Characteristics and Predicting Factors of Repeat Dental Treatment Under General Anesthesia in Patients with Special Health Care Needs: A Retrospective Study

Pornpailin Kasemkhun[1]*, Apiwan Smutkeeree[1], Varangkanar Jirarattanasopha[1]

1. Department of Pediatric Dentistry, Faculty of Dentistry, Mahidol University, Bangkok, Thailand.

Abstract

Repeat dental procedures under general anesthesia (GA) in patients with special health care needs (SHCN) can increase anesthetic risks and consequences. This study aimed to investigate the characteristics and predicting factors of repeat GA in SHCN patients.

The hospital records of SHCN patients who underwent dental treatments under GA during year 2005-2019 were reviewed. The difference between single and repeat GA groups were statistically analyzed.

From 162 cases, the repeat GA rate was 29 cases (17.9%). The mean elapsed time after first GA was 5.03±3.07 years. At baseline, negative behavior, number of pulp and periodontal treatment needs in repeat GA group were statistically significant higher than single GA group. New caries occurrence, poor oral hygiene and negative behavior were significantly found in repeat GA group after 24 months of recall, although there was no significant difference in recall behavior between groups. Reasons for repeat dental treatment under GA were dental caries (62%), surgical removal of impacted tooth/teeth (30%) and periodontal disease (8%) respectively.

SHCN patients who initially were definitely negative behavior with distinct pulp and periodontal treatment needs including failure of behavior and oral hygiene improvement at recall periods had higher tendency to repeat dental treatment under GA.

Clinical article (J Int Dent Med Res 2022; 15(2): 766-770)

Keywords: Dental treatment, General anesthesia, Repeat treatment, Special health care needs.

Received date: 02 March 2022 **Accept date:** 07 April 2022

Introduction

According to the higher level of resistance and lack of cooperation of special health care needs (SHCN) patients, there are some unmet dental needs that cannot accomplish by non-pharmacological behavior management techniques. Dental treatment under general anesthesia (GA) is one of the advanced behavior management techniques that has been recommended and widely used in patient with SHCN,[1] and the number of cases are increasing over the recent years.[2]

Dental treatment under GA has numerous of advantages such as reduce potential harm during routine treatment aside from fear or anxiety of patients, and able to complete all required treatment procedures in one visit with superior quality. Nonetheless, some conditions need to be compromised such as cost of treatment, anesthetic requirements including hospital admission in some cases and risk of anesthetic complications.[3] The attempt to reduce the repeat dental treatment under GA should be concerned to minimize those risks and conditions. The repeat GA rates in general pediatric populations were quite low (<10%)[4-7] with various factors affecting the rate reported such as medical problem, age, type of procedure receiving at first treatment under GA, and loss to follow-up.[8-10] In SHCN patients, the inconsistent repeat GA rates range from 7.2-20.7% were observed,[11-14] with lack of intention to highlights on the predicting factors of repeat GA rates and the difference from those who underwent only one GA. Therefore, the purpose of this study is to investigate the characteristics of SHCN patients who underwent the repeat dental treatment under

*Corresponding author:
Pornpailin Kasemkhun, DDS, MSc
Department of Pediatric Dentistry, Faculty of Dentistry, Mahidol University
6 Yothi Road, Bangkok 10400, Thailand. Fax: +662-200-7820
E-mail: p.kasemkhun@gmail.com

GA including predicting factor(s) affecting the repeat rates.

Materials and methods

This retrospective study was approved by the Ethics Committee of Mahidol University, Thailand (MU-DT/PY-IRB 2021/DT002). The hospital records of SHCN patients at Pediatric dental clinic, Faculty of Dentistry, Mahidol University between January 2005 and December 2019 were collected and analyzed by a pediatric dentist as single examiner. The intra-examiner reliability was tested from 10% of all samples, the Kappa value was 0.77 which was considered as good.

The study populations were SHCN patients at any ages who had at least one disability; behavioral, developmental, intellectual, physical and sensory. They all received comprehensive dental treatment under GA by pediatric residents under supervision of the full time faculty staffs of Dental Hospital, Faculty of Dentistry, Mahidol University, Bangkok, Thailand. The preoperative assessments were carefully performed to justify the use of general anesthesia in dental treatment individually. The written consent was given from the main caretaker. The standard GA setting was arranged by the anesthesiologist. All patients were made an appointment for 1-week follow-up and continued for routine recall according to their individual caries risk level. Likewise, the preventive program was planed based on patient's caries risk level at the beginning and emphasized throughout the following visits.

The subjects were divided into two groups; only single GA as a control *versus* repeat GA group. The baseline data consisted of demographic data; age, gender, residency area, type of disability, dental conditions; the simplified oral hygiene index (OHI-S) using Greene-Vermillion index, [15] the decayed-missing-filled teeth in both primary and permanent dentitions (dmft/DMFT), behavior level (Frankl scores), [16] dental treatment needs. Repeat GA rates and reasons for repeat GA were collected in repeat GA group. Recall behavior, dental treatment outcomes, OHI-S and Frankl behavior level after 24 months of recall were also compared between groups.

Statistical Analysis: The data were analyzed using SPSS (version 23.0. IBM, Armonk, NY, USA). Descriptive statistics were analyzed and informed as frequencies and mean ± standard deviation. Pearson's chi-squared test, Fisher's exact test and Mann-Whitney U test were used to compare the difference between control and repeat GA group. The statistical significant level was set at 0.05.

Results

There were 162 cases of SHCN patients who underwent dental treatment under GA during year 2005-2019. The repeat rate was 17.9% (n=29) for repeat GA group, and 82.1% (n=133) for control group. The mean ages of all subjects was 15.51±9.57 years old (ranged between 3 to 43.1 years) without a difference between two groups. The number of male were significantly higher in control group, while the number of female were significantly higher in repeat GA group (*P*=.008). There was no significant difference in residency area, type of disability, caries experience and OHI-S index between two groups (*P*>.05) as shown in Table 1.

	Total (N=162)	Single (N=133)	Repeat (N=29)	*P-value*
†Age (Mean ± SD years)	15.51±9.57	15.82±9.93	14.12±7.69	.618
†Gender N(%)				
Male	107(66.1)	94(70.7)	13(44.8)	.008*
Female	55(33.9)	39(29.3)	16(55.2)	
Residency area N(%)				
Bangkok & vicinity	140(86.4)	117(88.0)	23(79.3)	.219
Up-country	22(13.6)	16(12.0)	6(20.7)	
Type of disability N(%)				
Physical disability	36(22.2)	30(22.6)	6(20.7)	.827
Developmental disability	129(79.6)	105(78.9)	24(82.8)	.644
Intellectual disability	25(15.4)	17(12.8)	8(27.6)	.084
Sensory disability	8(4.9)	8(6.0)	0(0)	.353
Behavioral disability	10(6.2)	7(5.3)	3(10.3)	.387
Caries experience (Mean ± SD case)				
Primary dentition	11.9±4.72	11.95±4.55	11.69±5.63	.084
†Permanent dentition	8.3±6.49	7.94±6.35	9.73±6.98	.261
†OHI-S index N(%)				
Good	11(6.8)	10(7.5)	1(3.4)	.139
Fair	53(32.7)	46(34.6)	7(24.1)	
Poor	98(60.5)	77(57.9)	21(72.4)	
†Frankl behavior scores N(%)				
Definitely negative (1)	107 (66)	83 (62.4)	24 (82.8)	.031*
Negative (2)	39 (24.1)	35 (26.3)	4 (13.8)	
Positive (3)	11 (6.8)	10 (7.5)	1 (3.4)	
Definitely positive (4)	5 (3.1)	5 (3.8)	0 (0)	
Treatment needs	case(%)	case(%) n/case	case(%) n/case	
Sealant	118(72.8)	96(72.2) 4.9±4.8	22(75.9) 5.3±4.8	.723
Filling	131(80.9)	106(79.7) 3.7±3.7	25(86.2) 4.6±3.4	.080
SSC	66(40.7)	52(39.1) 1.9±3.0	14(48.2) 1.6±2.8	.206
Pulp treatment	28(17.3)	19(0.8) 0.2±0.7	9(31.0) 0.7±1.3	.038*
Extraction (caries)	99(61.1)	81(60.9) 2.7±3.9	18(62.1) 3.1±3.4	.273
Minor Surgery	50(30.9)	41(30.8) 1.1±1.8	9(31.0) 1.1±1.8	.924
Periodontal treatment	7(4.3)	0(0) 0	7(24.1) 0.2±0.4	<.001*

Table 1. Demographic data.
SD: standard deviation; OHI-S: simplified oral hygiene index.
†The differences were analyzed by the Mann-Whitney U test, whereas other demographic data were analyzed by the Pearson's chi-squared and the Fisher's exact test. *Statistical significance (*P*<.05).

Nonetheless, the Frankl behavior scores were significantly different between groups: the high number of definitely negative and less number of positive behavior were observed in repeat GA group (*P*=.031). The treatment needs of pulp and periodontal treatment were significantly higher in repeat GA group (*P*=.038 and *P*<.001 respectively). The percentage of 1-week recall after GA, the continued recall rate and the regularity of recall were not significantly different as shown in Table 2.

	Single (N=133) n(%)	Repeat (N=29) n(%)	*P-value*
Recall 1-week after GA	110 (82.7)	26(89.7)	.576
Continued recall	99 (74.4)	20 (69.0)	.546
Regularity of recall			
Regular (≤ 6 months)	76(76.8)	18(81.8)	.863
Irregular (> 6 months)	23(23.2)	4(18.2)	

Table 2. Recall behavior.
*Statistical significance (*P*<.05).

After 24-month of first GA, the failure of treatments was no significant difference in both groups. New caries occurrence was significant higher (*P*=.001) as well as poor level of OHI-S index (*P*<.023) and definitely negative Frankl behavior score (*P*<.018) in repeat GA group as shown in Table 3.

	Single (N=133) n(%)	Repeat (N=29) n(%)	*P-value*
Failure of treatments			
Sealant loss	27(20.3)	7(24.1)	.647
Defective Filling	16(12.0)	4(13.8)	.794
SSC dislodgement	6(4.5)	3(10.3)	.215
New caries			
New caries (case)	99(74.4)	26(89.7)	.001*
OHI-S	**N=99**	**N=20**	
Good	22(22.2)	2(10.0)	.023*
Fair	57(57.6)	9(45.0)	
Poor	20(20.2)	9(45.0)	
Frankl behavior scores N(%)			
Definitely negative (1)	36(36.4)	12(60)	.018*
Negative (2)	37(37.4)	7(35)	
Positive (3)	16(16.2)	1(5)	
Definitely positive (4)	10(10.1)	0(0)	

Table 3. Outcomes of dental treatments at ≥ 24 months of recall.
OHI-S: simplified oral hygiene index. The data were analyzed by Mann-Whitney U test. *Statistical significance (P<.05).

The reasons for repeat GA were shown in Figure 1. The mean elapsed time after first GA was 5.03±3.07 years. There were 3 cases (1.85%) that repeated GA for three times and only 1 case (0.62%) that underwent the highest number (5 times) of repeat GA during 14 years of study period.

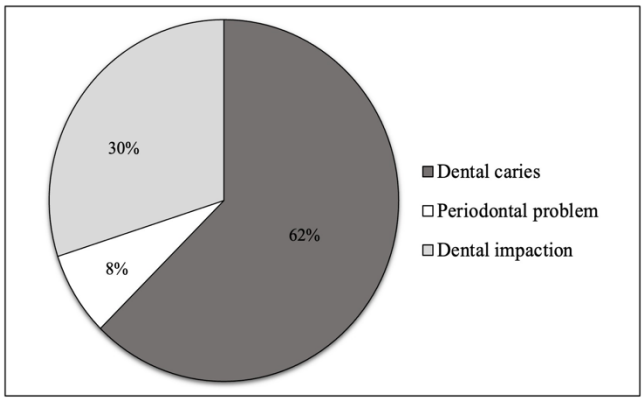

Figure 1. Reasons for repeat dental treatment under general anesthesia.

Discussion

This study highlighted on the characteristics of SHCN patients who underwent repeat dental treatment under GA and predicting factors for risk of repeat GA treatment. It was found that the repeat rate of 17.9% was lower than 20.7% from the study of Pecci-Lloret et al.[11] but higher than Mitchell et a1,[12] Roeters et a1[13] and Bucher et al[14]: 7.2%, 10.2% and 11% respectively. The possible reasons could be the diversity of study-based country that resulted in the varied caries experience in each country which was rather high in our country population. Secondly, the individual's complexity and severity level of disabilities that indicate for GA were different in each study. Since this dental hospital was not a hospital-based setting, thus the extremely severe or complex cases were not referred to us, and this might lead to a lower percentage of ours. Moreover, the study period might affect the percentage of repeat GA as well, since a lower percentage of the repeat rates were detected in a shorter period of study. Comparing to the general children populations, the repeat rate of this study was higher than the previous findings of Kakaounaki et al[4] and Rudie et al[5]: 8.9% and 7% respectively. This could due to the fact that even SHCN patients are getting up in years, they still have high caries risk level and poor oral hygiene that lead them to the increasing caries experience in consequence of their limiting conditions.[17-20]

The mean elapsed time between first and second GA in the present study (5.0 years) was longer than the previous findings of Bucher et al[14](2.4 years) and Vertullo et al[21] (2.7 years), but was shorter than the study by Oh et al[22] (8.6 years). It could be explained that the first two studies population had lower mean ages (< 6 years) as compared to the latter study including ours (≥14 year). This was in agreement with Sheller et al.[10] who found more risk of repeat GA in patients that underwent first GA at very young age. Furthermore, those two studies with shorter mean elapsed time had included the medically compromised patients or in the other words, medical conditions had an influence on the interval of repeat GA, and this was consistent with the earlier studies.[7,9]

The most frequent reasons for repeat GA were dental caries which was in accordance with many previous studies[7,11,14,21-23], followed by impacted tooth and periodontal disease. However, the latter two reasons seemed to be unavoidable for the reason that surgical removal of impacted tooth/teeth could help prevent further complications such as pericoronitis, dental cyst and so on. Similarly, periodontal disease that could be prevented by improving oral hygiene care, yet compromised host immune response was still a crucial contributing factor as presented in Down syndrome, and this has led to the multiple repeat GA as presented 3 cases (1.85%) in the current study.

The repeat GA group had significant higher number of definitely negative behavior than the single GA group at both pre-treatment and after 24-month of recall, and there was no significant improvement of behavior in repeat GA group. Similarly, there was a significant poor level of OHI-S with very minor improvement including higher new caries occurrence in repeat GA group. Failure in improvement oral hygiene could also increase risk of repeat GA as plaque is one of the foremost contributing factors of dental caries. Additionally, pulp and periodontal treatments were performed in a significant higher number which could be attributed to the more severe level of dental caries and periodontal disease in repeat GA group patients apart from a challenge of treatment's outcome prediction. From these results, it could be implied that SHCN patients whose behavior were extremely negative that could not be improved during the following recalls with initially had increased in pulp and periodontal problems tend to have repeat GA. Thus, the intensive preventive program, that specifically develop relating to the severity level of each SHCN patient, is suggested rather than the universal preventive program in order to effectively improve the oral health.

Surprisingly, the recall behavior did not affect the repeat GA rate. There were more than 80% showed up for 1-week recall after GA. For whom that continued the following recalls, most of them showed up regularly or every 3-6 months of each interval. This finding was comparable to Guidry et al[9] who found no association between 1-week recall and the needs for repeat GA. However, it was contrary to the previous studies which found more repeat GA rate in irregular recall cases.[10,22]

The limitation of this present study was that the socioeconomic status of the main caretaker couldn't be retrieved from the chart records but it should be taken into account as it played a key factor influencing the oral health habits.[24,25] Further study should focus on the developing of preventive programs or tools that could enhance the caretaker in improving of oral health care of SHCN patients based on the severity level of individual disability.

Conclusions

Based on the result of this study, it could be concluded that the SHCN patients who initially were definitely negative behavior with distinct pulp and periodontal treatment needs had high tendency to repeat dental treatment under GA. Moreover, failure in behavior and oral hygiene improvement could also lead to the repeat GA.

Declaration of Interest

The authors report no conflict of interest.

References

1. American Academy of Pediatric Dentistry. Management of dental patients with special health care needs. Pediatr Dent 2016;38(6):171-6.
2. Mallineni SK, Yiu CK. Dental treatment under general anesthesia for special-needs patients: analysis of the literature. J Investig Clin Dent 2016;7(4):325-31.
3. Dougherty N. The dental patient with special needs: a review of indications for treatment under general anesthesia. Spec Care Dentist 2009;29(1):17-20.
4. Kakaounaki E, Tahmassebi JF, Fayle SA. Repeat general anaesthesia, a 6-year follow up. Int J Paediatr Dent 2011;21(2):126-31.

5. Rudie MN, Milano MM, Roberts MW, Divaris K. Trends and characteristics of pediatric dentistry patients treated under general anesthesia. J Clin Pediatr Dent 2018;42(4):303-6.
6. Kirby J, Walshaw EG, Yesudian G, Deery C. Repeat paediatric dental general anaesthesia at Sheffield Children's NHS Foundation Trust: a service evaluation. Br Dent J 2020;228(4):255-8.
7. Tahmassebi JF, Achol LT, Fayle SA. Analysis of dental care of children receiving comprehensive care under general anaesthesia at a teaching hospital in England. Eur Arch Paediatr Dent 2014;15(5):353-60.
8. Berkowitz RJ, Moss M, Billings RJ, Weinstein P. Clinical outcomes for nursing caries treated using general anesthesia. ASDC J Dent Child 1997;64(3):210-1.
9. Guidry J, Bagher S, Felemban O, Rich A, Loo C. Reasons of repeat dental treatment under general anaesthesia: A retrospective study. Eur J Paediatr Dent 2017;18(4):313-8.
10. Sheller B, Williams BJ, Hays K, Mancl L. Reasons for repeat dental treatment under general anesthesia for the healthy child. Pediatr Dent 2003;25(6):546-52.
11. Pecci-Lloret MP, Guerrero-Girones J, Lopez-Gonzalez B, et al. Dental treatments under general anesthesia on children with special health care needs enrolled in the Spanish dental care program. J Clin Med 2021;10:182.
12. Mitchell L, Murray JJ. Management of the handicapped and the anxious child: a retrospective study of dental treatment carried out under general anaesthesia. J Paediatr Dent 1985;1:9-14.
13. Roeters J, Burgersdijk R. The need for general anesthesia for the dental treat- ment of mentally handicapped patients: a follow-up study. J Dent Child 1985;52:344-6.
14. Bucher K, Rothmaier K, Hickel R, Heinrich-Weltzien R, Kuhnisch J. The need for repeated dental care under general anaesthesia in children. Eur J Paediatr Dent 2016;17(2):129-35.
15. Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc 1964;68:7-13.
16. Frankl SN, Shiere FR, Fogels HR. *Should the parent remain with the child in the dental operatory?* J Dent Child 1962;29:150-63.
17. Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. Spec Care Dentist 2010;30(3):110-7.
18. Norwood KW, Slayton RL. Oral health care for children with developmental disabilities. Pediatrics 2013;131(3):614-9.
19. Latifi-Xhemajli B, Begzati A, Kutllovci T, Ahmeti D. Dental health status of children and adolescent with special health care needs. J Int Dent Med Res 2018;11(3):945-9.
20. Aras A, Dogan MS. A retrospective evaluation of requirements and causes of dental general anesthesia in pediatric dentistry. J Int Dent Med Res 2020;13(1):290-4.
21. Vertullo L, Barrett E, Quinonez C, Sidhu N, Casas M. Trends in repeat general anaesthesia for treatment of dental caries at a children's hospital in Toronto, Canada: a 10-year retrospective investigation. Eur Arch Paediatr Dent 2021;22(6):1087-93.
22. Oh TJ, Nam OH, Kim MS, Choi SC, Lee HS. Oral health of patients with special health care needs after general anesthesia: a 25- year retrospective study. Pediatr Dent 2018;40(3):215-9.
23. Jockusch J, Sobotta BAJ, Nitschke I. Outpatient dental care for people with disabilities under general anaesthesia in Switzerland. BMC Oral Health 2020;20(1):225.
24. Oberoi SS, Sharma G, Oberoi A. A cross-sectional survey to assess the effect of socioeconomic status on the oral hygiene habits. J Indian Soc Periodontol 2016;20(5):531-42.
25. Howell R, Brimble M. Dental health management for children with special healthcare needs. Nurs Child Young People 2013;25(5):19-22.