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Anaesthetic and surgical management of airway penetrating injuries in children in resource-poor setting: Case reports



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ABSTRACT

INTRODUCTION: Impacted penetrating foreign body (FB) in the airway especially the postnasal space presents with management challenges. The challenges are worsened by lack of modern equipment in resource-poor settings. Two suchlike cases were managed in this report.

PRESENTATION OF CASES: Case 1: A 4-year-old girl who fell on a metal rod in her mouth while playing alone. Examination revealed an agitated child in open mouth posture, with a silvery straight metallic object impacted on the hard palate and projecting from the mouth. X-ray of the post nasal space showed a radiopaque object through the hard palate impinging on the skull base.

Case 2: A 5-year-old male presented with swollen neck and difficulty in breathing following a fall on a sharp pencil while at play in school. The object which pierced through the neck was immediately removed by an attendant. Examination revealed a child in obvious respiratory distress with swollen neck, face and eyes with a slit measuring 2 cm over the crico-thyroid membrane (subcutaneous emphysema).

DISCUSSION: With no available fibre-optic laryngoscope, classical Macintosh laryngoscopy was infeasible. With refusal of tracheostomy, the authors employed three-man intubation technique to successfully secure the airway for excision of the FB in first patient. The second was induced with IV ketamine since he could not tolerate the supine position and facemask. Due to falling oxygen saturation, an orotracheal intubation was done before a successful mid-level emergency tracheostomy was sited.

CONCLUSION: Penetrating airway injuries in children pose serious management challenges. Careful anticipation and quick intervention are helpful.

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1. Introduction

Impacted penetrating foreign body to the postnasal space/airway in children is uncommon but presents with airway management challenges [1]. In contrast, foreign body lodgements in cavities of the head and neck are common in emergency rooms [2]. Management challenges are occasioned by unavailability of ideal working instruments in resource-poor settings [3,4]. Therefore, practitioners grapple with archaic instruments or improvise to rescue threatened airways. These case reports highlight the difficulties encountered in securing the airway and extracting foreign body in a child whose airway was compromised due to penetrating foreign body in the hard palate and in another, whose injured airway resulted in subcutaneous emphysema, before placement of tracheostomy tube.

This work has been reported in line with the SCARE criteria [5].

2. Presentation of cases

CASE 1: AM, a four-year old female was brought by parent to the Emergency Paediatric Unit of the Benue State University Teaching Hospital, Makurdi, Nigeria, with a two-and-a-half hour history of fall over manual screw-driver held in her mouth while playing alone in a room. The metallic portion of the screw-driver pierced her via the open mouth, penetrated and impacted the hard palate. There was minimal external bleeding but no cerebrospinal fluid leak. The patient could not feed, phonate or close mouth which was drooling saliva. There was no convulsion or altered consciousness (Fig. 1).

Physical examination showed an irritable child with open mouth drooling blood-stained saliva. She was neither pale, dehydrated nor in respiratory distress (rate 22cycles/minute). The pulse rate was 102beats/minute. The blood pressure could not be taken

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Fig. 1. Showing the child at presentation.



Fig. 2. Skull radiograph showing foreign body penetrating the hard palate through the open mouth.

due to inappropriate cuff. Only first and second heart sounds were heard.

Oral cavity examination revealed a silvery straight metallic object impacted and projecting from the mouth. The object pierced the posterior end of the hard palate at the midline. The oral mucosa was blood-stained. The faucial pillars appeared normal; tonsils were atretic. The nasal cavities were patent, dry with central septum. The abdomen was normal. Patient was assessed American Society of Anesthesiologists class IIE. Body weight was 12 kg. Nil per os regimen was instituted.

Investigations requested were: X-ray post nasal space, full blood count (FBC), retroviral test, serum electrolytes/urea/creatinine(SEUC).

X-ray showed radiopaque straight object through the open mouth penetrating the hard palate, nasopharynx that impinged the skull base (Fig. 2). Packed cell volume was 42%. The other components of FBC/SEUC were undone for financial constraints. Patient was booked for emergency exploration of the oral cavity/FB extrac-



Fig. 3. The foreign body (metallic portion of a manual screw driver) after surgical removal.

tion under general anaesthesia. Intravenous fluid 4.3% dextrose in 0.18% saline was commenced alongside IV ceftriaxone 500 mg and metronidazole 250 mg.

We observed that laryngoscopy with the classical Macintosh or Magill laryngoscope would be challenging as the FB was lodged centrally across the mouth and projected above the lips making bag-mask ventilation difficult [6]. To overcome these, a larger-than-size facemask was placed so that the anterior tip of the FB was within the mask. A three-man intubation team was set up. Inhalational induction was performed with incremental dose of halothane. Suxamethonium 18 mg was given for muscle relaxation. One of the three (Anaesthesia Registrar) applied cricoid pressure. The Consultant Anaesthesiologist inserted the blade of the laryngoscope (Macintosh laryngoscope, Timesco Orion, UK) to the left side of the mouth away from the foreign body and lifted the tongue with the floor of the mouth. The third assistant, the Consultant otorhinolaryngologist then picked the tip of the tongue with a Magill's forceps and lifted it up and out. The larynx came into view. A size 5.5 mm cuffed endotracheal tube (ETT) was passed from the right side of the mouth lateral to the foreign body into the trachea. The tube was inflated and cricoid pressure released. The throat was packed and patient was maintained on isoflurane 1.8%/100% oxygen under manual ventilation. Intravenous fentanyl 25mcg was given for analgesia.

Thereafter, oral cavity, oropharynx and nasopharynx were examined directly and with the aid of postnasal mirror. Findings were that of a silvery metallic object (screw driver) measuring about 8.5 cm (Fig. 3).

The puncture site was infiltrated with epinephrine 1:100,000. Incision made encompassing the wound site and palatal flap was raised and bone around FB drilled to free it. The edges of the wound was debrided and haemostasis secured by diathermy. Wound was irrigated and flap edges apposed with interrupted suturing using vicryl 4/0. Oropharyngeal pack was removed and patient was recovered from anaesthesia. Patient was placed on nil per oral for 12 h while continuing IV-fluids, antibiotics and analgesics. Patient did well and was discharged on second post-operative day for financial constraints. Follow-up interaction confirmed she is doing well.

CASE 2: GBN, a five-year old male was brought from school to the Accident and Emergency department, Federal Medical Centre, a tertiary hospital in Jalingo, Nigeria with complaints of swollen neck and breathlessness following a fall on a sharp pencil while at play. The object pierced through the anterior neck and was removed by the school attendant. The child had difficulty breathing and the neck, face and eyes were swollen. The time between the accident and arrival at the hospital was not ascertained.



Fig. 4. The child with subcutaneous emphysema following penetrating pencil to the neck.

Casualty Officer's examination revealed a dyspnoeic, aphonic child with swollen neck. There was decreased breath sound in the chest. Respiratory rate was not documented. Cardiovascular system was not examined. The otorhinolaryngologist was invited.

Otorhinolaryngologist's examination revealed a severely dyspnoeic, irritable child who preferred the sitting position. He had subcutaneous emphysema extending from the forehead, face and eyes to the chest involving the upper limbs. There was a stab wound measuring 2 cm x 2 cm along the skin crease at the cricothyroid membrane (Fig. 4). Patient was booked for emergency tracheostomy.

In the theatre, he could not lie supine. Peripheral oxygen saturation in room air was 88%; PR was 143beats/min. He rejected facemask. He was induced with IV ketamine 36 mg after premedication with IV atropine 0.3 mg. An initial attempt at sitting a tracheostomy was aborted because of rapid desaturation. Endotracheal intubation was done using suxamethonium 20 mg with lubricated cuffed ETT (Braun, UK) size 5.0 mm. Oxygen saturation improved but there was air leakage through the slit on the neck. He was maintained on 1% halothane in 100% oxygen.

A mid-level tracheostome was fashioned between tracheal rings 2–4 and a metallic paediatric (size 4.5) tracheostomy tube (T-tube) was introduced and secured. A size 4.0 mm ETT tube was inserted into the T-tube after removing the inner tube. The catheter mount was disconnected from the ETT and connected to the 4 mm tube attached to the T-tube. The ETT was then removed. Anaesthesia was maintained via the T-tube-ETT mount till the surgeon completed the skin repair and applied dressing. The patient was recovered from anaesthesia and placed on oxygen placed over the T-tube and discharged to the ward for intensive nursing care of the tracheostomy (Fig. 5). The time from arrival at the A&E to anaesthesia/surgical interventions was 59 min.

Patient made good recovery and was discharged home after 7 days. At follow-up visit two weeks later, the slit on the neck had healed.

DISCUSSION: Penetrating oropharyngeal injuries due to sticks, pencils, pens, toys etc have been severally reported [7,8]. However, penetrating impacted hard palatal injury such as our first case and that involving the larynx with resultant massive subcutaneous emphysema like the second case are uncommon. FB's, penetrating or otherwise, are commoner in children [9,10]. The penetration of FB's is enhanced by falls while handling the objects or holding same in the mouth [11–13].

Some authors believe that anatomical differences in the paediatric palate and practices such as thumb sucking and feeding patterns account for the tendency of objects to adhere to the hard



Fig 5. The child after a successful placement of a tracheostomy.

palate thereby resulting in penetrating injury on impact [14]. The objects commonly implicated in injuries to the oral cavity and oropharynx include pipes, cylindrical toys and pens among children under 6 years [15]. Our cases are both children under 6 years who were playing with suchlike pointed cylindrical objects. Potentially life threatening complications can occur following such injuries that may require active management like our second case with massive cervical emphysema [14,15].

In a well-equipped centre, the airway management challenges presented by the first case could easily have been surmounted by the use of either a flexible fiberoptic, Bonfils or Glidescope video laryngoscopes [16,17]. These pieces of airway management equipment were unavailable to the authors as is the case in many sub-Saharan settings. The authors were left with the option of using ingenuity to improvise what was on ground, the Macintosh classical laryngoscope. Alternatively, tracheostomy would have been an option but the procedure is poorly acceptable to patients and their relatives [18].

These cases re-emphasize the need for parents and care givers to give proper supervision to growing children at home and school. The economic downturn in the country has meant that both parents work, often leaving growing children unattended or attended by siblings. Poor family planning/child spacing compounds this problem. Generally, school environments in our setting complicate matters as children often play unattended. Our patients were playing with manual screw-driver and pencil unnoticed and unattended until they got injured.

3. Conclusion

Penetrating airway injuries in children, though rare, can pose serious management challenges. Importantly, care givers should pay more attention to children and keep away sharp objects.

Conflict of interest

None.

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Ethical approval

Ethical approval was sought from the Health Research Ethics Committee of the Benue State University Teaching Hospital for these case reports.

Consent

Written informed consent was obtained from the parents of the patients for publication for these case reports and the accompanying images. Copies are available on request.

Author contribution

Bassey E. Edem: Concept and design of study, data collection, data interpretation and analysis, drafting, revision, approval of final manuscript.

Amali Adekwu: Data collection, interpretation, analysis, drafting, revision and approval of final manuscript.

Michael E. Efu: Data collection, revision and approval of final manuscript.

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Gerald Onuchukwu: Data collection, revision and approval of final manuscript

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Guarantor

Dr. Bassey E. Edem

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.ijscr.2017.07.047>.

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