
Behavioral changes of children undergoing dental treatment using sedation versus general anesthesia

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Abstract

The behavioral changes of children receiving dental treatment with oral sedation in a clinic was compared with the behavioral changes of children receiving dental treatment with general anesthesia in a hospital. In addition, the emotional response of the mothers of these 2 groups was compared before, during, and after the child's dental treatment.

The children who received dental treatment with sedation underwent behavioral changes similar to the children who received dental treatment with general anesthesia. According to their mothers, both groups exhibited postoperative behavioral changes not seen by children receiving routine dental treatment.

The mothers of both experimental groups of children reported similar levels of stress before and after the procedure. During the procedure, the mothers of children receiving general anesthesia reported greater stress than those whose children received oral sedation. At all times, both groups of mothers reported more stress than mothers whose children received routine dental care.

The pediatric dentist uses a wide variety of techniques to allay the fears of children to increase their cooperation while receiving dental treatment. These include symbolic modeling, desensitization, tell-show-do, visual imagery, and familiarization.¹ When these techniques fail, other treatment modalities such as sedation and general anesthesia must be attempted.

Sedation is indicated for children who are uncooperative (Duncan et al. 1983; Houpt et al. 1985), fearful of the dental environment, or unable to cope because of physical or mental handicaps (Barr et al. 1977; McDonald and Avery 1983). The goal of sedation is to relax the patient, allowing completion of the dental treatment while maintaining communication and responsiveness (Wright et al. 1983).

General anesthesia also can be used to complete

dental treatment. It may be the preferred method in treating uncooperative children with extensive decay, rather than subjecting them to numerous sedation visits (Musselman and Dummett 1979). Venham and Quatrocelli (1977) have shown increased sensitization of children to repeated stressful procedures, with accompanying decreased cooperative behavior. General anesthesia is also indicated for children with extreme decay who have significant medical disease or mental and physical handicaps (McDonald and Avery 1983; Musselman and Dummett 1979). Although restoring extensive decay has been the main reason suggested for the use of general anesthesia (Musselman and Dummett 1979), some authors have even advocated its use for an emergency extraction on a child with minimal previous dental care (Kilgore 1985).

Despite the many and similar indications for sedation and general anesthesia, very few practitioners take into account the child's emotional and psychological response to such treatment. Further, the responses of the parents rarely are mentioned in treatment decisions regarding the use of sedation versus the use of general anesthesia.

It has been shown that children exhibit some degree of behavioral change following hospitalization for medical reasons (Vernon et al. 1966). These changes can be seen in many ways, including bed wetting, nightmares, and fear of strangers (Vernon et al. 1966). It would be interesting to know whether children exhibit these same types of emotional responses and accompanying behavior changes following dental treatment under similar stressful and unfamiliar circumstances.

There is ample evidence that parents, especially mothers, suffer extreme anxiety while their child is hospitalized and undergoing medical surgery (Gofman et al. 1957; Skipper et al. 1968). The dentist should

¹ Ayer 1973; Herbett and Innes 1979; O'Donnell and Cohen 1984.

TABLE 1. Mother's Questionnaire

To help us understand your feelings and your child's feelings, and to help us deliver better dental care, please fill out this survey. Thank you.

	No Stress	Slight Stress	Moderate Stress	A Lot of Stress
1) The day <i>before</i> your child's procedure, did you feel:	___	___	___	___
2) <i>During</i> your child's dental procedure, did you feel:	___	___	___	___
3) The first 2 hours <i>after</i> your child's dental procedure, did you feel:	___	___	___	___
4) If your child needed another dental appointment, <i>exactly</i> like this one, would you feel:	___	___	___	___

be concerned with the mother's anxiety while the child is sedated in a clinic or office, or under general anesthesia in a hospital. A mother who is emotionally upset may not be able to adequately support and com-

fort her child before and after the dental treatment. Further, numerous authors have established a positive relationship between maternal anxiety and the child's behavior in a dental situation (Wright and Alpern 1971; Johnson and Baldwin 1969).

The purpose of this study is to compare the behavioral changes of children receiving dental treatment with the aid of oral sedation in a clinic versus those receiving dental treatment with general anesthesia in a hospital. In addition, the mother's subjective emotional response is compared.

Methods and Materials

This study involved 3 groups of asymptomatic children who received their first definitive restorative procedure. All the children needed at least 2 quadrants of restorative dentistry and the decision of management protocol was made on a subjective basis by the practitioners. No specific tests or criteria were used, but parental compliance, degree of untoward patient behavior, urgency of treatment, and availability of hospital facilities were some of the variables taken into consideration.

The 3 groups of children ranged in age from 23 months to 71 months. An analysis of variance showed

TABLE 2. Child Behavior Questionnaire

Please note any change in behavior in your child over the next 7 days. Thank you.

	Less Than Before Dental Work	Same as Before (No Change)	More Than Before			
1) Does your child make a fuss about going to bed at night:	___	___	___	13) Does your child spend time trying to hold or get your attention:	___	___
2) Does your child make a fuss about eating:	___	___	___	14) Is your child afraid of the dark:	___	___
3) Does your child seem to be afraid of leaving the house with you:	___	___	___	15) Does your child have bad dreams at night or wake up and cry:	___	___
4) Does your child wet the bed at night:	___	___	___	16) Is your child irregular in his (her) bowel movements:	___	___
5) Does your child bite his (her) fingernails:	___	___	___	17) Does your child have any trouble getting to sleep at night:	___	___
6) Does your child get upset when you leave him (her) alone for a few minutes:	___	___	___	18) Does your child seem to be afraid or shy around strangers:	___	___
7) Does your child need a lot of help doing things:	___	___	___	19) Does your child have a good appetite:	___	___
8) Does your child seem to avoid or be afraid of new things:	___	___	___	20) Does your child tend to disobey you:	___	___
9) Does your child have difficulty making up his (her) mind:	___	___	___	21) Does your child break toys or other objects:	___	___
10) Does your child have temper tantrums:	___	___	___	22) Does your child suck his (her) fingers or thumb:	___	___
11) Is it difficult to get your child to talk to you:	___	___	___			
12) Does your child follow you everywhere around the house:	___	___	___			

TABLE 3. Sedation Group—Child Behavior Questionnaire

	Less Than Before Dental Work	Same as Before (No Change)	More Than Before			
1) Does your child make a fuss about going to bed at night:	<u>1</u>	<u>11</u>	<u>1</u>	13) Does your child spend time trying to hold or get your attention:	—	<u>12</u> <u>1</u>
2) Does your child make a fuss about eating:	—	<u>12</u>	<u>1</u>	14) Is your child afraid of the dark:	<u>1</u>	<u>12</u> —
3) Does your child seem to be afraid of leaving the house with you:	—	<u>12</u>	<u>1</u>	15) Does your child have bad dreams at night or wake up and cry:	—	<u>11</u> <u>2</u>
4) Does your child wet the bed at night:	—	<u>13</u>	—	16) Is your child irregular in his (her) bowel movements:	<u>1</u>	<u>12</u> —
5) Does your child bite his (her) fingernails:	—	<u>13</u>	—	17) Does your child have any trouble getting to sleep at night:	—	<u>12</u> <u>1</u>
6) Does your child get upset when you leave him (her) alone for a few minutes:	—	<u>13</u>	—	18) Does your child seem to be afraid or shy around strangers:	—	<u>12</u> <u>1</u>
7) Does your child need a lot of help doing things:	<u>1</u>	<u>12</u>	—	19) Does your child have a good appetite:	—	<u>13</u> —
8) Does your child seem to avoid or be afraid of new things:	—	<u>13</u>	—	20) Does your child tend to disobey you:	—	<u>12</u> <u>1</u>
9) Does your child have difficulty making up his (her) mind:	—	<u>13</u>	—	21) Does your child break toys or other objects:	—	<u>13</u> —
10) Does your child have temper tantrums:	—	<u>12</u>	<u>1</u>	22) Does your child suck his (her) fingers or thumb:	—	<u>13</u> —
11) Is it difficult to get your child to talk to you:	—	<u>13</u>	—			
12) Does your child follow you everywhere around the house:	—	<u>13</u>	—			

Total children with negative changes: 5 of 13 = 38%. Total children with positive changes: 4 of 13 = 31%. Total number of negative changes: 10. Total number of positive changes: 4.

no significant differences in age among the 3 groups at the $P < 0.01$ level. The mean age was 40.2 months (range 23–51 months) for those receiving sedation, 50.8 months (range 27–71 months) for those receiving general anesthesia, and 55.1 months (range 40–69 months) for the control children. A chi-square analysis of the distribution of boys and girls in the 3 groups was not significant. In the sedation group there were 8 boys and 5 girls, in the general anesthesia group, 5 boys and 7 girls, and in the control group, 4 boys and 3 girls. The groups were felt to be comparable since there were no significant differences in age and sex.

The first group of 13 children received oral sedation (chloral hydrate, hydroxyzine, or diazepam) and nitrous oxide. The premedication was administered and the treatment completed by residents at the Medical College of Virginia Pediatric Dental Clinic. In all cases, a Papoose Board^a was used during treatment.

The second group of 12 children received outpatient general anesthesia at either Children's Hospital or Richmond Eye and Ear Hospital, and the dental treatment was done by three of the authors. All

three practitioners have provided dental treatment at both hospitals and were in agreement as to the similarity with which the children were treated at each facility.

The third group of 7 children was a control group. Only local anesthesia was used and the treatment was done at the Medical College of Virginia Pediatric Dental Clinic by both undergraduate dental students and pediatric dentistry residents.

At the conclusion of the first restorative visit (or the general anesthesia procedure), each child's mother was given a 2-part questionnaire. This questionnaire was returned within 4 weeks at a follow-up visit. If the mother forgot the form she was given a second one to complete during the follow-up visit. The validity of a questionnaire completed within a 4-week time span has been substantiated previously (Vernon et al. 1966).

The first part of the questionnaire was a modification of one used by Skipper et al. (1968; Table 1). They studied the mother's feelings of stress on the day before a medical operation, during the operation, and 2 hr after the operation. The second part of the questionnaire asked the mothers to note any changes in the behavior of their children in the 7 days fol-

^a Olympic Medical Corp; Seattle, WA.

TABLE 4. General Anesthesia Group—Child Behavior Questionnaire

	Less Than Before Dental Work	Same as Before (No Change)	More Than Before			
1) Does your child make a fuss about going to bed at night:	<u>1</u>	<u>11</u>	—	13) Does your child spend time trying to hold or get your attention:	—	<u>10</u> <u>2</u>
2) Does your child make a fuss about eating:	<u>3</u>	<u>9</u>	—	14) Is your child afraid of the dark:	—	<u>10</u> <u>2</u>
3) Does your child seem to be afraid of leaving the house with you:	—	<u>12</u>	—	15) Does your child have bad dreams at night or wake up and cry:	<u>1</u>	<u>10</u> <u>1</u>
4) Does your child wet the bed at night:	—	<u>12</u>	—	16) Is your child irregular in his (her) bowel movements:	—	<u>12</u> —
5) Does your child bite his (her) fingernails:	—	<u>10</u>	<u>2</u>	17) Does your child have any trouble getting to sleep at night:	—	<u>12</u> —
6) Does your child get upset when you leave him (her) alone for a few minutes:	—	<u>10</u>	<u>2</u>	18) Does your child seem to be afraid or shy around strangers:	—	<u>10</u> <u>2</u>
7) Does your child need a lot of help doing things:	—	<u>12</u>	—	19) Does your child have a good appetite:	—	<u>9</u> <u>3*</u>
8) Does your child seem to avoid or be afraid of new things:	<u>1</u>	<u>9</u>	<u>2</u>	20) Does your child tend to disobey you:	—	<u>11</u> <u>1</u>
9) Does your child have difficulty making up his (her) mind:	—	<u>12</u>	—	21) Does your child break toys or other objects:	—	<u>12</u> —
10) Does your child have temper tantrums:	<u>2</u>	<u>9</u>	<u>1</u>	22) Does your child suck his (her) fingers or thumb:	—	<u>11</u> <u>1</u>
11) Is it difficult to get your child to talk to you:	<u>2</u>	<u>10</u>	—			
12) Does your child follow you everywhere around the house:	—	<u>10</u>	<u>2</u>			

* These responses were judged a positive behavior change. Total children with negative changes: 5 of 12 = 42%. Total children with positive changes: 5 of 12 = 42%. Total number of negative changes: 18. Total number of positive changes: 13.

lowing dental treatment. A modification of Vernon, Schulman and Foley's Post-Hospital Behavior Questionnaire (1966, Table 2) was used. Their findings as to the reliability and validity of such a questionnaire, through comparisons of questionnaire scores and independent ratings of nondirective interviews with parents, was considered satisfactory for use in this study.

Results

The impact of the dental visit on the subsequent emotional behavior of the patients was of primary concern. In order to assess this impact, the frequency of behavior changes reported by mothers of children in each experimental group was analyzed and compared to the reports of mothers from the control group. Summaries of both positive and negative behavior changes for the 3 groups are presented in Tables 3-5.

Of the children receiving oral sedation (Table 3), 38% (5 of 13) exhibited negative behavior changes. On the average, these 5 children had 2 of the listed behaviors that were worse. Conversely, 31% (4 of 13) of the sedated children had behaviors that were better postoperatively. These children averaged an im-

provement in 1 of the listed behaviors. Since 2 of the children exhibited both positive and negative behavior changes, a total of 54% of the patients (7 of 13) exhibited some type of behavioral change.

Of the children receiving general anesthesia (Table 4), 42% (5 of 12) exhibited negative behavior changes. Their behaviors worsened in an average of 3.6 of the categories. Interestingly, 42% (5 of 12) also exhibited positive behavior changes. Their behaviors improved in an average of 2.6 of the categories. Again, 2 of the children exhibited both positive and negative behavior changes, meaning 75% of the patients (8 of 12) exhibited some type of behavioral change. No change in behavior was reported for any child in the control group (Table 5).

These results suggest that changes in behavior reported by mothers in the experimental groups were related to the treatments. In fact, chi-square analysis of the number of mothers reporting changed versus unchanged behavior following treatment indicated that for both treatment groups a significant number of mothers reported changed behavior following treatment as compared to the control group ($P < 0.05$). The 2 treatment groups did not differ greatly and

TABLE 5. Control Group—Child Behavior Questionnaire

	Less Than Before Dental Work	Same as Before (No Change)	More Than Before			
1) Does your child make a fuss about going to bed at night:	—	<u>7</u>	—	13) Does your child spend time trying to hold or get your attention:	—	<u>7</u>
2) Does your child make a fuss about eating:	—	<u>7</u>	—	14) Is your child afraid of the dark:	—	<u>7</u>
3) Does your child seem to be afraid of leaving the house with you:	—	<u>7</u>	—	15) Does your child have bad dreams at night or wake up and cry:	—	<u>7</u>
4) Does your child wet the bed at night:	—	<u>7</u>	—	16) Is your child irregular in his (her) bowel movements:	—	<u>7</u>
5) Does your child bite his (her) fingernails:	—	<u>7</u>	—	17) Does your child have any trouble getting to sleep at night:	—	<u>7</u>
6) Does your child get upset when you leave him (her) alone for a few minutes:	—	<u>7</u>	—	18) Does your child seem to be afraid or shy around strangers:	—	<u>7</u>
7) Does your child need a lot of help doing things:	—	<u>7</u>	—	19) Does your child have a good appetite:	—	<u>7</u>
8) Does your child seem to avoid or be afraid of new things:	—	<u>7</u>	—	20) Does your child tend to disobey you:	—	<u>7</u>
9) Does your child have difficulty making up his (her) mind:	—	<u>7</u>	—	21) Does your child break toys or other objects:	—	<u>7</u>
10) Does your child have temper tantrums:	—	<u>7</u>	—	22) Does your child suck his (her) fingers or thumb:	—	<u>7</u>
11) Is it difficult to get your child to talk to you:	—	<u>7</u>	—			
12) Does your child follow you everywhere around the house:	—	<u>7</u>	—			

there was no statistical difference between the frequency of mothers reporting behaviors improving or worsening.

Of secondary interest was the impact of the 2 types of treatments on the subjective experience of the patients' mothers. The results of the mother's questions are presented in Table 6. Because of the subjective nature of the "moderate stress" or "a lot of stress" ratings, these 2 categories were combined in the results to indicate moderate/high stress. For all 4 questions there was a significantly higher amount of stress reported by the mothers of the experimental groups, as compared to the control group. For only 1 question, number 2 (during the dental procedure), was there a significant difference in stress level *between* the 2 experimental groups. In this case the mothers of the general anesthesia group reported significantly more stress than the mothers of the sedation group ($P < 0.01$).

Discussion

The use of pharmacological sedation and general anesthesia is well documented as a method for dental treatment of children (Stewart et al. 1982; Wright et al. 1983). In fact, a recent survey showed that 80% of

the responding American Academy of Pediatric Dentistry Diplomates (1981) use sedation and 76% use general anesthesia. The most common route of sedation is oral (McDonald and Avery 1983; Wright and McAulay 1973) and 3 of the most commonly used drugs are chloral hydrate, hydroxyzine, and diazepam (Duncan et al. 1983; Wright and McAulay 1973). The range of dosages for these drugs in this study was chloral hydrate 25–50 mg/kg, hydroxyzine 15–50 mg/child, and diazepam 0.2 mg/kg. These all correspond to normally recommended dosages (Stewart et al. 1982; Physicians' Desk Reference 1985). In addition, nitrous oxide was always used at a concentration of 20–50%.

This study was concerned with how children responded to either the use of sedation in a clinic environment or general anesthesia in a hospital. The use of questionnaires was adopted from previous studies involving children undergoing medical treatment. In these studies the behavioral changes, indicative of emotional and psychological reactions, are well documented in children who undergo hospitalization. Those reactions to a stressful medical situation led to the question of whether a child might be going through similar reactions to a stressful dental

TABLE 6. Mother's Questionnaire Responses

Mother's Question #1 The day <i>before</i> your child's procedure, did you feel:				Mother's Question #3 The first 2 hours <i>after</i> your child's procedure, did you feel:			
	General Anesthesia	Sedation	Control		General Anesthesia	Sedation	Control
No Stress	2	1	6	No Stress	3	2	6
Slight Stress	4	8	1	Slight Stress	6	8	1
Mod/High Stress	6	4	0	Mod/High Stress	3	3	0
2 experimental groups significantly different from Control Group $P < 0.005^*$				2 experimental groups significantly different from Control Group $P < 0.05^*$			
Mother's Question #2 During your child's dental procedure, did you feel:				Mother's Question #4 If your child needed another dental appointment, <i>exactly</i> like this one, would you feel:			
	General Anesthesia	Sedation	Control		General Anesthesia	Sedation	Control
No Stress	2	0	3	No Stress	4	5	7
Slight Stress	1	8	4	Slight Stress	5	6	0
Mod/High Stress	9	5	0	Mod/High Stress	3	2	0
2 experimental groups significantly different from Control Group $P < 0.005^*$				2 experimental groups significantly different from Control Group $P < 0.05^*$			
General Anesthesia Group significantly different than Sedation Group $P < 0.01^*$							

* 1-tailed tests.

situation. Because of the previously mentioned effect of maternal anxiety on children, the mother's response to these procedures also was examined.

The behavioral changes of the sedation group of children were quite similar to the changes of the general anesthesia group. Fewer sedated children had negative behavior changes (38% versus 42%) and positive behavior changes (31% versus 42%) than the general anesthesia group. However, the difference was not significant. The average number of behaviors that changed for the sedated group was fewer than the average number for the general anesthesia group (2.0 versus 3.6 for the negative behaviors, 1.0 versus 2.6 for the positive behaviors).

None of the behaviors observed had a consistent change. In fact, the change in behaviors was relatively equal among all those listed. Although no statistical test can be assigned to such a balanced chart of behaviors, a trend can be seen showing slightly greater changes, both good and bad, among the general anesthesia group. Since no changes were seen in the control group, the assumption that the 2 experimental groups were stressed is valid.

Also valid was the assumption of increased maternal anxiety of the 2 experimental groups compared to the control group. In fact, the significantly greater amount of stress felt by both experimental groups of mothers may have contributed to the children's anxiety and postoperative behavioral changes. In only 1 instance, during the procedure, did the experimental mothers differ from each other in stress level.

The changes observed in both treatment groups could be due to a variety of reasons. In each case the

children were subjected to many new and potentially threatening situations. One group was consciously sedated, separated from the mother, and restrained. A nasal mask delivering nitrous oxide, prechordial stethoscope, and pulse oximeter all were placed on the child. Upon release the patient was still feeling the effects of oral anesthesia, the sedative medication, and possibly a great deal of fatigue. The second group also was separated from the mother, anesthetized in an unfamiliar operating room, and awakened in a strange recovery room, feeling the attendant effects of general anesthesia. It is not unusual that both sets of children should undergo some types of postoperative behavior change. It is interesting that the changes were similar.

The mothers' similar reactions also were interesting. There seemed to be no increased fear of general anesthesia and the hospital environment over the sedation procedure. The difference in stress *during* the procedure may be due to 2 reasons. First, the general anesthesia procedure takes longer and the parent is left alone for a greater period of time. Second, in this study the parents of the sedated children were allowed to "peek in" on the procedure any time they wanted. This is quite helpful in assuring the parent that "everything is alright."

Variables that could affect results are offered in the hopes of stimulating future study. The use of different types of oral premedicants may have differing effects on children. Perhaps there are socioeconomic or prior hospitalization factors that affect children differently. Age and life experiences may predispose some children to react differently. Since none of the

questionnaires collected varied widely from the rest, these factors seemed to have little effect on the results, but certainly cannot be discounted.

Finally, the behavioral changes of children needing numerous sedation visits to complete treatment is a factor that requires further study. This study has shown similar child and parent reactions following the first sedation visit compared to general anesthesia. In many cases, however, second or third visits are needed, and future studies must address the child's and mother's ability to cope with this added burden.

Conclusion

Children undergoing dental treatment with oral sedation in a clinic environment undergo similar behavioral changes to children receiving dental treatment with general anesthesia in a hospital. According to their mothers, both groups exhibit postoperative behavior changes not seen by children receiving routine dental treatment.

The mothers of both groups of children report similar levels of stress before and after the procedure. During the procedure, the mothers of children receiving general anesthesia report greater stress than those whose children receive oral sedation. At all times, both groups of mothers report more stress than mothers whose children are receiving routine dental care.

The opinions expressed are those of the authors and do not represent the views of the United States Air Force.

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