ORIGINAL ARTICLE

Anaesthesia for Maxillofacial Surgeries: A 10 Year Review in ABUTH Zaria

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ABSTRACT

Background: Maxillofacial surgeries pose lots of challenges to the attending anaesthetist especially as regards emergency airway management. The anaesthetist must be conversant with the techniques and appliances of managing both anticipated and unanticipated difficult airway.

Objective: To present a retrospective review of the anaesthesia for 952 cases of maxillofacial surgeries treated over a period of ten years (2006 - 2015) in Ahmadu Bello University Teaching Hospital (ABUTH) Shika-Zaria, Nigeria.

Methodology: After obtaining ethical approval from the hospital Ethics Committee, data were sourced from the clinical records of 952 cases of maxillofacial surgeries in ABUTH. All the patients had pre-anaesthetic assessment by the attending anaesthetist and informed consents were taken. Decision for the intubation technique was based on airway assessment by Mallampati classification, thyromental distance and atlanto-axial mobility. All patients were premedicated with intravenous atropine 10mcg/kg on the operating table.

Results: Our findings identified fractures as the most common injury suffered by the patients, affecting 264 patients (27.7%), followed by ameloblastoma 168 patients (17.6%). Patients who had foreign body in the nostril were 10 (1.1%), while 165 (17.3%) were unclassified cases. Nasal intubation with direct visualization of vocal cords occurred most frequently (62.9%), followed by fibre-optic intubation (24.9%). Oral intubation was carried out in 44 (4.6%) patients, while tracheostomy was performed in 72patients (7.6%). In 281patients with anticipated difficult airway, fibre-optic intubation was attempted in all cases with asuccess rate of 84.7%.

Conclusion: Difficult airway in maxillofacial surgeries is common anddemands special attention. Time of surgery should be carefully planned allowing reduction of anaesthetic morbidity and mortality.

***Key words**: Difficult airway, Premedication, Anaesthetic plans, Fibre-optic intubation, Tracheostomy.*

INTRODUCTION

Management of the airway of patients with craniofacial disorders poses many challenges to the anaesthetist physician. Anatomical abnormalities may affect intubation, airway management, or both.[1] In trauma patients, the difficulty of airway management can complicate their injuries.[2] The primary challenge is to secure the airway for adequate and effective breathing and ventilation.[2]

Another significant consideration is the temporo-mandibular joint (TMJ) function, the hinge that opens the upper airway and also translocates the lower jaw forward.[1] In cases of restriction, it is important to determine if rigidity is fixed or may be overcome once the patient is anesthetized. Causes of fixed rigidity and or ankylosis of the TMJ include congenital anomalies or previous trauma; these will not change with anaesthesia. In patients with head and neck neoplasm, the incidence of difficult airway is high due to factors such as limited head and neck movement, reduced mouth opening or limited upper airway space due to tumour or previous surgeries.[3]

To the best of our knowledge, there has not been a review on anesthetic management of oral and maxillofacial patients in our hospital Ahmadu Bello University Teaching Hospital (ABUTH) Shika-Zaria, Nigeria in the past. This article aimed at reviewing the practice of anaesthesia for maxilla-facial and dental surgery in our institution, a tertiary health institution in North-West Nigeria.

METHODOLOGY

Case notes of 952 patients were reviewed and data retrospectively obtained from patients aged 5 weeks - 70 years; who had maxillofacial surgeries between January 2006 and December 2015.

Data collected include diagnosis, number of cases operated per year, gender, age, pre-operative haemoglobin value, American Society of Anaesthesiology (ASA) physical classification and airway management technique. Kruskal-Wallis test was used to analyze the data generated and presented in percentages.

Approval for the study was obtained from the hospital Ethics Committee (ABUTH/PGO/COMM/16)

The conventional protocol for anaesthetic management for maxillofacial surgeries was followed for all patients. Thus, pre-anaesthetic assessment was done by the attending anaesthetist and written informed consent was obtained from all the patients, followed by the administration of general anaesthesia for different surgical procedures. Decision for the intubation technique was based on airway assessment by Mallampati class III and IV, thyromental distance of less than 12.5cm, inter-incisor gap of equal or less than 4cm and atlanto-axial mobility. Patients who did not meet at least two criteria were labeled as anticipated difficult airway.

Airway management followed the standard plan. Plan A is the conventional laryngoscopy with endotracheal intubation. Plan B is the conventional laryngoscopy with the use of airway adjuncts such as gum elastic buggies, lighted stylet or malleable stylet. Plan C comprises the use of laryngeal mass airway (LMA) or fibre-optic laryngoscope. Plan D involves the use of crico-thyroidotomy, mini tracheostomy or surgical tracheostomy. Airway management was secured either by fibre-optic intubation or surgical tracheostomy in anticipated difficult airways. Nasal intubation was planned for all patients, but surgeons' preference was also a guiding factor for the choice of nasal or oral intubation.

Routine monitoring, in the form of non-invasive blood pressure, pulse oximetry and electrocardiography was instituted on arrival to the operation theatre, with capnograph placed in between the anaesthetic circuit and endotracheal tube to confirm endotracheal intubation. All patients were premedicated with atropine 10mcg/kg IV on the operating

table. For patients in whom airway was considered adequate, anaesthesia was induced with propofol 1.5mg/kg, intubation was facilitated with suxamethonium 0.5mg/kg and maintained with non-depolarizing muscle relaxants (pancuronium or atracurium), oxygen and halothane/isoflurane. Residual effects of non-depolarizing muscle relaxant were antagonized by mixture of neostigmine 80mcg/kg and atropine 20mcg/kg administered intravenously. Extubation was carried out with the patients' return of spontaneous breathing with patients fully awake and having satisfactory muscle power. Patients who had reduction and immobilization secondary to fracture were extubated in the ward.

Patients with anticipated difficult airway were considered unsuitable for conventional laryngoscopy and endotracheal intubation. This group of patients had administration of intravenous anaesthetics with propofol 2mg/kg and suxamethonium 1mg/kg. Analgesia was provided by instillation of 2% lidocaine into the nasal cavity and allowed to stay in nasopharynx for 3-5 minutes, to provide surface analgesia. Tracheal mucosa was anaesthetized with 2-3 ml of 2% lidocaine injected through cricothyroid membrane and needle withdrawn immediately before patient start coughing. The cough enhances the spread of local anaesthetics over tracheal mucosa and vocal cords.

Nasal intubation was established via a flexible fibre-optic bronchoscope with a well lubricated endotracheal tube introduced through the nostril into the pharynx and finally into the trachea. Manipulation was needed in most cases by way of flexion of the neck, and extension at atlantoaxial joint; and stabilization of larynx by cricoid pressure and correcting direction of endotracheal tube. Some patients had surgical tracheostomy either due to failed fibre-optic bronchoscopy or where the use of fibre-optic bronchoscopy was not feasible.

RESULTS

There were a total of nine hundred and fifty-two (952) patients with maxillofacial surgeries treated at Ahmadu Bello University Teaching Hospital Zaria over a period of ten years. A majority of the cases was done in 2008 (15.4%), as seen in Figure 1.

The three most common indications were facial fracture 264 (27.7%), followed by Ameloblastoma 168 (17.6%) and squamous cell-carcinoma 65 (6.8%), while the least common of the cases were foreign body in the nostril constituting 0.2% (Figure 2). Five hundred and sixty-six (59.5%) patients were male whereas 386 (40.5%) were female. The mean haemoglobin was 12.3 ± 2.1(g/dl). Majority of our patient were ASA I constituting 49.2%; with ASA II and III constituting 44.3% and 6.5%, respectively. None of our patient was of ASA IV or V category. Five hundred and ninety-nine (62.9%) had conventional airway management, while 353 (37.1%) of patients had advanced airway management (Table 1).

Nasal intubations were achieved in 836 patients (87.8%), with direct visualization of vocal cords in 599 patients constituting 71.6%, while intranasal fibre-optic intubation and tracheostomy accounted for 237(28.3%) and 72(7.6%) cases, respectively. Oral intubation was carried out in 44 patients (4.6%), see Table 3.

Success and failure rate of both fibre-optic intubation and surgical tracheostomy reveals success rate of 84.7% and 100%; and failure rate of 15.3% and 0% respectively (Table 3).

Figure 1. Graphic representation of the trend of number of cases done for the 10 years

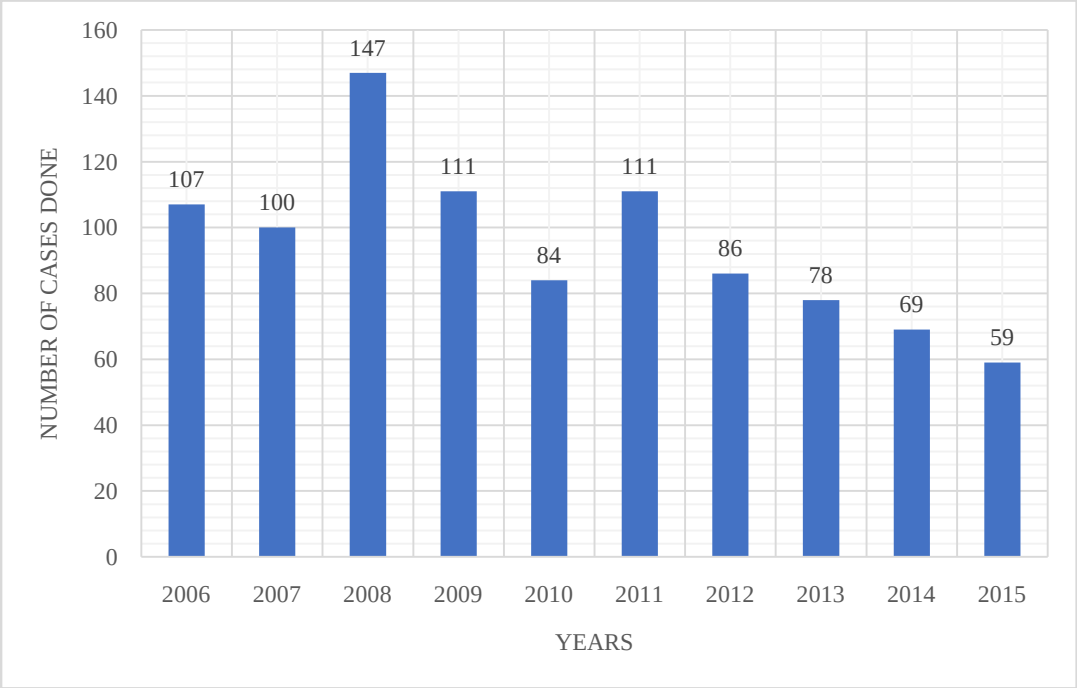
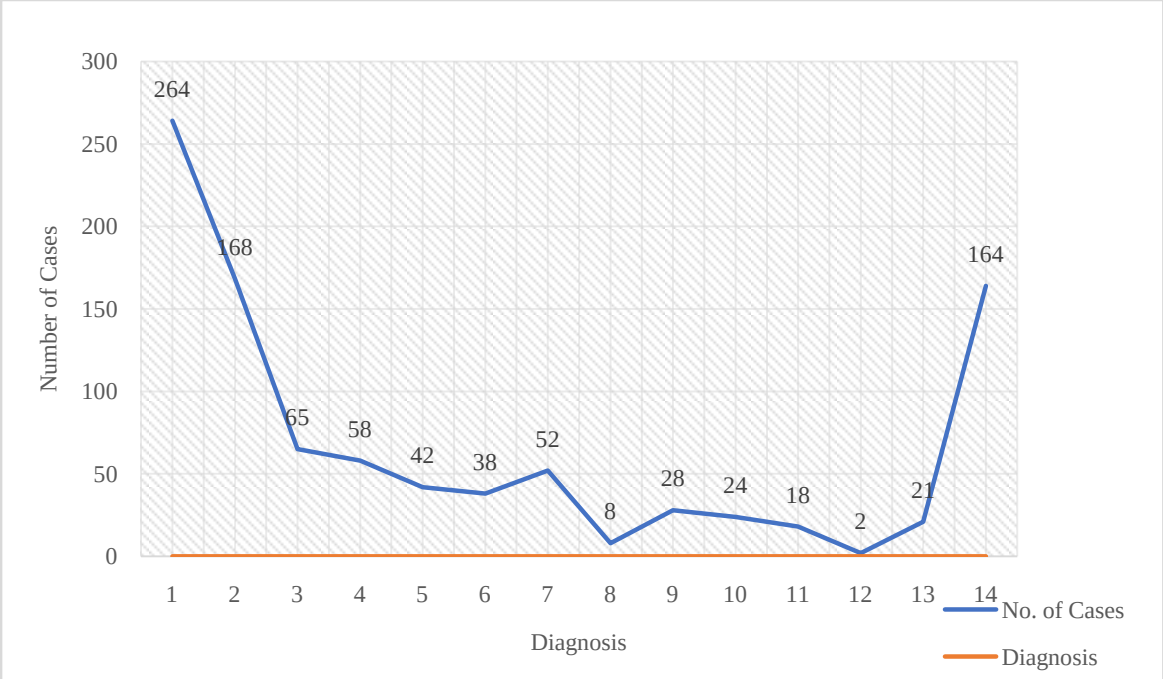


Figure 2. Graphic representation of the Number of Cases verses the diagnosis



Footnote for Diagnosis:
1: Facial Fracture, 2: Ameloblastom, 3: Carcinoma, 4: Haemangioma, 5: Lymphangioma, 6: Facial defects, 7: Cleft lip/palate, 8: Gunshot injuries, 9: Neurofibroma, 10: Avulsed upper lip, 11: Parotid cyst, 12: Foreign body in nostril, 13: Lymphoma, 14: Others

Table 1. Patients chart based on Diagnosis and number of cases, Gender, Age, Pre-operative Haemoglobin, and Airway Management techniques

Diagnosis/ Cases	Gender M	F	Age (Yrs)	Pre-operative Haemoglobin value (g/dl)	Airway management Conv*.	Advance**
Facial Fracture (264)	187 (70.8%)	77 (29.2%)	33.1±11.4	12.6±2.2	166(62.9%)	98(37.1%)
Ameloblastoma (168)	115 (20.3%)	53 (13.7%)	32.4±6.2	12.3±4.0	133(79.2%)	35(20.8%)
Carcinoma (65)	38 (6.7%)	27 (6.9%)	37.4±5.7	12.1±4.2	54(81%)	11(19%)
Haemangioma (58)	22 (3.8%)	36 (9.3%)	27.3±9.1	12.2±1.2	21(36.3%)	37(63.7%)
Lymphangioma (42)	21 (3.7%)	21 (5.4%)	28.4±6.1	12.0±2.1	33(79.6.4%)	9(20.4%)
Facial defect (38)	26 (4.5%)	12 (3.1%)	30.2±9.5	12.3±2.0	26(69.4%)	12(30.6%)
Cleft lip/ palate (52)	19 (3.5%)	33 (8.5%)	5.4±5.0	12.4±2.3	30(57.7%)	22(42.3%)
Gunshot injuries (8)	8 (1.4%)	0 (0%)	32.2±5.8	12.3±2.1	6(75%)	2(25%)
Neurofibroma (28)	18 (3.1%)	10 (2.5%)	20.1±4.3	12.4±2.3	3(10.7%)	25(89.3%)
Avulsed upper lip (24)	18 (75%)	6 (25%)	32.1±5.3	12.0±2.1	16(66.7%)	8(33.3%)
TMJ ankylosis (24)	15(62.5%)	9(37.5%)	20.625	12.4±2.3	0(0%)	24(100%)
Parotid cyst (18)	8 (44.4%)	10 (65.6%)	10.4±4.5	12.3±3.0	5(27.8%)	13(72.2%)
Foreign body in nostril (2)	2 (100%)	0 (0%)	30.6±11.1	12.2±2.1	2(100%)	0(0%)
Lymphoma (21)	11 (52.4%)	10 (47.6%)	25.4±15.0	12.3±2.4	9(42.9%)	12(57.1%)
Others (140)	52 (37.1%)	88 (62.9%)	26.5±13.3	12.5±2.3	62(44.3%)	78(55.7%)
						353(37.1%)
TOTAL	**560(58.8%)**	**392(41.2%)**			**599(62.9%)**	

* Conv: Conventional method defined as laryngoscopy and intubation without the use of any device(s).
**Advanced airway is defined as need for the use of airway adjunct i.e. fibre-optic bronchoscopy or surgical tracheostomy.

Table 2. Methods of endotracheal intubation

Number of Patients Intubated	Nasal intubation			Oral Intubation	Tracheostomy
952(100%)	Direct laryngoscopy 599(62.9%)	Fibre-optic intubation 237(24.9%)	Total nasal intubation 836(87.8%)	44(4.6%)	72(7.6%)

Table 3. Success and failure rate of both fibre-optic intubation verses surgical tracheostomy

Fibre-optic Intubation	Number of cases	281	Success rate	237 (84.7%)	Failure rate	43 (15.3%)
Tracheostomy Intubation	Number of cases	72	Success rate	72 (100%)	Failure rate	0 (0%)

DISCUSSION

There were more males than females with a ratio of 1.46 to 1. The mean age of patients was 34 years with range of 5weeks to 70 years. Facial fractures (27.7%) constituted the bulk of the cases followed closely by odontogenic tumour (17.6%) and then carcinomas. Trauma is considered the 'Epidemic of twenty first century' and accounts for thousands of deaths every year. Patients having maxillofacial injuries with or without cervical spine fractures and head injury need their airway secured by the anaesthetists and surgeons who should put in practice their skill to reduce mortality and morbidity. ATLS protocol must be followed

in all cases of maxillofacial trauma and associated injuries addressed according to the priority.[4]

Mouth opening is a major challenge in facial fracture due to pain when patients are attempting to open their mouth, this affects clinical evaluation of airway and ease of intubation.[5] Preoperative assessment of airway is the key to a successful anaesthetic management. Mallampati classification provides good assessment of airway but may not be accurate in the presence of disrupted anatomy.[6] Different criteria were used to improve assessment of airway. Such criteria included, thyromental distance, inter incisor gap and atlanto-axial mobility; these correlated well with ease of intubation in all cases.

Odontogenic tumours (17.6%) constituted the second largest number of cases. Patients in this group had distorted jaw anatomy with attendant effect on mask seal and bag/mask ventilation during intubation. This is in agreement with the findings by other researchers.[3,7] Also, adequate jaw trust may be lacking and intraoral extension of the growth may not allow insertion of the laryngoscope blade to visualize the vocal cords.[7]

Nasotracheal intubation (87.7%) was the most widely used techniques with direct laryngoscopy accounting for 62.9%. It accounted for 66.2% in a study on ameloblastoma in same centers, 44.3% in Pakistan and 66.6% in United Kingdom where they worked on fractures alone.[7,8] It is the preferred route of intubation in maxillofacial surgery especial for intraoral tumours and fractures not involving the nasal complex.

Where there is anticipated difficult airway, blind nasotracheal intubation may be attempted. This is not the practice in our center, because of the possibility of uncontrollable bleeding from the tumour or intracranial intubation in fractured patients. Awake blind nasal intubation can be done in other circumstances where the above complications do not exist; but this needs patience on the part of anaesthetist and high degree of co-operation from the patients. Weitzel *et al*. reported the success rate of 90% for pre-hospital intubation using the blind nasotracheal method in penetrating neck trauma.[9] However, back up plans for failed conventional techniques of intubation is mandatory. Smoot *et al*. in a survey reported that more than 50% of the respondents chose some form of nasotracheal intubation (blind or fibre-optic) for fracture patterns involving the midface.[10]

Fibre-optic bronchoscope assisted intubation is safest and most certain method of ensuring nasal or oral intubation, as it confirms the placement of endotracheal tube in the trachea. Fiber-optic intubation accounted for 24.9% in the present study as compared to 11.76% in a previous study by Fomete *et al*. in Nigeria.[7] Surgical airway should be reserved for the patients with severe injuries or failed intubations.[11]

Tracheostomy was a first choice for patients with TMJ ankylosis or those with loss of consciousness and huge tumours. Tracheostomy accounted for 7.6% of all intubation techniques in this study which is higher than the 4.41% from a previous study on ameloblastoma in the same center.[7] However, Siddiqui *et al.* reported 13.5% in postoperative tracheostomy but none of our cases was done postoperatively. In the United Kingdom, 9% of the cases were on trauma.[7,8] Tracheostomy is an available option for difficult airway and failed anaesthetic plans.

Cricothyroidotomy provides efficient airway in emergency situations, and is fast to perform with minimal early postoperative complications[9]. However, none of our patients had cricothyroidotomy, as our centre lacks the device for this procedure.

In a recent review, submental intubation has been found to be safe , but it has been observed to increase tracheal pressure as a

result of deviation and compression of tube.[12] Since we did not have any experience in these techniques it was not considered.

Retrograde oral or nasal intubation, utilizing epidural catheter is another alternative in difficult or failed intubations. However, availability of fibre-optic bronchoscope restricted us to use this technique, noting that it is more safe and definitive. Recently various intubation aids like Airtraq® and Macintosh® laryngoscopes, Frova® single-use tracheal tube introducer and PAXpress® have been tried with variable results.[13,14] Currently, endotracheal intubation can be done with the aid of ultra-sonographic scan and fluoroscopy.[15,16]

CONCLUSION

Anaesthesia for maxillofacial surgeries is very challenging, especially in a low-resource settings where advanced devices and medical equipments are inadequate. In our centre, conventional technique for endotracheal intubation was used most often, compared to the advanced technique which is lacking.

Based on the prevalence of maxillofacial cases, especially facial fractures; most of the cases treated were on males, which is expected, since they are more exposed to injuries. Fibre-optic intubation being a valuable technique of intubation had a success rate of 84.7%. With adequate and availability of modern intubation techniques, the success rate would improve, thereby preventing the use of surgical tracheostomy in maxillofacial surgeries which is associated with complications.

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