

A Retrospective Audit of Dental Treatment Provided to Special Needs Patients under General Anesthesia During a Ten-Year Period

Sreekanth Kumar Mallineni*/ Cynthia Kar Y Yiu **

Objective: The purpose of this study was to perform a comprehensive audit of dental treatment provided to special needs patients (SNP) under general anesthesia (GA) over a ten-year period. **Study design:** Special needs patients who received dental treatment under GA as an in-patient at Queen Mary Hospital, Hong Kong SAR during the time period January 2002 and December 2011 were included in the study. The study population was divided into three groups, based on age (<6 years, 6-12 years, >12 years). One-way ANOVA was used to evaluate the effect of "age group" on duration of treatment, post-recovery time, treatment procedures and utilization of different restorative materials. Kappa statistics were used for intra-examiner reliability. **Results:** A total of 275 patients (174 males and 101 females) were included in the study. The mean age of the patients at the time they received GA was 12.37 ± 10.18 years. Dental procedures performed were mostly restorative in nature (47%). The >12 years group had significantly shorter treatment duration ($p < 0.05$). No significant difference in post-operative recovery time was observed among the three age groups ($p > 0.05$). The <6 years group received significantly less preventive, but more restorative procedures ($p < 0.05$). Significantly fewer extractions were performed in the 6-12 years group ($p < 0.05$). The use of composite restorations was significantly higher in the <6 years group; while amalgam restorations were more frequently used in the >12 years group ($P < 0.05$). Stainless steel crowns were more frequently employed in SNP under 12 years of age ($p < 0.05$). Intra-examiner reliability was good ($k = 0.94$). **Conclusions:** Most of the dental procedures performed under GA on SNP were restorative procedures. For children less than 6 years of age, had longer treatment time under GA. Composite restorations and stainless steel crowns were more frequently used in the primary dentition and amalgam restorations were more frequently employed in the permanent dentition.

Key words: Special needs patients. Dental treatment, General Anesthesia

INTRODUCTION

According to the American Academy of Pediatric Dentistry, any physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairment or limiting condition that requires medical management, health care intervention, and/or use of specialized services or programs are included under special health care needs.¹ The proportion of medically compromised children and those with developmental disabilities who survive are increasing and these children remain at high risk of development of dental caries and periodontal disease.² It has become a common practice to provide dental treatment for special needs patients (SNP) as soon as possible to improve their oral health status, which is also important for their general health and long-term welfare.

Dental treatment under general anesthesia (GA) may become necessary for SNP, when other behavioral management techniques have attempted and failed.^{3,4} The provision of dental treatment under GA for SNP is to establish and maintain a state of cooperation, where the patient is able to receive dental assessment and treatment safely and successfully.² Treatment under GA provides immediate relief of pain for the patients and offers the opportunity

From the Paediatric Dentistry and Orthodontics, Faculty of Dentistry, University of Hong Kong, Hong Kong SAR, China

*Sreekanth Kumar Mallineni MDS, Associate Professor, Department of Paedodontics and Preventive Dentistry

**Cynthia Kar Y Yiu, Professor.

Send all correspondence to:

Sreekanth Kumar Mallineni, Associate Professor, Department of Paedodontics and Preventive Dentistry Narayana Dental College and Hospital, Nellore, India.

drmallineni@gmail.com.

+918985833533

for all necessary work to be undertaken in one setting.⁵ It has been reported that there is an increasing number of SNP receiving dental treatment under GA over the recent years.⁶

Dental treatment under GA for SNP requires an assessment of the patient from a medical and a dental point of view.⁷ The medical assessment includes review of the patient's past medical history, past and current medications. The dental evaluation entails obtaining enough information concerning dental abnormalities to justify the provision of dental treatment under GA. The provision of dental treatment under GA in the hospital-based setting allows for many positive outcomes.⁸⁻¹⁰ These include comfort and convenience for the patient as well as the dentist, ease of scheduling and often a significant cost savings for the patient as well as cost efficiency for the dentist. This treatment approach should never be looked at as a negative experience for the patient. The provision of routine dental treatment for SNP is renowned to be more difficult than normal patients. Special needs patients require more attention in the provision of dental treatment, which is not easy to ensure since it depends on the collaboration and agreement of the physician, dentist, and the parents/care giver of the patient. Furthermore, it is mandatory for some patients to receive dental treatment under GA, because of their lack of cooperative behaviour.

Comprehensive dental treatment is the most important goal for SNP, when performing treatment under GA.⁸ However, very few studies have described the dental treatment provided to SNP under GA.¹¹⁻¹⁵ The purpose of this study was to produce a retrospective audit of dental treatments provided to SNP under GA. This study aimed to test the hypothesis that the dental treatment procedures provided to the SNP under GA would be the same for all age groups.

MATERIALS AND METHOD

The records of SNP who received dental treatment under GA as an in-patient at Queen Mary Hospital, Hong Kong SAR during the time period between January 2002 and December 2011 were collected. The dental treatment were provided by the postgraduate students and teaching staff from the discipline of Pediatric Dentistry, Faculty of Dentistry, University of Hong Kong.

This is a retrospective study of dental treatments performed under GA in SNP. Following a washout period of 2 weeks, after obtaining the complete details, 10% of the patient records were randomly selected to evaluate the intra-examiner reliability. All SNP who received comprehensive dental treatment under GA, were reviewed at the Pediatric Dentistry Clinic, Prince Philip Dental Hospital with complete records was included in the present study. Patients were excluded from the study if the records were incomplete, had repeated GA, cleft lip and/or palate, treated by other disciplines or they did not attend post-operative review at Prince Philip Dental Hospital.

All SNP were either referred by general dental practitioners, special needs schools or they were brought to the Pediatric Dentistry Clinic of the Prince Philip Dental Hospital, Hong Kong SAR by their caregivers. The patients were usually attended by the Junior House Dental Officers. At the first screening appointment, the patient's chief complaints, history of present complaints, past medical and dental histories were taken, followed by clinical and radiographic examinations. Panoramic radiographs, bilateral bite-wings and upper anterior occlusal radiographs were routinely taken

if necessary, depending on the level of cooperation of the patient. A provisional treatment plan was formulated for the patient following discussion with the teaching staff and parents. The different behavioural management options and the risks and benefits of each option were explained to the parents. For those cooperative or potentially cooperative SNP patients, they would be placed on the waiting list for treatment by the postgraduate students in the SNP session. However, for those uncooperative SNP or those whom other behavioural management techniques had been attempted and failed, they were then placed or transferred to the waiting list for dental treatment under GA at the Queen Mary Hospital.

A detailed oral examination was performed following successful intubation of the patient and correlated to the radiographic findings, if available. No additional radiographs were taken at the operating theatre. In general, the operative procedures were routinely performed under rubber dam isolation; while tooth extractions were performed after all the restorative treatment had been completed. Local anesthetic solution (2% lidocaine with 1:100,000) were used for tooth extractions. The extractions sites were routinely sutured. The duration of treatment is the total time taken for provision of dental treatment under GA. The time utilized for anesthetic technique was not included in the duration of treatment. After completion of the dental treatment, the patient was transferred to the adjoining recovery room and kept under observation until full recovery from anesthesia. The post-operative recovery time include from the time the patient entered the recovery room to the time patient left the room for the ward. If no complications rose from GA, then the patient would be discharged on the same day following the operation. If the patient was found to have any complications, he or she would be kept under observation until the vital signs were stable. The patient was usually reviewed two weeks post-operatively back in the Prince Philip Dental Hospital.

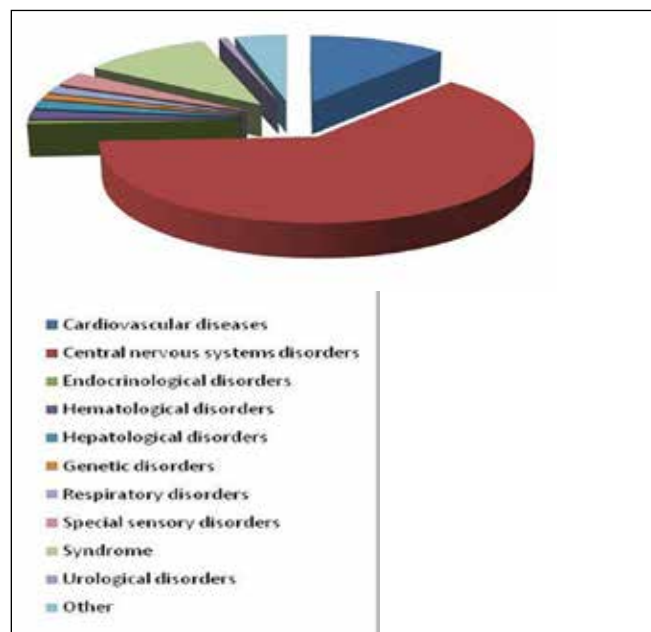
Details of the patient's clinical records were obtained, which included name, date of birth, gender, age, and Prince Philip Dental Hospital folder number. Information collected prior to GA included patient's medical condition, reason for dental treatment under GA, clinical diagnosis, date of dental treatment under GA, types of intubation, duration of dental treatment and types of dental treatment provided. Information collected after GA included post-operative recovery time and post-operative complications. For the purpose of comparison among different age groups, the treatment procedures were classified as preventive (scaling and fissure sealants), restorative (amalgam, composites resin, glass ionomer cements and stainless steel crowns), pulp therapy (pulpotomy and pulpectomy for primary teeth and pulpotomy for permanent teeth), root canal treatment (for permanent teeth), simple tooth extractions, surgical procedure (surgical removal of canines and supernumerary teeth, biopsy, cyst removal, gingivectomy, frenectomy, and foreign body removal) and tooth slicing. Computer print outs, which contain all the details for the study, were carefully screened.

Data were analyzed using the SPSS (Version 20.0, Chicago, Illinois) software. One-way ANOVA was used to examine the effect of "age group" on the treatment duration, post-operative recovery time, number of treatment procedures and utilization of different restorative materials. Post hoc multiple comparisons were performed using the Tukey-Kramer method at $\alpha = 0.05$. Kappa statistics were used to assess the intra-examiner reliability.

RESULTS

A total of 275 SNP patients (174 males and 101 females) that had received dental treatment under GA at Queen Mary Hospital between 2002 and 2011 were included in the final analysis. The intra-examiner reliability was good (K=0.94). The distribution of SNP based on their medical conditions is shown in Figure 1. Over 60% (172) of the patients had central nervous system diseases. Twelve percent (32) of the patients had cardiovascular diseases and 30 (11%) had syndromes. The mean age of SNP at the time they received treatment under GA was 12.37±10.18 years, with a range from 2.49 to 50.04 years.

Figure 1. Distribution of special needs patients based on their medical conditions.



The SNP were divided into three age groups: <6 years, 6-12 years and above 12 years to make them representative of the primary (<6 years), mixed (6-12 years) and permanent dentitions (>12 years). Based on age the distribution of the SNP were groups is 36% (<6 years), 32% (6-12 years), and 32% (>12 years) respectively. No statistically significant difference was observed between genders across the different age groups. The most common reason was dental caries (86%), followed by scaling (5%) and minor surgical procedures (3.6%). One hundred and seventy-two patients (62%) were treated as elective basis; while a hundred and three (38%) as emergency.

The intubation for GA was performed either nasally or orally. Nasal intubation was used for 94% of the patients. The mean duration of dental treatment was 115±55 minutes, ranging from 8 to 339 minutes and was directly related to the complexity of dental treatment provided. The >12 years group had significantly shorter treatment duration than the other two age groups (P<0.05) (Table 1). The mean post-treatment recovery time was 41±20 minutes, with a range from 5 to 175 minutes (Table 1). No significant difference in post-operative recovery time was observed among the three age groups (P>0.05). Thirty-nine patients (14%) experienced post-operative complications. One patient had laryngospasm and one patient

had severe gingival inflammation around the stainless steel crowns. The rest of the patients mainly complained about post-operative pain, nausea and discomfort.

A total of 3,217 treatment procedures were performed in the SNP under GA over the ten year period, of which 629 (20%) were preventive procedures, 1,506 (47%) were restorative procedures, 234 (7%) were pulp therapy, 811 (25%) were simple extractions, 37 (1%) for root canal treatment, surgical procedures and tooth slicing. Majority of the procedures performed under GA was restorative in nature (Table 2). The mean number of restorative treatment procedures per child was 5.48. The majority was composite resin restorations 923 (61.3%), followed by stainless steel crowns 418 (27.8%), glass ionomer restorations 84 (5.6%) and amalgam 81 (5.4%). The second most common dental procedure under GA was extraction, with a mean of 3.0 extractions per patient. This is followed by preventive procedures with a mean of 2.3 treatments per patient (Table 2).

The mean number of treatment procedures for each age group is shown in Table 3. The <6 years group received significantly less preventive procedures than the other two age groups (p<0.05). The use of restorative procedures was significantly higher in patients with primary dentition than patients with mixed or permanent dentitions (p<0.05). Pulp therapies include pulpotomy and pulpectomy for primary molars and pulpotomy in permanent molars. There was a significant greater use of this procedure in patients in the primary and mixed dentition stages (p<0.05). The number of extractions was significantly lower in the mixed dentition stage, when compared to

Table 1. Treatment duration and post-operative recovery time of patients treated under general anesthesia by age group.

Time (min)	Age group		
	<6 years	6-12 years	>12 years
Treatment duration	125.5±50.99 ^a	113.8±49.1 ^a	103.8±66.0 ^b
Post-operative recovery time	42.9±27.9 ^a	40.9±21.8 ^a	41.7±21.0 ^a

Values are means ± standard deviation. Groups identified by different superscripts were significantly different (p<0.05).

Table 2. Treatment procedures performed under general anesthesia from 2002 to 2011.

Treatment Procedures	Number of procedures	Percentage (%)	Mean number of procedures per patient
Preventive procedures	629	19.55	2.28
Restorative procedures	1,506	46.81	5.48
Pulp therapy	234	7.27	0.85
Extractions	811	25.21	2.94
Surgical procedures	16	0.50	0.58
Root canal treatment	8	0.25	0.03
Tooth slicing	13	0.40	0.05

Table 3. Number of procedures by age group.

	Age group		
	<6 years	6-12 years	>12 years
Treatment Procedures			
Preventive procedures	1.24±1.65 ^a	2.78±2.60 ^b	2.98±3.52 ^b
Restorations procedures	7.60±4.10 ^a	4.77±3.09 ^b	3.98±4.34 ^b
Pulp therapy	1.45±1.97 ^a	0.98±1.63 ^a	0.03±0.24 ^b
Extractions	3.01±2.92 ^a	1.02±1.63 ^b	2.54±3.32 ^a
Surgical procedures	0.06±0.24 ^a	0.06±0.23 ^a	0.06±0.23 ^a
Root canal treatment	-	0.05±0.21 ^a	0.05±0.21 ^a
Tooth slicing	0.08±0.27 ^a	0.06±0.23 ^a	-

Values are means ± standard deviation. Groups identified by different superscripts were significantly different (p<0.05)

Table 4. Number of restorative procedures by age group.

	Age group		
	<6 years	6-12 years	>12 years
Restorative Procedures			
Amalgam restorations	- ^a	0.10±0.37 ^a	0.82±1.60 ^b
Composite restorations	4.79±3.54 ^a	2.67±2.24 ^b	2.64±2.98 ^b
Glass ionomer cements	0.35±1.34 ^a	0.10±0.43 ^a	0.46±1.40 ^a
Stainless steel crowns	2.46±2.38 ^a	1.89±2.40 ^a	0.06±0.28 ^b

Values are means ± standard deviation. Groups identified by different superscripts were significantly different (p<0.05).

the primary and permanent dentition stages (p<0.05). No significant difference was observed in the treatment rate of root canal treatment, surgical procedures and tooth slicing across the three age groups (p>0.05).

Mean number of restorative procedures by age group is shown in Table 4. The use of amalgam restorations was significantly higher in the patients with permanent dentition than patients with primary or mixed dentitions (p<0.001). The number of composite restorations was significantly higher in the patients in the primary dentition (<6 years), when compared to the other two age groups. The use of stainless steel crowns was significantly higher in the patients with primary and mixed dentitions (p<0.001). No significant difference in the number of glass ionomer restorations was observed across the three age groups.

DISCUSSION

In the present study, the SNP who had received dental treatment under GA for the ten-year period were classified into 11 groups based on their medical conditions for better understanding of the study population. It has been stated that the pattern of dental treatment of the SNP under GA, may be influenced by the underlying medical cause.¹⁶ Among them, over 60% of the patients presented with neurological and neuromuscular disorders, 12% with cardiovascular problems and 11% with different syndromes. It is very difficult to draw a standard classification for the SNP patients. In a meta-analysis of SNP who had received dental treatment under GA,

Stanková *et al*¹⁴ divided their study population into 14 groups, based on their medical diagnoses. In their study, more no of patients were those with anxiety, followed by patients with neurological problems and cardiac problems. In contrast, studies from Spain¹⁷ and Mexico⁴ reported that the most commonly treated SNP patients were those who were intellectually disabled, followed by patients with cerebral palsy and Down syndrome. However, it has been suggested that ethnicity, demographics, and treatment facilities oblige an important role in every study for the variations in distribution of patients based on the diagnosis⁴.

Special needs patients presenting with signs and symptoms from their dental conditions or at high-risk medical conditions were given priority for emergency dental treatment under GA. In our study, 38% of the patients were treated as an emergency basis, where pain and facial swelling arising from dental caries were the most common reasons. Examples of SNP with high-risk medical conditions are patients with congenital heart diseases, waiting for surgery to repair the cardiac defect and those with compromised immune system. Two recent studies from Canada reported the importance of prioritization of elective dental treatment under GA.^{18,19} Casas *et al*¹⁸ developed a system to prioritize operating room booking for children requiring elective dental treatment, based on the medical and the dental risks of the patients and they demonstrated improved timeliness of treatment for urgent cases and the effects of additional measures taken to reduce the waiting list. The gender disproportion observed in our study (174 males and 101 females) has also been reported in previous studies.^{11,14,15,20,22} Conversely, some studies reported a predominance of females in their study population.^{7,13} However, it has not been clearly explained in these studies why males consistently outnumbered the females. Over one-third (100) of the SNP who have received treatment under GA belonged to <6 years group and more than 60% of the patients were less than 12 years of age. Similar age distribution had been reported in a study on dental service utilization rate among disabled children in Singapore.²⁰

Nasal intubation is a commonly performed procedure for dental treatment under GA.²³ Most of the anesthetists prefer nasal intubation for surgeries to be performed in the oral cavity.²⁴ It provides good access to the mouth; while maintaining a clear airway for the patient. In our study, 94% of patients received nasal intubation and only 16 patients went through oral intubation, of which 12 patients were electively intubated through the mouth and four because of nasal obstruction. The findings were in agreement with a previous study, where 97.5% patients were possible with nasal intubation.²⁵ Information on the duration of dental treatment under GA is also very important. The knowledge of operating time will allow optimal utilization of theatre time.²⁶ Significant difference in duration of treatment was observed among the different age groups. The <6 years group utilized more operating time. This could easily be explained as dental treatment for patients from this age group was mainly restorative in nature, as reflected by the higher mean number of restorative procedures and hence, the longer treatment time. The mean duration of treatment was 115 ± 55 minutes, with a range between 8 and 339 minutes. Five percent of the cases were completed before 30 minutes; while two cases were extended beyond 5 hours. This is similar to findings reported in a previous study,²⁴ where 4.5% cases were completed before half an hour. The post-treatment recovery time was fairly constant across all age groups.

The treatment rates for preventive procedures, restorative procedures, pulp therapy, extractions, surgical procedures, root canal treatment, and tooth slicing were 2.28, 5.48, 0.85, 2.94, 0.58, 0.03, and 0.05, respectively. These findings were different to an earlier study from Hong Kong.⁹ The study population of the previous study consisted of both healthy children and SNP and the mean age was 76.3 ± 43.2 months. The reported treatment rates of the previous study were 5.37, 0.33, 4.17 and 0.25 for restorative, pulp therapy, extractions and tooth slicing. The treatment rates for pulp therapy were slightly higher in present study; while treatment rates for extractions and tooth slicing were higher in the previous study. Results from our study showed that a more conservative treatment approach has been adopted for the SNP in our Hospital.

In our study, the treatment rates for restorative procedures performed under GA for SNP were higher than all other procedures. This treatment approach was similar to several previous studies on SNP.^{3,11,14,15,27} Roeters and Burgersdijk³ reported an average of 5.2 restorations and 3.8 extractions performed for each patient in 215 mentally handicapped patients. In another study of 121 patients with systemic diseases and developmental disorders, the treatment rates for restorative procedures and extractions were 7.6 and 2.2, respectively.¹⁵ Our study, however, was in contrast to an earlier study, which reported higher treatment rate for extractions when compared to other treatment procedures.²⁸

The patients in the <6 year group received more restorations, when compared with other age group of patients. This is in contrast to a recent study, which reported more extractions (7.5) than restorative procedures (1.52) were being performed in 281 patients with 5 years of age.¹⁴ An earlier studies on dental treatment under GA for handicapped patients also reported more extractions than restorations.^{28,29} It was evident from our study that the restorative treatments was frequently performed than extractions. Patients from 6-12 years age group were in mixed dentition. Natural exfoliation of primary teeth was the main reason for the lower extraction rate observed in this group. However, patients from the 6-12 and >12 years group required more preventive procedures, including scaling and fissure sealant application to maintain their oral hygiene and prevent development of caries in the newly erupted

first and second permanent molars. Nunn and her co-workers²⁹ reviewed patients treated under GA over a ten year period and suggested very aggressive approach to preventive dental care for patients undergoing dental treatment under GA. Moreover Peretz and Gluck³⁰ opined that preventive measures might successfully arrest caries lesions, which could avoid invasive procedures and dental treatment under GA.

The usage of amalgam restorations was higher in the older SNP patients (>12 years). This age group received 81% of the total amalgam restorations. The number of composites per patient was higher in the <6 years group. The results from our study showed that composite were commonly used to restore carious primary teeth; while amalgams are used in the permanent teeth. It has been reported that composites restorations showed two to three times higher failure rate than amalgam restorations in permanent molars in 8 years' period.³¹ Contrarily, Raskinco-workers³² reported that 40-50% of amalgam restorations required further treatment in 10 years. The usage of amalgams in permanent teeth with relatively higher success rate was justified by the outcomes of these studies.

As the treatment procedures were different for the three age groups, our null hypothesis was rejected. Our study was a retrospective study; only patients with complete records were included. There were 11 heterogeneous groups of patients included in our study; hence, we cannot generalize the findings from the study. The number of patients being treated over the years during our study period was not consistent. Further studies are recommended to assess the clinical outcomes of the dental treatment provided to SNP under GA. Based on our study we concluded that disparities existed for the treatment procedures and type of restorations placed under GA among the three age groups of SNP. Most of the dental procedures performed under GA on SNP were restorations, followed by extractions and preventive procedures. For children less than 6 years of age, the treatment procedures were mainly restorative in nature and they had longer treatment time under GA. More preventive procedures were provided for patients in the mixed and permanent dentitions. Composite restorations and stainless steel crowns were more frequently used in the primary dentition and amalgam restorations were more frequently employed in the permanent dentition.

REFERENCES

1. American Academy of Pediatric Dentistry. Council on Clinical Affairs. Guideline on management of dental patients with special health care needs. *Pediatr Dent*, 34:160-165, 2012.
2. Voytus ML. Evaluation, scheduling, and management of dental care under general anesthesia for special needs patients. *Dent Clin North Am*, 53: 243-254,2009.
3. Roeters J, Burgersdijk R. The need for general anesthesia for the dental treatment of mentally handicapped patients: a follow-up study. *J Dent Child*, 52:344-346, 1985.
4. Loyola-Rodriguez JP, Zavala-Alonso V, Gonzalez-Alvarez CL, Juarez-Lopez LA, Patino-Marin N, Gonzalez CD. Dental treatment under general anesthesia in healthy and medically compromised developmentally disabled children: a comparative study. *J Clin Pediatr Dent*, 34:177-182,2009.
5. Grytten J, Holst D, Dyrberg L, Faehn O. Some characteristics of patients given dental treatment under general anesthesia. *Acta Odontol Scand*, 47:1-5,1989.
6. Messieha Z. Risks of general anesthesia for the special needs dental patient. *Spec Care Dentist*, 29:21-25,2009.
7. de Nova García MJ, Gallardo López NE, Martín Sanjuán C, MourelleMartínez MR, Alonso García Y, CarracedoCabaleiro E. Criteria for selecting children with special needs for dental treatment under general anesthesia. *Med Oral Patol Oral Cir Bucal*, 12:e496-503,2007a.
8. Mallineni SK, Yiu CKY. A retrospective review of outcomes of dental treatment performed for special needs patients under general anaesthesia: 2 year followup. *ScientificWorldJournal* 2014:748353, 6 pages, 2014.
9. Kwok-Tung L, King NM. Retrospective audit of caries management techniques for children under general anesthesia over an 18-year period. *J Clin Pediatr Dent*, 31:58-62,2006.
10. Madan C, Kruger E, Perera I, Tennant M. Trends in demand for general anaesthetic care for paediatric caries in Western Australia: geographic and socio-economic modelling of service utilisation. *Int Dent J*, 60:190-196,2010
11. Mitchell L, Murray JJ. Management of the handicapped and the anxious child: a retrospective study of dental treatment carried out under general anesthesia. *J Paediatr Dent* 1985;1:9-14.
12. Machuca-Portillo MC, Hanke Herrero R, del Lopez Valle L, Machuca-Portillo G, Bullon Fernandez P. General anesthesia: as a challenge and treatment need option in pediatric dentistry. *P R Health Sci J*, 24:291-296,2005.
13. Loyola-Rodriguez JP, Zavala-Alonso V, Patino-Marin N, Friedman C. A new classification system for dental treatment under general anesthesia. *Spec Care Dentist*, 26:25-29, 2006.
14. Stanková M, Bucek A, Dostalova T, Ginzelova K, Pacakova Z, Seydlova M. Patients with special needs within treatment under general anesthesia—meta-analysis. *Prague Med Rep*, 112:216-225, 2011.
15. Peretz B, Spierer A, Spierer S, Rakocz M. Dental treatment of patients with systemic diseases compared to patients with developmental disabilities under general anesthesia. *Spec Care Dentist*, 32:21-25, 2012.
16. Harrison MG, Roberts GJ. Comprehensive dental treatment of healthy and chronically sick children under intubation general anaesthesia during a 5-year period. *Br Dent J*, 184:503-506, 1998.
17. Rodriguez-Vazquez C, Garcillan R, Rioboo R, Bratos E. Prevalence of dental caries in an adult population with mental disabilities in Spain. *Spec Care Dentist*, 22:65-69, 2002.
18. Casas MJ, Kenny DJ, Barrett EJ, Brown L. Prioritization for elective dental treatment under general anesthesia. *J Can Dent Assoc*, 73:a321, 2007.
19. Chung SS, Casas MJ, Kenny DJ, Barrett EJ. Clinical relevance of access targets for elective dental treatment under general anesthesia in pediatrics. *J Can Dent Assoc*. 2010; 76:a116.
20. Lo GL, Soh G, Vignehsa H, Chellappah NK. Dental service utilization of disabled children. *Spec Care Dentist*, 11:194-196, 1991.
21. Ananthanarayan C, Sigal M, Godlewski W. General anesthesia for the provision of dental treatment to adults with developmental disability. *Anesth Prog*, 45:12-17, 1998.
22. de Nova-García MJ, Martínez MR, Sanjuán CM, López NE, Cabaleiro EC, García YA. Program for coordinated dental care under general anesthesia for children with special needs. *Med Oral Patol Oral Cir Bucal*, 12:e569-575,2007b.
23. Alcaino E, Kilpatrick NM, Smith ED. Utilization of day stay general anesthesia for the provision of dental treatment to children in New South Wales, Australia. *Int J Paediatr Dent*, 10:206-212, 2000.
24. O'Brien HD, Suthers WD. Conservative dentistry for children under general anesthesia in the dental surgery. *Aust Dent J*, 28:73-78, 1983.
25. Nazif MM. Nasal intubation in complete oral rehabilitation: a survey of eighty cases. *J Dent Child*, 43:25-27, 1976.
26. Foley J, Soldani F. The use of theatre time for paediatric dentistry under general anesthesia. *Int J Paediatr Dent*, 17:29-33, 2007.
27. Watson AO. Treatment of cerebral palsied patients. A report on 33 years of treatment from 1946 to 1978. *Aust Dent J*, 24:290-300, 1979.
28. Robertson JR, Ball HC. Dental treatment with general anaesthesia for handicapped patients. *Br Dent J*, 134:151-153, 1973.
29. Nunn JH, Davidson G, Gordon PH, Storrs J. A retrospective review of a service to provide comprehensive dental care under general anesthesia. *Spec Care Dentist*, 15:97-101, 1995.
30. Peretz B, Gluck G. Early childhood caries (ECC): a preventive-conservative treatment mode during a 12-month period. *J CliPediatrDent*, 30:191-4, 2006.
31. Collins CJ, Bryant RW, Hodge KL. A clinical evaluation of posterior composite resin restorations: 8-year findings. *J Dent*, 26:311-317, 1998.
32. Raskin A, Michotte-Theall B, Vreven J, Wilson NHF. Clinical evaluation of a posterior composite 10-year report. *J Dent*, 27:13-19,1999.