

Comprehensive Dental Treatment under General Anesthesia in Healthy and Disabled Children

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Background: Differences in dental treatment under general anesthesia (GA) in healthy and disabled children are rarely reported. This retrospective study evaluated the characteristics and treatment modalities performed under general anesthesia in pediatric dental patients at Taipei Chang Gung Memorial Hospital between 2004 and 2005, and compared the different treatment patterns performed in healthy children and children with special health care needs.

Methods: The data were reviewed in pediatric patients from 1 to 18 years old who underwent dental treatment performed under general anesthesia from January 2004 to December 2005. Patients with special health care needs who had at least one type of mental or physical disability were assigned to the disabled group (Group D) and the other healthy patients were assigned to the healthy group (Group H). The treatment modalities of operative restoration, crowns, pulp therapy, sealant and extracted teeth were compared in the two groups.

Results: A total of 185 patients were assigned to group H and 112 to group D. The patients in group D were significantly older than those in group H. There were no significant differences in the mean number of teeth treated between the two groups. However, there was a significantly greater mean total number of teeth extracted in group D patients ($p < 0.001$). In addition, there were more stainless steel crown reconstructions ($p < 0.05$) and pulp therapies ($p < 0.001$) performed in group H patients. In group D, there were no significant differences in the total number of teeth extracted between the 1-3 year old patients and the 3-6 year-old patients ($p = 0.99$).

Conclusions: For very young children or those with special health care needs, dental treatment performed under general anesthesia is beneficial and efficient. The findings of this study suggest that underlying medical or mental conditions may influence the dental condition and treatment modality provided.

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Key words: dental care, disabled, general anesthesia, dental treatment, teeth extracted

Pediatric dentists provide oral care and solve dental problems for infants, children, adolescents

and young persons with special care needs. The majority of children can be adequately treated with

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nonpharmacologic behavior modification techniques such as the tell-show-do technique. However, some children who have extensive dental problems cannot cooperate due to a lack of psychological or emotional maturity and/or mental, physical or medical disabilities, and their dental treatment needs to be completed with pharmacological behavior management, such as nitrous oxide/oxygen sedation or general anesthesia.⁽¹⁻⁴⁾

Since 1988, comprehensive dental treatment under general anesthesia has been provided for many patients in the operating room at Taipei Chang Gung Memorial Hospital. These patients consisted of a certain percentage of healthy children with substantial dental needs who were extremely uncooperative or uncommunicative with no expectation that the behavior would soon improve. Other patients with certain physical, mental, or medically compromised conditions were possibly unable to tolerate treatment under local anesthesia alone or together with inhalation sedation. Dental treatment performed under general anesthesia allows a total oral rehabilitation in a single course, including a full mouth prophylaxis treatment, operative dental restoration, pulp therapy, tooth extraction, stainless steel crown reconstruction, and preventive resin restoration.

The purposes of this retrospective study were first, to evaluate the characteristics and treatment modalities under general anesthesia in pediatric dental patients in this hospital between 2004 and 2005, and second, to compare the different treatment patterns between healthy children and children with special health care needs.

METHODS

Subjects

The database for this study involved all patients treated under general anesthesia in the Pediatric Dental Department of Taipei Chang Gung Memorial Hospital from January 2004 to December 2005.

Data collection

All the patients received dental and anesthetic pre-operative assessments. Dental assessment included a dental and medical history, clinical examination, oral radiographs and appropriate hematological tests. A provisional treatment plan for each patient was formulated and advice on prevention was given to

the parents. A consultant anesthesiologist made an assessment of the patient's suitability for general anesthesia and commented on any precautions to be taken. On the day of the operation, the treatment plan was finalized and consent was obtained. Most dental treatments were carried out under general anesthesia with nasoendotracheal intubation. A very small number of patients with limited mouth opening capability or other conditions received oral intubation. All dental treatments were performed by one of five senior pediatric staff dentists. Unless there were other adverse conditions, the patient was discharged one hour after recovery.

The data from their personal profiles were retrospectively reviewed, including general history, dental history, reasons for general anesthesia and treatment modalities, such as the number of restorative primary teeth, and restorative permanent teeth, which were the total number of teeth undergoing operative restoration, stainless steel crowns and sealant procedures. If the tooth was treated with preventive resin, we assigned it to the operative restored tooth group. We also recorded the number of pulp treated primary teeth, pulp treated permanent teeth, extracted primary teeth, and extracted permanent teeth, which included supernumerary teeth.

Patients were divided into two groups; those with special health care needs who had at least one type of mental or physical disability were assigned to the disabled group (group D) and those with neither mental nor physical disabilities were included in the healthy group (group H).

Statistical analyses

The data were recorded and analyzed using a two-sample t-test, with $p < 0.05$ indicating significance using the SPSS (IBM, Chicago, U.S.A.) 15.0 program.

RESULTS

There was a total of 305 patients in the database. After excluding patients older than 18 years and those with incomplete records, a total of 297 patients were included. In total, 185 patients were assigned to Group H and 112 to Group D.

Patient characteristics

The age of the patients studied ranged from

1 year 7 months to 17 years 10 months. For group H, the age distribution was 1 year 7 months to 12 years 1 month and the average age was 3.6 years, while that in group D was 2 years 3 months to 17 years 10 months and the average age was 7.2 years. The patients in group D were significantly older than those in group H ($p < 0.001$). The Fig. 1 shows the age distribution in both groups.

In this study, 191 patients were boys (64.3%) and 106 were girls (35.7%). Boys were predominant in both groups. The boy to girl ratios in group H and D were 1.7 to 1 and 1.9 to 1, respectively. Most patients in group D were mentally disabled. The two major underlying problems were mental retardation (36.6%) and autism (29.5%). Other problems included cerebral palsy (14.3%), developmental delays (8.9%) and epilepsy (6.3%).

Treatment modalities

The treatment modalities and specific number of

treated teeth in both groups are shown in Table 1. The mean numbers of teeth treated in group H and group D were 13.2 and 13.6, respectively. There were no significant differences in the total number of teeth treated between groups. The mean number of extracted teeth was significantly greater in group D patients for both primary and permanent teeth. Although there was no significant difference in the total number of restored teeth, there were more primary teeth restored than permanent teeth treated in group H patients. Also, there were no significant differences in the number of teeth receiving operative restoration and sealant procedures. However, there were more stainless steel crowns and pulp therapies performed in group H patients.

The majority of patients were 1~6 years old. Table 2 demonstrates the treatment pattern in patients who were younger than 6 years old. There were 163 patients in group H and 52 patients in group D in this age group. There were no significant differences in

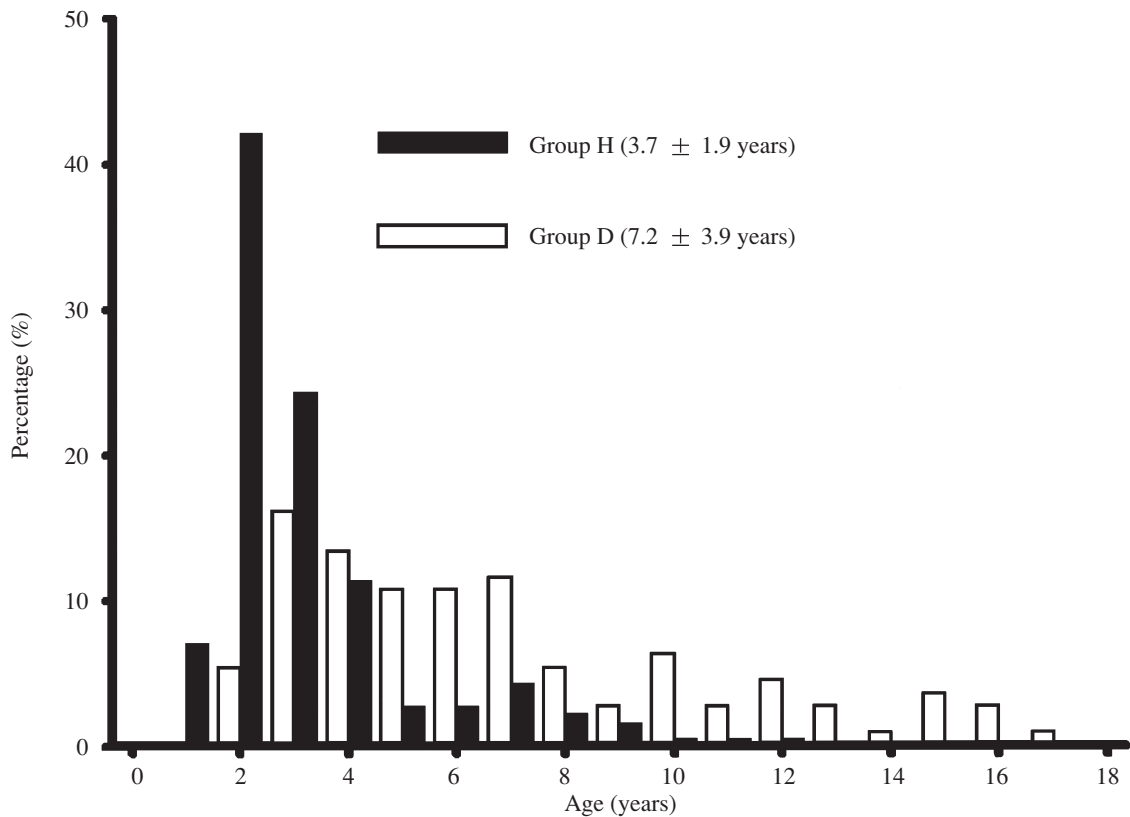


Fig. 1 Age distribution of the healthy (H) and disabled (D) groups. The patients in group D were significantly older than those in group H (7.2 ± 3.9 y/o vs 3.7 ± 1.9 y/o, $p < 0.001$).

Table 1. Dental Treatment in Healthy (H) and Disabled (D) Patients from 1~18 Years Old

	Group H (n = 185)	Group D (n = 112)	p value
Operative restoration	7.9 ± 4.3	7.9 ± 4.7	0.95
Crown	4.3 ± 3.0	3.6 ± 2.9	0.04
Pulp therapy	5.6 ± 3.7	3.9 ± 3.4	< 0.001
Sealant	0.2 ± 0.9	0.2 ± 0.8	0.91
Total number of teeth restored			
Primary teeth	12.4 ± 5.8	7.9 ± 5.8	< 0.001
Permanent teeth	0.1 ± 0.5	3.8 ± 5.7	< 0.001
All teeth	12.5 ± 5.7	11.7 ± 4.2	0.17
Total number of teeth extracted			
Primary teeth	0.7 ± 1.5	1.6 ± 2.7	0.001
Permanent teeth	0.0 + 0.1	0.2 ± 0.7	0.005
All teeth	0.7 ± 1.5	1.9 ± 2.8	< 0.001
Total number of teeth treated	13.2 ± 5.7	13.6 ± 4.2	0.53

Data are presented as the mean ± SD

Table 2. Dental Treatment in Healthy (H) and Disabled (D) Patients from 1~6 Years Old

	Group H (n = 163)	Group D (n = 52)	p value
Operative restoration	8.8 ± 3.7	7.1 ± 3.7	0.005
Crown	5.0 ± 2.7	5.1 ± 2.7	0.68
Pulp therapy	6.4 ± 3.4	5.6 ± 3.8	0.19
Sealant	0.2 ± 1.0	0.1 ± 0.5	0.38
Total number of teeth restored			
Primary teeth	14.0 ± 4.1	12.3 ± 3.9	0.008
Permanent teeth	0	0.01 + 0.4	0.09
All teeth	14.0 ± 4.1	12.4 ± 3.9	0.01
Total number of teeth extracted			
Primary teeth	0.7 ± 1.6	1.9 ± 3.4	0.03
Permanent teeth	0.0 + 0.1	0	0.57
All teeth	0.7 ± 1.6	1.9 ± 3.4	0.03
Total number of teeth treated	14.7 ± 4.2	14.2 ± 3.8	0.45

Data are presented as the mean ± SD

the mean number of stainless steel crowns, pulp therapies, sealant procedures and total teeth treated between the two groups. Group D patients had significantly more extractions and fewer restoration treatments, especially operative treatments, than Group H patients.

In the group between 6 and 12 years old, there were 21 patients in group H and 43 patients in group D. Extractions of supernumerary or impacted teeth were performed in 20 of 21 group H patients, but in only 4 of 43 group D patients. The mean numbers of teeth treated for most modalities were greater in group D, except for the total number of permanent teeth extracted ($p = 0.553$) and the mean number of teeth treated by a sealant procedure ($p = 0.453$).

In the group between 12 to 18 years old, there were 25 patients assigned to group D, but only one to group H. That patient received dental treatment under general anesthesia for extraction of an impacted supernumerary tooth. A descriptive sample of these two groups was not included in the analysis.

Table 3 shows the mean number of teeth treated with various modalities between patients from 1 to 3 years old and 3 to 6 years old in both groups. In group D, there were no significant differences in the number of teeth treated by any of the treatment modalities in these 2 age groups. However, in group H, the 3-6 year-olds had more total teeth extracted and more stainless steel crowns than 1-3 year-olds group. Furthermore, the patients between 1~3 years old in group H had more operative restorations than did those between 3~6 years old. There were no significant differences for the other treatment modalities, such as pulp treatments, sealants, total number of restored teeth and treated teeth, between these two age groups in group D.

DISCUSSION

Dental treatment performed under general anesthesia in a hospital environment provides great efficacy and safety for particular groups of patients, such as very young or disabled children.^(3,5-7) In our study, 185 young healthy children (mean age 3.7 years) and 112 children with special health care needs (mean age 7.2 years) received treatment for 13.5 teeth on average during a single operation.

The majority of the healthy patients were under 3 years old (50.8%). In that group, the greatest diffi-

Table 3. Dental Treatment in Healthy (H) and Disabled (D) Patients 1~3 Years and 3~6 Years Old

	Group H			Group D		
	1~3 y/o n = 94	3~6 y/o n = 69	<i>p</i> value	1~3 y/o n = 8	3~6 y/o n = 44	<i>p</i> value
Operative restoration	9.5 ± 3.3	7.9 ± 3.9	0.02	6.0 ± 3.0	7.3 ± 3.7	0.77
Crown	4.3 ± 2.6	5.7 ± 2.6	0.004	6.2 ± 2.7	4.9 ± 2.7	0.41
Pulp therapy	6.0 ± 2.8	6.7 ± 3.9	0.39	7.2 ± 4.0	5.3 ± 3.7	0.25
Sealant	0.3 ± 1.1	0.1 ± 0.6	0.56	0	0.1 ± 0.5	0.92
Total number of teeth restored	14.2 ± 3.9	13.7 ± 4.2	0.79	12.2 ± 3.8	12.4 ± 3.9	0.99
Total number of teeth extracted	0.3 ± 0.8	1.2 ± 2.1	<0.001	1.7 ± 2.4	1.8 ± 3.6	0.99
Total number of teeth treated	14.5 ± 4.0	15.0 ± 4.3	0.73	14.0 ± 4.5	14.2 ± 3.7	0.99

Data are presented as the mean ± SD

culty was behavior problems combined with severe early childhood caries. Therefore, behavior problems during dental treatment were the main reason for seeking treatment under general anesthesia.⁽⁸⁾ In our study, after excluding difficult surgeries for supernumerary or impacted teeth, there were 165 (89.1%) young children in Group H who were treated under general anesthesia because of a lack of cooperation. The percentage was higher than that reported by Tsai et al. (69.9%),⁽⁹⁾ O’Sullivan and Curzon (76%),⁽¹⁰⁾ Wang et al. (40%),⁽⁷⁾ Vermeulen et al. (42%),⁽⁴⁾ and Tarján et al. (49%).⁽¹¹⁾

The ratios of boys to girls in Groups H and D were 1.7 and 1.9, respectively. This was similar to the study by Al-Eheideb et al (1.7:1).⁽¹²⁾ That ratio was higher than that of Tsai et al. (1.2:1).⁽⁹⁾ Boys may be less cooperative with dental treatment than girls.

Harrison et al. found that a greater number of extractions were carried out for chronically sick children, than healthy children with similar findings observed by Tsai et al.^(9,13) and in the present study. Before the age of 6 years old, there was no difference in the total number of teeth treated in either group. However, the number of extracted teeth was greater in the disabled group. Underlying medical conditions may affect the treatment modality provided. The dentist may prefer a less complex dental procedure for a disabled child to avoid complications or the necessity for re-treatment. For example, a tooth extraction is preferable to pulp therapy for periapical pathological teeth. Ibricevic et al. did not find any differences in terms of the extraction of teeth

between healthy and disabled groups.⁽¹⁴⁾ However, in their study, the total number of procedures were significantly higher in the healthy group than the disabled group.

In the 1-6 year age group, the total number of restored teeth were greater in the healthy group. However, in the 1-18 year age group there was no significant difference between the two groups and there were more stainless steel crowns and pulp therapies performed in the healthy patients. The patients in the disabled group were significantly older than those in the healthy group. Therefore, there were more permanent teeth that needed to be treated. In permanent teeth, crowns and pulp therapy are too complicated to be completed in one appointment, and therefore, dentists may choose alternative treatment, such as operative restoration or extraction.

For the patients between 6 and 12 years old, the number of teeth treated were usually higher in the disabled group, however that was not the case for the total number of permanent teeth extracted. That was attributed to the different reasons for the dental treatment under general anesthesia in the two groups. One of the major reasons for dental treatment under general anesthesia in the healthy group was difficulty in extracting impacted teeth.

In Singapore, Vignehsa et al. found that disabled children had higher levels of oral disease and received less dental care.⁽¹⁵⁾ The same findings were presented by Nunn et al.,⁽¹⁶⁾ Shyama et al.,⁽¹⁷⁾ Gizani et al.⁽¹⁸⁾ and Mielnik-Blaszczak et al.⁽¹⁹⁾ Mielnik-Blaszczak et al. also found that the dental treatment

index was lower, especially in deciduous teeth. In the present study, more teeth were extracted and stainless steel crowns applied in the healthy group after 3 years old. Tooth decay becomes more severe when patients get older. However in group D, tooth decay was extensive or teeth need to be extracted before the patients were 3 years old. There was no difference in the various treatment modalities between the 1~3 and 3~6 year old children in the disabled group. Disabled children have a variety of medical conditions from very early in life regardless of their oral condition. As a result, we found more complicated dental problems in this group. The non-significant difference with low statistical power was due to the small sample of disabled patients from 1~3 years old. Furthermore, oral health education and early intervention for dental problems in the disabled group needs to be improved in our society.

Conclusions

Dental treatment performed under general anesthesia is necessary for very young children or those with special health care needs.

The underlying medical or mental condition may influence the dental condition and treatment modality provided. For disabled children, the dentist may prefer a dental procedure that is less complex or has a lower risk of complications, such as extraction.

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健康與身心障礙兒童於全身麻醉下進行牙科治療之比較

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背景： 有關健康與身心障礙兒童於全身麻醉下進行牙科治療的差異性，其文獻有限。我們回溯性地探討 2004 及 2005 年在台北長庚醫院兒童牙科門診病患中，於全身麻醉下接受牙科治療的情形，並比較健康與身心障礙兒童族群的治療差異性。

方法： 回溯性地記錄從 2004 年 1 月至 2005 年 12 月，在台北長庚醫院兒童牙科，於全身麻醉下接受牙科治療之 18 歲以下族群在當次手術中所進行的牙科治療。若病患至少有 一個心智上或身體上的障礙者屬於身心障礙族群，其他則屬於健康族群。

結果： 健康族群有 185 人，身心障礙族群有 112 人。身心障礙族群的平均年齡大於健康族群。在當次治療中，兩族群的每人平均治療牙齒數無統計學上的差異性，然而身心障礙族群的平均拔牙數大於健康族群 ($p < 0.001$)。在健康族群中平均牙套數 ($p < 0.05$) 及根管治療牙齒數 ($p < 0.001$) 皆明顯較大。在身心障礙族群裡，3 歲以前的兒童與 3 到 6 歲的兒童，其拔牙數無差異性 ($p = 0.99$)。

結論： 對於年紀幼小的兒童與身心障礙族群來說，全身麻醉下進行牙科治療是積極及有效的治療。然而病患的身心狀況會影響兒童牙科醫師對於治療計畫的考量。
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關鍵詞： 牙科照顧，身心障礙，全身麻醉，牙科治療，拔牙

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