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CORRELATION BETWEEN POSITION OF RED RUBBER CATHETER ON X RAY AND GAP LENGTH IN TYPE C ESOPHAGEAL ATRESIA (EA)

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ABSTRACT

BACKGROUND AND AIM: Gap length is important determinant for feasibility of primary repair in atresia and also for the preparedness and prognosis of delayed or staged operative procedures. A diagnostic plain radiograph with a red rubber catheter in situ might provide reliable information regarding the gap length without involving additional risk and cost. The present study was conducted to assess the gap length between the two esophageal pouches by preoperative plain radiography with in situ red rubber catheter in upper esophageal pouch and to know the correlation between position of red rubber catheter and measured gap length between upper and lower pouch.

METHODOLOGY: Out of all patients admitted and diagnosed as gross's type C EA during September 2018 to November 2019 were included in the present study. The data regarding clinical history, general and systemic examination, pre-operative investigations including plain radiograph with in situ red rubber catheter and intraoperative measured gap length were recorded. Statistically correlation assessed between position of red rubber catheter and intraoperatively measured gap length among patients with type c EA.

RESULTS: Total 283 patients were included in the present study. Radiologically position of red rubber catheter was found at level of T2, T3 and T4 in 18.7%, 55.5% and 25.8% respectively. A correlation was found between the preoperative radiological assessments of position of red rubber catheter with intra operatively measured gap length in this study and association between these two variable were found statistically significant (r=-0.66, P=0).

CONCLUSION: The preoperatively radiographic position of upper pouch should be assessed carefully to predict the gap width and it helps in preparedness of surgical management of the patients.

KEYWORDS : Correlation, Esophageal pouch, Gap length, Predictor

INTRODUCTION:

Oesophageal atresia (OA) is a group of congenital anomalies comprising of an interruption of the continuity of the oesophagus with or without a persistent communication with the trachea. It occurs 1 in 2500 live birth. [1] Many authors had classified the gap length between the two esophageal pouches in cases of EA and tracheoesophageal fistula (EA-TEF) as short, intermediate or long gap. [2-4] Gap length is important determinant for feasibility for the primary repair of atresia and also for preparedness and prognosis of delayed or staged operative procedure. Various investigations like CT scan, plain radiograph advised by some authors to assess the gap length. [5-7] A diagnostic plain radiograph with a red rubber catheter in situ might provide reliable information regarding the gap length without involving additional risk and cost.

The present study was conducted to assess the gap length between the two esophageal pouches in cases of EA by preoperative plain radiography with an in situ red rubber catheter in upper esophageal pouch and to know the correlation between position of red rubber catheter and the measured gap length between upper and lower pouch.

OBJECTIVES:

To know the correlation between position of red rubber catheter on preoperative radiography and to assess the measured gap length between upper and lower pouch intraoperatively.

METHODOLOGY:

The cross-sectional observational study was carried out in the Paediatric Surgery department of XYZ Hospital, ABC city, Rajasthan. All neonates with EA admitted in the Neonatal Intensive Care Unit (NICU) of the department of paediatric surgery during period of September 2018 to November 2019 were included in the study. Based on gross's anatomic classification, cases of type C esophageal atresia were included in the present study.

Patients who were transferred to the paediatric surgery department of XYZ Hospital, ABC city, Rajasthan after the corrective surgery performed outside were excluded from the study.

Informed consent was taken from parents before enrolment in the study. Ethical clearance was obtained from the Institutional Review Board before starting the study

Detailed clinical history including the presenting symptoms, maternal history, birth history, general and systemic examination was taken and data was collected in predesigned proforma. Also, preoperative investigations were undertaken for the establishment of diagnosis, associated anomalies, operative procedure, intraoperative findings, postoperative complications, and treatment outcomes. Pre-operative radiograph (both anteroposterior and lateral views) with red rubber catheter in situ carried out and position of catheter was recorded.

Intraoperative measured gap length was classified in three group: Group A (gap length >2 cm) long gap, Group B (1 cm to 2 cm) intermediate gap and Group C (≤1 cm) short gap. Follow-up was not done in the present study.

Statistical correlation was assessed between the position of red rubber catheter (distance between incisor and level of vertebra) and intraoperatively measured gap length.

RESULTS:

A total number of 283 cases were enrolled over the study period. Patients were categorized into the three groups as per the radiological preoperative assessment of position of red rubber tube; red rubber tube at level of T2, T3 and T4. As per the intraoperative measurement of gap length patients were categorized into the three groups: Group A (long gap), Group B (intermediate gap) and Group C (short gap).

Radiologically nearly more than half of the patients' (55.5%) catheter's position was found at T3 level. In 73 (25.8%) patients it was found at level of T2 while in 53 (18.7%) patients it was found at T4 level.

Table 1: Radiological position of red rubber catheter (N=283)

Radiological position of red rubber catheter	N	%
T2	73	25.8%
T3	157	55.5%
T4	53	18.7%
Total	**283**	**100%**

The gap length between the two esophageal pouches was measured

intraoperatively in centimetres before ligation and upper pouch mobilization. Long gap was recorded in 36 (13%) patients while short gap was recorded in 109 (39%). Nearly half (49%) of the patients had intermediate gap.

Table 2: Distribution of intraoperative gap length (N=283)

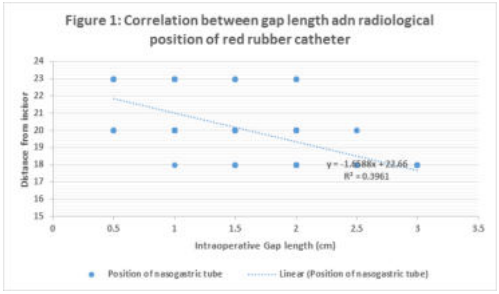
Gap length	N	%
Long gap (>2 cm)	36	13%
Intermediate Gap (>1 to ≥ 2 cm)	138	49%
Short gap (≤1 cm)	109	39%
Total	283	100%

Among group A (Long gap length), 34 (94.4%) patients' red rubber catheter was found at level of T2 vertebra while only 2 patients' red rubber catheter was found at level of T3 vertebra. In group C (short gap length), majority of patients' (99.1%) red rubber catheter was found at the level of T3 and beyond.

Table 3: Position of red rubber catheter and recorded gap length.

Position of red rubber catheter	Long Gap Length	Intermediated Gap Length	Short Gap Length
T2	34 (94%)	38 (28%)	1 (1%)
T3	2 (6%)	88 (64%)	67 (61%)
T4	0 (0%)	12 (9%)	41 (38%)
Total	36	138	109

To analyse the correlation for radiological level of catheter, distance from the incisor was taken into consideration. A correlation was found between the preoperative radiological assessments of position of red rubber catheter and intra operatively measured gap length in this study and association between these two variable was found statistically significant (r=-0.66, P=0). (figure 1)



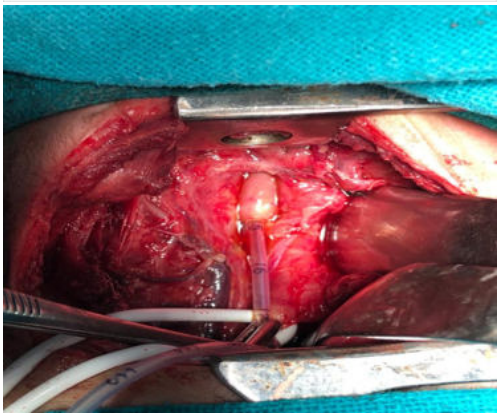


Figure 2a: Gap length between upper and lower esophageal pouch

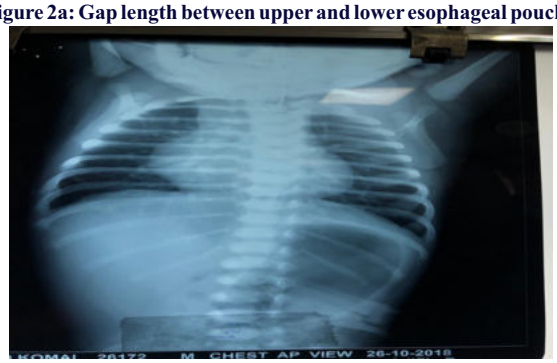


Figure 2b: Position of red rubber catheter at T2 vertebral level

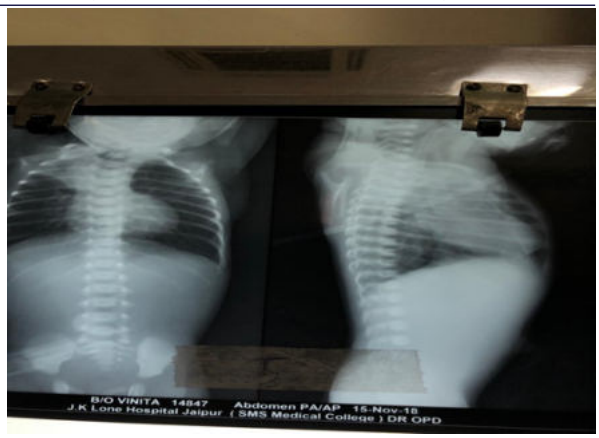


Figure 2c: Position of red rubber catheter at T3 vertebral level

Figure 2d: Position of red rubber catheter at T4 vertebral level

DISCUSSION:

The desired outcome from a surgeon's perspective in cases of EA is to achieve a primary tension free anastomosis in cases of esophageal atresia. There are evidenced which suggest that the gap length between the two esophageal pouches is an important predictor for the outcome of surgery. [3,4,8]

There is no precise definition of long gap oesophageal atresia. 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 up to 3 cm as intermediate and less than or equal to 1 cm as short. Hands and Dudley considered 2cm as long. [9,10] In present study gap length >2 cm defined as long gap and ≤1 cm as short gap while between 1 cm to 2 cm it defined as intermediate gap length.

Intraoperatively it was observed that 36 (%) patients had long gap length, 138 (%) patients had intermediate gap length and 109 (%) patients had short gap length. Mansoor H et al and Upadhyaya et al also found similar distribution of group length. [4,11]

In present study, out of long gap length patients, 94.4% patients' catheter was at level of T2. Among intermediate gap length patients, 126 (91.3%) patients' NGT was found at T2 or T3 vertebral level while in group of short gap length, 99% of patients' NGT was found at level of T3 and T4 vertebra. Rassiwala M et al also found that, 95.12% among group A found catheter at T2 or T3 level and 93.9% patients among group C found at T3 and T4 level. [12]

Level of upper pouch can be assessed by a plain x-ray with a catheter *in situ* but it cannot be useful to assess the level of the lower pouch. In present study the assessment by a plain radiograph was correlated with the actual gap length measured intraoperatively. A correlation between the preoperative radiological assessments of gap length with intra operatively measured gap length was found in this study and association between these two variable was found statistically significant (r=-0.66, P=0). Similar correlation was observed in some other studies also. [12,13]

CONCLUSION:

Preoperative radiological (cheat x-ray) assessment of gap length by vertebral level of red rubber catheter in upper pouch correlate with intraoperatively measured gap length in cases of esophageal atresia. Hence the preoperatively radiographic position of upper pouch should be assessed carefully to predict the gap width and helps in preparedness of surgical management of the patients.

REFERENCES:

1. Spitz L. Oesophageal atresia. Orphanet J Rare Dis 2007;2(1):24.
2. Burge DM, Shah K, Spark P, Shenker N, Pierce M, Kurinczuk JJ, et al. Contemporary management and outcomes for infants born with oesophageal atresia. Br J Surg 2013;100(4):515–21.
3. Tandon RK, Sharma S, Sinha SK, Rashid KA, Dube R, Kureel SN, et al. Esophageal atresia: Factors influencing survival - Experience at an Indian tertiary centre. J Indian Assoc Pediatr Surg 2008;13(1):2–6.
4. Upadhyaya VD, Gangopadhyaya AN, Gupta DK, Sharma SP, Kumar V, Pandey A, et al. Prognosis of congenital tracheoesophageal fistula with esophageal atresia on the basis of gap length. Pediatr Surg Int 2007;23(8):767–71.
5. Garge S, Rao KLN, Bawa M. The role of preoperative CT scan in patients with tracheoesophageal fistula: a review. J Pediatr Surg 2013;48(9):1966–71.
6. Mahalik SK, Sodhi KS, Narasimhan KL, Rao KLN. Role of preoperative 3D CT reconstruction for evaluation of patients with esophageal atresia and tracheoesophageal fistula. Pediatr Surg Int 2012;28(10):961–6.
7. Su P, Huang Y, Wang W, Zhang Z. The value of preoperative CT scan in newborns with type C esophageal atresia. Pediatr Surg Int 2012;28(7):677–80.
8. Brown AK, Tam PK. Measurement of gap length in esophageal atresia: a simple predictor of outcome. J Am Coll Surg 1996;182(1):41–5.
9. Boyle EMJ, Irwin ED, Foker JE. Primary repair of ultra-long-gap esophageal atresia: results without a lengthening procedure. Ann Thorac Surg 1994;57(3):576–9.
10. Hands LJ, Dudley NE. A comparison between gap-length and Waterston classification as guides to mortality and morbidity after surgery for esophageal atresia. J Pediatr Surg 1986;21(5):404–6.
11. Mansur, S. H., Talat, N., & Ahmed, S. (2005). Oesophageal atresia: role of gap length in determining the outcome. Biomedica, 21(2), 125-128.
12. Rassiwala M, Yadav PS, Choudhury SR, Khan NA, Shah S, Debnath PR, et al. Prediction of Gap Length by Plain Radiograph of Chest with Nasogastric Tube in the Upper Esophagus in Patients with Esophageal Atresia and Distal Tracheoesophageal Fistula. J Indian Assoc Pediatr Surg 2019;24(4):281–4.
13. Rassiwala M, Choudhury SR, Yadav PS, Jhanwar P, Agarwal RP, Chadha R, et al. Determinants of gap length in esophageal atresia with tracheoesophageal fistula and the impact of gap length on outcome. J Indian Assoc Pediatr Surg 2016;21(3):126–30.