

Anaesthesia for Oesophageal Replacement with Colonconduit– A Review of Forty Six Cases.

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SUMMARY

This paper reviews the anaesthetic management of 46 adults with severe oesophageal burns replaced with colon conduit at the University of Nigeria Teaching Hospital, Enugu Nigeria over a 14 year period (Jan.1987 –Dec. 2000).

Aim: To highlight the common anaesthetic challenges in the management of oesophageal burns.

Methods: A retrospective review of all adult patients with corrosive burns of the oesophagus was made and the pre-operative, intra-operative and postoperative anaesthetic care records were extracted and analyzed.

Result: Nine (19.5%) patients presented as emergency. Twelve (26%) patients required preoperative tracheostomy and the patients received feeding gastrostomy. Bradycardia occurred in all the patients during intestinal mobilization for the colon graft while tachycardia occurred during retrosternal tunneling of the colon conduit. Elective post-operative ventilation was necessary in eleven (24%) patients whose pleura were breached during the procedure.

Conclusion: Care and protection of the airway and nutritional support are the main pre-operative challenges faced by the anaesthetist in the management of oesophageal burns. During the colon transplant surgery, adequate ventilation, volume replacement and control of arrhythmias are necessary for the success of the procedure.

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INTRODUCTION

People ingest corrosive solutions accidentally, suicidally or are forced to do so as part of punishment for misdemeanor. If not fatal in the early stages, it usually results in burns of the aero-digestive tracts. Management of caustic ingestion remains a challenge, with the outcome ranging from an asymptomatic state to intractable esophageal strictures¹. Morbidity and mortality following such oesophageal burns could be reduced or even avoided with early aggressive surgical intervention.²

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Anaesthetic management in the early periods involves resuscitation of the patient, establishment of a patent airway, commencement of steroid and antibiotic treatment¹⁻³.

Passage of nasogastric tube in the early stage helps in feeding and maintenance of patency of the oesophageal lumen. Conservative management with periodic anterograde and/or retrograde dilatation averts severe strictures in many cases with best results in burns caused by agents other than lye⁴. Those with significant strictures will have reduced intake of feeds and usually become wasted and malnourished. Establishment of a feeding gastrostomy is an essential pre-operative management strategy.

PATIENTS AND METHOD

The clinical records of adult patients prepared for oesophageal replacement by one team of surgeons and anaesthetists over a fourteen year period, (January 1987 to December 2000) at the University of Nigeria Teaching Hospital Enugu, were reviewed. The period between the ingestions of the corrosives and presentation at the hospital were noted. Following presentation, the immediate management protocol for each patient in relation to - early resuscitation with oxygen therapy, intravenous fluid and calorie input, antibiotics and hydrocortisone treatment were noted. The number of general anaesthetic exposures for procedures like upper airway examination, tracheostomy and establishment of a feeding gastrostomy were noted as well as the rehabilitation strategy and pre-operative work-up. Intra-operative care as indicated by blood pressure control, blood loss / replacement and detection and management of dysrhythmias were recorded. The position and technique of placement of the colon graft in the thorax was noted. These were all pooled and analyzed and results presented in tables.

RESULT

Fifty seven (57) adult patients with severe oesophageal strictures following corrosive burns were prepared for surgical replacement of the oesophagus with colon graft under General anaesthesia (GA). Eleven of these patients declined further treatment after 6-8 weeks of rehabilitation. Forty six patients (37 males and 9 females) aged 17-48 years, were finally anaesthetized for oesophageal replacement surgery. The modal age range was 25 – 34 years (Table 1) and male to female ratio 5:1).

Eighteen (39%) of these patients who had oesophageal replacement presented after 6 weeks of the burns, twelve (26%) presented between 4 and 6 weeks, seven (15%) between 2 and

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4 weeks and nine (19%) within 24 hours as emergency (Table 2). Eleven (24%) patients in severe respiratory distress and another eight (17%) patients who had significant burns and scarring of the pharyngo-laryngeal structures had emergency and elective tracheostomies under local anaesthesia (LA) to secure the airway. One patient with tracheo-oesophageal fistula also had fistulectomy during the tracheostomy and, six patients (12%) with frequent aspirations received proximal oesophagostomy (Table 3). All the patients had feeding gastrostomy for nutritional rehabilitation prior to the definitive surgery under light general anaesthesia (GA). Two to four GAs was also required for oesophagoscopy and upper airway examination in each patient. Each patient was fed with high protein/calorie diet made up of crushed bones crayfish and local carbohydrate meals through the gastrostomy tube to achieve a haemoglobin (Hb) level above 36 grams and American Society Anesthesiologists' (ASA) 2 grading before the oesophageal replacement surgery.

All the patients had atropine 0.01mg/kg body weight for premedication before the anaesthesia. Rapid sequence induction was achieved with a sleep dose of thiopentone or propofol in patients without tracheostomy and, endotracheal intubation facilitated with succinylcholine 1mg/kg body weight. Midazolam 0.05mg/kg, diazepam 0.3mg/kg or ketamine 1.0mg/kg body weight was used for induction in tracheostomy patients. Anaesthesia was maintained with halothane 0.5-1.0 vol.% and 60% nitrous-oxide in oxygen while pancuronium bromide 0.06-0.1mg/kg body weight was used for intra-operative muscle relaxation. Patients with blood pressures 120/80mmHg and above were electively given intravenous chlorpromazine 0.15 – 0.25 mg/kg body weight in one litre of normal saline to achieve average mean blood pressure of 70 mmHg for reduced blood loss. Parameters monitored included Non-invasive blood pressure, Nasopharyngeal temperature, Electrocardiogram and urine output.

Table 1: Age range and sex incidence of patients with corrosive burns of the oesophagus

Age range (Years)	Frequency	
	(Male)	(Females)
15 – 19	1	-
20 – 24	4	-
25 – 29	12	3
30 – 34	10	4
35 – 39	6	2
40 – 44	3	-
45 – 49	1	-

Table 2: Time interval between ingestion of corrosive and presentation to Hospital

Period of time	Number of Patients
<2 weeks	9
2 – 4 weeks	7
4 – 6 weeks	12
>6 weeks	18

The colon grafts were tunneled retrosternally in thirty eight (82%) patients and episternally in eight (17%). Arrhythmias occurred in all the patients during the extensive intra-abdominal manipulations and the retrosternal tunneling. Atropine was administered during bradyarrhythmias and stable realized in each case. The pleurae were breached in eleven (23%) patients necessitating chest tube drainage and elective post-operative ventilation in the Intensive Care Unit for 8 hours. The recorded complications are as shown in (Table 4). Muscle relaxation was not reversed even in patients that did not require post-operative ventilation, instead time was allowed for the relaxants to wear off completely before spontaneous respiration was allowed. These ventilated patients were all extubated before 24 post-operative hours and returned to the ward within three days. The average blood loss/transfusion dropped from 4 units of blood in 1987 to 2 units from the year 1996. The operative period dropped from about 4 hours in the first 5 years of the study to 2 ½ hours in the last 7years. Similarly, blood loss / transfusion dropped from about 4 units in the first 4 years of the study to 2 units in the last 5 years, with an overall average blood loss / transfusion of 3 units.

Table 3: Age range and, incidence of Tracheostomy, Oesophagostomy and Gastrostomy in patients with corrosive oesophageal burns.

Age range (years)	Tracheostomy		Oesophagostomy	Gastrostomy
	(emergency)	(elective)		
15 -19	1	-	-	1
20 -24	2	-	1	4
25 -29	3	4	2	15
30 -34	3	2	2	14
35 -39	1	2	-	8
40 -44	1	-	1	3
45 -49	-	-	-	1

Table 4: Observed complications and their frequency during anaesthesia for oesophageal replacement surgery.

Type of complication	Frequency	Percentage
Bradycardia	46	100
Tachycardia	46	100
Missed beat / Ectopics	46	100
Hypotension (BP < 90/60 mmHg)	37	80.5
Hypothermia (T ^o c < 36° C)	28	61
Pleural rupture	11	24

DISCUSSION

Following serious caustic insult the oesophagus not only narrows but also shortens thereby altering the integrity of the lower oesophageal sphincter resulting in gastric reflux.⁵ Significant gastroesophageal reflux is an indication of severity of the burns. The characteristics of the ingested material is the most important determinant of severity, with lye containing preparations being the most injurious.¹ A lot has been written on surgical replacement of these severely burnt oesophagus with intestinal graft.^{6 - 8} Literatures on the anaesthetic management of these procedures are however scanty.

Anaesthetic management of burnt oesophagus involves early resuscitation of patients following the burns in all the cases no matter the time of presentation. The most severe cases usually present shortly after the ingestion, with pains, compromised airway due to oedema of the pharynx and drooling of saliva³. Oxygen therapy, fluid, steroid and a patent airway are mandatory at that stage. Less severe cases tend to present to hospital later, when they are no longer able to cope with the complications of airway obstruction and feeding. Securing a patent airway, fluid therapy and treatment of infection were most urgent in these patients at that time. A number of anaesthetic exposures for procedures like emergency / elective tracheostomy, oesophagostomy, feeding gastrostomy and oesophagoscopy would then be indicated. Conservative management requires periodic dilatation and evaluation under light general anaesthesia often with muscle relaxation. Most patients in the paediatric age group have been successfully managed conservatively, especially at ages below 8 years; where agents other than lye were ingested; when stricture is confined to the proximal third of the oesophagus and when stricture segment is not more than 5 centimetres.⁴ Full thickness burns however would inevitably end in stricture. Multiple strictures are usually refractory to dilatation and expectedly patients easily get tired with the 'unending procedures' and tend to become uncooperative. Long-term stenting has been found to be superior to traditional periodic antegrade / retrograde dilatation.⁹

In our centre, early replacement of burnt oesophagus with intestinal conduit¹⁰ is the preferred choice of management since the prevailing economy rarely leaves the patients with the ability to pay for more than a few hospital admissions. Our management protocol involves early rehabilitation with enteral feeding, aimed at achieving a significant protein (albumin >3gdl⁻¹) and calorie reserve to attain a haemoglobin level of 12gdl⁻¹ and above, which is necessary for the success of the replacement procedure. Since almost all our patients belong to the low socio-economic class, conventional methods of nutritional rehabilitation with total parenteral nutrition (TPN) was not practicable, as the burden of medical expenses was entirely borne by patients and relations. Feeding the patients through the gastrostomy tube regularly with locally available but cheap protein sources which are within their reach, remarkably improve their protein and calorie profile as evidenced by the steady improvement of their haemoglobin concentration. Descending chest infection is common, and usually associated with stasis of saliva in the oral cavity and frequent aspirations. This is more so in cases of tracheo-oesophageal fistula. Early ligation of fistulae where present is essential, and with good oral hygiene and specific antibiotic treatment the clinical outlook of the patients remarkably improved. General attitude towards gastrostomy tube feeding was varied. Whereas some patients started rejecting it once well rehabilitated, others developed a strange tendency to live with it and decline further procedure. Balanced general anaesthesia using nitrous-oxide, halothane and pancuronium was suitable for the patients once the pre-operative preparations were adequate. Isoflurane and Halothane decrease mean arterial pressure, cardiac output and systemic vascular resistance. However, it is Isoflurane and not, halothane

that increases mesenteric blood flow to the oesophageal ileocoloplasty, and decrease mesenteric resistance index.¹¹ Isoflurane was not available at the time of these procedures. Intra-operative blood-pressure control with low dose chlorpromazine (0.15 -0.25 mg/kg)¹² given early in the operation, helped to achieve a low average blood pressure to limit blood loss.

The right colon is usually tunneled into the neck in a blunt dissection, and the caecum anastomosed to the proximal oesophagus to provide an isoperistaltic conduit.¹³ Endoscopic resection of scar segment has been practiced¹⁴ which would have been effective for our economically deprived patients when found appropriate for the technique. Staying close to the sternum during tunneling avoids trauma to the neck veins and also limits blood loss. The arrhythmias observed were thought to result from vagal stimulation during the manipulations of the gut and the intermittent pressure on the heart during the tunneling. Vagal stimulation releases acetylcholine at the sino-atrial (SA) node which depresses the pacemaker resulting in bradycardia. The antimuscarinic agent atropine is used to counteract this vagal effect during the operation. The use of nasotracheal or tracheostomy airway made elective postoperative ventilation easy, since the patients tolerated these better than the oral route. Muscle relaxation was not reversed even in patients that did not require post-operative ventilation in order to protect the anastomosis, instead time was allowed for the relaxants to wear off completely before spontaneous respiration was allowed. Such non-reversal anaesthesia is usually planned for postoperative ventilation and anastomosis protection.¹⁵

In conclusion, mobilizing the colon in the abdominal cavity and tunneling it through the thorax to the neck was risky. General anaesthesia arrangements that protect the airway, permit early surgical correction, ensure stable cardiovascular parameters and provide for post-operative ventilation remain the only hope for these patients. These risks were much less in well nourished and psychologically prepared patients.

REFERENCES

1. Moazam F., Talhert J. L., Miller D., Mollit D. L. Caustic Ingestion and Its Sequelae in Children. *Southern Med. J.* 1987; **80(2)**: 187-190.
2. Estera A., Taylor W., Mills L. J., Platt M. R. Corrosive burns of the oesophagus and stomach; a recommendation for an aggressive surgical approach. *Ann. Thoracic surg.* 1966; **(41)**: 276-283.
3. Ezike H. A. Airway complications following corrosive ingestion. *Nigerian Journal of Otorhinolaryngology.* 2005; **2 (1)**: 33 - 36.
4. Gundodu H. Z., Tanyel F. C., Buyukpamukcu N., Hicsonmez A. Conservative treatment of caustic esophageal strictures in children. *Journal of Pediatric Surgery* 1992; **27(6)**: 767-770.
5. Mutarf O., Genc A., Herek O., Demircan M., Ozcan C., Arikan A. Gastroesophageal reflux: A determinant in the outcome of caustic oesophageal burns. *Journal of Pediatric Surgery* 1996; **31(11)**: 1494-1495.
6. Posttethawait R. W. Colonic interposition for oesophageal substitution. *Surg. Gynecol. Obstet.* 1983; **(156)**: 377-382.
7. Huguier M., Gordin F., Maillard J. N., Lortat-Jacob J. L. Result of 117 oesophageal replacements. *Surg. Gynecol.*

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- Obstet.* 1970; **(130)**: 1054–1058.
8. Wu M. H., Lai W. W. Oesophageal reconstruction for resection after corrosive injury. *Ann. Thorac. Surg.* 1992; **53(5)**: 798–802.
 9. Oktay Mutaf. Treatment of corrosive oesophageal strictures by long-term stenting. *Journal of pediatric Surgery* 1996; **31(5)**: 681–685
 10. Chattopadhyay T. K., Kapoor V. K., Gupta S. The management of extensive corrosive oesophageal stricture: do not dilate and procrastinate. *Jpn. J. Surg.* 1989; **19(2)**: 171–6.
 11. Jacob L. Boudaoud S. Payen D., Rabary O., Sarfati E., Gossot D. *et al.* Isoflurane and not Halothane increase mesenteric blood flow supplying esophageal Ileocoloplasty. *Anesthesiology* 1991; **74(4)**: 699–704.
 12. Umeh B. U. O. Initial clinical experience with chlorpromazine for induced hypotension. *Afr. J. Anaesth. and Intensive Care.* 1989; **1(1)**: 1 – 4.
 13. Aghaji M. A., Chukwu C. O. Oesophageal replacement in adult Nigerians with corrosive oesophageal strictures. *Int. Surg.* 1993; **78(3)**: 189–92
 14. Anies Mahomed, Anver Mahomed, George Youngson. Endoscopic restoration of oesophageal continuity in caustic burns. *Journal of Pediatric Surgery*, 1997; **32(12)**: 1747– 1748
 15. Al-Salim A. H., Qaisaruddin S., Abu Srair H., Al Dabbous I., Al-Hayek R. Elective postoperative ventilation in the management of oesophageal atresia and tracheoesophageal fistula. *Pediatric Surgery International* 1997; **12(4)**: 261–263.