

A COMPARISON OF PATIENT TYPES
AND DENTAL TREATMENT PERFORMED
UNDER GENERAL ANESTHESIA,
1980 TO 1982 AND 1990 TO 1992

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Abstract

The operation records of forty-nine children who received dental treatment under general anesthesia at Oregon Health Sciences University Hospital from 1980 to 1982 and two-hundred-twenty-one children from 1990 to 1992 were reviewed. The following information was obtained: date, age, sex, ethnic background, payment method, health status, dental treatment completed under general anesthesia, and other procedures performed. There was no significant difference between the two time periods for patient sex, ethnic background, or payment method utilizing the chi square analysis, $p < 0.05$. There was a significant difference found for the health status using the chi square analysis. Some changes have been noted in the types of dental procedures performed, but there is no change in the number of teeth restored, t-test, $p < 0.05$. A significant difference was found for the mean ages, and total number of cases per year using the t-test. These differences can be attributed to the changes in patient management philosophies and in-office patient management techniques.

A Comparison of Patient Types and Dental Treatment Performed Under General Anesthesia, 1980 to 1982 and 1990 to 1992

Introduction

It has been reported that there is an increasing number of pediatric dental cases that are treated in the operating room under general anesthesia (Vermeulen, 1991). It has also been reported that there is an overall decrease in dental caries in the pediatric population (Waldman, 1990). Since these two statements seem to contradict each other, one must ask: If there is less decay, then why are more children being treated under general anesthesia, and has this been the trend for our patient population? The purpose of this paper is to answer these questions by comparing the patient characteristics and the treatment they received under general anesthesia from 1980 to 1982 and 1990 to 1992 at Oregon Health Sciences University (OHSU).

Literature Review

Dental treatment in the operating room under general anesthesia is an accepted procedure at most hospitals (Enger, 1985). Over the years, authors have reported an increase in the number of pediatric dental rehabilitation cases completed under general anesthesia (Bohaty, 1992 and Vermeulen, 1991).

In pediatric dentistry, the use of general anesthesia has been categorized as a patient management technique in much of the literature (Murphy, 1984, Nathan, 1989, and Vermeulen, 1991). Along with general anesthesia, there are many different behavior management techniques available to the dentist (Nathan, 1989). Examples are:

- 1) Tell-show-do
- 2) Positive reinforcement
- 3) Voice control
- 4) Nitrous oxide
- 5) Physical restraint, dentist
- 6) Physical restraint, assistant
- 7) Hand-over-mouth-exercise (HOME)
- 8) Conscious sedation
- 9) General Anesthesia
- 10) Papoose Board - Olympic Medical Group, Seattle, WA

Among these techniques, Tell-show-do has the highest approval rating by parents. Other techniques rated acceptable by parents include positive reinforcement, voice control, and nitrous oxide. Techniques falling in the unacceptable range were physical restraint by either the dentist or the assistant, Hand-over-mouth-exercise, and conscious sedation. The least acceptable of the techniques were general anesthesia and Papoose

Board restraint (Fields, 1984, Lawrence, 1991, and Murphy, 1984). Although many parents feel that some of the behavior management techniques demonstrated were not acceptable, they agree that in specific cases these methods are needed (Murphy, 1984 and Ready, 1988).

Parents in today's society play a very active role in determining how their child is to be managed in the dental office. Many parents voice their concerns and object to such behavior management techniques they feel may adversely effect the psyche or traumatize their child. Because of these concerns, there has been a trend in training programs to reduce or eliminate the use of certain behavior management techniques. A 1990 survey of program directors of all accredited advanced pediatric dentistry training programs in the United States found a trend over the previous five years of decreasing usage of parenteral sedative agents either through an I.M or I.V. route as well as the use of Hand-over-mouth-exercise and Hand-over-mouth with airway restriction. With this decline, the use of other behavior management techniques has increased. The methods which show an increased use are oral conscious sedation and general anesthesia. The use of nitrous oxide has remained unchanged overall, and the use of Papoose Board restraint is also unchanged (Acs, 1990).

For the vast majority of children, treatment in the dental office can be accomplished successfully without the use of sedative agents or physical restraint, but there is a group of children who do not respond well to any form of in-office behavior management. The only acceptable alternative for these patients is treatment under general anesthesia in a hospital operating room (Bohaty, 1992, Ferretti, 1984, and Ready, 1988). Although general anesthesia is very safe in a healthy child, it is not without risks (Cohen, 1990, Enger, 1985, and Morrow, 1986). Therefore, those children to be treated under general anesthesia for completion of dental care must meet one or more of the following criteria (Bohaty, 1992, Ferretti, 1984, and Vermeulen, 1991):

1) Acute Stress Reaction to Dental Treatment

Although this is usually age related, a child of any age can exhibit unreasonable fear and anxiety towards dental treatment, thus making dental treatment in an outpatient setting inappropriate.

2) Very Young Age

It is difficult for many young children to sit quietly for anything, especially dental treatment. Also it is not recommended that children under the age of two years receive in-office sedation as a method of behavior management due to the possibility of increased risk of respiratory depression and the difficulty of maintaining a small airway.

3) Extensive Dental Treatment Needs

A moderately behaved child may best be served having all dental treatment completed in one session if the alternative is multiple long appointments with sedation.

4) Mentally or Physically Handicapped

Handicapped children are often unable to comprehend the procedures or the need for dental treatment, or they are physically, emotionally, or mentally unable to cooperate for treatment.

5) Medically Compromised

The medical condition of a child may necessitate completing dental treatment in a hospital setting where appropriate care can be provided.

6) Living in a Remote Area

For a child living in a remote area where dental care is not available and transportation is a problem, dental treatment in the operating room may be the most logical choice.

Even though the dentist may feel that a child has met the criteria to become a patient in the hospital setting, the ultimate decision to treat a child in the operating room under general anesthesia is in the hands of the parents. In a survey done of parents

whose children underwent general anesthesia for dental care, the majority (91%) felt that this was the best way for their child to receive dental treatment (Ready, 1988).

Methods and Materials

The operation records of forty-nine children who received dental treatment under general anesthesia during the years of 1980-1982 and two-hundred-twenty-one children during 1990-1992 were reviewed. All of the patients were treated at Oregon Health Sciences University Hospital by the second year residents in the Pediatric Dentistry Residency Program at OHSU School of Dentistry in Portland, Oregon. The following information was obtained from the records:

- 1) Date of operation
- 2) Age of patient at the time of surgery
- 3) Sex of the patient
- 4) Ethnic background of the patient
- 5) Payment method
- 6) Health status
- 7) Dental treatment completed under general anesthesia
- 8) Other procedures performed at the time of surgery.

The dental treatment was categorized according to the number of teeth for each procedure:

- 1) Extractions
- 2) Pulpotomies and/or pulpectomies
- 3) Stainless steel crowns
- 4) One surface alloy restorations
- 5) Two surface alloy restorations
- 6) Three surface alloy restorations
- 7) Anterior composite restorations
- 8) Posterior composite restorations
- 9) Sealants

10) Total number of teeth restored.

Patient characteristics including payment method, health status, race, and sex were analyzed using the chi square analysis, significance at $p < 0.05$. The patient's age and the results comparing the different types of dental treatment performed for each time interval was analyzed using the t-test, significance at $p < 0.05$.

Results

The data for the patient characteristics of sex, ethnic background, method of payment, and health status were analyzed using the chi square analysis with significance at $p < 0.05$. The data for the age of the patients at the time of treatment and for the different dental procedures completed under general anesthesia were analyzed using the t-test with significance at $p < 0.05$.

A significant difference was found between the ages of the patients treated during the two time periods. From 1980 to 1982, the ages of the patients treated in the operating room for dental restorations was 7.8 years with 38.8% of the patients below three years of age, 16.3% of the patients between four and six years old, 12.3% between seven and nine years, 20.4% between ten and twelve years, and 12.2% were thirteen years and above. In comparison, the mean age for a patient treated in the 1990 to 1992 period was 4.3 years with 63.4% of the patients below the age of three years. Twenty-four percent of the patients were between four and six years, 6.8% were between seven and nine years, 2.7% were between ten and twelve years and 3.1% of the patients were thirteen years or older. (Table 1 and Figure 1)

The percentage of males versus females treated during the two different time periods were very similar with results for the two time period almost identical. (Table 2 and Figure 2)

The ethnic backgrounds of the patients treated under general anesthesia were not significantly different, although there was a significance within each time interval. White patients accounted for 73.5% of the total number of patients treated during the

1980 to 1982 interval, while minority patients including black, Asian, Hispanic and others, made up 26.5% of the total. Similar results were found during the 1990 to 1992 period with white patients accounting for 79.2% of the total, and minority patients representing the remaining 20.8%. (Table 3 and Figure 3)

No significant difference was found in the method of payment over the years. From 1980 to 1982, 77.6% of the patients were covered by either the Oregon or Washington Medicaide program, 20.4% of the patients were covered by private insurance, and 2.0% were non-sponsored at the time of treatment. Corresponding results for 1990 to 1992 were Medicaide - 82.8%, private insurance - 16.3%, and non-sponsored - 0.9%. (Table 4 and Figure 4)

There was a significant difference in the health status of the patients that were treated during the two time periods. (Table 5 and Figure5) For patients receiving treatment from 1980 to 1982, 79.6% of the children treated were diagnosed with a mental, emotional, or physical condition that necessitated the dental treatment be completed in the hospital under general anesthesia. These patients have been classified as class 3. These conditions included cerebral palsy, severe mental retardation, developmental delay, autism, seizure disorder, Trisomy 21, cystic hygroma, Mobius syndrome, histiocytosis, and progressive degenerative disease of the central nervous system. Many of the children had more than one of these conditions. From 1980 to 1982, 18.4% of the patients treated were classified as healthy (class 1), and 2.0% had a medical condition that was not a factor in the decision for hospitalization (class 2). Examples were heart murmur, otitis media, and ankyloglossia. Some of the patients had previous unsuccessful in-office sedations which affected the decision to treat in the operating room under general anesthesia.

In contrast, only 18.1% of the children treated in the 1990 to 1992 group fell under the class 3 category. They had medical, emotional and physical conditions that were similar to those mentioned previously. The vast majority of this group, 74.7% of

the children, were classified as class 1 and 7.2% of the patients fell into the class 2 category.

A small number of cases during both time intervals were scheduled with other medical or dental specialists and multiple procedures were completed while the patient was under general anesthesia. Procedures performed by other dental specialists included extractions of impacted teeth by Oral Surgery and full mouth periodontal flap surgery by Periodontology. Surgical procedures performed by other medical specialists included adenoidectomy, tonsillectomy, myringotomy, and ventilation tube placement by Otolaryngology and abdominal surgery by Pediatric Surgery.

The data compiled for the different dental procedures completed under general anesthesia indicated that there was a significant difference in the average number of extractions and pulpotomies and/or pulpectomies, but there was no difference in the average number of stainless steel crowns placed in the operating room. During the 1980 to 1982 period, an average of 3.2 teeth per patient were extracted, and an average of 0.8 teeth received a pulpotomy and/or pulpectomy. From 1990 to 1992 the average number of extractions dropped to 1.6 per patient, but there was an increase in the average number of pulpotomies and/of pulpectomies to 1.7 per patient. (Table 6 and Figure 6)

A statistical difference in the average number of one and two surface alloy restorations completed per patient was observed. The average number of teeth restored with alloy in the 1980 to 1982 time interval was 2.2 one surface alloy restorations and 1.5 two surface restorations. In comparison, from 1990 to 1992, each patient received an average of 1.2 one surface and 0.9 two surface alloy restorations. There was no difference in the average number of three surface alloys completed for the two periods. (Table 7 and Figure 7)

A significant difference was found for the average number of anterior and posterior composite restorations as well as for sealants. From 1980 to 1982, each patient averaged 1.1 anterior and 0.1 posterior composite restorations. No sealants were placed

in any patient during the 1980 to 1982 period. From 1990 to 1992, each patient received an average of 2.7 anterior and 0.9 posterior composite restorations, and 1.1 sealants.

(Table 8 and Figure 8)

The total number of teeth restored per case has not changed significantly over the past ten years. For the 1980 to 1982 period the average number of teeth restored per patient was 11.7, and for the 1990 to 1992 period the average was 12.2 teeth. (Figure 9)

There was a significant difference in the total number of cases completed per year in the operating room between the two time periods. The 1980 to 1982 interval averaged 16.3 cases per year, as opposed to the 1990 to 1992 interval which averaged 73.7 cases per year. This is an increase of 4.5 times as many patients treated during 1990 to 1992 over 1980 to 1982. (Figure 10)

Discussion

For the patient receiving dental treatment under general anesthesia at Oregon Health Sciences University Hospital, this study revealed that there was no significant change for the patient demographics of sex, race or payment status over the last decade, but there has been a change in the health status of the average patient and also the age of the patients being treated.

A number of factors may account for the changes that have been noted. Most of the patients treated today are healthy children who are very young. There has been a re-thinking of practitioners in their attitude towards which patients are being treated in the operating room. This change has come about through the changes in society as a whole. Today, parents are taking a much more active role in the way their children are treated in all aspects of their lives. Parents are less willing to agree with the use of certain in-office behavior management techniques that were widely used and taught a decade ago (Acs, 1990, Nathan, 1989, and Pinkham, 1990). Many parents wish to be present during their child's dental appointment, and dentists are adjusting their practices to accommodate these parents (Venham, 1978). Because of this, the patient management philosophies of the dentist are also challenged. An increasing number of patients treated in the operating room are young, healthy children. Ten years ago, these children may have been treated in the office with multiple sedation appointments, or handled with other management techniques such as Hand-over-mouth-exercise and physical restraint. The decreased use of these techniques have come about through many reasons. Parental attitude towards these techniques play a major factor, but other reasons must also be

taken into consideration. Today's society is a more litigious one than that of a decade ago (Klein, 1987). With this has come changes in insurance coverage with higher costs to those practitioners who use in-office sedation techniques. Some states also require the use of more sophisticated monitoring devices such as pulse oximetry, which was not available ten years ago. These advances in monitoring instrumentation have made in-office sedation safer, but also more expensive for the practitioner. These increased costs for monitoring equipment and insurance coverage may steer some dentists away from in-office sedations and to the operating room.

Regarding the types of dental treatment being rendered in the operating room under general anesthesia, the results reveal significant differences in the areas that are consistent with the variances in the ages of the patient populations and also follow the advances that have been made in the new dental materials. With an older population of patients in the 1980's, mean age of 7.8 years, there were more teeth being extracted instead of receiving pulpal therapy. A higher number of amalgam restorations of one and two surfaces during the 1980 to 1982 period were placed with no sealant usage. During this time, sealants had been on the market for approximately 5-7 years (Gonzalez, 1988 and Weintraub, 1989). Sealants gained acceptance slowly because of questions of bond strength to the enamel and the problem of the possibility of sealing over decay. With the increased strength and bonding ability of composites, more posterior composites are being done now than ten years ago. The average number of anterior composites placed between the two time intervals also correspond to what one would expect to find. In a child of 7.8 years (the mean age from 1980 to 1982), one would not likely find decay involving permanent incisors, while a child of 4.3 years with bottle caries (the mean age from 1990 to 1992), would require restoration of primary incisors. Many of the posterior composites places today would most likely have been amalgam restorations ten years ago (Full, 1993).

There was no significant difference in the utilization of stainless steel crowns, three surface alloy restorations, or the overall number of teeth being treated. The operating room is still being reserved for those patients with extensive dental treatment needs.

The average number of patients treated between the two different time periods is significantly different. Four and one half as many children then were treated ten years ago are receiving O.R. care now. This large increase can be contributed to changes in parental expectations, and changes of patient management philosophies by the practitioner (Nathan, 1989 and Pinkham, 1990).

Conclusion

The result of this study reveal that there has been no significant change in the patient sex, ethnic background, or method of payment for children who have received dental treatment under general anesthesia over the past decade. However, there have been significant changes in the mean ages of the patients and of their health status. Although there has been some changes in the types of dental procedures performed in the operating room, there has been no change in the total number of teeth treated per patient over the past ten years. Although more children are receiving dental treatment under general anesthesia, the operating room is still reserved for those patients with extensive dental treatment needs. These findings agree with other authors who suggest that changes in patient management philosophy, and in-office management techniques account for the increase number of dental cased being completed under general anesthesia (Nathan, 1989 and Pinkham, 1990).

Table 1 Percent of patients by age, treated under general anesthesia, from 1980-1982 versus 1990-1992.

Age In Years	1980-1982	1990-1992
0-3	38.8%	63.4%
4-6	16.3%	24.0%
7-9	12.3%	6.8%
10-12	20.4%	2.7%
13>	12.2%	3.1%

Figure 1

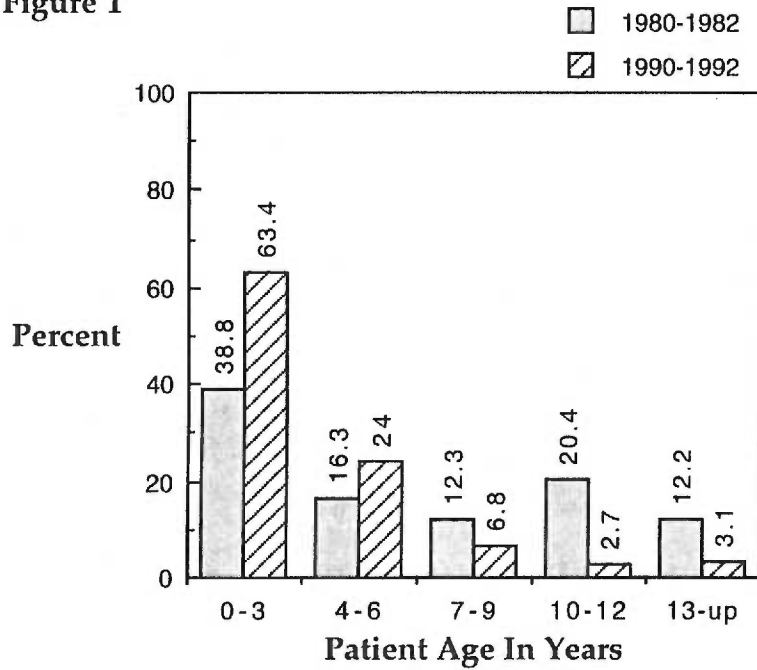


Table 2 Percent of patients by gender, treated under general anesthesia, from 1980-1982 versus 1990-1992.

Sex Of Patient	1980-1982	1990-1992
Male	53.1%	56.1%
Female	46.9%	43.9%

Figure 2

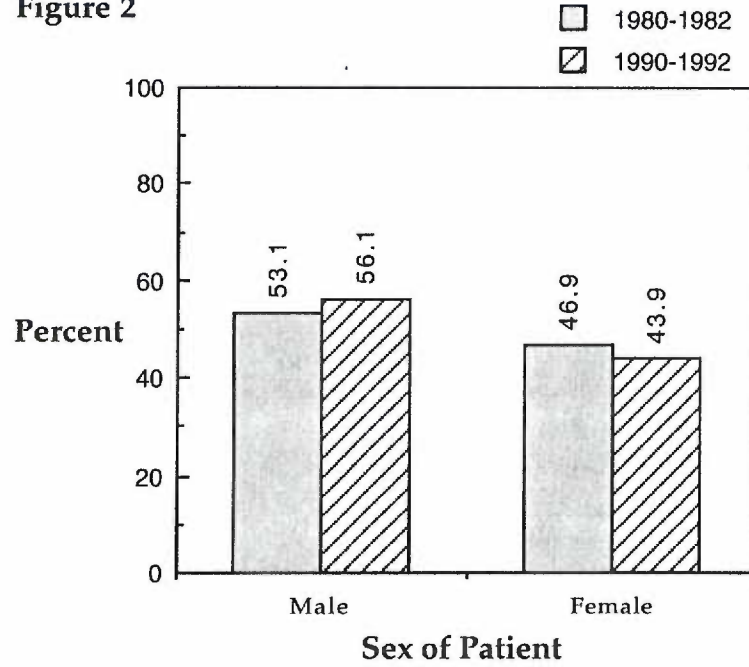


Table 3 Percent of patients by ethnic background, treated under general anesthesia, from 1980-1982 versus 1990-1992.

Ethnic Background	1980-1982	1990-1992
White	73.5%	79.2%
Black	4.1%	6.8%
Asian	10.2%	4.5%
Hispanic	8.1%	4.5%
Other	4.1%	5.0%

Figure 3

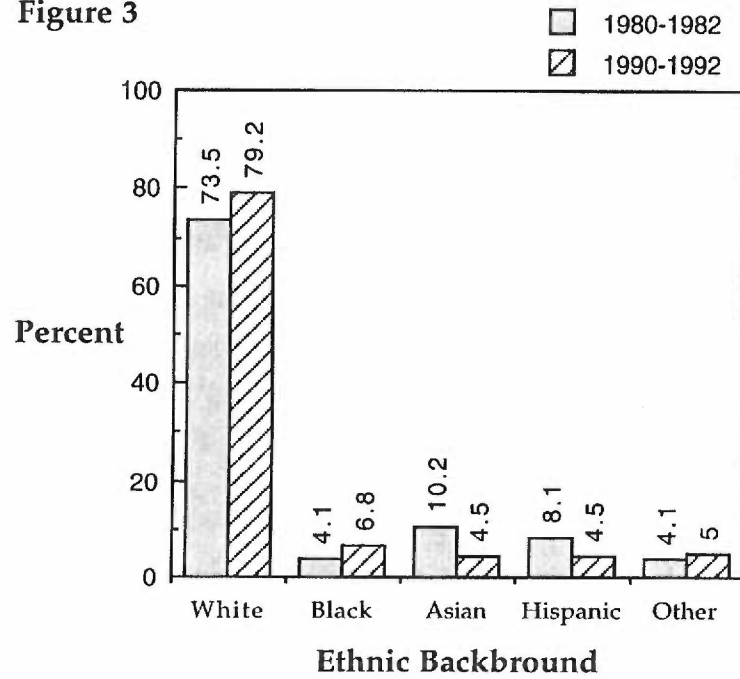


Table 4 Percent of patients by method of payment, treated under general anesthesia, from 1980-1982 versus 1990-1992.

Method Of Payment	1980-1982	1990-1992
Medicaide	77.6%	82.8%
Insurance	20.4%	16.3%
Non-sponsored	2.0%	0.9%

Figure 4

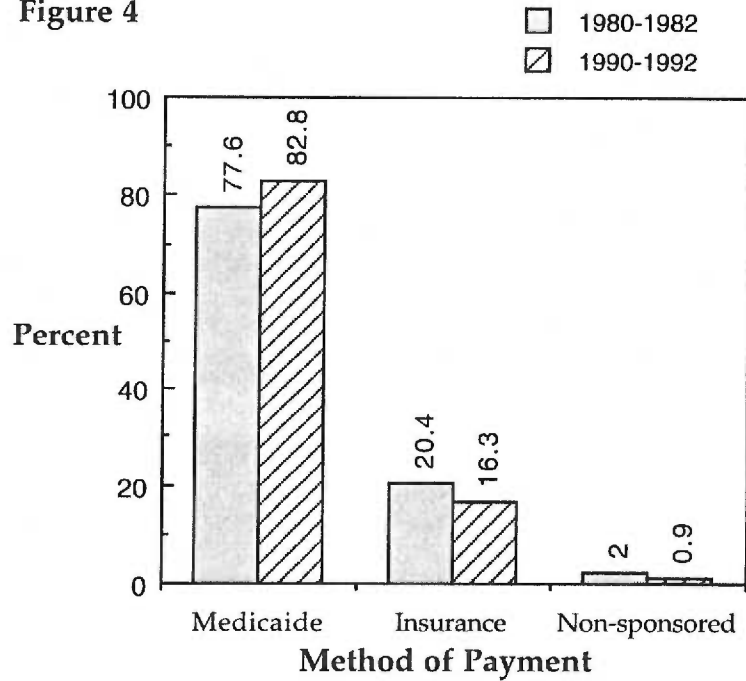
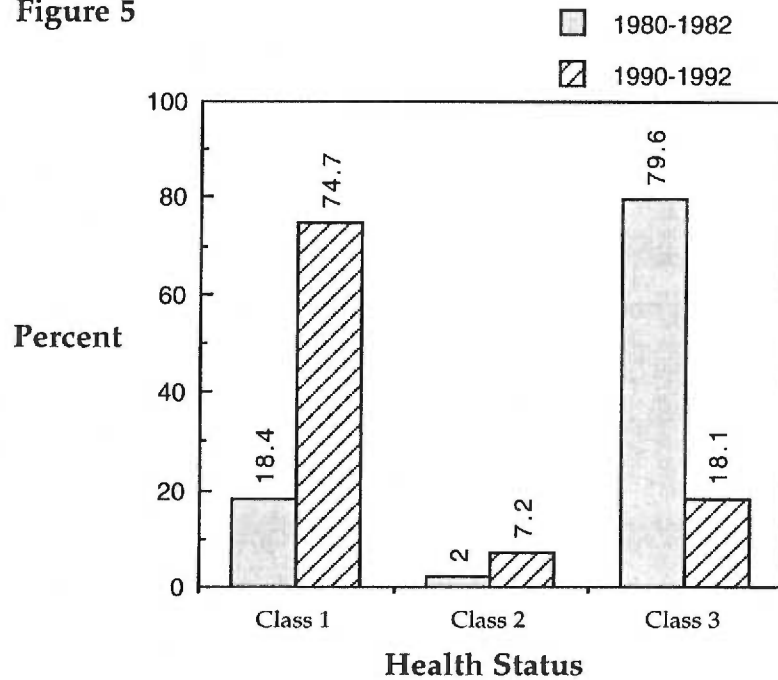


Table 5 Percent of patients by health status, treated under general anesthesia, from 1980-1982 versus 1990-1992.

Health Status	1980-1982	1990-1992
Class 1	18.4%	74.7%
Class 2	2.0%	7.2%
Class 3	79.6%	18.1%

Figure 5



Class 1 - Healthy

Class 2 - Medical condition not influencing hospitalization

Class 3 - Medical, emotional or physical condition necessitating the need for hospitalization

Table 6 Mean number of procedures completed per patient under general anesthesia, from 1980-1982 versus 1990-1992.

Procedure	1980-1982	1990-1992
Extractions	3.2	1.6
Pulpal Therapy	0.8	1.7
Stainless Steel Crowns	3.5	3.6

Figure 6

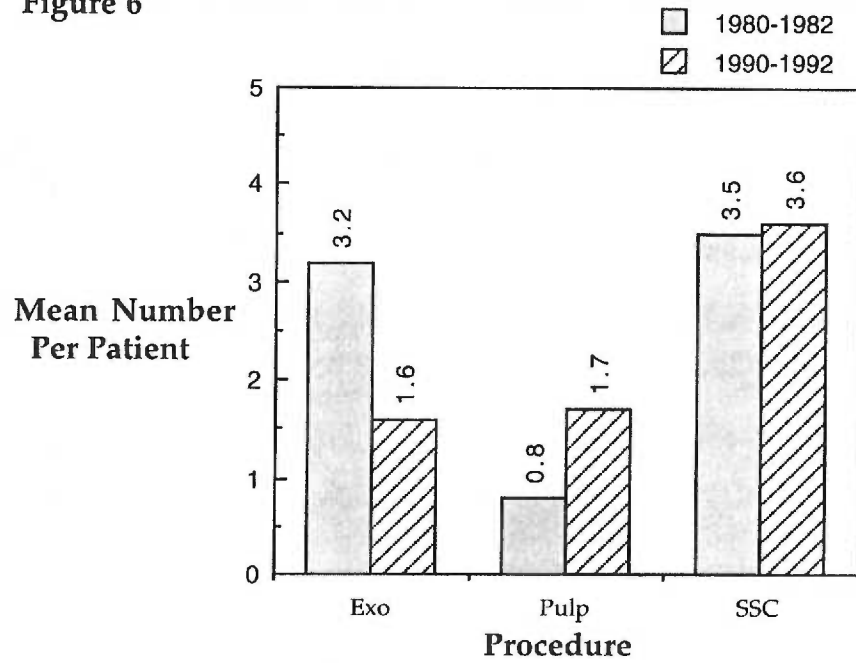


Table 7 Mean number of restorations completed per patient under general anesthesia from 1980-1982 versus 1990-1992.

Amalgam Restorations	1980-1982	1990-1992
One Surface	2.2	1.2
Two Surfaces	1.5	0.9
Three Surfaces	0.2	0.2

Figure 7

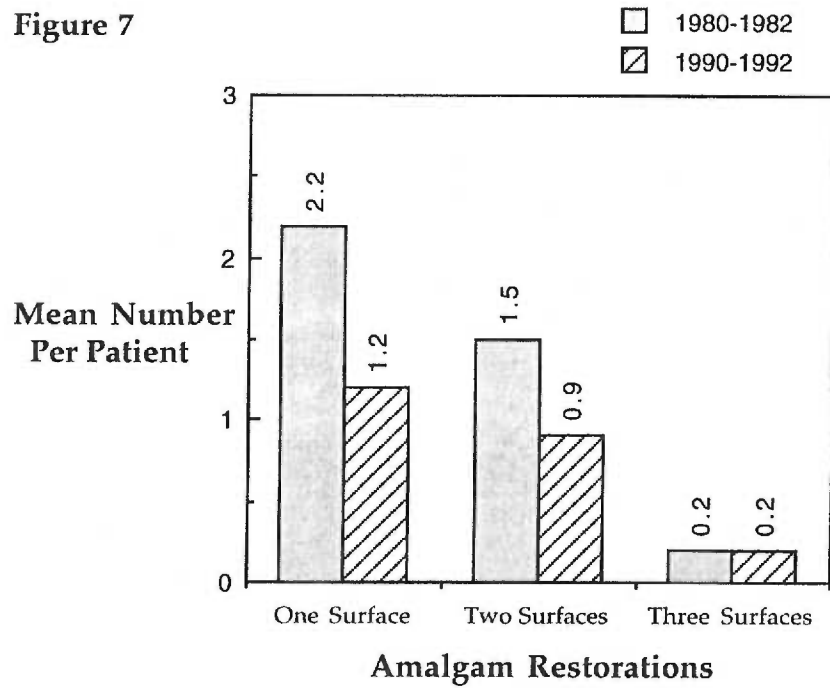


Table 8 Mean number of procedures completed per patient under general anesthesia, from 1980-1982 versus 1990-1992.

Procedure	1980-1982	1990-1992
Anterior Composites	1.1	2.7
Posterior Composites	0.1	0.9
Sealants	0.0	1.1

Figure 8

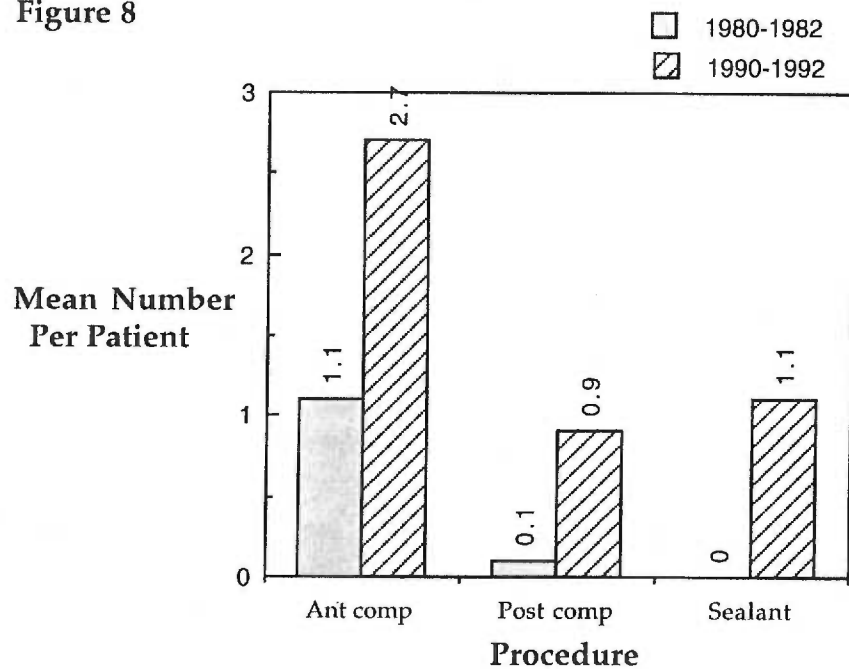
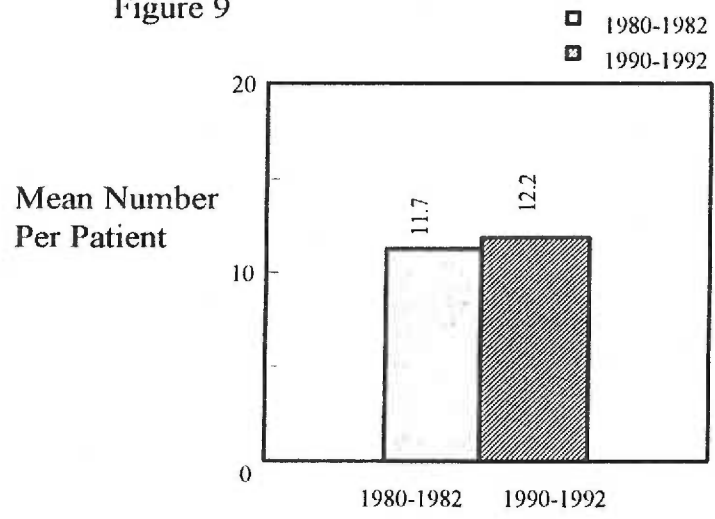
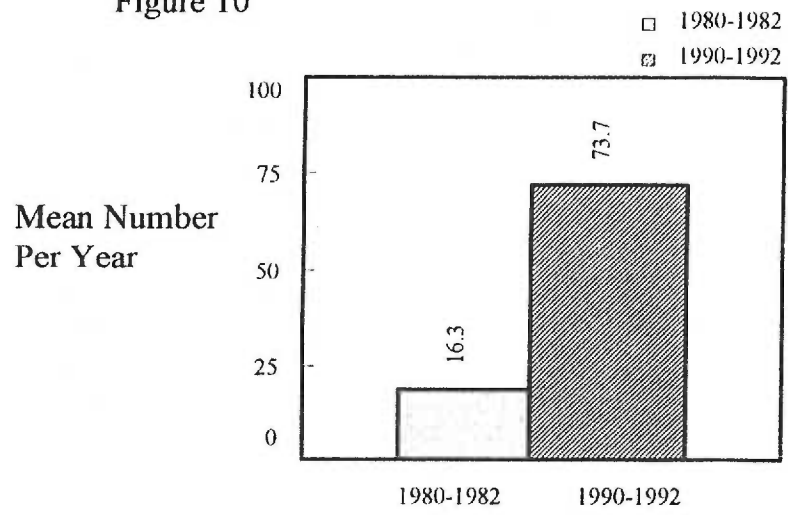


Figure 9



Total Number of Teeth Restored

Figure 10



Total Patients

Bibliography

- Acs, G., Musson, C. W., and Burke, M. J. Current teaching of restraint and sedation in pediatric dentistry: a survey of program directors. *Pediatr. Dent.* 12: 364-367, 1990.
- Bohaty, B. and Spencer, P. Trends in dental treatment rendered under general anesthesia, 1978-1990. *J. Clin. Pediatr. Dent.* 16: 222-224, 1992.
- Full, C. A. and Hollander, W. R. The composite resin restoration: A literature review part III What the future holds. *J. Dent. Child.* 60: 57-59, 1993.
- Cohen, M. M., Cameron, C. B., and Duncan, P. G. Pediatric anesthesia morbidity and mortality in the perioperative period. *Anesth. Analg.* 70: 160-167, 1990.
- Enger, D. J., and Mourino, A. P. A survey of 200 pediatric dental general anesthesia cases. *J. Dent. Child.* 52: 36-41, 1985.
- Ferretti, G. A. Guidelines for outpatient general anesthesia to provide comprehensive dental treatment. *Dent. Clin. N. Am.* 28: 107-120, 1984.
- Fields, H. W., Machen, J. B., and Murphy, M. G. Acceptability of various behavior management techniques relative to types of dental treatment. *Pediatr. Dent.* 6: 199-203, 1984.
- Fuks, A. B., Chosack, A., and Eidelman, E. Assessment of marginal leakage around Class II composite restorations in retrieved primary molars. *Pediatr. Dent.* 12: 24-27, 1990.
- Gonzalez, C. D., Frazier, P. J., and Messer, L. B. Sealant knowledge and use by pediatric dentists: 1987 Minnesota survey. *J. Dent. Child.* 55: 434-440, 1988.
- Klein, A. Physical restraint, informed consent and the child patient. *J. Dent. Child.* 54: 121-122, 1987.

- Lawrence, S. M., McTigue, D. J., Wilson, S., Odom, J. G., Waggoner, W. F., and Fields, H. W. Parental attitudes toward behavior management techniques used in pediatric dentistry. *Pediatr. Dent.* 13: 151-155, 1991.
- Morrow, J. W., Seale, N. S., Berry, C. W., and Love, W. D. Incidence of temperature elevations after a full mouth dental rehabilitation under general anesthesia. *J. Dent. Child.* 53: 420-424, 1986.
- Murphy, M. G., Fields, H. W., and Machen, J. B. Parental acceptance of pediatric dentistry behavior management techniques. *Pediatr. Dent.* 6: 193-197, 1984.
- Nathan, J. E. Management of the difficult child: A survey of pediatric dentists' use of restraints, sedation and general anesthesia. *J. Dent. Child.* 56: 293-301, 1989.
- Pinkham, J. R. Behavioral themes in dentistry for children: 1968-1990. *J. Dent. Child.* 57: 38-45, 1990.
- Ready, M. A., Barenie, J. T., Hanes, C. M., and Myers, D. R. Parental attitudes concerning children's hospitalization and general anesthesia for dental care. *J. Pedodon.* 13: 38-42, 1988.
- Venham, L. L., Bengston, D., and Cipes, M. Parent's presence and the child's response to dental stress. *J. Dent. Child.* 45: 213-217, 1978.
- Vermeulen, M., Vinckier, F., and Vandebroucke, J. Dental general anesthesia: clinical characteristics of 933 patients. *J. Dent. Child.* 58: 27-30, 1991.
- Waldman, H. B. Is there a future for pediatric dentistry? Reviewing the other side of the story. *J. Dent. Child.* 57: 198-202, 1990.
- Weintraub, J. A. The effectiveness of pit and fissure sealants. *J. Pub. Health Dent.* 49: 317-330, 1989.