

Trends in dental treatment performed on children under general anesthesia at the College of Dentistry in Riyadh, Saudi Arabia

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أجريت هذه الدراسة لمقارنة (١) خصائص المرضى ونوع المعالجة السنوية المقدمة للأطفال تحت التخدير العام في الفترة الواقعة ما بين ١٩٩٢-٢٠٠٠ و ما بين ١٩٨٢-١٩٩٠؛ (٢) نسبة إذعان المرضى لفترة المتابعة المبرمجة كل ستة أشهر خلال هاتين الفترتين. تمت مراجعة ملفات الأطفال الذين تمت معالجتهم في الفترة ١٩٩٢-٢٠٠٠ حيث جمعت الحقائق المتعلقة بعمر المريض خلال فترة المعالجة وجنسه والحالة الطبية والجسمانية واستطبائات المعالجة ونوع المعالجة المقدمة إضافة إلى عدد المرات التي تمت مراجعة الأطفال خلال فترة المتابعة. استعملت المعلومات المتعلقة بالفترة ١٩٨٢-١٩٩٠ والتي عرضت مسبقاً لإجراء المقارنة. أظهرت النتائج عدم وجود أي اختلاف ما بين الفترتين فيما يتعلق بعمر المرضى وجنسهم، باستثناء زيادة معالجة المرضى الذين تتراوح أعمارهم ما بين ٦-١٠ سنوات في فترة ١٩٩٢-٢٠٠٠ مقارنة بالفترة المبكرة. واعتبرت المشاكل السلوكية المترافقة من النخور المنتشرة السبب الرئيسي لاستعمال التخدير العام في طب أسنان الأطفال. نسبة الإجراءات الجراحية التي أنجزت في الفترة ١٩٨٢-١٩٩٠ كانت أكثر من الفترة ١٩٩٢-٢٠٠٠. ونسبة تجاوب الأهل للزيارات الدورية كانت منخفضة بشكل عام، وبشكل عام كان مراجعة المرضى في الفترة ١٩٨٢-١٩٩٠ أفضل مما هي في الفترة ١٩٩٢-٢٠٠٠.

Objectives: This study was undertaken to compare (i) the characteristics of patients and type of dental treatment carried out on children under general anesthesia (GA) from 1992-2000 and 1982-1990; (ii) rate of compliance of patients with scheduled 6-monthly follow-up appointment during the two periods. **Methods:** Records of children who were treated under GA in 1992-2000 were reviewed and the data collected included age of patient at the time of treatment, gender, medical/physical status, indications for treatment and nature of treatment provided. Also the number of times parents brought their children for the 6-monthly recall appointment was recorded. Data for the years 1982-1990 which had earlier been reported were used for comparison. **Results:** Results showed that, in general, the characteristics of patients regarding age and gender have not changed during the two periods except that more children aged 6-10 years were treated in 1992-2000 than earlier period. **Conclusions:** Behavior management problem coupled with extensive caries continues to be the major reasons for using GA to treat pediatric dental patients. There were more surgical procedures done in 1982-1990 than in 1992-2000. Also significantly more extractions, stainless steel crowns and pulpotomies were done in 1992-2000. Parental compliance with 6-monthly recall appointment was generally low, nevertheless significantly more patients turned up in 1982-1990 than in 1992-2000.

INTRODUCTION

General anesthesia (GA) is used to provide dental care for patients who are unable to accept alternative treatment methods of patient management. This treatment modality is a valuable option for the pediatric dentists to provide comprehensive oral health care for children, especially the very young, pre-cooperative and severely mentally retarded who are unable to cooperate for complicated or extensive dental procedures.¹ GA is relatively safe when

administered in a hospital setting but is not without risk of complications.^{2,3}

Several studies have described the clinical characteristics of patients that received treatment under GA.⁴⁻⁶ In a review of 80 children treated under GA, O'Sullivan and Curzon reported that most of the children were less than 5 years of age. Rampant caries was the main indication for treatment followed by behavior management.⁴ Similar findings were reported by Sheller⁶ and Sheehy⁷. Recent reports indicate a large number of children who have medical or

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developmental disabilities also avail of this modality of treatment.^{6, 8, 9}

Analysis of pediatric dental care provided under GA also has been the focus of some reports.^{3, 5, 10-14} In a study of 300 pediatric patients treated under GA, Enger and Maurino³ reported that the most frequent procedures done were amalgam restorations (35.5%), extractions (27.1%), stainless steel crowns (21.8%) but less of composite restorations and pulpotomies. Results of O'Sullivan and Curzon⁴ showed extraction (33%) as the most prevalent procedure, to a lesser extent was amalgam and composite/glass ionomer restorations which were about equal to stainless steel crowns placed.

The outcome of dental treatment performed on children under GA were also reported by some authors.¹¹⁻¹⁶ Legault *et al.* reported that 38% of children treated under GA required further dental treatment after 15 months.¹⁵ Eidelman *et al.* reported a higher rate (59%) of re-treatment less than 2 years after the initial GA.¹⁶ However, in the study by O'Sullivan and Curzon only 8.75% of the patients required re-treatment.⁴ Al-Eheideb and Herman noted that restorations of posterior teeth with stainless steel crowns were more successful (95.5%) when compared to amalgam or composite restorations (50%), while vital pulpotomy and sealant showed 97.1% and 68.3% success respectively after an average of 16.5 months follow-up.¹²

Many institutions report an increased demand for dental rehabilitation and increased length of time that children have to wait for treatment under GA.^{5, 8, 10} Over the last one and half decades, there have been changes in the pattern of dental diseases and changes in treatment philosophies and methods.⁶ This is borne out of current understanding of caries process and recent developments in biodental materials. While many developed countries report a declining

prevalence and severity of dental caries,¹⁷ recent studies have consistently shown a high prevalence of caries especially in preschool and school aged children in Saudi Arabia.¹⁸⁻²⁰

Facilities for GA became available in the College of Dentistry, King Saud University, Riyadh in 1982 and only one study covering the span of 1982-1990 has been reported.¹¹ It would be worthwhile therefore to investigate the trend in dental treatment rendered under general anesthesia since the last report. The purpose of this study was to (i) compare the characteristics of patients and type of dental procedures performed on children under general anesthesia from 1982-1990 and 1992-2000 (ii) compare the rate of compliance of parents of these children for two years postoperatively with scheduled 6-monthly follow-up dental visit during the two periods.

METHODS

Following approval of the College of Dentistry Research Center (CDRC), the records of children who received dental rehabilitation under GA during the years 1992-2000 were reviewed. All patients were treated by postgraduate students under the supervision of an attending consultant pediatric dentist in the pediatric dentistry graduate program at the College of Dentistry, King Saud University in Riyadh. The standard protocol for treating patients under GA has been described earlier.¹¹

Data collected from the records of the children included age of patients at the time of treatment, gender of patient, medical history and physical status, indication for treatment under GA and the nature of treatment provided. Also the number of times parents brought their children for the 6-monthly recall appointment was recorded. The nature of treatment provided were categorized

according to number of (a) extractions (b) amalgam restorations (c) stainless steel crowns (SSCs) (d) composite restorations (e) glass ionomer/composmer restorations (f) occlusal sealants (g) pulpotomies (h) pulpectomies (i) strip crown and (j) surgical procedures completed on each patient. Data for the years 1982-1990 which had earlier been reported¹¹ were used for comparison.

Data Analysis

Demographic characteristics including age, gender and parents' compliance with follow-up recall visit at each time interval were analyzed using Chi-square test. Independent samples t-test was used to assess the means and standard deviation of each dental procedure completed. A *P* value of less than .05 was considered statistically significant.

RESULTS

Of the 156 cases of complete oral rehabilitation that were performed under GA from 1992-2000, the records of 149 children who were followed up for 2 years post treatment were available for analysis. Fifty-two percent of these children were 3-5 years of age, 43% were 6-10 years and 5% were 11-15 years of age (mean = 5.2 years). In comparison, between the years 1982-1990, sixty-one percent of the children were 3-5 years of age, 29% were 6-10 years and 10% were 11-15 years of age (mean = 5.0 years) as shown in Table 1. There was a statistically significant difference in the percentages of children in 6-10 years age group and 11-15 years age group when the two time periods were compared. More children in 6-10 years age category were treated in 1992-2000 than in 1982-1990 and also more of those in 11-15 years category were treated in 1982-1990 than in 1992-2000 ($X^2=7.400$; $df = 2$; $P = .025$).

Table 1. Distribution of children treated under GA by age group during the years 1992-2000 versus 1982-1990

	Age group (years)			Total
	3 - 5	6 - 10	11 - 15	
1992 - 2000	78 (52%)	64 (43%)*	7 (5%)	149 (100%)
1982 - 1990	73 (61%)	34 (29%)	12(10%)*	119 (100%)

$X^2 = 7.400$; $df = 2$; $P = .025$

* Significant change

Table 2 shows the number of male patients versus female patients treated during the years 1992-2000 and 1982-1990. There were no significant differences between the two groups. During the period under review, indications for treatment under GA included behavior problems, gross caries, medical/developmental disabilities and surgical procedures. There were no significant differences in the percentages of patients who were admitted for any particular reason when comparing the two time periods except for surgical reasons for which significant percentage of children were admitted in 1982-1990 (Table 3). About 73.2% of the patients were classified as having no medical/developmental disabilities and 26.8 % were with disabilities in 1992-2000. The corresponding percentages for 1982-1990 were 68.9% and 31.1%, respectively.

Table 2. Distribution of children treated under GA during the years 1992-2000 versus 1982-1990 by gender

Period	Males	Females	Total
1992 - 2000	81 (54%)	68 (46%)	149 (100%)
1982 - 1990	54 (45%)	65 (55%)	119 (100%)

$X^2 = 2.136$; $df = 1$; $P = .144$

Table 3. Reasons for treatment under GA in 1992-2000 versus 1982-1990

Resources [#]	1992 - 2000	1982 - 1990	X^2 test <i>P</i> value
Management problems	108 (72.5%)	87 (73.1%)	.909
Extensive caries	115 (77.2%)	96 (80.7%)	.488
Medical/ developmental disabilities	40 (26.8%)	37 (31.1%)	.445
Surgical procedures	3 (2.0%)	20 (16.8%)*	.000

[#] Some patients had more than one reason

* Significant difference

Table 4 shows the type of dental procedures carried out. There were significantly more extractions, SSCs and pulpotomies done in 1992-2000 than in 1982-1990. On the other hand, significantly more strip crowns and surgical procedures were done in 1982-1990 than in 1992-2000. There were no significant differences in the number of amalgams, composites, sealants and pulpectomies completed per patient during these time periods. Table 5 shows the number of parents who brought their children for the 6-monthly recall appointments during a 2-year period after treatment under GA. Significantly more parents turned up in the first 12 months following initial treatment in 1982-1990 than in 1992-2000. However, the response was very low after the first 12 months and there were no differences in the frequency of visit between the two periods.

Table 4. Comparison of dental procedures provided per patient under GA during the years 1992-2000 versus 1982-1990

Dental procedures	1992 - 2000			1982 - 1990			t test P values
	No. of patients	Mean	SD	No. of patients	Mean	SD	
Extractions	136	5.6*	3.6	76	4.2	1.5	.000
Amalgam restorations	82	2.7	1.8	102	3.4	1.8	.198
SSCs	111	3.7*	2.1	62	2.8	1.2	.000
Composites	97	3.4	2.2	66	2.5	1.6	.336
GIC/Compomers	-	5.8	3.7	-	-	-	-
Sealants	51	2.2	1.2	25	3.3	1.3	.253
Pulpotomies	83	2.9*	1.9	64	2.3	1.3	.047
Pulpectomies	6	2.5	1.0	22	2.2	1.2	.742
Strip crowns	19	1.3	0.6	30	2.3*	1.2	.000
Surgical procedures	2	-	-	13	-	-	.024

* Significantly higher than the other group

Table 5. Number of parents that complied with 6-monthly recall appointment following GA during the years 1992-2000 versus 1982-1990

Recall appointment schedule	1992 - 2000 (N=149)		1982 - 1990 (N=119)	
	No. of parents: (%)		No. of parents: (%)	
6 months	43 (28.9%)		50 (42.0%)*	
12 months	23 (15.4%)		36 (30.3%)*	
18 months	3 (2.0%)		2 (1.6%)	
24 months	2 (1.3%)		2 (1.6%)	

*P < .05

DISCUSSION

The results of this study showed that, in general the characteristics of patients who were treated under GA in King Saud University College of Dentistry as regards age and gender have not changed during the last two decades. A significant number of children treated were about 5 years of age. This is similar to the findings of other studies.^{12,13} The reasons may not be far-fetched. Several studies have reported high prevalence of caries among preschool age children,^{18,19} in addition to the fact that this is the age group most children are unable to adapt their coping skills to dental treatment under local anesthesia, while conscious sedation may be ineffective.¹⁶ More children in 6-10 years age group were treated in 1992-2000 than in 1982-1990. This may be due to several factors. One factor may be the waiting time or access to dental facilities. The high caries prevalence at an early age might have resulted in corresponding increase in demand for GA facilities. However, during the latter period, the number of GA sessions has not increased from the four sessions per month that it was in 1982-1990. A very long waiting period has thus ensued before each patient is scheduled for treatment. Other factors may be caries pattern, referrals or socio-economic variables.^{13,20}

Majority of the patients had multiple indications for GA. The most frequent indications during the two periods were management problems and extensive caries. This is in agreement with other reports.^{15,16} When the number of dental treatment provided was compared between the two periods, the frequency of extraction, pulpotomy and SSC was more in 1992-2000 than in 1982-1990. This observation reflects the grave nature dental caries has assumed in this environment which is consistent with several epidemiological studies.¹⁷⁻²⁰

Untreated dental caries is a disease that progresses with time resulting in highly demineralized and undermined tooth enamel and dentine. It may subsequently involve the pulp. Children may have extensive carious lesion, with no apparent history of pain or, if dental problems develop early, such as early childhood caries, the child may have no experience of teeth feeling any other way.¹⁷ Furthermore, lack of knowledge regarding importance of primary teeth¹⁸ and some parents' perception that children visit the dentist only at time of emergency or when there is pain²¹ may have contributed to the severity of caries in those children often resulting in pulp therapy or extraction if the teeth are not restorable. It is interesting to note that restorations with amalgam and composite resin were at the same frequency in 1982-1990 as it was in 1992-2000. For many decades, dental amalgam has been the most commonly used restorative material mainly for its durability, ease of handling and low cost.²² Although not supported by any scientific evidence, increasing concern about the safety of dental amalgam, both for the human and the environment has restricted its use in some countries.²³ This is not the case in Saudi Arabia. Papathanasiou *et al.*²⁴ noted that composites are similar to amalgam in short term studies but have high long term failure rate mainly due to discoloration, polymerization shrinkage, loss of retention and secondary caries. Glass ionomer and compomer restorative materials were not readily available for use in 1982 - 1990.

More surgical procedures were carried in 1982-1990 than in 1992-2000. Procedures performed in 1982-1990 with/without restorative treatment included enucleation and marsupialization of dental cysts, removal of mesiodens and odontoma, exposure of embedded teeth, gingivectomy and gingivoplasty. Almost all

patients who received surgical treatment were in the 11-15 years old category. This reflected a close liaison between pediatric dental faculty and other specialties which made possible the combined approach to treatment planning during the earlier period. Prior to 1993, all cases were done by pediatric dentistry faculty. Since the commencement of the graduate program in Pediatric dentistry in 1993, treatment under GA has been rendered by graduate students as part of their training under the supervision of a consultant pediatric dentist. Surgical cases usually were referred to the oral and maxillofacial unit for treatment because the unit has a separate operating list.

Following complete oral rehabilitation under GA, a follow-up recall visit is essential to re-evaluate the restored teeth, assess development of new caries and reinforce oral hygiene, dietary habits and other preventive measures. This study shows that parental compliance with recall appointment was generally low and less than 50% of the parents showed up at any recall visit. In 1982-1990, forty-two percent of the parents turned up at 6 months, 30.3% at 12 months and less than 2% in the following 12 months. The corresponding figures for 1992-2000 were 28.9% and 15.4% respectively for the first 12 months. Despite the low turn up, significantly more parents complied with recall visit in 1982-1990 than in 1990-2000. This might partly be due to the protocol then whereby patients were immediately appointed to see the same pediatric dental specialist that carried out the treatment under GA, unlike in 1992-2000 when parents were to call the appointment desk at the appropriate time to schedule an appointment. However, due to high turn over of pediatric dental specialists with attendant changes in faculty schedule in subsequent years, parental response to recall appointments diminished substantially. It is also

possible that parents of patients could have relocated or moved out of town. Low parental compliance to follow-up dental care was also reported by Worthen *et al.*,²⁵ Roberts,²⁶ and Al-Hussyeen.²⁷ Berkowitz *et al.*²⁸ stated that poor compliance with follow-up dental visits may lead to early relapse, and should be considered a potential "risk factor" in determining the type of treatment rendered during GA. Because of the failure rate of amalgam and composite restorations reported in some studies,^{22,23} coupled with low parental compliance in bringing their children back for follow-up care, a definitive treatment plan of SSC, pulp therapy and/ or extraction may be preferred for children undergoing oral rehabilitation under GA.²⁵ Parents who failed to show up appear less interested in preventive dental care or might have thought that child's problems had been solved and no further treatment was needed.²⁵ There is need to motivate parents at GA appointments to fulfill the obligations of bringing their children for regular follow up especially the high risk patients. The frequency in which patients should return for periodic examination has been debated for many years. Current evidence shows that dental recall visits should be based on risk factors of the patient and not by predetermined interval based on calendar.²⁹

CONCLUSIONS

There are no substantial changes in the characteristics of patients, who received comprehensive oral rehabilitation under general anesthesia in the last two decades at the College of Dentistry, King Saud University except in age.

Behavior management problems coupled with extensive caries continue to be major reasons for using GA to treat pediatric dental patients.

More children received extensive restorative treatment and extractions but less of surgical procedures done by other dental specialists in 1992-2000 than in 1982-1990.

Parental compliance with 6 monthly recall appointment was generally low, nevertheless, significantly more parents turned up in 1982-1990 than in 1992-2000.

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