



Review Article

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Uniportal VATS For Esophageal Atresia Repair, Case Series Experience and Review of Literature



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Abstract

Congenital oesophageal atresia is one of congenital aero digestive tract malformation and is characterized by excessive oral secretions with or without signs of respiratory distress; it's one of the causes of neonatal and infantile respiratory distress. This study was performed on 10 children with congenital esophageal atresia ranging from 2 to 10 days. The commonest age incidence was the neonatal period, frequently presented in males. Tachypnea and dyspnea that were present in all of the cases. The diagnosis was confirmed by coiling back of orogastric tube on Chest x-ray and intraoperative bronchoscope. All patients underwent uniportal video assisted thoracic surgical repair (VATS). All cases survived after operation with no intraoperative accident or major post-operative complication. The aim of this work is to evaluate and assess ten cases of oesophageal atresia pre- and post-surgical repair in the pediatric using uniportal VATS.

Keywords: Esophageal Atresia; Tracheoesophageal Fistula; Respiratory Distress; VATS

Abbreviations: EA: Esophageal Atresia; TOF: Tracheoesophageal Fistula; VATS: Video-Assisted Thoracic Surgery; COA: Congenital Oesophageal Atresia; VACTERL/VATER: Vertebral, Anorectal, Cardiac, Tracheoesophageal, Renal, and Limb abnormalities; OA: Oesophageal Atresia; TEF: Tracheoesophageal Fistula; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; ICU: Intensive Care Unit; NGT: Nasogastric Tube

Introduction

Congenital oesophageal atresia refers to a congenitally incomplete oesophagus [1]. It is commonly referred to as oesophageal atresia (OA) with or without tracheo oesophageal fistula (TOF) [2]. The congenital absence of the oesophageal connection with the stomach in OA prevents swallowing, and this in turn prevents normal feeding and may cause the baby to aspirate residual saliva or milk leading to aspiration pneumonia [3]. The incidence of COA is 1: 3000-4500 births. Maternal polyhydramnios occurs in approximately 33% of mothers with fetuses with OA and distal TOF and in virtually 100% of mothers with fetuses with OA without TOF [2,3]. The typical presentation of babies with OA is excessive oral secretions with or without signs of mild respiratory distress; this may progress to significant respiratory distress and cyanosis [1,3]. The diagnosis of OA should be confirmed if a orogastric tube coil back on a plain chest radiograph in the proximal oesophageal pouch [4]. It usually occurs in association with other significant congenital malformation in about 30-60% of

babies [2,4]. The associated congenital malformation is the main source of comorbidity and mortality [1,4]. Early identification and management of OA prevents respiratory compromise and improves the outcome [2,5].

Patients

Between May 2022 and June 2024, 10 children born with EA and distal fistula were admitted to our department. All the patients were managed with VATS for surgical repair using one port. Out of total 10 cases of (TOF). There were 7 males and 3 females, the age of onset of symptoms was within first 7 days of life in 6 (60%), 8 days to 10 days in 4 (40%), Presenting features varied, Tachypnea and dyspnea was present in all cases (100%), excessive salivation in 6 (60%), Cyanosis in 2 (20%), fever due to chest infection in 5 (50%), and Wheezing in 3 (30%). Gestational age varied from 36 weeks to 42 weeks (mean, 38.5 weeks). Birth weight ranged between 3000 g and 4000 g (mean 3640 g). Diagnosis

of distal fistula between distal esophageal pouch and trachea was confirmed by intraoperative rigid bronchoscopy which is routinely done in our department for all tracheoesophageal fistulas suspected cases. There were no associated anomalies

in our series which was confirmed by clinical examination and radiological investigation. Informed consent was obtained from all parents preoperatively.

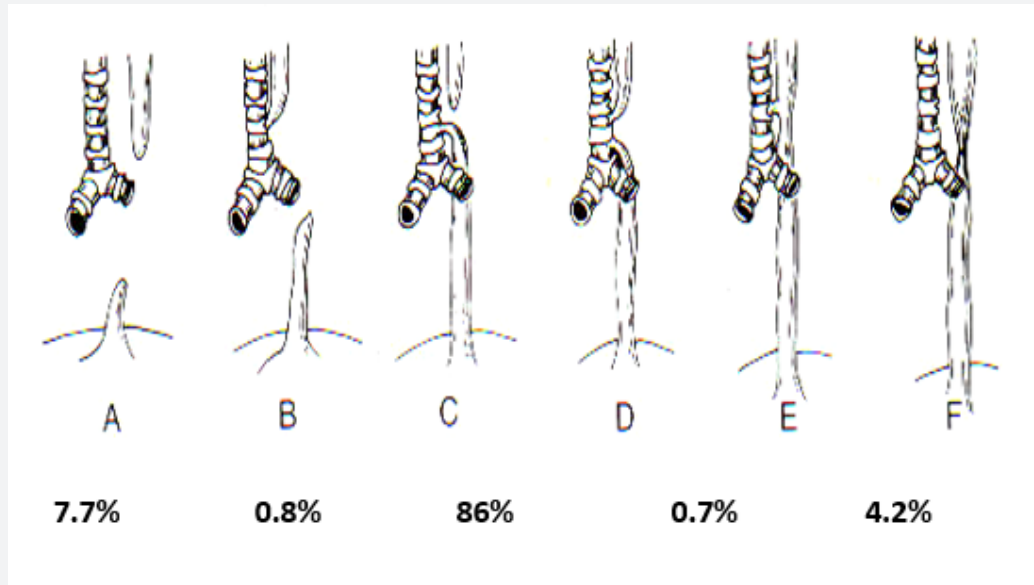


Figure 1: Our case represents the most common type, type C with the five types of oesophageal atresia (Gross and Vogt Classification) are listed.

Results

All repair procedures were performed by VATS for surgical repair. There were no intraoperative complications, although anastomosis was difficult in two patients due to an extensive distance between the proximal and distal esophagus. The mean operating time was 3.2 h (range, 2.45-4.5). Except for the two patients with the long-gap EA, the last eight procedures all lasted less than 3.5 h. Short-term postoperative complications encountered in five patients out of ten. Four of them due to stenosis of the anastomosis suggesting that incision at the proximal esophagus were so small, and required one or more dilatations. One of two children with the long-distance EA, had anastomotic leakage, which was managed conservatively. A late complication consisted of gastroesophageal reflux in 2 patients and was managed by antireflux medications. Feeding by nasogastric tube was started after a mean of 4.7 days (range, 3-7), and total oral feeding was possible after a mean of 9.6 days (range, 8-14). Mean hospitalization was 13.5 days for the 9 patients. One child required a longer hospitalization (20 days) due to anastomotic leakage. Mean follow-up was 14.2 months (range, 1-25). The chest drain was not used in our repair. No skeletal abnormalities have been observed in long term follow-up.

Operative Technique

Position: patients were placed in left lateral decubitus. One incision of 3.5 cm length at level fifth right intercostal space was done so we get Single-incision VATS here in our patients, we get benefit from a direct vision of the open minithoracotomy and the magnified image of the camera that we introduce by the same incision. Extrapleural approach was applied as we swept the parietal pleura carefully away from the thoracic wall taking care not to open it. The azygos vein was identified and divided. The distal TEF was dissected from surrounding tissue and traction sutures were applied at the tracheal and esophageal pouch, then esophageal fistula was divided and closed using fine absorbable sutures. The care was taken to avoid damage to the nerve and blood supply to the distal esophageal pouch. A tension-free end-to-end one-layer interrupted anastomosis with absorbable suture (4-0) was our technique for esophageal repair; feeding tube was used as stent and passed through the anastomosis. NO Chest drain was used in our cases.

Discussion

Congenital oesophageal atresia include a group of congenital anomalies with primary congenital discontinuity of the oesophagus

with or without persistent communication with the trachea [1,5]. literature reported thorough description of the symptoms and anatomy of the most common encountered association of tracheoesophageal anomalies, a proximal oesophageal atresia with a distal tracheoesophageal fistula [4,6]. Typically (86%) of cases with OA have oesophageal atresia with distal fistula connected to trachea, while Pure OA (without fistula) is much less common occurring in about (6%) of total cases [1,2,6]. The diagnostic feature of pure congenital oesophageal atresia is a pattern of gasless abdomen due to absence of fistula communicating respiratory and alimentary tract [3,7]. Isolated TEF is not common condition with a little epidemiological information [2,8]. Our case represents the most common type, type C with the five types of oesophageal atresia (Gross and Vogt Classification) are listed in Figure 1[9].

The etiology of OA is idiopathic. It is very likely to be due to many factors, most commonly genetic factors and environmental uterine events [7,10]. There are no human teratogens causing OA. However, recurrence of OA in families has been reported in literature [3,4,10]. Old studies have shown the risk of recurrence is 2% in a sibling provided that an index case is affected [2,8,11]. While other study made by reported contrast to previous data, suggesting a very low recurrence risk for isolated OA/TOF and/or for the vertebral defects, anal atresia, cardiac defects, renal and limb malformation (VACTERL/VATER) association spectrum among first-degree relatives [2,11]. The genetic factor is further supported by the occasional association of COA with Trisomies 21, 13, and 18 [8,12]. Furthermore, studies reported an increased incidence of oesophageal atresia with/without TOF among twins [4,6,9]. Nevertheless, genetic causes can be identified in less than 10% of the patients with EA [11,12]. Yet, it is estimated that 30-60% of the babies with COA with TOF have associated anomalies [2,10]. It is recognized that associated anomalies as well as prematurity-related problems significantly affect the morbidity and mortality of COA babies [2,11]. The reported congenital anomalies associated syndrome are tracheoesophageal fistula, urogenital system anomalies, (VACTERL/VATER). Coloboma, heart defects, choanal atresia, growth retardation, abnormal genitalia, and ear abnormalities (CHARGE) [3,4,10]. Also, neural tube defects, hydrocephalus, tethered cord and holoprosencephaly has been described in association with OA [2,3,12]. Furthermore reported associated malformations include, pyloric stenosis, duodenal, small bowel atresia, omphalocele, midgut malrotation, meckel diverticulum, pulmonary agenesis, congenital diaphragmatic hernia, maldescended testicles, hypospadias and ambiguous genitalia [12-14]. The prognosis is generally promising in the absence of significant comorbidities due to associated anomalies or prematurity [5,14].

Right aortic arch is a seldom finding in babies with OA presenting only in about 5% of cases [6,14]. An updated retrospective studies reported surgical repair for neonates with right aortic arch is surgically possible from either both right and

left chest side. However, these studies reported a higher morbidity due to anastomotic strictures with the right thoracotomy approach [13-15].

Antenatal diagnosis of OA by ultrasound could be suggested based on findings like small or absent stomach with or without maternal polyhydramnios; however, these radiological findings should not be considered diagnostic criteria because of having a very low positive predictive value [4,11]. Studies for the prenatal detection of OA concluded that prenatal ultrasound findings alone are a deficient diagnostic tool for identifying OA, due to the increasing rate of false positive diagnoses and recommending that, magnetic resonance imaging use plus amniotic fluid analysis following the ultrasound suspicion of OA is recommended [6,8,15]. The clinical presentation of undiagnosed antenatal cases is basically presented as symptoms related to inability to swallow milk or the baby's own saliva secretions, also recur of secretions following suction are typical findings in the majority of cases. Some babies present with respiratory distress, choking and cyanosis due to the reflux of the accumulated secretions from the hypopharynx into the airway [3,5,10]. The H type fistulas symptoms are related to their diameter stomach dilatation leading to persistent airway secretions in large fistulas presents with respiratory distress, whereas small ones present with recurrent cyanotic episodes due to saliva and milk aspiration [5,10,15].

Soon after birth, a French gauge orogastric tube size 10 -12 should be passed through the mouth into the oesophagus for any newborn if the antenatal diagnosis suggests the possibility of oesophageal atresia. The same should be applied to babies presenting within 48 hours of birth with symptoms of choking, cyanosis, profuse oral secretions and respiratory distress [12,13]. For pre-term babies' smaller size orogastric tube is adequate. Failure to pass the orogastric tube more than 10 cm from oropharynx has been recognized in literature as the classical sign of OA [1,4,15]. A chest and abdomen plain radiograph would show the tip of the gastric tube to coil within the upper esophageal pouch. However, appearance of gas in the stomach and intestine indicates the presence of a distal Fistula [3,4,12]. All suspected cases should be managed within the neonatal intensive care unit as they should be kept nothing per mouth with adequate parenteral fluids and nutrition [3,7,10]. The baby should be nursed prone with a semi flexed head 45 degree. Low pressure continuous suction should help to prevent aspiration pneumonia by accumulated secretions effect [2,3,12]. Continuous drainage of saliva from the upper oesophageal pouch should be considered in cases with copious secretions or if the surgical intervention is delayed more than 48-hours. Drainage tube should be within 0.5 cm above the distal end of the upper pouch [4,8,16]. While preparations are made for surgery broad-spectrum antibiotics should start [13,14]. Radiological measurement of gap between the upper and lower oesophageal pouches pre-operatively is essential in order to decide the most suitable surgical procedures [6,7,15]. Associated malformations should be ruled out by clinical

and radiological assessment as they are mainly responsible for the long-term prognosis in these patients [16-18]. Echocardiography is highly recommended before surgical correction as surgical approach may be modified in case of presence of a right-sided aortic arch [14,17].

Uniportal VATS is a technique with limited experience in pediatric surgery. Only a few reports exist in pediatric patients. These include the treatment of lung and pleural diseases like empyema debridement, lung abscesses, or lung biopsies but there are no reports in literature of its use for the treatment of this congenital esophageal malformation [19]. The most significant advantages of this access are that we have get a better vision of the surgical field because of direct and camera vision and adequate working space so we need less ipsilateral lung compression so oxygen desaturation was less likely to occur. All patients were hemodynamic stable during surgery. Operating time for our patients was no longer than other reports with open or thoracoscopic surgery [20]. Thoracoscopic repair of OA has decreased the long-term morbidity associated with open surgery. However, the improved mortality in recent years is most attributable to improved neonatal anaesthesia and peri-operative care [6,17]. Long-gap OA still poses a high mortality, and oesophageal replacement still may be needed in some cases [12,13,17]. Rigid ventilating bronchoscope just before surgery together with bronchoscopic examination will help to identify the level, number and size of TOF and to verify the anatomical variants [18]. Post-operative mechanical ventilation, should be weaned early as possible. Adequate postoperative analgesia should be provided using neonatal score for pain management [15,16]. Total parenteral nutrition is usually required for feeding. If no leak is identified on the X-ray postoperatively the trans-anastomotic tube should be removed [4,10,12]. Antireflux medications are mandatory as gastro oesophageal reflux is common following the anastomosis [13,16].

Conclusion

Esophageal atresia should be suspected in antenatal screening if there is polyhydramnios and or if the stomach bubble is absent or small in size. Profuse frothy oral secretions, in neonate baby, with or without respiratory distress are the typical post-natal presenting symptoms. The cornerstone modality of management is surgical repair which consists of end-to-end anastomosis of the proximal and distal ends of oesophageal pouches and separation of any coexisting tracheal fistula. Uniportal VATS is a safe, feasible and secure procedure, using only one incision which is less invasive than open conventional procedure or multi portal technique. We recommend this procedure for the esophageal atresia repair surgery. Meticulous pre-operative assessment is required as associated anomalies occur in 30-60% of cases. Short- and long-term postoperative complications could happen and

must be managed accordingly.

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