Mortality risks associated with pediatric dental care using general anesthesia in a hospital setting

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The purpose of the present study was to the review the literature and survey the risk of mortality associated with general anesthesia in children in a hospital setting. An 8-item, one page, survey was sent to all (928) southeast regional hospital members of the American Hospital Association (AHA). A response rate of 41% was established. They reported 22,615 dental cases using general anesthesia on children the ages 1 to 6 years and there were no deaths associated with anesthesia reported by responding hospitals. It was concluded that no deaths were reported among more than 22,000 cases over a 10-year period. This provides valuable information on the safety using general anesthesia for pediatric dental care.

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INTRODUCTION

The majority of pediatric dental patients are treated in the conventional dental environment without the need for of pharmocological behavior management agents, except for the occasional use of nitrous oxide/oxygen inhalation analgesia for the mildly anxious child. However, general anesthesia (GA) may be essential to provide invasive dental procedures for patients, who are developmentally or medically compromised, or are acutely anxious in the dental environment. This modality may also be the treatment of choice for preschool-aged children, who have extensive dental needs and have not developed the language skills or attention span to cope with conventional dental care.

For such children, an increasing popular option among parent/caregivers and clinicians is general anesthesia.[1] When indicated the use of general anesthesia is valuable in allowing dental care to be delivered that would otherwise be extremely difficult or impossible. The Academy of Pediatric Dentistry recognizes "that for optimum health and dental care, there exists a pediatric population for whom routine behavior management is not a viable option…where deep sedation and general anesthesia is necessary to provide optimum care".[2] A recent analysis of general anesthesia versus multiple sedation visits has demonstrated in certain situations a cost advantage with general anesthesia.[3] Yet general anesthesia carries an element of risk that must be considered.

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BACKGROUND

Overall anesthesia-related mortality risks

The number of deaths associated with general anesthesia has declined steadily over the past several decades as the standard of anesthesia practice has improved and as advances have been made in instrumentation, monitoring, and anesthetic and adjuvant drugs. The classic survey of ten hospitals by Beecher and Todd[4] involving nearly 600,000 anesthetic cases between 1948 and 1952 suggested that mortality primarily attributable to anesthesia occurred 1 in 2680 or 3.7 in 10,000. Another study by Dornette and Orth[5] showed similar rates. During the 1970s and 1980s statistics on anesthesia related mortality in the United States have been scarce. Anesthesia related mortality rates from Canadian, British and European sources during this period ranged from 0.7 to 2.2 per 10,000.[6]

More recently, British and Australian studies have shown much lower rates of mortality directly attributed to anesthesia. The report from the Confidential Enquiry into Periopertive Deaths (CEPOD), a survey

that was jointly organized by the Associations of Anesthetists and Surgeons of Great Britain and Ireland, has indicated that mortality attributable to anesthesia alone was 1 in 185,000 (0.054 per 10,000).[7] In the United States, Einchorn analyzed the data from nine Harvard-affiliated hospitals between 1976 and 1988 and found an anesthetic mortality rate of 1 in 200,200 (0.05 per 10,000).[7]

Pediatric anesthetic-related mortality risks

Modern medicine has improved the survival rates of children and infants through the use antibiotics, better understanding of physiology of growth and development, and improved understanding of the pathophysiology of disease. The mortality rate of infants and children has dramatically decreased over the passed fifty years. However, several reports have indicated that the mortality related to anesthesia is higher in-patients who are less than one year of age.

The reported anesthetic-related mortality for the pediatric age group has been disproportionately high in the literature.[6] In a 1957 report by the Baltimore Anesthesia Study Committee,[9] it was found that anesthesia-related mortality for children less than 15 years of age was 3.3 per 10,000, but these authors also found that anesthetic deaths were disproportionately higher during the neonatal period.

By the 1970s anesthetic-related mortality decreased considerably. Management of known general anesthetic hazards, such as the full stomach, preoperative fever, and hypovolemia were greatly reduced by increased experience. There was a reported 35,710 consecutive tonsillectomies and adenoidectomies without a single death at the Eye and Ear Hospital of Pittsburgh.[10] There were 7,500 consecutive anesthetics for cleft lip and cleft palate repairs without a death at the Children's Hospital Medical Center in Boston.[11] In a five year study between 1970 and 1975 at the Primary Children's Hospital in Salt Lake City, one anesthetic death was reported in 29,101 (0.34 per 10,000) cases of children under 11 years of age.[11] Downes and Raphaelly[12] reported an anesthetic mortality of 0.2 per 10,000 in 50,000 patients at a Children's Hospital in Philadelphia. Most reported fatalities occur during the first year of life, beyond which the risk of mortality is no higher than that in teenagers and young adults. In spite of the improvements in pediatric anesthesia, statistics still show that mortality rates in children are three times higher than in the general population.

Anesthetic-related mortality risks in dentistry

The incidence of anesthetic deaths in an outpatient setting is usually lower, probably because of the involvement of less complicated surgery and healthier patients. This applies to both medical and dental cases. One of the earlier studies to specifically examine general anesthesia for dental cases in a five-year period determined the mortality rate of 1 per 162,000 cases.[12] A review of dental general anesthesia cases in a 6-year period in England and Wales found a crude death rate of 1 in 300,000.[13]

There have been no published reports that have focused exclusively on the risk of death in a pediatric population receiving only dental care associated with general anesthesia administered in a hospital operating room. Accordingly, the present survey was conducted in an attempt to investigate the risk of death associated with general anesthesia in this defined population and situation.

METHODS AND MATERIALS

In 1998, a survey was developed and pretested on a group of local hospital administrators; a double envelope technique was used to allow for responder anonymity and to encourage reply. The 8-item, one page, survey was sent to all southeast region hospital members of the American Hospital Association (AHA). The institutions names and addresses were obtained from the AHA and included the following states Delaware, Virginia, Maryland, North Carolina, South Carolina, Georgia, Florida and the District of Columbia.

The survey instrument included questions such as; 1) type of institution, 2) does your hospital have a dental service, 3) how many pediatric dental cases were completed during 1987-1997, 4) the American Association of Anesthesiology (ASA) classification of these patients, and 5) how many of these dental general anesthesia cases resulted in a death. The study was specific and limited to children between the ages1-6 years of age.

All surveys were numerically coded to confirm receipt of the data. Once surveys were received, codes were removed and the participating institutions could no longer be identified.

RESULTS

There were 928 AHA southeast member institutions in 1998, of which 376 returned the survey; a response rate of 41% was established. Ten percent of the responding hospitals completed any pediatric dental cases using general anesthesia during 1987-97. A reported 22,615 dental cases were completed using general anesthesia on children the ages 1 to 6 years in the Southeast region and there were no deaths associated with anesthesia reported by responding hospitals.

DISCUSSION

There is no doubt that general anesthesia is associated with an element of risk and there have been numerous studies in the past that attempted to quantify this risk. However, the low incidence of mortality associated with general anesthesia and the numerous variables in study design have made it difficult to compare the

findings of these various surveys. Limiting the surveys to only cases which are dentally related has made the task even more daunting.[15-21]

Previous studies that examined the number of deaths associated with general anesthesia and dentistry have included those that occurred in dental offices as well as hospitals. It is reasonable to assume that risks associated with general anesthesia would be fewer involving less invasive procedures and healthier patients.

An invasive medical procedure to a child that has even the most remote risk of death will always cause anxiety for the parents/caregiver. No study will eliminate those concerns. However, sharing the data presented in this report with parents and caregivers of perspective children being considered for dental care in the hospital operating room under general anesthesia should provide a measure of comfort when the various treatment options are being considered. Our study examined mortality risks exclusively and did not attempt to identify morbidity associated with use of general anesthesia.

CONCLUSIONS

The exact mortality risk associated with providing dental care under general anesthesia in a hospital operating room was not established in this study. However, the fact that no deaths were reported among more than 22,000 cases over a 10-year period does provide valuable information.

The data from this and previous studies suggest that providing dental care under general anesthesia in a hospital setting is a safe alternative. In consultation with the dentist, determining the most appropriate site and situation for dental care remains a combination of patient age, behavior, amount of dental care required, medical and mental status of the patient and preferences of the parents/caregivers.

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