

ODONTOLOGY

General Anesthesia: as a Challenge and Treatment Need Option in Pediatric Dentistry

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Objective. The purpose of this study was to determine the type and characteristics of the interventions, indications of dental treatment and procedures performed to patients treated under general anesthesia (GA) by pediatric dentistry residents, during the 1997-1999 period.

Method. A sample of 57 hospital records of patients treated as part of the Special Pediatric Course at the Puerto Rico Pediatric Hospital were reviewed. Statistical analysis was done using the chi-square test for inferences on proportions.

Results. MR patients made up 59.7% and NMR patients made up 40.3% of the sample studied. Ages ranged from 2 to 35 years with a mean age of 11 years (SD=8.54). MR patients were classified into 7 categories: mental retardation (38.2%), cerebral palsy (14.7%), epileptic (5.9%), mental syndromes (26.9%), hydrocephalic (5.9%), autism (5.9%) and others (2.9%).

The NMR were classified into 5 categories: early childhood caries (65.2%), cardiac patients (8.7%), maxillofacial anomalies (4.3%), organic syndromes (13.1%) and others (8.7%). The dental procedures performed were: dental extractions 84%(MR) and 68%(NMR), restorative procedures 87.3%(MR) and 12.7%(NMR). Oral prophylaxis was performed in 76.8%, fissure sealants in 10.7% and topical fluoride applications in 21.8%.

Conclusion. Dental extraction was a frequently performed procedure in both groups. The prevalence of exodontia and restorative procedures indicates the need to design and implement prevention programs for special pediatric patients.

Key words: Pediatric Dentistry Program, General anesthesia, Epidemiology, Special patient, Early childhood caries

During 1984, Ferreti (1) presented dental treatment under general anesthesia as an alternative for those patients who were difficult or impossible to treat in the dental office. Dental treatment under general anesthesia has specific indications; a hospital setting is required as well as a highly qualified professional. (2). The disabled patients, specially those with mental retardation and the behavioral management patients like severe cases

of early childhood caries (ECC), are the most suitable special care population for dental care under general anesthesia (3).

In the last 20 years, an increase in the population with some type of disability has been observed (20% in USA population) and of those, about 12% have severe disabilities (4). Early Childhood Caries is a condition specific of certain age group of children that in severe cases requires treatment under general anesthesia. ECC in the USA affects 5% (5) of the population of children between 1 to 5 years old and its prevalence varies in minority populations and other ethnic subpopulations (6,7). Several studies (8) performed at Puerto Rico showed a ECC prevalence between 40% and 50%. Other studies in Hispanics populations showed high prevalence of the condition (9). An increase in the use of general anesthesia for ECC cases has been observed (10). Specific alternatives for the management of dental care and treatment needs of the disabled patients and ECC cases should be a priority in future oral health policies.

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Purpose

The purpose of this study was to determine the type and characteristics of the interventions, indications of dental treatment and procedures performed to patients treated under GA by pediatric dentistry residents, during the 1997-1999 period.

Materials and Methods

A sample of 57 hospital records of patients treated as part of the Special Pediatric Course at the Puerto Rico Pediatric Hospital was reviewed. All patients were treated under general anesthesia by pediatric dentistry residents, during the January 1997- December 1999 period.

All patients from the sample requiring dental procedures under general anesthesia were divided in two main groups (11): those with mental retardation and those of normal intelligence with dental behavior problems and mild to severe anxiety (12). The patients in either group may or may not have an associated medical pathology.

Residents performed an oral examination to patients visiting the University Pediatric Hospital dental clinic. After a complete medical history, including age and patient behavior when visiting the dental office, the indication for treatment under general anesthesia was determined. If indicated, laboratory testing, chest X-rays, and pre-anesthetic exam was performed. Parent or care giver informed consent was indispensable. Residents completed the Resident Admission Note (RAN) which is an integrated history taken during the interview with the patient and parents along with other data available from the medical record. The RAN included initial information, chief complaint, present illness, past history, family history, social history, system review and physical evaluation, oral examination, and diagnosis. Dental treatment under general anesthesia depended on particular patient needs and consisted of prophylaxis, dental extractions, restorations, surgical and periodontal procedures, as well as preventive procedures (fissure sealants, fluoride application). Once the treatment performed under general anesthesia was completed, the resident filled out the report of operation, where the following data was obtained: (a) Patient characteristics, including age, gender, medical and dental pathology (b) Surgical procedures: surgical time and complications and (c) Dental procedures: dental extractions, restorative procedures, pulpotomies, stainless steel crowns, and preventive procedures. All these data was analyzed and tabulated. Descriptive statistics was obtained from the demographic variables and frequency tables were obtained for each variable in the study.

Statistical analysis was performed using the chi-square test for inferences on proportions. Results were considered statistically significant when p values were under 0.05.

Results

Patients treated under general anesthesia by pediatric dentistry residents at the Special Pediatric Course at the Puerto Rico Pediatric Hospital showed the following:

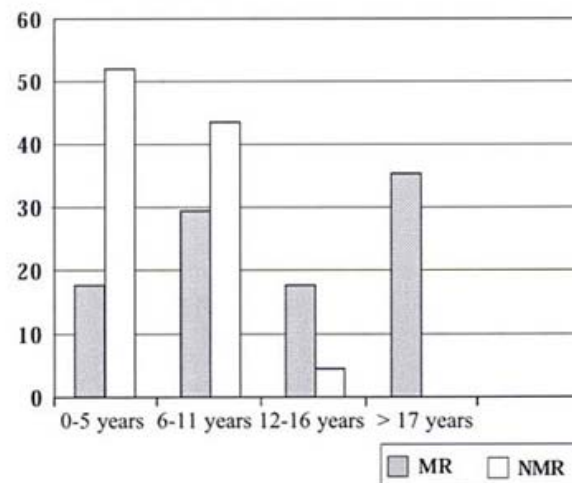
The patients were divided into two groups (11): those with mental retardation (MR) and those not mentally retarded (NMR). The group of patients with mental retardation (MR) accounted for 59.7% and the non-mentally retarded (NMR) group accounted for 40.3% of the sample studied. Patients with more than one pathology were classified according to the condition which required general anesthesia.

MR patients were classified into seven categories: mental retardation (38.2%), cerebral palsy (14.7%), epileptic (5.9%), mental syndromes (26.9%), hydrocephalic (5.9%), autism (5.9%) and others (3%). Less frequent pathologic conditions accounted for the others category, as was the case of a patient with tuberous sclerosis.

NMR patients were classified into five categories: early childhood caries (ECC) (65.2%), cardiac patients (8.7%), maxillofacial anomalies (4.3%), organic syndromes (13.1%) and others (8.7%). Less frequent pathologic conditions accounted for the others category, as was the case of a patient with scleroderma and one HIV+ patient.

Patient Characteristics. Age of patient at time of operation ranged from 2 to 35 years with a mean age of 11 years (SD=8.54). Age distribution is shown in Figure 1.

Figure 1. Percent Distribution of Patients by Age Group and MR and NMR Groups



Thirty-eight patients (66.7%) were under 12 years of age. Thirty-five percent of the MR patients were between the ages of 17 and 35. A statistically significant difference was observed regarding age groups and MR ($p < 0.01$). The most prevalent age in the NMR group of patients was 0-5 years (55%) and in the MR was >17 years (35%). In analyzing the groups according to sex, 53% in the MR group of patients were females and 55% in the NMR group were males (50% of the patients in the ECC caries subgroup were female). There was not a statistically significant difference regarding sex groups and mentally retarded patients.

Procedures Characteristics. We have studied the operation time regarding age, gender and dental procedures: exodontias, restauratives (amalgam, resins), stainless steel crowns (SSC) and pulpotomies. As shown in Table 1, 28.3% of the operation time was less than two hours and 1.9% more than five hours. There was not a

Table 1. Dental treatment under general anesthesia. Distribution according to operation time.

	n	%
< de 2 hours	15	28.9 %
2 - 3 hours	21	40.4 %
3 - 4 hours	9	17.3 %
4 - 5 hours	6	11.5 %
> 5 hours	1	01.9 %

statistically significant difference regarding the operation time and mental retardation patients, age or restorative procedures. There was a statistically significant difference (Table 2) regarding the operation time and dental extractions ($p = 0.045$), pulpotomies ($p = 0.01$), and stainless steel crowns ($p = 0.001$).

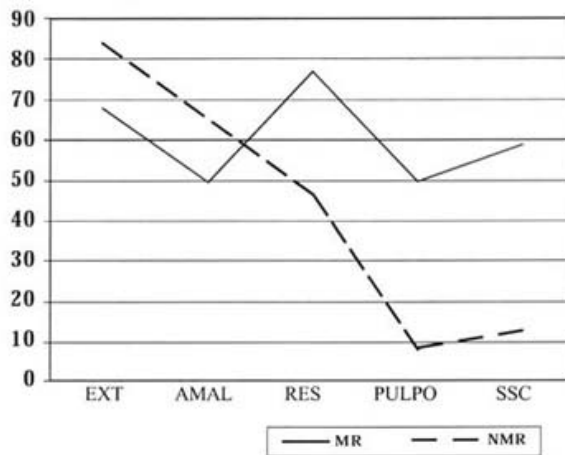
Seventy-one percent of patients with exodontia had operations of less than three hours length and none had operations of more than five hours. Sixty-nine percent of patients who underwent crown procedures showed operation time of two to four hours and none of less than two hours.

Table 2. Distribution according to operation time under GA and dental extraction, stainless steel crowns (SSC) and pulpotomies

	Extraction n (%)	SS C n (%)	Pulpotomies n (%)
< de 2 hours	11 (28 %)	0 (0 %)	1 (8 %)
2 - 3 hours	17 (43 %)	5 (31 %)	3 (25 %)
3 - 4 hours	9 (23 %)	6 (38 %)	3 (25%)
4 - 5 hours	3 (8 %)	4 (25 %)	4 (33%)
> 5 hours	0 (0 %)	1 (6 %)	1 (8%)
p value	$p < 0.045$	$p < 0.001$	$p < 0.01$

Dental Treatments. In MR patients the dental procedures performed under general anesthesia were: dental extractions 13%, restorative procedures 5%, both procedures 69%. In NMR patients the dental procedures performed under general anesthesia were: dental extractions 5%, restorative procedures 27%, and both procedures 64%. The distribution for the dental treatments completed under general anesthesia per patients and MR is shown in Figure 2. There was a statistically significant

Figure 2. Comparisons Between Dental Procedures Performed Under GA by MR and NMR Patients



difference regarding resin procedures and MR ($p < 0.025$), and stainless steel crown procedures and MR ($p < 0.008$). The mean number of dental procedures is described in table 3.

Table 3. Mean number of dental procedures under GA per patient

	Mean	SD	Minimum	Maximum
Extraction	6.05	4.27	0	19
Restoratives	6.07	3.45	0	15
Amalgams	3.84	2.27	0	9
Resins	4.74	2.86	0	12
Pulpotomies	2.42	1.78	0	6
SSC Crowns	2.89	2.31	0	9

Also, preventive procedures have been performed under general anesthesia. Oral prophylaxis was performed in 76.8% patients, occlusal sealants in 10.7% and topical fluoride applications in 21.8%.

Complications were observed in four patients (7.5%) which accounted for sublingual edema, urinary retention, and cough, and inferior labial laceration in two patients. There was not a statistically significant difference

regarding complications and mental retardation, age or dental procedures.

Discussion

The results of this study indicate a high prevalence of dental extractions and restorative procedures in the population treated under general anesthesia by the Pediatric Dentistry Residents in the Pediatric Hospital of Puerto Rico during the period from 1997 to 1999.

The patients in our study who underwent general anesthesia for dental treatment were classified according to previous pathology. From previous studies we know (1, 11, 13) that MR patients are highly recommended candidates for general anesthesia. For this reason, patients were divided into two groups: mentally retarded or non-mentally retarded patients. A higher percentage (59.7 %) of MR patients was observed. Then, each subgroup was further divided into several categories. Early Childhood caries was the most prevalent condition in NMR patients, followed by syndromes not related to MR. The findings of this study agreed with the studies conducted by Vermeulen (14) and Enger and Morino (15) and Jamjoom et al (16) which concluded that the main indication for dental treatment under general anesthesia in very young patients was early childhood caries.

Ibricevick et al (17) studied pediatric dental procedures under general anesthesia of 96 patients of those fifty-eight were healthy patients and thirty-eight patients had special needs.

In our study we observed a high prevalence from very young patients requiring dental treatment under general anesthesia. Problems with patient management is one indication for this procedure. The median age for the NMR group of patients was 5.45 years, which is in agreement with other published studies in which the median age was 6 years (10, 18, 19). The median age in the MR group was 14.29 years, also, in agreement with other published studies in which the number of older children and young adults was higher (11, 20, 21). We want to point out the study conducted by Ghezzi, et al. (22) in which the need for safety and efficacy is emphasized while providing treatment under general anesthesia to the elderly population), especially edentulous adult patients and those with behavioral problems or physically or mentally handicapped. Fifty percent of the patients in our study were women, which is similar to the study presented by Vermeulen in Belgium (14) and Bohaty (10).

The duration of dental treatment under general anesthesia did not show a statistically significant difference regarding previous patient pathology, nor for age. On the other hand, when the type of procedure

performed was analyzed, we observed that dental extractions were of shorter duration than those in which more complicated procedures were performed, like pulpotomies and SSC. No important complications were observed in our study, neither were the complications related to patient characteristics nor the type of treatment performed. Libman, et. al. (23) studied 600 cases of general anesthesia and no significant complications were observed. This was attributed to preoperative evaluation, appropriate anesthetic management and vigilant postoperative observation. In our study we found a high prevalence of restorative procedures and dental extractions.

We have observed how all types of dental procedures may be performed under general anesthesia, from complicated procedures like extractions to preventive procedures, like the application of fissure sealants or of topical fluoride. Nunn, et. al. (24) have described a change in the type of dental treatment under general anesthesia to patients in two time periods. Initially, (1979-1983) many dental extractions and complex restorative procedures were performed, while during another period (1983-1993) these procedures had been reduced. Currently, many more fissure sealants and primary teeth restorative procedures and less permanent teeth restorative procedures and dental extractions are performed. Although the number of extractions have been reduced in MR patients in 23% during the period from 1989-1994 (11) to 13% during 1997-1999, we consider it to be too numerous. Several factors can influence the oral health status of the population studied as the need for preventive measures, the delay in the search for treatments and infrequent professional debridments (25). The mean number of teeth extracted and resin per patient is greater in our study (6.05 and 4.7) than in Bohaty (10) (3.8 and 3.2) and Smallridge (26) (4.14). We obtained lower mean values of pulpotomies and stainless steel crowns (2.42 and 2.49 vs 8.9 and 6.6).

In analyzing the NMR category of early childhood caries and comparing it with the MR population, a similarity in treatments was found between the treatments received by both group of patients (Figure 2 and Table 3). Early Childhood Caries (ECC) is an acute condition occurring at early age that may be prevented with preventive measures.

This condition causes inability to eat and growth pattern alterations as well as speech and communication difficulties. Parents and/or caretakers may reduce the risk for ECC by providing good dental hygiene (27). Preventive measures on ECC children must include parents and caretakers education and motivation on children's oral hygiene to continue the prevention follow up after dental treatment under general anesthesia. Studies (28) have demonstrated the development of recurrent lesions in a 6

month follow up period in children who received extensive dental treatment for severe caries but did not follow intensive preventive treatment along with the restorative treatment.

In both groups of patients dental extraction was more significant, followed by amalgam restorations (25). Other studies present dental extraction as the most prevalent dental treatment followed by amalgam restorations (29). The pediatric population still needs extensive restorative dentistry (25,26). The mean number of teeth extracted per child is 4.14 (27).

When comparing both groups of patients, MR and NMR, with the type of dental procedure performed, we observed significant statistical differences. We agree with other authors that at present the pediatric population needs dental treatment under general anesthesia mainly extensive restorative dental treatment (29, 30).

We want to point out the continued increase in dental treatment under general anesthesia (18, 19) for which the development of criteria for patient selection is imperative (20). Many researchers have studied the percentage of patients receiving dental treatment under general anesthesia. Gotenborg (31) found it to be 4% from 146 children, 37% in a group of 47 children with autism in Nebraska (33), and 10% from 82 children in the Community Dental Service in Rochdale (33). Caries patterns in children who have received treatment under general anesthesia are similar to the general child population. (34).

This type of treatment is becoming more extensive to other population groups, but one must point out the importance of other treatments and when not possible, then general anesthesia is the option. In the opinion of Poswillo, the use of general anesthesia should be avoided whenever possible (21). Its indications are being delineated while reducing the risks involved. The high cost should not be ignored as well as the possible risks and consequences from treatment or from surgical procedures.

Conclusion

The results of this study support that General Anesthesia should be a treatment procedure indicated for major problems of disabled patients. These complex dental treatments under General Anesthesia in which many types of dental procedures are performed at the same time are the major indications for disabled patients as well as for behavioral and medical compromised cases.

The prevalence of exodontia and restorative procedures in both groups (MR and NMR) indicates the need to design and implement programs for special pediatric patients.

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