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OESOPHAGEAL ATRESIA: ROLE OF GAP LENGTH IN DETERMINING THE OUTCOME

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Twenty neonates born with oesophageal atresia and tracheoesophageal fistula over a period of two years were managed and the role of gap length between the two ends of oesophagus on the outcome was studied. Twelve (60%) were males and 8 (40%) were females. Body weight ranged from 2.2 kg to 3 kg. Only 2 (10%) were received within 24 hours of birth. Six (30%) were received within 48 hours of birth, 3 (15%) were 3 days old and 9 (45%) were ≥6 days old at the time of admission. Gap between the upper pouch and the lower fistulous end of oesophagus was ≤2cm in 4 (20%), >2cm but ≤3cm in 8 cases (40%) and >3 cm in 8 (40%) cases. Preoperatively chest infection was found in 16 (80%) cases. Associated congenital malformations were found in 7 (35%) cases. Primary anastomsis of Oesophagus was performed in all the cases. In order to relieve the tension on the anastomosis upper segment circular myotomy was performed in 8 (40%) cases. Post operative survival was 45%. Early postoperative complications among survivors included anastomotic leak in 3 (33%), pneumonia in 2 (22%) and wound infection in 2 (22%) cases. Late complications included gastroesophageal reflux in 7 (78%) and stricture formation in 6 (67%) cases. Major cause of death was sepsis secondary to chest infection. Authors conclude that prognosis of oesophageal atresia-tracheoesophageal fistula is excellent in children born with gap length ≤2cm. Morbidity and mortality increases proportionately as gap length increases beyond 2 cm.

Key Words: *Oesophageal atresia, Oesophageal anastomosis, Tracheoesophageal fistula, Myotomy.*

INTRODUCTION

Bridging the long gap successfully between the two ends of oesophagus is the true test of the skill of a paediatric surgeon. Apart from other factors like birth weight, respiratory tract infection, associated cardiac malformations etc, gap length plays a major role in determining the outcome of the treatment[1]. It is usually not possible to perform a successful anastomosis without elongating the oesophagus in cases of long gap oesophageal atresia. The best conduit is patient's own oesophagus[2]. Adequate blood supply of proximal oesophageal pouch allows its extensive mobilization for anastomosis[3]. Proximal circular myotomies have also been tried along with mobilization of upper oesophageal segment to relieve the anastomotic tension.[4] An attempt has been made in the present study to evaluate the critical gap length for the safe oesophageal anastomosis.

PATIENTS AND METHODS

In a prospective study twenty neonates with the diagnosis of oesophageal atresia-distal tracheo-oesophageal fistula were admitted to the department of Paediatric Surgery, Mayo Hospital, Lahore, over a period of two years i.e., from January, 2002 to December, 2003. Four cases of isolated oesophageal atresia admitted during the period were not included in the study. All the neonates were thoroughly examined at the time of admission and their physical findings were noted. Special emphasis was laid on the body weight, respiratory status and associated congenital, especially cardiac malformations. They were resuscitated by repeated throat suction, oxygen inhalation, fluid and antibiotic administration via intravenous route. Vitamin K was given to all of them. All were operated upon. Retropleural approach was adopted for right sided thoracotomy through 4th intercostal space. They were arbitrarily divided into 3 groups according to gap length measured per operatively with a caliper. In Group A gap length was ≤ 2cm whereas it was >2cm but ≤ 3cm in Group B and >3cm in Group C. The gap length was measured without mobilization of oesophagus. Tracheoesophageal fistula was identified and closed with 4/0 silk stitches. Single layer end to end oesophageal anastomosis was perform-

ed after adequate mobilization of proximal oesophageal segment. Interrupted 4/0 silk stitches were applied for anastomosis. Transanastomotic nasogastric tube was used in cases having adequate lumen of the distal segment and it was removed after the completion of anastomosis in cases of very narrow lumen of the distal segment. Subjective assessment of tension at the anastomotic site was made. Single circular myotomy was performed on the proximal segment 1 cm proximal to its lower end in 50% cases of Grouop B and 50% cases of Group C. Circular myotomy was not performed in any case of Group A as there was not much tension on the anastomotic site after adequate mobilization of proximal segment. Nasogastric feed was started on third post-operative day in cases having transanastomotic tube whereas others without it were put on parenteral nutrition for 7 days. Perianastomotic drain was also placed in all cases. Follow up of the survivors was upto one year.

RESULTS

There were 12 male and 8 female babies in the study. Age ranged from 6 hours to 9 days (Fig. 1). Body weight was in the range of 2.2 kg-3 kg. Eighty percent of these neonates were having severe chest infections. Congenital malformations were found in 30% cases (cardiac 15%, Gastrointestinal 10% and vertebral 5%). Overall mortality was 55%. It was 25% in group A and 50% in group B. Further break up showed that 25% patients in group B undergoing circular myotomy of the proximal segment died whereas mortality was 75% in group B patients having anastomosis by simple mobilization and without myotomy. Seventy five percent patients of group C died. In this group all those without myotomy died whereas 50% of those undergoing myotomy survived (Table 1). Only survived patients were considered for post-operative complications. Anastomotic leak was detected in 33% cases, gastroesophageal reflux in 78% cases and stricture formation in 66% cases (Table 2). These complications were mainly found in patients of Group B and C.

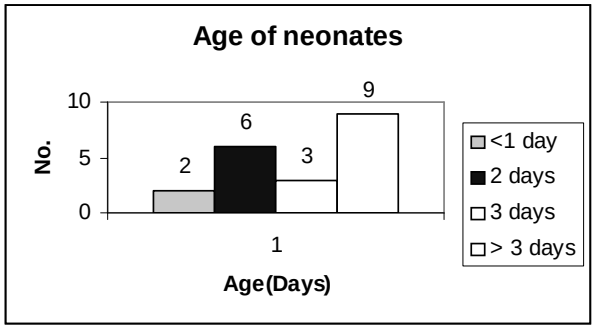

Figure 1: Age range of patients.

Table 1: *No. of patients with or without myotomy.*

Group	Total No.	With Myotomy	Without Myotomy	Mortality
A	4	-	4(1)	25%
B	8	4(1)	4(3)	50%
C	8	4(2)	4(4)	75%

No. in the parenthesis shows deaths

Table 2: *Post operative complications.*

Group	Anastomotic Leak	Reflux	Stricture
A(3)	-	1	1
B(4)	1	3	4
C(2)	2	2	2

No. in the parenthesis are survivors.

DISCUSSION

Ultimate goal in the management of oesophageal atresia is to achieve a primary tension free oesophageal anastomosis. The distance between the two ends of the oesophagus is a critical factor in determining the outcome[1]. Increased tension at anastomotic site embarrasses the circulation. Blood supply of the proximal segment arises from the thyrocervical trunk and runs downwards in the submucosal plane[3]. Therefore, extensive mobilization of upper pouch is safe[5]. A gap of up to 2cm can be overcome by local mobilization alone[6].

Difficulties usually arise while bridging the long gap between two ends of oesophagus[7]. There is no precise definition of long gap oesophageal atresia. What is amenable to primary repair by a surgeon may be considered long or ultralong by others[8]. Boyle et al defined the gap of more than 3.5 cm as ultralong whereas Brown and Tam described a gap of >3cm as long, greater than 1 and upto 3 cm as intermediate and less than or equal to 1 cm as short. Hands and Dudley considered <2cm as short and >2cm as long[9,1,10]. To cope with the severe tension during primary repair, different tension relieving procedures have been devised. Circular myotomy of the proximal segment reduces the force required to approximate the oesophageal ends[11]. Traction is mainly exerted on the submucosa which is predominantly madeup

of elastic connective tissue with loose attachment to the overlying muscles. This allows it to elongate and change its position in relation to muscular layer. Thus atraumatic mobilization of proximal segment without jeopardizing the viability of oesophageal tissue takes place. This allows easy accomplishment of anastomosis in cases of long gap oesophageal atresia[12].

Lower oesophageal segment has segmental blood supply and excessive mobilization can result in ischaemia[3]. Distal segment myotomy is therefore not recommended for fear of ischaemia. Despite the long held opinion about the tenuous blood supply of distal segment many surgeons still believe that it can be mobilized to facilitate primary anastomosis without producing ischaemia[13,14]. Circular myotomies have also been tried with success on distal segment[13]. Although circular myotomy provides extra length for the anastomosis and decreases the anastomotic tension, results of long gap oesophageal atresia are not as good as those of short gap.

Gap length indirectly defines the magnitude of surgical problem and its possible outcome. In a series presented by Brown et al mortality, anastomotic leak and stricture formation were 3%, 6%, 17% respectively in short gap, 6%, 25% and 31% in intermediate and 18%, 31% and 44% for long gap atresia[1]. Results of the present study also shows that mortality and morbidity of surgery increases as the gap length increases. Anastomotic leak is the most important immediate post operative complication of oesophageal anastomosis. The incidence of leak in long gap atresia varies from 0 to 100% in some series[9,15]. In the present study it was found in 33% cases. Gastroesophageal reflux was found in 78% cases and stricture formation in 66% cases. In the study presented by Lai et al. leak was found in 40% cases, gastroesophageal reflux in 80% and stricture formation in 20% cases. In repairs of long gap atresia without lengthening procedure presented by Boyle et al, stricture developed in 50% cases and reflux in 62.5% cases. High mortality in the present study is due to the fact that 80% of the patients were of Waterston type B or C with severe pulmonary infection. These categories carry high mortality. However in the present study, this factor is almost the same for all sub types of gap length. Although circular myotomy is a valuable adjunct in dealing with long gap atresia, it is not effective in all cases and gap length plays a major role in the outcome[16]. Many surgeons prefer intact native oesophagus for long term function and perform anastomosis without myotomies. Although reported mortality in these studies is low but they have high incidence of complications like gastroesophageal reflux and stricture formation. Gap length is a better predictor of the outcome than the Waterston classification due to improvement in the care of neonates with low birth weights and respiratory problems[17].

It was thus **concluded** that gap length is an important predictor of the outcome of treatment in cases of oesophageal atresia-tracheoesophageal fistula. High success rate can be expected in gap length upto 2cm whereas above that mortality and morbidity increases propor-tionately even when lengthening procedures are adopted for the oesophageal anastomosis.

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