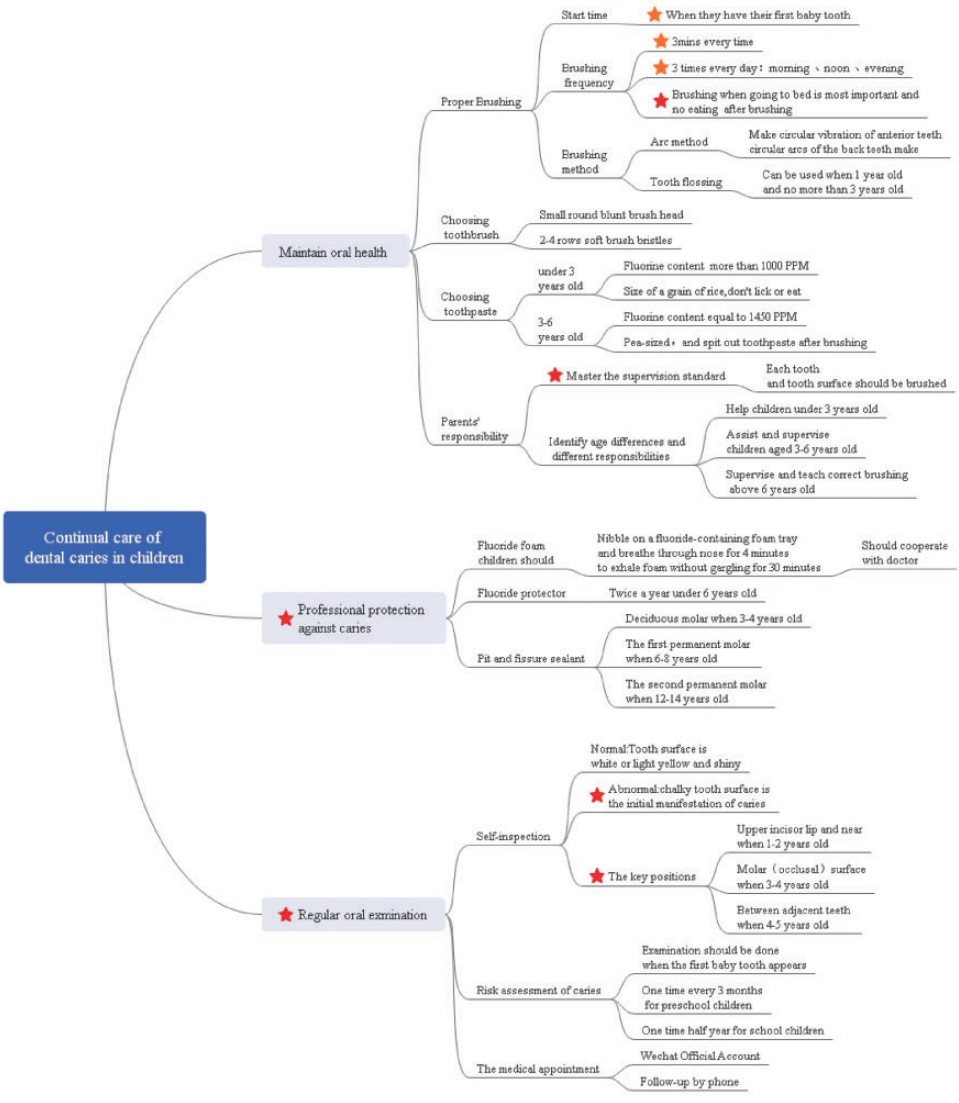

Figure 1. Main lines of the mind map.

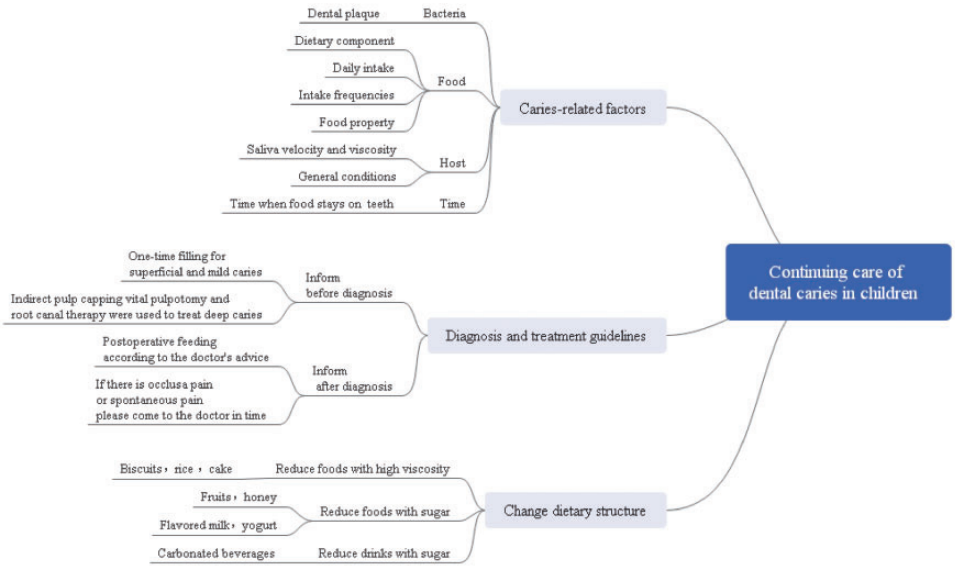

Figure 2. Details of the mind map.

Figure 3. Details of the mind map.

maps as part of the extended care health education. The contents of the mind map were explained in terms of each child's specific case to guide children in mastering the correct method of brushing teeth. Supervision information was provided to parents to explain how they could supervise tooth brushing. Parents' questions were registered and summarized; common questions were answered in the extended care theory lessons, practice lessons and via a WeChat public account.

Evaluation indexes

1. Mastery of caries knowledge in children and parents. In the third month after the first visit, children and their parents from both groups jointly completed the Questionnaire on Children's Caries Prevention Knowledge.[5] The questionnaire's content validity index value was 0.85 and Cronbach's α reliability coefficient was 0.80. The questionnaire comprises 20 items on five aspects; 5 items are for children and 15 are for parents. A nurse asked the children's questions and the children answered. Parents independently answered the parent items. One point was awarded for a correct response and 0 points for incorrect or unsure responses. The total possible score was 20 points; higher scores indicated better knowledge of child caries.

2. Bacterial plaque test. According to the debris index (DI) in the Simplified Oral Hygiene Index,[19] a score of 0 indicates no debris on the teeth; 1 indicates debris covering an area less than 1/3 of the dental surface; 2 indicates debris covering an area between 1/3 and 2/3 of the dental surface; and 3 indicates debris covering an area more than 2/3 of the dental surface. In the third month after the first visit, children in both groups were examined for intraoral DI. The finished bacterial plaque indicator was coated with cotton swabs and applied to six tooth surfaces (55, 51, 65, 71 buccal labial surfaces and 75, 85 lingual surfaces) and gargled after 30 seconds. The cleaning effects were checked and recorded. The cleaning effects in both groups were compared using the proportion of children who scored 0 or 1. Higher scores indicate lower compliance with brushing.
3. Number of follow-up visits. It was recommended that children in both groups receive follow-up visits every 3 months after their first visit. In the third and twelfth month after the first visit, nurses called the children's parents to remind them to attend the follow-up visits. Parents were also reminded between the fourth to the eleventh month after the first visit. No further notifications were given. The total number of visits within 12 months was recorded and number of follow-up visits were compared between the two groups.

Statistical analysis

Data analysis was conducted using the statistical software SPSS version 22.0 (SPSS Inc., Chicago, IL, USA). Measurement data were expressed as mean ± standard deviation and compared using the rank sum test. $P < 0.05$ was considered statistically significant.

Results

Patient characteristics

Eighty eligible children, who were selected and numbered in odd months, were randomly enrolled in the observation group; the remaining 79 eligible children, who were numbered in even months, were enrolled in the control group. There were no significant between-group differences in gender, age, pathogeny, education level and age of children's parents. Hence, the two groups were comparable.

Comparison of caries health knowledge mastery in children and their parents

The scores for health knowledge mastery were lower in the control group (15.84 ± 1.95) than in the observation group (16.81 ± 1.87) and the difference was statistically significant ($Z = -2.998$, $P = 0.03$).

Comparison of bacterial plaque test results

Plaque test data were recorded and statistically analysed (Table 1). In the control group, the number of children with a DI of 0 was 23, the number of children with a DI of 1 was 44 and the number of children with a DI of 2 or 3 was 12. In the observation group, the number of children with a DI of 0 was 29, the number of children with a DI of 1 was 48, the number of children with a DI of 2 was 3 and the number of children with a DI of 3 was 0. Statistical analysis showed no significant difference between the control group and observation group. However, the results indicated that the total number of children with a DI of 2 or 3 was higher in the control group than in the observation group and the proportion of children with grade 0 and I was higher in the observation group (96.25%) than in the control group (84.81%).

Table 1 Comparison of the bacterial plaque test

	Debris index (DI)					
Groups	0 (n)	1 (n)	2 (n)	3 (n)	Z	P
The control group (n = 79)	23	44	II	I		
The observation group (n = 80)	29	48	3	0	−1. 762	0.078

Table 2 Comparison of follow-up visits within 12 months

Groups	Cases	4 times	3 times	2 times	Z	P
The control group (n = 79)	79	32	38	9	-2.756	0.007
The observation group (n = 80)	80	48	30	2		

Comparison of follow-up visits within 12 months

The number of follow-up visits in the two groups was recorded and statistically analysed (Table 2). In the control group, 9, 38 and 32 children, respectively, attended two, three and four follow-up visits. In the observation group, 2, 30 and 48 children, respectively, attended two, three and four follow-up visits. The difference was statistically significant ($Z = -2.756$, $P = 0.007$).

Discussion

The fourth Chinese oral health epidemiological survey report revealed that the incidence of caries in 5-year-old children in China has reached 70.9% (an increase of 5.8% over the past 10 years) and the incidence of childhood caries continues to increase.[20] Extended diagnosis and treatment measures can ensure that children with caries receive continuous oral health services.[5] However, there are several implementation problems, such as the multiaspected and complicated nature of health education.

Previous studies have shown that mind mapping can improve the effectiveness of health guidance for patients,[21,22] especially for elderly and paediatric patients.[20] In the present study, a mind map of extended care health education for children with caries was designed and implemented.[23]

Previous studies have showed that mind mapping can organize fragmentary information about caries health education for children into a systematic and structured three-dimensional form; this avoids visual and reading fatigue caused by planar flattening of traditional texts or pictures,[24] and increases the interest and participation of children and their parents. Furthermore, mind mapping has a clear focus,[25] which improves parents' understanding and memory for information about treatment and prevention. Mind mapping is also an effective tool for nurse–patient communication,[26] which can help parents to supervise and manage their children in relation to health care.[27] For these reasons, mind mapping could help children and their parents improve their mastery of caries knowledge. We found similar results in this study: compared with the control group, children in the observation group had greater mastery of caries knowledge (15.84 ± 1.95 vs. 16.81 ± 1.87, $P = 0.03$).

The organics deposited on the surface of the teeth appear shortly after the eruption

of the teeth into the oral cavity.[28] These sediments can form dental bacterial plaque.[29] Bacteria in the biological membranes of bacterial plaque are the initiating factors of caries.[30] The mind map used here was designed to implement professional, systematic, effective and easy-to-understand tooth brushing methods to meet the clinical requirements of dental bacterial plaque removal. Although the bacterial plaque test results showed no significant difference between the two groups, the proportion of children with grade 0 and I was higher in the observation group than in the control group. In addition, the observation group attended more follow-up visits than the control group. Thus, our results revealed that mind mapping can induce better compliance with medical treatment.

The health education content in the mind map highlighted the prevention and care of oral health. The mind map strengthened memory and facilitated timely access to information, thereby enhancing the effect of the intervention.[31] Our findings indicated that mind mapping is effective in the implementation of extended care for children with caries. The information on the mind map was more accessible to children and their parents, increasing their compliance with the health education. Thus, mind mapping is a useful tool for health education in extended care for children with caries.

The study had several limitations. The sample size was small, making it difficult to draw firm conclusions. The mind map was not effective in differentiating cavities from dental caries; we plan to construct a future mind map to solve this problem. Furthermore, the duration of patient follow-up was short. Studies with longer follow-up periods are needed.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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