

Original Article

Comparison of dental treatments performed under general anesthesia for healthy and disabled children

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ABSTRACT

Background: This study aimed to assess and compare the type of dental procedures performed under general anesthesia for healthy and disabled children.

Materials and Methods: This descriptive, cross-sectional study evaluated 361 dental records of children who received dental treatments under general anesthesia in the operating room of Torabinejad Research Center during 2011–2013. Patients with mental or physical disability were categorized as disabled. The age and gender of patients, number of treated teeth, duration of general anesthesia, type of tooth, and type of dental treatment such as extraction, pulp therapy, placement of stainless steel crowns, composite restoration, preventive resin restoration (PRR), fissure sealant treatment, and fluoride therapy were separately recorded for the healthy group and patients with disability. Data were analyzed using one-way ANOVA, and independent sample *t*-test at $P < 0.05$ level of significance.

Results: Of 361 patients, 263 patients were healthy and 102 patients had disability. Of all disabled children, 48% had physical and 52% had mental disability. Among patients with physical disability, allergy (40%), followed by cardiovascular diseases (26%) were the most common. Mental retardation (54%) followed by cerebral palsy (10%) were the most common mental disabilities. Number of extracted teeth was significantly higher in disabled children ($P = 0.006$). Furthermore, disabled children received significantly lower PRR ($P = 0.015$), fissure sealant treatment ($P = 0.003$), fluoride therapy ($P = 0.002$), and pulp therapy ($P < 0.001$) compared with healthy children.

Conclusion: Tooth extraction has a higher frequency in disabled children; while, attempts are made to preserve the teeth as much as possible in healthy children.

Key Words: Dental care, disabled children, general anesthesia, pediatric dentistry

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INTRODUCTION

Provision of dental treatment to pediatric patients is challenging due to their high-level anxiety and poor cooperation.^[1,2] The behavior of most children is often controlled with nonpharmaceutical behavioral methods

such as the tell-show-do technique in dental office.^[3] Nonetheless, some children require pharmaceutical behavioral management due to poor cooperation as the result of physiological or psychological problems,

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or physical or mental disability.^[2,3] Pharmaceutical behavioral management of children includes sedation (i.e. by administration of nitrous oxide) and general anesthesia. General anesthesia is the method of choice for behavioral management of very young children, those with very high anxiety level, and patients with physical or mental disability.^[2-4] General anesthesia allows provision of several dental treatments such as restorative treatments, pulp therapy, tooth extraction, preventive resin restoration (PRR), and placement of stainless steel crowns (SSCs) for a high number of teeth all within the same session.^[3,4] General anesthesia allows efficient and safe provision of dental treatment to children with poor cooperation or those with disabilities in a hospital setting.^[1-5]

To the best of the authors' knowledge, the types and frequency of dental treatments provided to disabled children under general anesthesia have not been evaluated in Iran. Knowledge in this respect can help in strategy planning for preventive programs for this group of children. Thus, this study aimed to assess the frequency and type of dental treatments performed for the disabled and healthy children under general anesthesia in Torabinejad Research Center, affiliated to Isfahan University of Medical sciences, which is a referral center in Isfahan city for dental treatments under general anesthesia.

MATERIALS AND METHODS

This retrospective, descriptive, cross-sectional study evaluated disabled and healthy pediatric dental patients who received dental treatments under general anesthesia at the Torabinejad Research Center, affiliated to Isfahan University of Medical sciences during 2011–2013.

The inclusion criteria were medical records of children under 12 years of age who received dental treatments under general anesthesia in Torabinejad Research Center during the abovementioned time period. Children under 12 years were selected for this study since many of them are uncooperative and need to undergo general anesthesia for dental procedures.

The exclusion criteria were medical records of children over 12 years of age, those who underwent dental treatment for reasons other than caries, and cases with incomplete medical/dental records.

Medical records of all eligible patients who received dental treatments under general anesthesia in

Torabinejad Research Center during 2011–2013 were retrieved and included in the study using convenience sampling. Patients with at least one mental (mental retardation, autism, cerebral palsy, seizures, and growth retardation) or physical (hepatitis, cardiovascular disease, coagulopathy, or respiratory diseases) disorder were classified under the category of “patients with disability”. The age and gender of patients, number of treated teeth, duration of general anesthesia, type of tooth, and type of dental treatment such as extraction, pulp therapy, placement of SSCs, composite restoration, PRR, fissure sealant therapy, and fluoride therapy were separately recorded for the healthy group and patients with disability. A checklist was used to collect the information extracted from patient records.

Data were analyzed using SPSS version 18 (SPSS Inc., IL, USA) through one-way ANOVA and independent sample *t*-test at $P < 0.05$ level of significance.

RESULTS

A total of 426 medical records were primarily evaluated; out of which 361 were eligible for study inclusion. Table 1 shows the demographic information of patients. Of 361 patients, 263 patients were healthy and 102 patients had disability. Of all disabled children, 48% had physical and 52% had mental disability. Among patients with physical disability, allergy (40%), followed by cardiovascular diseases (26%) were the most common. Mental retardation (54%) followed by cerebral palsy (10%) were the most common mental disabilities.

The mean age of disabled and healthy children was 6.5 and 4.5 years, respectively. This difference was significant, and disabled children had a higher mean age than healthy children ($P < 0.001$).

Table 2 compares the mean variables between the two groups. The two groups were not significantly different regarding the mean number of treated teeth ($P = 0.615$) or duration of anesthesia ($P = 0.177$).

The mean number of extracted teeth was significantly higher in the disabled group ($P = 0.006$). Furthermore, disabled children received significantly smaller number of preventive treatments, namely, PRR ($P = 0.015$), fissure sealant treatment ($P = 0.003$), and fluoride therapy ($P = 0.002$) than healthy children. The frequency of pulp therapy was also significantly lower in disabled children ($P < 0.001$).

Table 1: Demographic information of patients

Status	Number of patients (n)	Type of disability		Gender	
		Physical	Mental	Male (n)	Female (n)
Healthy	263	-	-	136	127
Disabled	102	Cardiovascular	-	6	7
		Endocrine	-	2	1
		Asthma	-	0	1
		Allergy	-	7	13
		Hematologic	-	3	1
		Renal	-	2	0
		Hepatic	-	2	4
		-	Mental retardation	18	11
		-	Autism	6	2
		-	Cerebral palsy	4	6
		-	Seizures	3	0
-	Growth retardation	1	2		

However, although the frequency of SSC treatment ($P = 0.936$) and composite ($P = 0.940$) and amalgam ($P = 0.059$) restorations were lower in disabled children, the differences did not reach statistical significance.

DISCUSSION

This study assessed and compared the type of dental procedures performed under general anesthesia for the healthy and disabled children. The results showed that both groups of children benefitted from dental treatments provided under general anesthesia. However, the frequency of tooth extraction was higher in disabled children while in healthy children, most dental treatments were aimed at preserving the teeth as much as possible (by pulp therapy, amalgam and composite restorations, and SSCs).

In this study, 72% of patients did not have any disability. They mainly received dental treatments under general anesthesia due to their poor cooperation and high level of fear and anxiety; this prevalence rate was higher than the values reported by Wong *et al.*,^[6] Vermeulen *et al.*,^[4] and Tarján *et al.*^[7] However, O'Sullivan and Curzon^[8] reported that dental treatments provided under general anesthesia were due to behavioral problems (fear, and poor cooperation) in 76% of patients, which was in line with our results. Lee *et al.*^[9] compared dental treatments under general anesthesia between the healthy and disabled children and reported that irrespective of the health status of patients, dental treatments under general anesthesia were efficient. They reported differences in the type of treatments provided to the two groups, such that the

healthy group received higher number of SSCs and pulp therapy. Furthermore, the number of extracted teeth was higher in the disabled group. Our results were in agreement with their findings, indicating the higher tendency to tooth extraction in disabled patients, while attempts are made to preserve the teeth as much as possible in healthy children. One reason for higher frequency of tooth extraction in disabled children, especially in those with cerebral palsy, is their inability to chew. They often can only swallow the food. Thus, if they have a tooth with questionable prognosis, dental clinicians mostly prefer to extract it. Oral hygiene promotion and increased number of remaining teeth due to early interventions under general anesthesia is another reason for higher frequency of extraction in disabled children. Similarly, Chia-Ling Tsai *et al.*^[10] reported higher frequency of tooth extraction in disabled children. They also reported that early intervention under general anesthesia in disabled children would improve their oral health and preserve higher number of teeth. Ibricevic *et al.*^[11] found no significant difference in the number of extracted teeth between the healthy and disabled groups, which was different from our findings. However, they reported higher number of dental procedures in the healthy group, which was in line with our results.

In this study, the two groups were not significantly different regarding the number of treated teeth, which was the same as the results of Lee *et al.*,^[9] and Chia-Ling Tsai *et al.*^[10] Furthermore, Harrison and Roberts^[12] compared the number of extracted and restored teeth under general anesthesia between the healthy and disabled children and concluded that the health status of children affected their dental treatment

Table 2: Comparison of the mean variables between the two groups. ($P < 0.05$ was considered statistically significant)

Mean variable	Healthy	Disabled	P
Age (years)	4.5	6.5	<001*
Number of treated teeth (n)	9.37	8.91	0.615
Duration of anesthesia (h)	2.38	2.52	0.177
Fluoride therapy (n)	0.246	0.345	0.002*
Fissure sealant therapy (n)	0.56	0.29	0.003*
SSC (n)			
Primary	2.81	3.22	0.936
Permanent	0	0.02	
Total	2.81	1.62	
PRR (n)			
Primary	0.006	0	0.015*
Permanent	0.094	0	
Total	0.05	0	
Amalgam restoration (n)			
Permanent	1.25	2	
Total	1.50	1.20	
Tooth extraction (n)			
Primary			
Anterior	2	2.04	0.940
Posterior	1	2.03	
Permanent			
Anterior	1.02	2	
Posterior	1.1	1.07	
Total	2.56	3.07	
Composite restoration (n)			
Primary			
Anterior	0.7	0.6	0.940
Posterior	0.3	0.1	
Permanent			
Anterior	1	1.2	
Posterior	0.14	0.07	
Total	1.07	1.03	
Pulp therapy			
Pulpotomy			
Anterior	1.8	0.9	<001*
Posterior	0.2	0.2	
Pulpectomy			
Anterior	0.8	0.3	
Posterior	0.3	0.22	
Total	1.55	0.76	

SSC: Stainless steel crowns; PRR: Preventive resin restoration

plan. They reported significantly higher number of extracted teeth in disabled children while they had significantly lower number of restored teeth. Their results were in line with our findings. Furthermore, our findings were in agreement with the results of several other studies.^[13-15] It may be concluded that pediatric dentists often alter the treatment plan for disabled children and consider more invasive procedures such as tooth extraction for them.

Harrison and Roberts^[12] discussed that all dental restorations have the potential to fail. In healthy children, a failed restoration can be easily replaced and does not have a significant effect on their general health. However, this is not the case for disabled children, and a faulty or failed restoration can be life-threatening for them, and necessitate medical interventions. Thus, when there is doubt about the success of a certain treatment, tooth extraction is preferred for such patients.

In this study, the mean age of disabled children was higher than that of healthy children. To determine an appropriate time for comprehensive dental treatments in children at high risk of caries, Worthen and Mueller^[15] suggested that treatment should be postponed until the eruption of primary second molars in order to decrease the need for dental treatments under general anesthesia. As the children become older, they often better cooperate with dental clinicians, and number of patients who may require dental treatment under general anesthesia decreases between the ages 6–12 years.

According to Harrison and Roberts,^[12] the parents of children with disability or chronic diseases are aware of the dental treatment needs of their children; however, they are often too involved with the medical needs of their children and thus, seek dental treatment often at a later time. The male-to-female ratio in our study was 1:07 in the healthy and 1:2 in the disabled group, which was similar to the ratio reported by Chia-Ling Tsai *et al.*,^[10] (1.2:1) and lower than that reported by Lee *et al.*,^[9] (1.7:1.9), which may indicate lower cooperation of boys compared with girls in dental office setting.

The current results also indicated that allergy and cardiovascular diseases were the most common physical disabilities, which was in accordance with previous findings.^[7-10,12] In our study, mental retardation was the most common type of mental disability followed by cerebral palsy and autism. In the study by Lee *et al.*,^[9] mental retardation was the most common mental disability followed by autism and cerebral palsy. These results highlight the fact that children with such disabilities have poor cooperation and are therefore good candidates for dental treatment under general anesthesia.^[10,14,15]

It should be noted that the same type and technique of general anesthesia was used for all patients in this study, and duration of anesthesia was not significantly

different between the two groups. In general, the authors suggest early interventions in disabled children under general anesthesia to preserve the teeth and decrease the need for tooth extraction. Furthermore, pediatric dentists should closely cooperate with the pediatricians to discuss the treatment options for disabled children. Moreover, preventive treatments should be provided to disabled children at a young age to minimize the rate of caries in them.

Retrospective nature, limited sample size, and single-center design of this study were among its limitations. Future multicenter randomized clinical trials with larger sample size are required to obtain more accurate results.

CONCLUSION

According to the results of the present study, both healthy and disabled children benefit from dental treatments performed under general anesthesia. However, the mean age was higher in the disabled group. As a result, tooth destruction was greater at the time of their presentation, resulting in higher number of extractions in this group; whereas, in healthy children, most dental procedures included pulp therapy, amalgam or composite restoration, and SSCs.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or nonfinancial in this article.

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