



Establishment of an intravenous conscious sedation service at a University Dental Clinic in Tanzania

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Background: With advances in safety measures for anesthesia, conscious sedation has gained popularity in the field of dentistry and has become essential in dental practice worldwide. However, in Tanzania, intravenous (IV) sedation is rarely practiced in the dental field. Therefore, we report the establishment of sustainable IV conscious sedation in dental practices and subsequently train local OMS residents in Tanzania.

Methods: In 2019, intravenous conscious sedation was initiated at the University Dental Clinic of the Muhimbili University of Health and Allied Science (MUHAS), Tanzania. During the preparatory phase of the program, local oral and maxillofacial surgeons (OMSs) were given a series of lecture notes that concentrated on different aspects of IV conscious sedation in dentistry. During the on-site training phase, an oral surgeon from the United States joined the OMSs for case selection, IV-conscious sedation procedures, and patient follow-up. Patients were recruited from existing patient records at the MUHAS Dental Clinic.

Results: The first conscious IV sedation program in dentistry was successfully launched at the University Dental Clinic in Tanzania. The local team of OMSs was trained on the safe administration of sedative agents (midazolam or ketamine) to perform various minor surgical procedures in a dental office. Nine patients with different ages, body masses, and medical conditions benefited from the training. No complications were associated with IV conscious sedation in the dental office.

Conclusion: This was the first successful “hands-on” training on IV conscious sedation provided to OMSs in Tanzania. It laid the foundation for the sustainable care of patients with special needs requiring oral health-related care in the country.

Keywords: Intravenous Conscious Sedation; Oral and Maxillofacial Surgery; Special Need; Tanzania.

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INTRODUCTION

With advances in safety measures for anesthesia, conscious sedation has gained popularity in the field of dentistry and has become a part of dental practice worldwide [1]. Conscious sedation entails the use of

pharmacological agents to achieve a state of relaxation or minimally depressed level of consciousness in a patient despite the patient independently retaining the ability to maintain a patent airway and satisfactorily respond to physical stimulation and verbal commands [2,3].

In most parts of the world, the indications for conscious sedation in dentistry include dental phobia, mental

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challenges (e.g., autism), long dental procedures (e.g., disimpaction), and pediatric patients [4,5]. Traditionally, patients with special needs requiring dental care are treated under general anesthesia [6], and this has been practiced in Tanzania in most health facilities to date. The setbacks of this traditional way of managing these patients include delays in dental care due to overwhelming theatre services, need for hospitalization, and the higher cost of treatment for patients and caretakers.

Recently, in the United Kingdom, there has been a proliferation of centers outside hospitals offering sedation for dental treatments to both adults and children [7], whereas in Tanzania, conscious sedation is rarely practiced. The bottleneck in practicing intravenous (IV)-conscious sedation in dentistry in Tanzania includes a lack of equipment, inadequate knowledge, and the cost of equipment used for IV-conscious sedation [1]. This program aimed to establish sustainable IV-conscious sedation in dental practice and subsequently train local OMS residents on safer ways to provide IV-conscious sedation in Tanzania.

METHODS

1. Planning phase

Two months prior to the on-site training, lecture notes on IV sedation were shared with OMSs and OMS residents at the School of Dentistry, Muhimbili University of Health and Allied Sciences (MUHAS).

The lecture notes focused on the following topics:

1. Historical perspectives of dental sedation
2. Role of IV-conscious sedation in pain management
3. Medical history, medical and physical evaluations, and risk assessment of patients scheduled for IV-conscious sedation
4. Monitoring of patient during IV-conscious sedation and general anesthesia
5. IV-conscious sedation rationale
6. Required armamentarium for IV-conscious sedation

7. Patients' discharge criteria based on the Aldrete score

8. Requirements for IV-conscious sedation/general anesthesia

For the initial implementation of the program, focus was to train OMFS residents and a group of OMSs willing to participate. Visiting oral surgeons from North Carolina, United States of America, have vast experience (more than 30 years) in the field of oral surgery, including IV-conscious sedation. Recruitment of patients for this training was done 1 week before the teaching visit in 2019.

2. Armamentarium

Most armamentaria required for IV-conscious sedation are available in Tanzania. These consisted of medications used for sedation (midazolam and ketamine), syringes (2–10 mL), cannulas (various gauges), tapes, cotton wool rolls, and adhesive dressings. Other types of equipment that were already acquired in the department included a weighing scale, pulse oximeter, blood pressure monitoring machine, height chart, tourniquet, airway management equipment (oropharyngeal airways, bag/mask system, and oxygen cylinder), and a stethoscope.

The trainer donated equipment to establish an IV-conscious sedation programme at the School of Dentistry. These items included an automated external defibrillator, electrocardiogram monitor, pulse oximeter, and first-aid kit.

3. On-site training and treatment phase

In March, 2019, a visiting oral surgeon joined the OMSs at the MUHAS Dental Clinic. Group discussions were conducted regarding different aspects of sedation in the dental office. The focus of the discussion was on the anticipated cardiovascular and respiratory complications, appropriate management, and informed consent. Patients recruited during the planning phase were assessed by both the local OMS and visiting oral surgeon. Patients selected for training purposes were those with ASA scores I or II and those who had to undergo oral

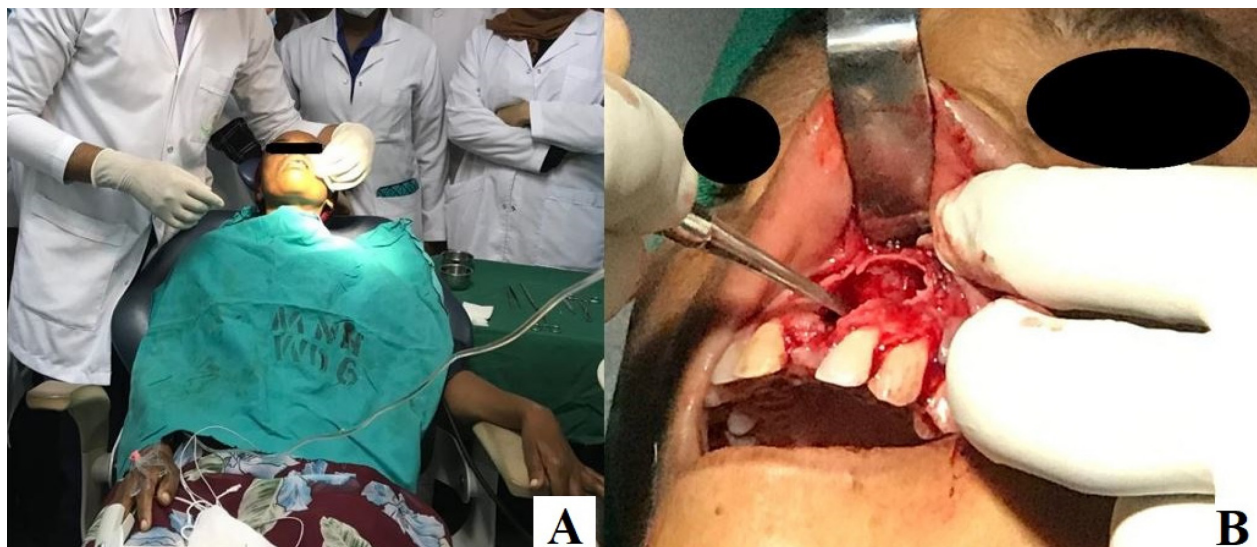


Fig. 1. (A) A woman sedated and planned for a surgical procedure under intravenous-conscious sedation with a group of trainees observing. (B) An intraoperative picture of the patient showing a bony defect on the anterior part of the maxilla following the enucleation of a cystic lesion.



Fig. 2. A man being monitored while being surgically managed under intravenous-conscious sedation.

surgical procedures, and those undergoing conservative dental treatment were excluded. A thorough patient history and examination (clinical and radiological) were conducted, focusing on the general health status,

diagnosis, and treatment plan. Based on the final recommendations of the experts, the surgical intervention was performed using IV-conscious sedation. The visiting oral surgeon administered IV-conscious sedation in the

first three cases; for the remaining cases, IV-conscious sedation was administered by the local OMS under close supervision of the visiting oral surgeon (Fig. 1). The drugs used for sedation included IV ketamine (1–1.5 mg/kg) and midazolam (0.5–0.7 mg/kg). The patients were instructed to fast for at least 6 h before the drug



Fig. 3. A child being prepared for an incisional biopsy carried out under intravenous-conscious sedation in a dental office setup.

was administered for sedation. All surgical procedures were performed by the local OMS (Fig. 1). Informed consent was obtained from all patients or their parents before treatment.

4. Posttreatment phase

After the procedure, all patients were observed for at least 1 h to guarantee sufficient recovery from the sedatives. Patients were requested to come back 3 days later for follow-up and assessment of sedation-related complications. After completion of the on-site training, the sustainability of the program was ensured by setting a specific weekly day to perform various oral and maxillofacial surgical procedures under sedation (Fig. 2 and 3) and by establishing a registry for patients managed under sedation in the center.

Ethical approval for this study was obtained from the MUHAS Institutional Review Board (Ref. No. DA.25/111/01). Participation in the program was voluntary. For confidentiality reasons, all respondents were registered in the study using serial numbers rather than their names.

RESULTS

The first IV-conscious sedation program at the University's Dental Clinic in Tanzania was successfully

Table 1. Patients' characteristics and details regarding the procedure

No	Age (years)	Sex	Weight (kgs)	Diagnosis	Treatment carried out	ASA score	Sedative agent used	Approximated Duration of treatment (minutes)
1	48	F	57	Inflammatory cyst-maxilla	Cyst enucleation	II	Midazolam	60
2	23	F	23	Ameloblastoma- mandible	Incisional biopsy	I	Midazolam	50
3	36	F	65	Maxillary tumor	Incisional biopsy	I	Midazolam	55
4	12	M	25	Ameloblastoma-mandible	Incisional biopsy	I	Ketamine	75
5	4	M	12	Burkitts Lymphoma-maxilla	Incisional biopsy	II	Ketamine	25
6	27	M	65	Impacted 3rdMolar-mandible	Disimpaction	I	Midazolam	80
7	16	F	52	Ectopic canine- Maxilla	Extraction	I	Ketamine	15
8	32	F	65	Impacted 3rdMolar-mandible	Disimpaction	II	Midazolam	70
9	33	F	93	Multiple caries- maxilla and mandible	Extraction	II	Ketamine	95

ASA, American Society of Anesthesiologists; F, female; M, male; No, number.

launched and included the establishment of protocols guiding the use of IV sedation in dental practice. Pretreatment case selection is crucial for the success of this program. Before clinical training on how to administer IV sedation, the patients were assessed, and the planned treatment was discussed. The selected patients had ASA I and II scores. During IV sedation training, nine patients underwent surgical treatment. The age range of the patients was 4 and 48 years, with a male-to-female ratio of 1:2. Most patients treated during the training phase had an ASA score of I, and both midazolam and ketamine were administered during training (Table 1). Different surgical conditions and subsequent management options contributed significantly to the learning experience. This was because the OMSs appreciated the usefulness of sedation in oral and maxillofacial surgeries. Moreover, the surgeons appreciated the ease of handling patients with anxiety using IV-conscious sedation. Of the nine patients, one had cerebral palsy and one had asthma. None of the patients experienced complications related to IV sedation during or after the training phase.

DISCUSSION

Clinical data from the MUHAS dental clinic registry shows that there has been an increase in the number of patients seeking dental care. With this, the number of patients who require special care during dental treatment is also on the rise. Most of the time, anxious or mentally challenged patients were taken to the major operating theatre at the Muhimbili National Hospital (MNH) (a tertiary health facility and teaching hospital for MUHAS) for dental treatment. In recent years, there has been an approximately two-fold increase in the number of oral and maxillofacial surgeries per annum in the major operating theatres of the MNH [8]. Therefore, with such an overload of cases requiring surgical care in the operating theatres of the MNH, patients with special needs had a delay in managing their oral health-related

conditions.

Considering the increasing demand for oral health-related conditions among patients with special needs in Tanzania, an alternative to general anesthesia was considered. Since the use of IV-conscious sedation is well established in other parts of the world [9,10] it has become sufficient proof that even in Tanzania, with appropriate equipment and training, such a program can be feasible. Therefore, the concept of establishing IV sedation services for dental patients has emerged.

The initial training for the IV conscious sedation program involved only three OMSs and three OMS residents. Such deliberate efforts were taken because, as in the United States of America, where OMSs are allowed to practice IV-conscious sedation [11], OMSs in Tanzania also undergo compulsory training in all aspects of anesthesia during their residency.

During the planning phase, the lectures included eight topics of interest; however, during on-site training, topics on emergencies related to conscious sedation were added. The emphasis on these additional topics was on cardiovascular and respiratory emergencies that could arise during conscious sedation, their pathophysiology, methods for avoiding complications, and managing these emergencies. The cardiovascular emergencies discussed in depth included hypo- and hypertension, arrhythmias, angina, and myocardial infarction. The respiratory emergencies taught included laryngospasm, bronchospasm, and respiratory depression. The management of these conditions was based on the protocols for managing sedation-related emergencies by Becker and Haas [12,13].

To facilitate a better understanding of the training, the visiting oral surgeon concentrated on the use of only two IV sedatives, midazolam and ketamine. Midazolam, a benzodiazepine, causes a period of anterograde amnesia following administration, which may be beneficial for patients with anxiety [14]. However, a side-effect of this drug is its tendency to cause respiratory depression [15]. In contrast, ketamine, an N-methyl-D-aspartate antagonist, is a sedative drug that also has an analgesic effect [2]. It tends to maintain both the patient's respiratory system

protective reflexes and muscle tone [2,15]; nevertheless, its disadvantage is its tendency to cause hallucinations during recovery [15]. The use of two different IV sedative agents enabled the trainees to appreciate the minor differences in the handling of patients who had been sedated with different drugs.

The selected patients for training were of a vast age range and had different ASA scores, body masses, and underlying conditions. This thoughtful selection of patients was achieved after a healthy discussion between the trainer and trainees. The idea behind this selection was to enable trainees to understand and learn how sedation works in individuals with different characteristics. All treatments performed during the training were surgical. This was not a coincidence; however, as mentioned earlier, the training exclusively involved OMSs and OMS residents. However, this established program is planned to be extended to other disciplines of dentistry (particularly pediatric dentists) and to facilitate the use of other sedative agents. We plan to establish continuous educational training for conscious sedation that will target dental professionals working in various parts of Tanzania.

Although investment in an IV-conscious sedation program in a university dental clinic helps reduce the workload in the main operating theatre, the main objective is to help patients in the long term. With the establishment of an IV-conscious sedation program, patients will be treated at the earliest time possible and in a cost-effective manner, as patients will not incur huge extra treatment costs of preoperative preparation, admission charges, and theatre charges [16].

One major limiting factor for the sustainability of this project was the high cost and limited availability of both equipment and sedative agents in Tanzania. The IV-conscious sedation program depended mainly on devices donated by the visiting oral surgeon, who was highly dedicated to helping countries with limited resources in the health field.

In conclusion, we report the successful establishment of a sustainable IV-conscious sedation program at a

university dental clinic in Tanzania, which can serve as a training center and become a model for the expansion of IV-conscious sedation programs to other parts of Tanzania. The establishment of an IV-conscious sedation program facilitates the early and cost-effective management of oral health-related conditions in patients with special needs in Tanzania. Therefore, this contributes significantly to the objective of providing equal and high-quality oral healthcare for all Tanzanians.

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