



*Full Length Research Papers*

# Experience with ambulatory anaesthesia for paediatric inguinoscrotal surgery in a surgical outreach

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Abstract

**Ambulatory anaesthesia for paediatric surgery has numerous benefits in appropriately selected patients. In rural surgical outreaches which constitute unusual environments with peculiar challenges, a specialized anaesthesia practice can improve outcome. This report highlights the experience of a specialized anaesthesia team in a rural surgical outreach for paediatric day case inguinoscrotal surgeries by the Lagos State Ministry of Health, Nigeria. Following logistic preparations and pre-surgical screening, resolutions of the anaesthetic outreach team were documented, while demographic, surgical and anaesthesia records of paediatric patients billed for inguinoscrotal surgery at various health centres between March 2007 and March 2009 were reviewed. These included types of surgery and anaesthesia as well as perioperative sequelae. Findings were documented and analysed using the SPSS v.16 software, and results presented as frequencies and means  $\pm$  standard deviation. A total of 535 patients aged 1-13yrs (mean- $8\pm 4.3$ ) with M:F ratio of 4:1 were seen. With preoperative cancellations in 25(4.7%), 510 patients were recruited. Surgical procedures were herniotomies 495(97.1%) and orchidopexies 15(2.9%). General anaesthesia was administered using volatile agents in 340(66.7%) and ketamine as sole agent in 170(33.3%). Mean duration of anaesthesia was  $37\text{min}\pm 12.2$ . Intraoperative and postoperative sequelae occurred in 8 (1.6%) and 49 (9.6%) patients respectively. No mortality or unanticipated admissions were recorded. Ambulatory anaesthesia for paediatric inguinoscrotal surgery offers advantages. Rural surgical outreaches are unusual settings with a need for high patient turnover, but specialised anaesthesia teams observing safe practice can improve outcome.**

**Keywords:** Ambulatory anaesthesia, paediatric surgical outreach, unusual environment.

## INTRODUCTION

Surgical outreaches designed by the government or philanthropic organizations are beneficial to the indigent in resource poor settings (Aderounmu et al., 2008; Umunna, 2011; Nwosu and Ezike, 2011) but they can be faced with challenges related to lack of skilled staff and equipments, anaesthesia in difficult environments (Hodges, 2007; Eguma, 2002), lack of access to comprehensive care, limited patient review times and the need to achieve rapid patient turnover (Verma et al., 2011; Nwosu and Ezike, 2011).

Ambulatory surgery where admission, anaesthetic review, surgery, recovery and discharge of patients are all conducted on the same day is advantageous to both patient and the healthcare provider, especially during surgical outreaches. There are however concerns and expectations to be met such as proper patient selection

through preoperative screening, and appropriate anaesthetic techniques targeted at rapid onset and recovery with minimal or no postoperative complications, thereby enhancing early discharge (Nwosu and Ezike, 2011; Rawal, 2001).

The paediatric age being the target population constitutes a high risk group with peculiar characteristics, and requires specialised care (Jacob, 2009), especially in such unusual setting, so as to reduce risks.

Careful consideration of these concerns with appropriate measures put in place will favour a good outcome with patient satisfaction. Anaesthetic management will therefore involve the conduct of safe anaesthesia in paediatric day stay surgery in unusual settings, bearing in mind the need for rapid patient turnover. This report highlights the anaesthetic

experience, with essential aspects of safe practice in ambulatory anaesthesia (AA) for paediatric inguinoscrotal surgeries in rural outreaches in a developing country.

## MATERIALS AND METHODS

Paediatric inguinoscrotal surgeries were conducted in 6 batches in 5 different health centres under the Lagos State Ministry of Health in Nigeria between March 2007 and March 2009, each session lasting between 5-10 days. Pre-outreach visits were made to each location by the surgical outreach team (comprising of the surgical, anaesthesia, nursing, pharmacy and laboratory teams) to assess the available facilities. The criteria for patient selection, approach to team organization and protocol for anaesthetic management at the various preparatory meetings of the anaesthetic outreach team were also documented.

### Patient selection

Following surgical screening to select the patients requiring simple surgical procedures appropriate for a community outreach and having the required minimum haemoglobin estimation, a pre-anaesthetic review by a consultant-led anaesthesia team was made.

Consenting patients in ASA categories I or II only, with responsible accompanying adults were eligible.

Exclusion criteria were those with fever, anaemia, diarrhea, respiratory tract infection (RTI), recent oral intake and those without consent.

### Team organization and protocol

Essential surgical and anaesthetic equipment were transported to the various locations which had not been used for surgical operations, or had any purpose built operating rooms.

The settings comprised of 2 operating theatres/rooms usually, each being supervised by an anaesthetic consultant. Each theatre was equipped with one anaesthetic machine, a source of oxygen, two self-inflating bags and two operating tables. Assigned to man each operating table was an anaesthetic medical officer/registrar or anaesthetic nurse. One table was for the conduct of inhalational anaesthesia with the anaesthetic machine, and the second was slated for those who received sole ketamine anaesthesia.

Paediatric versions of essential anaesthetic equipments, breathing circuits, airway maintenance devices and monitors were provided in each theatre.

Close preoperative patient observation was at the reception area, and patients were scheduled according to their age group such that surgery was performed on the younger patients first.

A designated recovery room (RR) or area was manned by at least two nurses and equipped with pulse

oximeters, suction machine, an oxygen source and means of administration. At the end of surgery, all patients were recovered from anaesthesia and observed in the RR for at least 2hrs, with monitoring of their vital signs and SaO<sub>2</sub>. Discharge of patients was made by the anaesthetist after full recovery.

Provision of a standby ambulance at each centre was made with an understanding with a tertiary centre for patient transfers in the event of an emergency.

### Anaesthetic preparation

In line with recommended fasting guidelines, clear fluids (water, sprite and 7up) were allowed up to 2hrs before anaesthesia.

An anaesthetic protocol that provides a practical technique conducive in our prevailing environment and with enhanced recovery was chosen.

Minimum monitoring was provided with pulse oximetry and precordial stethoscope.

Relatively short acting, fast emergence (S.A.F.E.) agents and anticholinergic prophylaxis was administered, while basic resuscitation drugs were provided.

Simple analgesics were chosen for pain management.

Venous access was established (generally at induction, but pre-induction in children above 10 yrs) with infusion of 4.3% dextrose in 0.45% saline.

The demographic records of patients scheduled for surgery were documented as well as perioperative findings. Data was analysed using the SPSS v.16 software and results were presented as frequencies and means  $\pm$  standard deviation.

## RESULTS

A total of 535 patients with mean age of  $8 \pm 4.3$  years and a male to female ratio of 4:1 belonging to ASA categories I (523:97.8%) and II (12:2.2%) were seen. Preoperative cancellations occurred in 25 (4.7%) patients due to RTI (10), fever (8), anaemia (3), and oral intake (4); and 510 (95.3%) patients were fit for anaesthesia (Table 1). Types of surgery and anaesthesia are as shown in Table 2 and prophylactic anticholinergic (atropine) was used in all patients. Intraoperative analgesia was achieved by IV paracetamol-15mg.kg<sup>-1</sup> (100%) and ibuprofen-1.5 mg.kg<sup>-1</sup> (45:23.5%), while postoperative skin infiltration with 0.125% plain bupivacaine (2 mg.kg<sup>-1</sup>) was offered in 358 (70.2%) patients. Mean duration of anaesthesia was  $37 \pm 12.2$  min. Intraoperative and postoperative sequelae seen in 8 (1.6%) and 49 (9.6%) patients respectively were successfully managed with pain being the commonest complication 20 (3.9%). No mortality or unanticipated admissions were recorded (Table 3).

## DISCUSSION

Ambulatory anaesthesia (AA) also called "daycase",

**Table 1.** Demographic and perioperative characteristics

|  |               |
|--|---------------|
| Number of health centres                     | 5             |
| Total number of patients screened            | 535           |
| Preoperative cancellations n(%)              | 25(4.7)       |
| Total number of patients operated n(%)       | 510(95.3)     |
| Age range in years (mean±SD)                 | 1-13(8 ± 4.3) |
| Male : Female ratio                          | 4:1           |
| ASA categories n(%)                          |               |
| I  | 523(97.6)     |
| II   | 12(2.4)       |
| Duration of anaesthesia in minutes (mean±SD) | 37±12.2       |

**Table 2.** Types of surgery and anaesthesia.

| <b>Types of surgery</b>     | <b>n(%)</b>     |
|-----------------------------|-----------------|
| Herniotomy                  | 495(97.1)       |
| Unilateral                  | 473(92.7)       |
| Bilateral                   | 22(4.4)         |
| Orchidopexy                 | 15(2.9)         |
| <b>Total</b>                | <b>510(100)</b> |
| <b>Types of anaesthesia</b> | <b>n(%)</b>     |
| General anaesthesia         |                 |
| Inhalational                | 340(66.7)       |
| with face mask              | 312(61.2)       |
| with LMA                    | 28(5.5)         |
| Intravenous (sole ketamine) | 170(33.3)       |
| <b>Total</b>                | <b>510(100)</b> |

**Table 3.** Perioperative outcome.

| <b>Intraoperative complications</b>       | <b>n(%)</b>    |
|---|----------------|
| Vomiting                                  | 5(1.0)         |
| Laryngospasm                              | 3(0.6)         |
| <b>Total</b>                              | <b>8(1.6)</b>  |
| <b>Postoperative complications</b>        | <b>n(%)</b>    |
| Pain                                      | 20(3.9)        |
| Shivering                                 | 15(2.9)        |
| Vomiting                                  | 8(1.6)         |
| Delayed recovery                          | 6(1.2)         |
| <b>Total</b>                              | <b>49(9.6)</b> |
| <b>Unanticipated admissions/Mortality</b> | <b>0(0)</b>    |

“daystay”, “daycare”, office-based or “outpatient anaesthesia” has numerous benefits for appropriately selected patients. These include reduced waiting times, increased patient turnover, as well as minimal disruption to family and social settings. Particularly with children, avoiding the psychological trauma of separation that is associated with hospitalization is very important. Equally important is that the risk of nosocomial infections is also reduced for daycase patients. The child is allowed to recuperate in a home environment (Letts et al., 2001)

which offers cost effective benefits. (Obalum et al., 2008). Paediatric patients have been described as excellent candidates for ambulatory surgery as most are healthy, and paediatric surgical procedures are simple and associated with prompt recovery (Letts et al., 2001). Due to their peculiar characteristics however, they require specialized care for a favorable outcome, particularly in rural settings (Nwosu and Ezike, 2011).

A successful surgical outreach must aim at providing safe and rapid recovery, avoiding backlog and increasing

the turnover rate if patients are to be discharged home on the same day. The logistics to support this include proper patient selection, efficient team organization and appropriate anaesthetic management protocols.

The transport of equipments to unusual sites for anaesthesia and provision of two operating tables per theatre to facilitate increased number of surgeries is well documented (Umunna, 2011; Nwosu and Ezike, 2011), and problems with equipments, connections, power generation, water supply, poor or no operating lights are also not uncommon. That is why our team, following a pre-outreach visit, was able to provide the essential equipment and the logistic support needed to set the stage for a successful outreach.

The pre-anaesthetic review was conducted on patients following surgical review on the same day - an approach documented by previous workers. (Nwosu and Ezike, 2011). Emphasis was to assess general wellbeing, exclude allergies and likely airway difficulties though intubation was not planned (being short procedures in fasted patients). Cancellation of cases and non-selection of patients are important safety measures that must be employed when patients are judged unfit for daycase anaesthesia, the commonest cause in this outreach being URTI. Although, URTI (or common cold) in children, increase the incidence of respiratory complications under anaesthesia namely cough, breath holding, desaturation, laryngospasm and bronchospasm, whether or not to proceed with anaesthesia in such patients, still remains a dilemma (Tait and Malviya, 2005). Recent oral intake by a child is not enough reason for cancellations but it may result in delayed procedures and time wasting (Nwosu and Ezike, 2011). Therefore, while fasting guidelines were maintained as much as feasible with close supervision by the nursing team in the reception area to ensure strict compliance, younger patients were scheduled earlier on the operation list to avoid a counterproductive and prolonged fast.

Use of prophylactic anticholinergics in paediatric patients offers vagolytic benefits, obtunds cardio-depressant effects of halothane, and reduces ketamine-induced hypersecretion.

Adequate oxygenation was ensured with 50% oxygen administration to those who received inhalational anaesthesia, bearing in mind the possibility of haemoglobinopathies in our environment and complications of hypoxia, more so since sickling tests were not performed. Significant desaturation was however absent except during periods of laryngospasm and vomiting in a few patients.

The relatively S.A.F.E. drugs available in our environment include propofol, ketamine, halothane and isofurane. Induction of anaesthesia using intravenous propofol in older children with venous access remains the gold standard of ambulatory anaesthesia because it has an early-recovery and early-discharge profile (Runcie et al., 1993). In a study carried out by Moore et al., (2003),

propofol induction and halothane/nitrous oxide maintenance of anaesthesia was found to be superior to sevoflurane/nitrous alone. The latter being associated with delirium, nausea and vomiting. Halothane is sweet smelling and can be safely applied by facemask for inhalational induction of smaller children without the bucking, salivation, coughing, breathholding and laryngospasm that is experienced with isoflurane (Pandit et al., 1985). However, isoflurane has a faster recovery profile compared with halothane and can be used for maintenance of anaesthesia following halothane inhalational induction as found in our study. Imarengiaye and associates (2009) have reported similar techniques of spontaneous ventilation with face mask and endotracheal anaesthesia in their practice of AA for paediatric patients. Endotracheal anaesthesia and suxamethonium were however not indicated in our setting, and they are best avoided in AA practice to prevent airway complications that may delay discharge, and 'suxamethonium pains' worsened by early ambulation respectively (Rawal, 2001). Of beneficial use in AA are laryngeal mask airways (Rawal, 2001; Eyelade, 2008) but due to limited supply, they were not frequently employed. Due to limited supply of anaesthetic machines, sole ketamine anaesthesia was administered in some older patients using the second operating table. In the hands of untrained personnel, this can be dangerous and must not be encouraged. However, in older children requiring operations of short duration and when administered by trained personnel in limited resource settings, ketamine anaesthesia has been found to be safe. (Iregi, 2002; Nwosu and Ezike 2011; Ilori, 2011).

Simple analgesics such as IV paracetamol ( $15\text{mg.kg}^{-1}$ ) coupled with wound infiltration with 0.125% plain bupivacaine ( $2\text{mg.kg}^{-1}$ ) at skin closure is a straight forward and practical technique of ensuring good analgesia. A loading dose of paracetamol  $40\text{mg.kg}^{-1}$  has been recommended, followed by a regular dosing of  $90\text{mg.kg}^{-1}\text{day}^{-1}$  to maintain therapeutic plasma concentrations thereby enhancing the analgesic effect (Wolf, 1999; Zacharias and Watts, 1998). Remifentanil, a titratable ultra-short acting opioid which may be used for AA, although not readily available in our environment, will require supplemental analgesia in the immediate postoperative period (Ross et al., 2001; Lonnqvist and Morton, 2005). The available opioids, such as pentazocine were omitted since procedures were of short duration and undesirable effects of nausea, vomiting and drowsiness can delay discharge.

In the study carried out by Kotiniemi et al. (1997), pain following daycase surgery in children was much less for inguinoscrotal surgeries in comparison with adenoidectomies and tonsillectomies. The incidence of pain (56%) was reported to be highest on the day of operation.

The high patient coverage that is important in ambulatory surgical outreaches was achieved by

meticulous titration of anaesthetic drugs, close monitoring, and early recovery from anaesthesia. All patients were subsequently observed in the RR and discharged by the anaesthetist after full recovery according to the team protocol.

Safety in AA has been measured in relation to unplanned admissions, return to facility and complication rates (Rawal, 2001). We were not faced with the first two challenges and complication rate (9.6%) was similar to earlier reports from Ilori (2011) and Edomwonyi (2006). In consonance with findings by Faponle (2007), Obalum et al., (2008) and Imarengiaye et al., (2009), pain was the commonest complication in our study and can contribute significantly to delayed discharge. Complications of delayed recovery and vomiting may not be unrelated to ketamine use, but these did not warrant any admissions.

However, respiratory complications were lower than values reported by Ilori et al. (2011) and Edomwonyi et al., (2006). This was expected because only ASA I and II paediatric patients having ambulatory inguinoscrotal surgery were reported in our study, whereas they studied patients ranging from ASA I to V with a wider and more complex case-mix in teaching hospital settings. Although paediatric anaesthesia practice should not be associated with adverse outcomes in experienced hands (Jacob, 2009), higher surgical risk categories and ASA status have been associated with higher incidence of perioperative complications and these patient types must never be treated as daycases. All complications in our series were however successfully managed.

Working in an unusual anaesthesia environment with inadequate facilities, inadequate staff welfare and fatigue (Nwosu and Ezike, 2011) in the face of high patient turnover are documented challenges in surgical outreaches (Fisher et al., 2001). A multitask approach with team cooperation and communication is essential. Safety however can be optimized by provision of appropriate equipments, proper selection of patients, procedures, anaesthetic techniques and discharge criteria (Rawal, 2011). A specialised anaesthesia team ensuring safe practice with patient satisfaction is also very crucial to success.

## CONCLUSION

The challenges associated with ambulatory anaesthesia for paediatric inguinoscrotal surgery in surgical outreaches can be overcome by proper planning, team cooperation and communication, as well as specialised anaesthetic teams observing safe anaesthesia practice.

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