International Journal of Surgery and Surgical Research
Online ISSN: 2664-9179, Print ISSN: 2664-9160
Received: 15-06-2019; Accepted: 28-06-2019; Published: 08-07-2019
www.surgeryjournals.net
Volume 1; Issue 2; 2019; Page No. 12-17

A study of thoracoscopic repair versus open repair of congenital diaphragmatic Hernia: A prospective study

Puneet Srivastava[1], Richa Jaiman[2], Anurag Anand[3*]

[1] MS MCh, Paediatric Surgery, Associate Professor, Department of General Surgery, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India

[2] Professor Head of Department, Department of General Surgery, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India

[3] JR 3, Department of General Surgery, Sarojini Naidu Medical College, Agra, Uttar Pradesh, India

Abstract

Introduction: The surgical repair of CDH has been traditionally achieved with an open thoraco-abdominal approach. The Congenital Diaphragmatic Hernia Study Group (CDHSG) reported that the subcostal laparotomy is the most commonly approach for repair (91%). However, the proliferation of minimal invasive surgery [MIS] in pediatric surgery has allowed thoracoscopic repair of CDH. The aim of our study was to compare between open and thoracoscopic approaches in CDH repair

Material and Methods: This prospective study namely "study of thoracoscopic repair versus open repair of congenital diaphragmatic hernia – a prospective study" was conducted in department of surgery, Sarojini Naidu Medical College and Hospital, Agra from January 2018 to June 2019 In 30 patients. These 30 patients were included in the study who were randomized in two groups of 15 patient each in study group and control group respectively.

Discussion: The utilization of MIS approaches have been suggested to be advantageous over traditional open surgery including less pain and incisional complications, avoidance of thoracotomy-related sequelae, as well as reduction of surgical stress

Conclusion: Thoracoscopic repair was superior to open technique in terms of post-operative pain, length of stay in hospital, ICU, and ventilator also post-operative initiation of feeding was early in thoracoscopic technique. Open technique take less time than thoracoscopic but post-operative complication was more in open technique in either short term as well as long term.

Keywords: congenital diaphragmatic hernia, minimal invasive CDH repair, CDH

1. Introduction

Congenital diaphragmatic hernia (CDH) is a lethal birth defect with a reported incidence of 1:3000 live births [1]. Herniation of abdominal contents occurs most often, in over 95% of cases, through the posterior foramen of Bochdalek, with 80% occurring on the left side. Less commonly, Retrosternal herniation occurs, through the foramen of Morgagn [2].

CDH commonly presents with severe immediate cardio-respiratory distress with cyanosis, tachypnea and tachycardia. However, 10% of CDH may present later in life with a differing clinical picture. The most frequent presentations are respiratory (43%), followed by GI (33%), both respiratory and GI (13%) and asymptomatic (11%) [3].

Minimally invasive surgery (MIS) for infants and children continues to grow. It was first introduced for the treatment of CDH in 1995; Silen *et al* used thoracoscopy, while Van der Zee and Bax used laparoscopy. However, most paediatric surgeons have hesitated to apply MIS in CDH because of the associated fragile respiratory status and pulmonary hypertension. MIS appears to be gaining more acceptance for CDH repair thus minimizing the strict selection criteria for achieving this goal [4].

Some surgeons supported the laparoscopic route, referring to easier manipulation of instruments, less probability of injury to the reduced viscera, avoiding unnoticed lesions, and the possibility of diagnosing and correcting intestinal malrotation associated with CDH [5-9]. Others supported the thoracoscopic approach referring to easier reduction of the herniated viscera with CO^2 insufflation into the thoracic cavity, wider space available for manipulating instruments, and easier repair of the defect as the reduced viscera doesn't obscure the operative field [2, 10, 6].

As minimally invasive approaches continue to gain popularity in the paediatric surgical community, the paediatric surgeons should report not only their successes but also their failures. Report of honest information will allow the paediatric surgical community to learn from each member's experiences and to apply the growing technology appropriately to infants and children. Attempt in repair of a CDH using minimally invasive techniques is not an easy task that requires careful planning, patient selection, and cooperation between surgeon, anaesthesiologist and an efficient ICU team [11].

Material and Methods

Research Setting

Data for this study was obtained from patient attended OPD in the Department of Surgery, Sarojini Naidu Medical College and Hospital, Agra.

Duration

The study was done between January 2018 to June 2019

Sampling Units

Both Males and Females

Elegibility Criteria

Inclusion criteria

- Both males and females
- Abdominal pain and respiratory distress
- Bowel loops on chest x-ray
- Mediastinal shift to the opposite side on CT thorax and abdomen

Exclusion criteria

- Neonate
- Poor general condition
- Investigation not supportive

Sample Size

30 Patients

Study Design

Only those who fulfil the eligibility criteria were taken in study and were prospectively randomized into two groups.

1. Group A [study group]: include all cases that were treated by thoracoscopic technique
2. Group B [control group]: includes all cases that were treated by open technique

The assessment were done under the following headings:

Intra operative assessment:

- Mean operative time
- Intra operative complications

Post-operative assessment

- length of stay
- ICU length of stay
- Ventilator support
- Initiation of feeding
- Complication
- Pain

Observation

30 patients were included in the study who were randomized in two groups of 15 patient each in study group and control group respectively.

The observation noted were as follows:-

Table 1: Age Distribution (Mean ± Sd) [Yrs.]

Group	N	Mean	SD
A	15	1.88	0.34
B	15	2.08	0.45

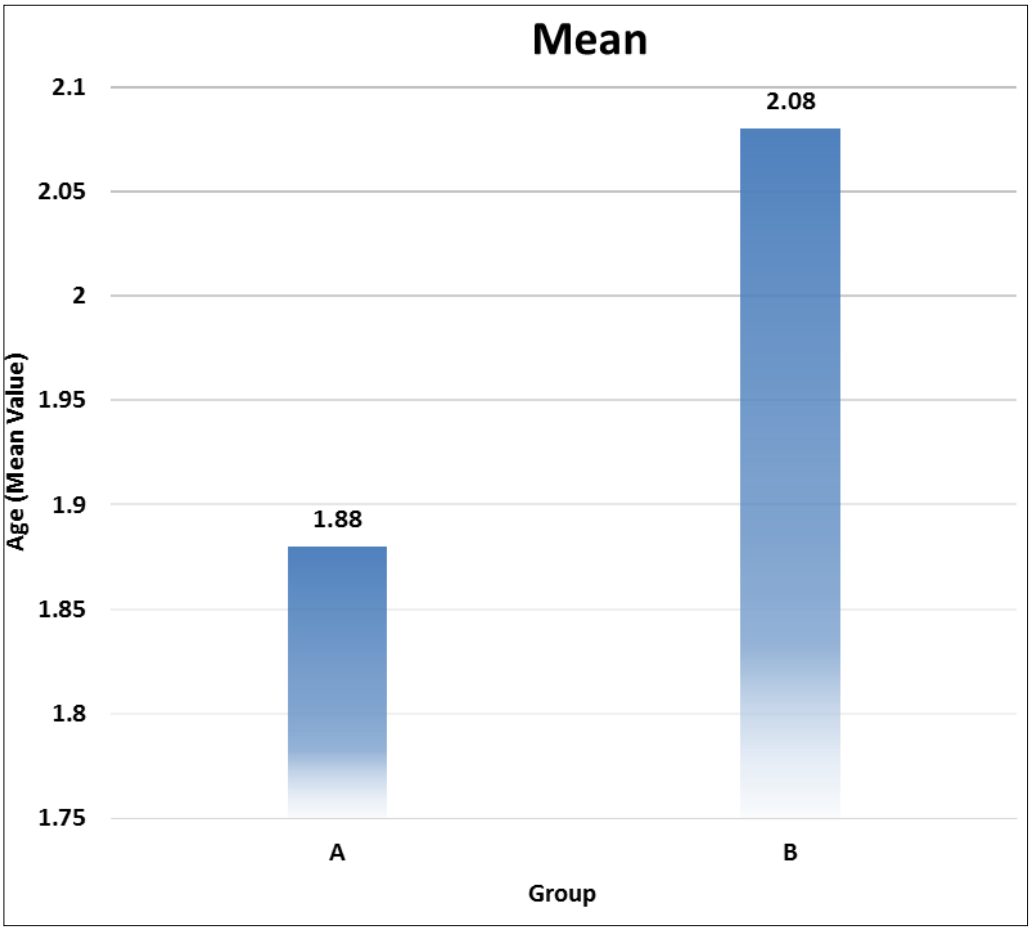

Fig 1: Age Distribution (Mean ± Sd)

Table 2: Sex Distribution (%)

Group	Male		Female	
	No.	%	No.	%
A	11	73.33	4	26.67
B	10	66.67	5	33.33

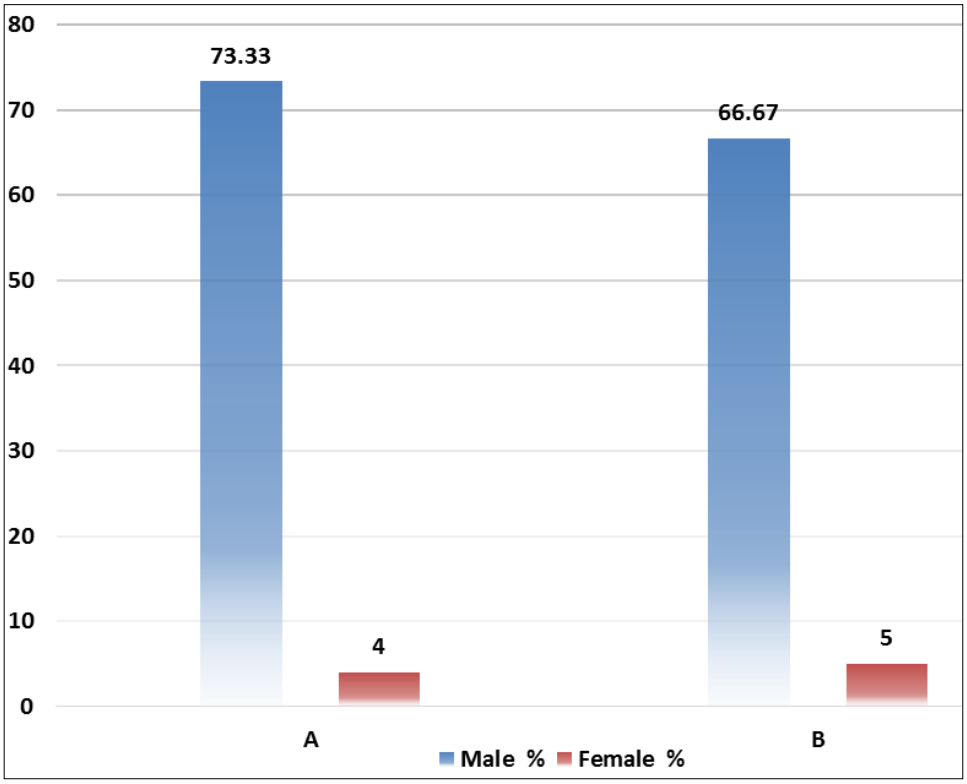

Fig 2: Sex Distribution (%)

Table 3: Post-Operative Pain-Flacc Scoring

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	1.60	0.60	1.5	1	3	<0.0001
B	15	3.07	0.59	3	2	4	

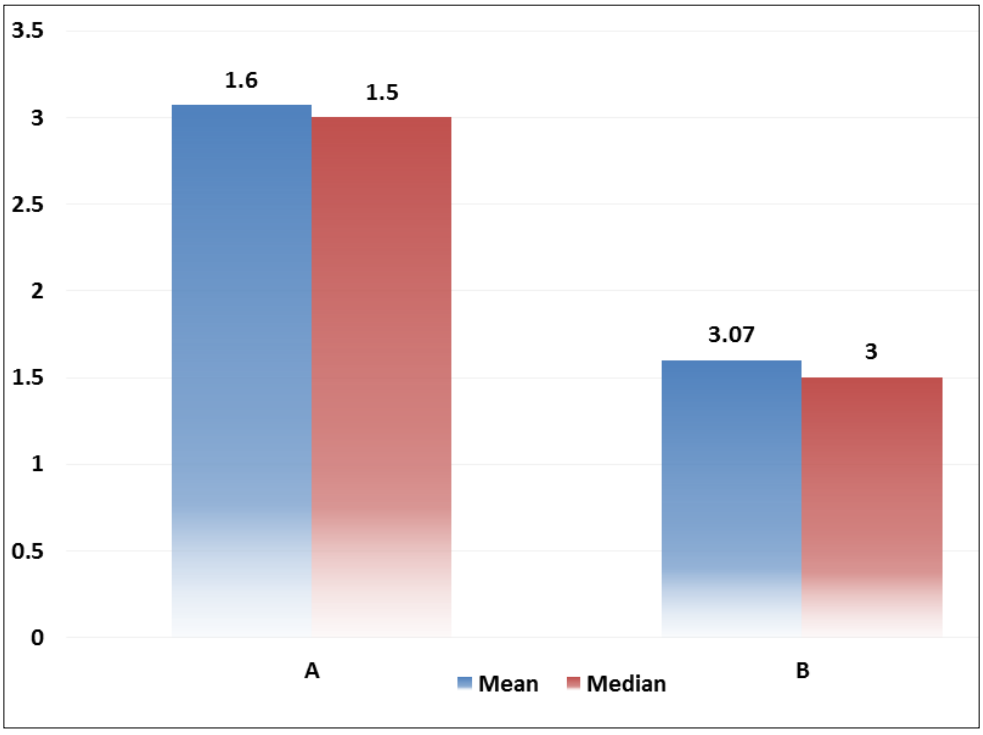

Fig 3: Postoperative Pain - Flacc Scoring

Table 4: Operative Time (Mean and Median) [Min.]

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	134	6.39	132	124	145	<0.0001
B	15	73.87	8.36	75	60	90	

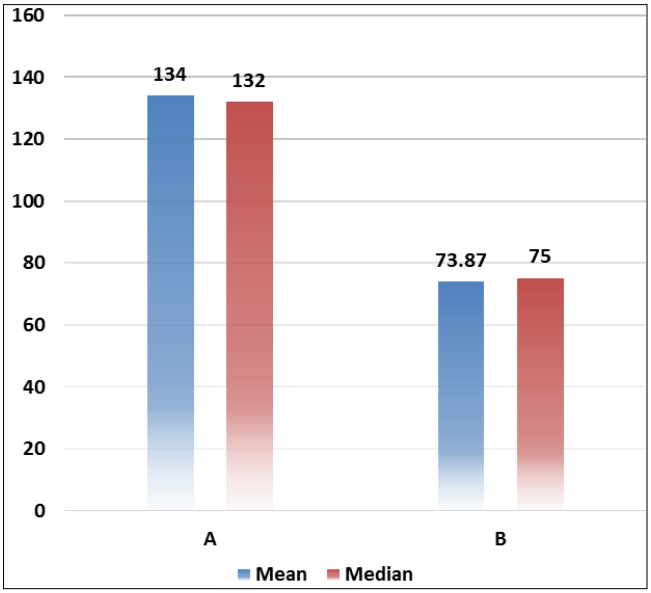

Fig 4: Operative Time (Mean and Median)

Table 5: Post-Operative Drainage [Ml.]

Group	N	Mean (ml)	SD	Median	Min.	Max.	p-value
A	15	46.83	14.35	45	15	50	0.67
B	15	48.16	9.05	50	20	60	

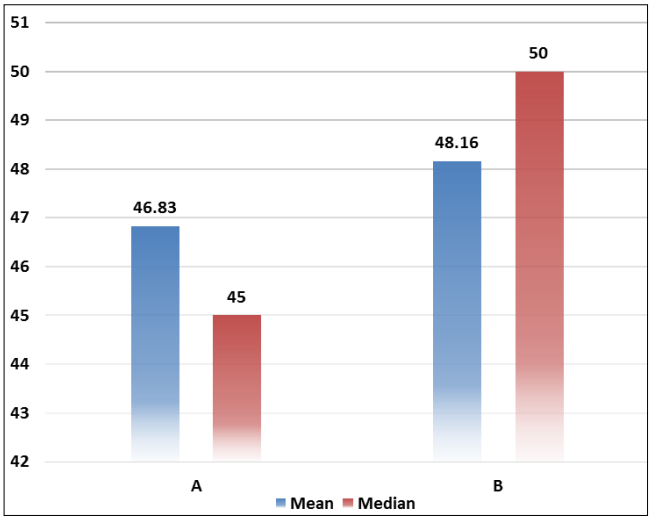

Fig 5: Post-Operative Drainage

Table 6: Total Length of Stay in Hospital [Hrs.]

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	8.80	1.47	9	7	12	<0.00014
B	15	11.53	1.30	12	9	14	

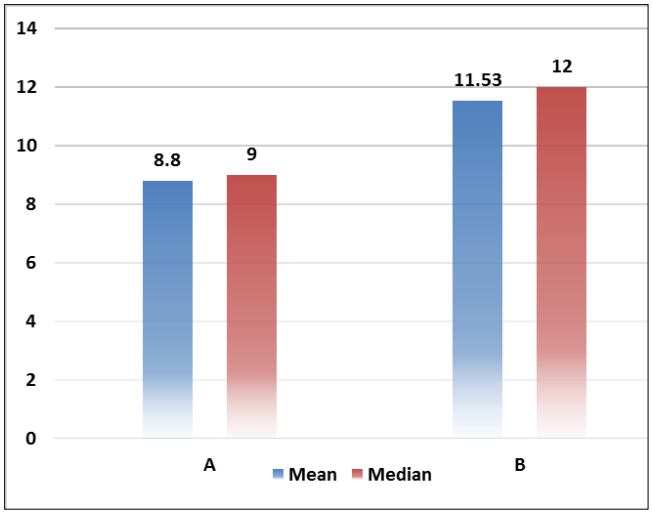

Fig 6: Total Length of Stay in Hospital

Table 7: Post-Operative Length of Stay [Days]

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	5.80	1.32	6	4	8	0.07508
B	15	6.73	1.33	7	4	9	

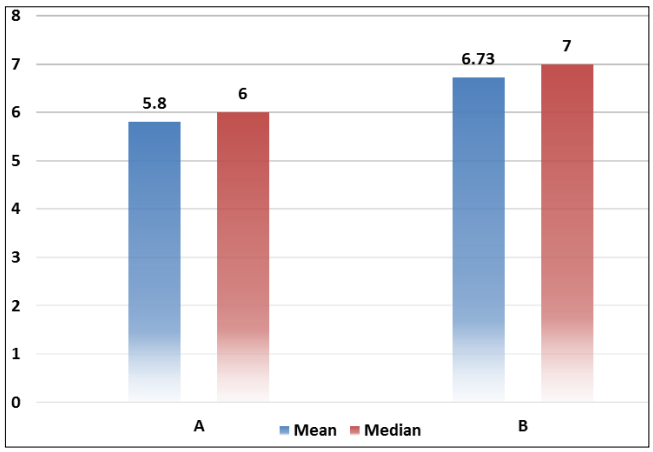

Fig 7: Post-Operative Length of Stay

Table 8: Post-Operative Icu Length Of Stay [Days]

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	1.60	0.60	1.5	1	3	<0.0001
B	15	3.07	0.59	3	2	4	

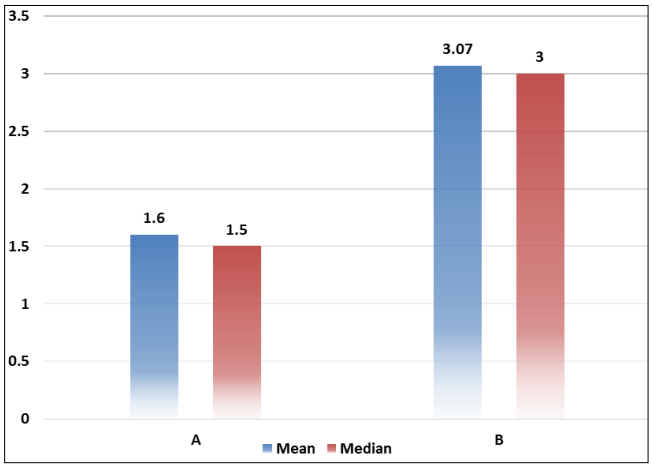

Fig 8: Post-Operative Icu Length Of Stay

Table 9: Post-Operative Ventilator Length of Stay

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	22.07	4.10	24	15	30	0.00008
B	15	40.00	10.80	36	24	60	

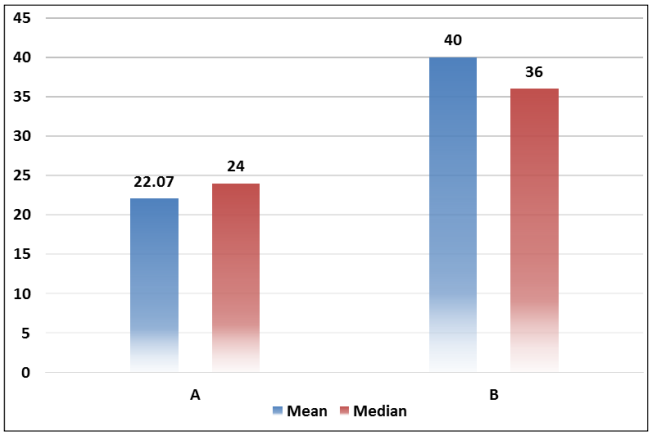

Fig 9: Post-Operative Ventilator Length of Stay

Table 10: Post-Operative Initiation of Feeding [hrs.]

Group	N	Mean	SD	Median	Min.	Max.	p-value
A	15	38.27	11.31	48	24	48	<0.00001
B	15	104.00	19.60	96	72	144	

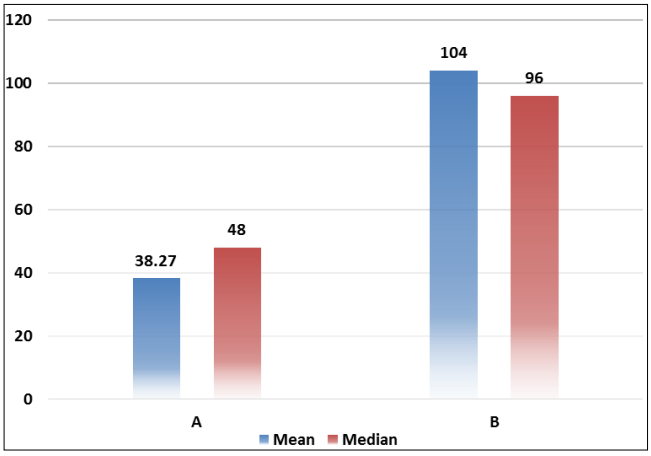

Fig 10: Post-Operative Initiation of Feeding

10. Intra Operative and Post-Operative Complication

There was not any intra operative complication happen in any group, however in control group 3 patient were gone through PSVT as immediate post operatively. Study group had not any complication in any of the case.

11. Conversion Rate

No case of thorocoscopic approach was converted to open at any time of study.

Discussion

The utilization of MIS approaches have been suggested to be advantageous over traditional open surgery including less pain and incisional complications, avoidance of thoracotomy-related sequelae, as well as reduction of surgical stress, but the open approach have been associated with shorter operative time and a lower recurrence rate. In addition, patients who are not candidates to MIS are managed by open approach. Moreover, the use of thoracoscopic approaches in the repair of such patients is still a matter of controversy; so, the utilization of MIS in the repair of CDH still needs further evaluation and meta-analysis [12, 13].

For such reason, 30 patients with CDH have been studied in this work, and 15 of them were operated using thoracoscopic technique and 15 using open technique.

- There were 11 [73.33%] males and 4 [26.57%] females in group B[study group] and 10 [66.67%] males and 5[33.33%] females in group A [control group]. The age ranges for group A was 1.5 to 3 yrs and that for group B was 1.5 to 2.5 yrs. Mean age for study group was 2.08yrs and for control group 1.88yrs.
- Mean operative time in study group was 134 min [range 124 – 145 min] and in control group was 73.87 min [ranges 60 – 90 min], on statistical analysis significant difference was present.
- Mean drainage in study group was 46.83 ml (range 20 to 80 ml) and in control group was 48.16 ml (range 20 to 180 ml). On Statistical analysis no significant difference was found in drainage of both the groups.
- Mean duration of total length of stay in hospital in study group was 8.80 days [ranges 7 – 12 days] and in control group was 11.53 days [ranges 9 – 14 days]. On statistical analysis, significant difference was found.
- Mean duration of post-operative length of stay in study group was 5.80 days [ranges 4-8 days] and in control group was 6.73 days [ranges 4-9 days]. On statistical analysis, significant difference was found.
- Mean duration of post-operative ICU length of stay in study group was 1.60 days [ranges 1-3 days] and in control group was 3.07 days [ranges 2-4 days]. On statistical analysis, significant difference was found.
- Mean duration of post-operative ventilator length of stay in study group was 22.07hrs [ranges 15-30 hrs] and in control group was 40.00 hrs [ranges 24- 60 hrs]. On statistical analysis, significant difference was found.
- Mean duration of post-operative initiation of feeding in study group was 38.27 hrs [ranges 24- 18 hrs] and in control group was 104.00 hrs [ranges 72-144 hrs]. On statistical analysis, significant difference was found.
- No case of thoracoscopic approach was converted to open at any time of study
- There was not any intra operative complication happen in any group, however in control group 3 patient were gone through PSVT as immediate post-operative complication and 1 patient developed scoliosis after 11 months post operatively. Study group had not any complication in any of the case

Summary and Conclusion

Hence, on the basis of our study we conclude that thoracoscopic repair was superior to open technique in terms of post-operative pain, length of stay in hospital, ICU, and ventilator also post-operative initiation of feeding was early in thoracoscopic technique. But if we take operative time in consideration, open technique take less time than thoracoscopic but it would not over shadow the other advantage of thoracoscopic technique which have greater impact over patient health and post-operative results, as we see that post-operative complication was more in open technique in either short term as well as long term. There is not any intraoperative complication and death of any patient throughtout study. Hence, we can say that in our study thoracoscopic technique of congenital diaphragmatic hernia

repair have significant advantage over open repair technique and we recommend the thoracoscopic technique over open technique.

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