

## A RETROSPECTIVE STUDY OF PEDIATRIC DENTAL PATIENTS TREATED UNDER GENERAL ANESTHESIA

Lanre L Bello,\* BDS, MS

هدفت هذه الدراسة إلى مراجعة ملفات الأطفال من مرضى الأسنان الذين تلقوا معالجة سننية شاملة تحت التخدير العام في كلية طب الأسنان جامعة الملك سعود في الفترة ما بين ١٩٨٢-١٩٩٠م ، تم تحليل الخصائص المميزة للمرضى المعالجين تحت التخدير العام ، ونوع المعالجة المنجزة و العناية السننية التالية للمعالجة لتقييم فعالية هذا النوع من المعالجة. تم الحصول على كافة المعلومات من ملفات المرضى الذين شملتهم الدراسة والذين بلغ عددهم ١١٩ مريضاً، ٥٤ ذكراً و ٦٥ أنثى ، جرت متابعتهم لمدة سنتين ، أعمارهم تتراوح من ٣ سنوات إلى ١٥ سنة وبمتوسط خمس سنوات . أكثر من ٦١% من المرضى كانوا بعمر خمس سنوات أو دون ، وغالبية المرضى كانوا أصحاء و فقط ٣١,١% منهم كان لديه إعاقة أو مشكلة طبية . احتل النحر الشامل والمعالجة السلوكية الاستطباب الأكثر لهذا النوع من المعالجة . خضع ١٦,٨% من المرضى لهذا الأسلوب من المعالجة لأسباب جراحية . والباقيون تلقوا معالجة تضمنت ترميمات الأملغم والراتنج المركب والاسمنت الزجاجي ،بالإضافة للتيجان الطوقية والمعالجات اللبية وتطبيق إجراء ختم الميازيب ، دلت النتائج على نجاح مميز للتيجان الفولاذية غير القابلة للصدأ والتيجان الطوقية بالمقارنة مع ترميمات الأملغم والراتنج المركب الاسمنت الزجاجي ، جرى تنفيذ إعادة بناء الفم خلال زيارة واحدة ، تلتهها عناية سننية خصصت للوقاية والتهديب السلوكي ، وكافة المرضى الذين كانوا بحاجة لمعالجة أكثر خلال فترات المتابعة أبدوا رغبة تلقى المعالجة تحت تأثير التوسكين أو التخدير الموضعي أكثر من تفضيلهم للتخدير العام .

The objective of this study was to review all child dental patients who received comprehensive dental treatment under general anesthesia (GA) at the College of Dentistry, King Saud University, between 1982 and 1990. The characteristics of the patients, indication for treatment under GA, types of treatment carried out and subsequent dental care received were analyzed in order to assess the efficacy of this type of care. All relevant data were obtained from the patients' dental records. The sample consisted of 119 patients who were followed up for a minimum of 2 years after the GA. There were 54 males and 65 females. Their ages ranged from 3 to 15 years with a median age of 5 years. Over 61% of them were 5 years or under. Most of the patients were healthy and only 31.1% had medical or developmental disability. Extensive caries coupled with behavior management was the major indication for using this regimen. Only 16.8% were admitted for surgical procedures. Treatment rendered included extractions, amalgam and composite/glass ionomer restorations, stainless steel and strip crown restorations, pulp therapy and placement of fissure sealants. Stainless steel and strip crown restorations were significantly more successful than amalgam or composite/glass ionomer restorations. Total oral rehabilitation was provided at a single operative visit and subsequent dental care devoted to prevention and behavior modification. All patients who needed further treatment during the follow-up visit accepted treatment under sedation and local anesthetic rather than under general anesthetic.

### Introduction

General anesthesia (GA) for dental care in children is necessary to facilitate the provision of safe, efficient, and effective quality treatment for the following<sup>1</sup>:

- Patients with certain physical, mental or medically compromising conditions.
- Patients with dental needs for whom local anesthesia is ineffective because of acute infection, anatomic variations or allergy.

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\*Assistant Professor, Division of Pediatric Dentistry  
Preventive Dental Sciences Department, College of Dentistry  
King Saud University, P.O. Box 60169, Riyadh 11545, KSA

- The extremely uncooperative, fearful, anxious or non-communicative child or adolescent with dental needs.
- Patients who have sustained extensive orofacial and/or dental trauma.
- Patients with dental needs who otherwise would not obtain the necessary dental care.
- Protection of the developing psyche of fearful children.

Complete oral rehabilitation is usually carried out to avoid repetition of the GA procedure, resulting in an extensive dental treatment

Address reprint requests to:

Dr. Lanre L. Bello

completed in a short period of time. Although the administration of a GA is relatively safe, complications such as allergic reactions, bronchospasms, nausea with vomiting, fever, sore throat, pharyngitis, lip swelling and delayed or prolonged recovery can occur.<sup>214</sup> Facilities for GA became available in the College of Dentistry, King Saud University since 1982. A review of literature reveals no reported data on comprehensive dental care for children under GA in the Kingdom of Saudi Arabia.

The aim of this paper was to discuss the characteristics of the patients, indications for the regimen, types of treatment provided and evaluation of the results of the total oral rehabilitation using general anesthesia during an 8-year period at the College of Dentistry in Riyadh.

### Materials and Methods

Information was collected on all child dental patients who received comprehensive dental care under GA at the College of Dentistry, King Saud University between 1982 and 1990. The dental procedure which had been carried out once weekly, except during vacation period, was performed by the Pediatric Dentistry faculty. Dental and anesthetic pre-operative assessment were carried out one day before the procedure. Details of previous medical and dental histories, clinical examination and radiographs, when possible were taken. Routine laboratory tests consisting of complete blood count, chest x-ray, urinalysis, PT and PTT were ordered for all patients. Parents were given written and verbal instruction to ensure nothing by mouth (NPO) from midnight.

On the morning of surgery, a final pre-operative assessment was carried out and then written consent obtained. The child was accompanied by a parent into the operating room until induction was achieved. After intubation and pharyngeal pack placement, intraoral radiographs were taken (when this could not be done earlier), peri-oral cleaning was done and the patient draped. Dental prophylaxis followed after which restorative treatment was carried out

under rubber dam isolation. Any extraction or surgery required was carried out at the end of treatment.

For cases requiring multi-specialty approach, patients were turned over to specialists who were usually present for treatment. One week following the treatment, the patients were reviewed. Subsequent dental care was carried out on a 6-month recall by the same member of the staff who completed the GA procedure. During routine recall examination, sealed and restored tooth surfaces were re-evaluated for loss of material and development of caries and necessary treatment was carried out. A follow-up preventive care consisting of dietary counseling, oral hygiene instructions, prophylaxis and topical fluoride application were then carried out. Data obtained from the records were: age of patient at the time of surgery, sex of patient, medical history and physical status, indication for treatment under GA and nature of treatment carried out. Further, follow-up data were recorded which included dates of recall visit to the Pediatric Dentistry Clinic, treatment received, whether local anesthetic was used and accepted and which restoration had to be replaced and why.

Data analysis was carried out with the use of the SPSS/PC+ statistical package on a personal computer. Frequency distribution was generated and the chi-square test was used to compare the success rate of different treatment modalities. Statistical significance was set at  $P < 0.05$ .

### Results

One hundred and eighty children were treated under GA during the study period. After surgery, however, some families could not be contacted because of changes in addresses or disconnected telephones. The results presented in this study, therefore, relate to 119 patients who were followed up for a minimum of 2 years and for whom complete data were available.

There were 54 males and 65 females (Table 1). The ages of the patients ranged from 3 years to 15 years with a median age of 5 years. Over 61% of the patients were 5 years or under.

**Table 1.** Distribution of child dental patients treated under general anesthesia by age and sex.

Sex	Age (years)			
	3-5 (%)	6-10 (%)	11-15 (%)	Total (%)
Male	34(28.6)	14(11.8)	6(5.0)	54(45.4)
Female	39(32.8)	20(16.8)	6(5.0)	65 (54.6)
Total	73(61.4)	34(28.6)	12(10.0)	119(100)

Eighty-two (68.9%) of the children had no relevant medical history. Thirty-seven (31.1%) children had medical/developmental disabilities. These were cerebral palsy, Down's syndrome, hearing and visual/speech impairment and cleft lip and palate. Other maladies were heart disease (2 patients), asthma (6 patients) and epilepsy (3 patients). There was also one case each of thalassemia and renal disease. (Table 2)

**Table 2.** Medical diagnosis of some of the patients treated under general anesthesia.

Diagnosis	No. of Patients	%
Cerebral palsy	16	13.5
Down's syndrome	4	3.4
Hearing & visual/speech impairment	3	2.5
Cleft lip & palate	1	0.8
Heart disease	2	1.7
Asthma	6	5.0
Epilepsy	3	2.5
Thalassemia	1	0.8
Renal disease	1	0.8

Table 3 shows indications for treatment under GA. The most common reasons for treatment were behavior management problem and extensive caries (affecting 8 or more teeth). The median age of children with management problem/extensive caries was 5 years. Thirty-seven patients had medical/developmental disabilities and twenty were admitted for surgical procedures. Many of the patients had more than one reason for treatment under GA.

**Table 3.** Indications for treatment under general anesthesia.

Reasons	No. of Patients*	%
Behavior management	87	73.1
Extensive caries	96	80.7
Medical or developmental disability	37	31.1
Surgical procedures	20	16.8

\*Some patients had more than one reason

**Table 4.** Dental treatment rendered under general anesthesia and failure rate of the procedures.

Treatment	Number	Failure	%
Amalgam restorations	344	49	14.2
Extractions	318	-	-
Stainless steel crowns	175	10	5.7
Composite / glass ionomer restorations	166	34	20.5
Formocresol pulpotomy	144	5	3.5
Fissure sealants	81	8	9.9
Strip crowns	66	2	3
Pulpectomy	48	1	2
Surgical procedures	20	-	-

Types of treatment rendered are shown in Table 4. Amalgam restorations and extractions constituted the most frequent dental procedure performed on child dental patients under GA. One hundred and seventy five stainless steel crowns (SSC) were placed on teeth which included 144 teeth treated by formocresol pulpotomy technique. Other types of treatment carried out in descending order of frequency were: composite/glass ionomer (GI) restorations, fissure sealants, strip crown restorations and zinc oxide eugenol pulpectomy. Amongst the 20 patients who were admitted for surgical treatment, 12 had mesiodens/odontome/ supernumerary teeth removed, 2 had embedded teeth exposed, 4 had gingivectomy and 2 had frenectomy.

The failure rate of the types of restorations inserted is also shown in Table 4 and reflects the number of restorations that had to be replaced during the follow-up visit. Significantly, more composite/GI (20.5%) and amalgam (14.2%) restorations were replaced than SSC (5.7%). ( $X^2 = 11.16$ ;  $df=1$ ;  $P = 0.001$ ). Ninety-seven percent of the strip crown restorations were still intact 2 years after placement. Two strip crowns were broken as a result of trauma and had to be replaced. Five of the pulp-tomized teeth and one treated by zinc oxide eugenol pulpectomy were extracted due to abscess/severe internal resorption. Among the 15 patients who required further restoration or extraction at the follow-up treatment visit, none was re-treated under GA.

#### Discussion

This study showed that extensive dental treatment was carried out under GA. Most of these children in which behavior management was a problem had gross caries and were young. These findings are similar to those reported in other studies.<sup>357</sup> It is possible that few of these children could tolerate restorative treatment and simple extraction with the use of local anesthetic and sedation, however, they would have needed many appointments to restore their dentition in view of the high level of caries. This may represent an unacceptable burden to the family concerned which could dampen the enthusiasm for keeping appointments, thus resulting in further deterioration of oral health of the child.

Because of the young age of so many of the children, the aim was to restore the dentition at a single visit and then begin behavior modification in the follow-up visit.<sup>6</sup> It is not unusual for some children to return for further treatment under GA after the first one. O'Sullivan and Curzon<sup>6</sup> reported 2.5% of their cases needed re-treatment under GA, compared to 27% of the patients reported by Vaughan-Williams et al.<sup>8</sup> Among the 87 behavior management cases in this study, 15 (17.2%) needed re-treatment which was accomplished under local anesthetic including five cases requiring sedation. None was re-treated under

GA. This is as it should be. The essence of any pharmacological behavior management technique especially the use of GA, is to train the child to accept future dental treatment without any more use of drugs. Similar findings were reported by Holt et al<sup>9</sup> as well as Sheehy et al.<sup>9</sup> It has also been suggested that repeat general anesthesia are seldom needed at least in the following four years.<sup>10</sup>

Mentally and physically handicapped children can, under GA, have a high standard of care, which might not be possible under local anesthetic as they are often unable to cooperate.<sup>6</sup> Over 31% of our sample constituted children who had medical or developmental disability. Previous studies<sup>11-12</sup> reported a lower quality of dental care for this group of patient in a regular clinical setting.

The combining of elective procedures in a single hospital admission under GA can be a very beneficial service for patients for whom such procedures are indicated. A number of patients in this study, in addition to restorative treatment, had oral surgical procedures such as exposure of embedded teeth, removal of impacted/supernumerary teeth and removal of odontome. Four patients with severe gingival hyperplasia had gingivectomy and gingivoplasty. This reflects a close liaison between different specialists and a combined approach to treatment planning. By minimizing the number of hospitalization for general anesthetic procedures, risks of anesthesia complications, the possibility of psychological trauma and financial burden of hospital treatment are reduced.<sup>13</sup>

The large number of amalgam, composite/GI and SSC restorations placed reflects the dental needs of these children, who appear to be the resistant group of children who continue to manifest high levels of caries in the primary dentition.<sup>14</sup> Failure of the amalgam and composite/GI restorations which occurred more in the younger age group were mostly due to poor oral hygiene, recurrent caries, deterioration of marginal integrity or marked wear as observed in many of the glass ionomer restorations. This confirms the observations reported in previous studies.<sup>615</sup> Full coverage restorations such as SSC and strip crown were

significantly better than amalgam and composite or GI restorations. Of the ten SSC that were replaced, three were worn and flattened down as a result of severe bruxism while the others were lost due to inadequate retention. The two strip crowns were dislodged following trauma sustained to the teeth. In the pre-school child with large proximal carious lesions, SSC are preferred to amalgam or glass ionomer because of durability.<sup>16</sup> It has also been suggested that lesion of similar size in teeth that are only 2-3 years to exfoliation may be restored with amalgam or glass ionomer because the anticipated lifespan is fairly short.<sup>16</sup> However, from the author's experience, except for the tooth which is within 12-18 months of exfoliation, full coverage restoration ought to be done.

Five (3.5%) of the pulpotomized teeth were unsuccessful and had to be extracted. Similar degrees of success were reported by O'Sullivan and Curzon<sup>6</sup> and Morawa et al.<sup>17</sup> In contrast, Rolling and Thylstrup<sup>18</sup> reported a 22% failure rate after 2 years. The lower failure rate observed in this study might be due to strict criteria adopted during treatment. Following coronal pulp amputation, any excessive amount of bleeding that persisted in spite of cotton pellet pressure coupled with a deep purple color of the tissue was indicative of inflammation extending into the radicular pulp.<sup>14</sup> Such teeth were treated by pulpectomy technique. All non-vital or abscessed teeth were extracted since procedures with doubtful prognosis were avoided especially in medically compromised patients. This policy indicates a radical approach to treatment planning in order to avoid the need for further GA.<sup>19</sup>

### Conclusion

- Dental treatment under general anesthesia has been effective with high success rate recorded in the work carried out.
- Most of the patients were of pre-school age and had extensive dental caries coupled with behavior management problems. There were also children with medical or developmental disability.

- More amalgam and composite/GI restorations were replaced due to poor oral hygiene, recurrent caries and deterioration of marginal integrity than the full coverage restorations.
- Total oral rehabilitation was provided at a single operative visit and subsequent dental care was devoted to prevention and behavior shaping.
- Patients who required further treatment at a later date accepted treatment in a normal way rather than under general anesthesia.

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