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ORIGINAL ARTICLE

Survey of comprehensive restorative treatment for children under general anesthesia

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KEYWORDS
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Abstract *Background/purpose:* General anesthesia provides optimal conditions for treating uncooperative children. The purpose of this retrospective study was to assess all restorative outcomes and evaluate the efficacy of comprehensive dental rehabilitation under general anesthesia in children.
Materials and methods: Sixty-eight complete records of children who underwent comprehensive dental rehabilitation under general anesthesia in the Kaohsiung Chang Gung Hospital, Kaohsiung, Taiwan between 2012 and 2013 were selected for this study. The clinical and radiographic assessments included determination of the outcomes of anterior versus posterior composite restorations, posterior composite restorations versus stainless steel crown restorations, and vital pulpotomies versus indirect pulp cappings.
Results: Posterior composite restoration had a significantly higher success rate (90.3%) than anterior composite restoration (71.7%, $P < 0.001$). Full-coverage stainless steel crowns had a significantly higher success rate (99.0%) than posterior composite restorations ($P < 0.001$). In addition, indirect pulp capping had a 100% success rate, which was higher than that of vital pulpotomy (94.9%). However, the difference was not significant ($P > 0.05$).
Conclusion: Although general anesthesia provides an optimal condition for treating children with high caries risk, high failure rates of composite restorations were noted. Indirect pulp capping and ferric sulfate pulpotomy followed by stainless steel crown restorations are successful techniques and can be used to treat deep carious lesions.

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Introduction

General anesthesia is a relatively safe dental treatment modality for young children who are fearful, medically compromised, and disabled, and have extensive early childhood caries (ECC). The decision to perform dental treatment for children under general anesthesia is based on the child's ability to cooperate in a normal setting, their medical status, and the extent of treatment required.[1–3] Eidelman et al.[4] found that the quality of treatment performed under general anesthesia was better than that of treatment performed under conscious sedation. Successful restorative outcomes of dental rehabilitation for a pediatric dental patient under general anesthesia depend on the expertise of the medical and dental team, and the ability of the parents or caretakers to comply with preventive dental care for their children after general anesthesia.[5,6]

General anesthesia provides optimal conditions for treating uncooperative children, leading to successful restorative outcomes. However, 53% of children develop new carious lesions within 2 years.[7] High failure rates for composite strip crown restorations (51%) and composite restorations (30%) were reported at least 6 months after dental rehabilitation.[8] O'Sullivan and Curzon[9] reviewed the findings for 80 children treated under general anesthesia for a minimum of 2 years and found that 80% of the children needing further treatment at a later date accepted local anesthesia and were treated in the normal way. Almeida et al.[10] further concluded that children with ECC, in particular, are highly predisposed to greater caries incidence in later years despite implementation of increased preventive measures.

Stainless steel crown restorations have been reported to be significantly more successful than amalgam or composite restorations for a minimum observation period of 2 years.[9] No study has investigated and compared the outcomes of indirect pulp capping and ferric sulfate pulpotomy performed during dental rehabilitation under general anesthesia. Therefore, the aims of this retrospective study were to: (1) assess all restorative outcomes, (2) compare the success rates of vital pulpotomy and indirect pulp capping performed on the primary molars with deep carious lesions, and (3) evaluate the efficacy of comprehensive dental rehabilitation for children under general anesthesia after a 24-month follow-up period.

Materials and methods

A total of 117 complete records of children who underwent comprehensive dental rehabilitation under general anesthesia in the Kaohsiung Chang Gung Hospital, Kaohsiung, Taiwan between 2012 and 2013 were selected for this study. The children were all healthy and had no medical issues. Of these children, 19.11% were treated under general anesthesia due to uncooperative behavior and 80.89% had extensive ECC. Procedures, discomfort/risks, and benefits were explained to the parents/guardians, and their informed consent for a dental examination was obtained prior to the investigation. The Institutional Review Board of Chang Gung Memorial Hospital reviewed and approved this investigation (IRB no.: 101-3606C).

Children included in the study were followed up for a minimum of 24 months. Dental examinations based on the World Health Organization diagnostic criteria[11] were conducted preoperatively, postoperatively, and 12 months and 24 months after the operation by two operators (Y.-T.L. and.Y.-T.J.L.) using standard mirrors and explorers. Adequate pre- and postoperative radiographs and follow-up radiographs were taken to assess the treatment outcomes. The clinical and radiographic assessments included the outcomes of anterior versus posterior composite restorations (Z100; 3M, St Paul, MN, USA), posterior composite restorations (Z100; 3M) versus stainless steel crown restorations, and vital pulpotomies versus indirect pulp cappings.

Vital pulpotomy on primary molars was performed under rubber dam isolation, and the coronal pulp tissue was completely removed with a spoon excavator. Bleeding was controlled using cotton pellets soaked in 15.5% ferric sulfate solution (Astringedent™; Ultradent Products Inc., Salt Lake City, UT, USA) on the pulpal stumps for 15 seconds, in accordance with the manufacturer's instructions, after which the coronal pulp space was filled with zinc-oxide eugenol cement. The crown was then restored with a stainless steel crown.

The method used for treating primary molars with indirect pulp capping was as follows: The carious dentin along the periphery of the lesion was removed completely, leaving the site of "risk for pulp exposure," which was then carefully removed with a #6 or #8 carbide bur at low speed to avoid mechanical exposure. A thin layer of calcium hydroxide (Dycal; Dentsply, Milford, DE, USA) was placed over the site of "risk for pulp exposure". When indicated, a resin-modified glass ionomer (Fuji IX GP; GC, Tokyo, Japan) was applied and a stainless steel crown was restored with glass ionomer cementation (Fuji I; GC).

Failure of restoration (resin or stainless steel crown) was defined as having recurrent caries and/or a restoration that required replacement due to fracture or dislodgment. Intact restorations without new caries detected clinically and radiographically at the time of follow-up were considered to be successful. The criteria used for determining clinical and radiographic success of the indirect pulp capping and pulpotomy were as follows: (1) absence of spontaneous pain and/or sensitivity to pressure; (2) absence of fistula, edema, and/or abnormal mobility; (3) absence of radiolucencies at the interradicular and/or periapical regions; and (4) absence of internal or external resorption. Two operators (Y.-T.L. and Y.-T.J.L.) performed the clinical and radiographic examinations, and a consensus was reached between them to determine if the tooth in question was a success or a failure.

Statistical analysis

Data were analyzed using Fisher's exact test to examine the outcomes of each variable in the time period between postoperation and 24 months later. The level of statistical significance was determined to be $P < 0.05$. The statistical software SPSS 19 (SPSS Inc., Chicago, IL, USA) was used for these analyses.