

# Pre-operative pediatric cardiac surgery: enema Versus not enema

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**Abstract.** *Background and aim of the work:* There is evidence in adult literature that the enema in the preoperative of thoracic surgery can be dismissed without disadvantage. However, there is a gap of articles about enema in childhood for thoracic surgeries. The aim of the work is to investigate whether the administration of enema in the preparation for cardiac surgery, the use of different analgo-sedation drugs and the Extracorporeal Circulation influence the children's intestinal motility in the post-operative period. *Methods:* A retrospective study was carried out comparing the data between users subjected to saline solution enema, originating from the U.O.C. of Pediatric Cardiology and Pediatric Cardiac Surgery and Congenital Heart Disease and users not subjected to such procedure, coming from the U.O.S.D. Pediatric Intensive Care. The data collected will evaluate the intestinal motility in the post-operative cardiac surgery. *Results:* The following three variables were analyzed: interval of post-operative evacuation days (mean 2.14, median 2.00, standard deviation 1.525 in non-enema children; mean 2.76, median 2.00, standard deviation 1.318 in enema children), administered analgo-sedation drugs and use of Extracorporeal Circulation - for which the Pearson Test was used. A sampling bias is also reported from the analysis of the data. The study did not show a statistical significance correlates the variables analyzed to intestinal motility in post-operative period. *Conclusion:* The sampling bias emerged could reflect the diversity of the catchment area in the two Wards. The study - in agreement with the literature concerning the adult user - proves that the practice of enema evacuation pre-operative cardiac surgery in the pediatric user is unnecessary and does not influence intestinal transit in the post-operative period. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Key words:** enema, pediatric cardiac surgery, preoperative cardiac surgery

## Background and aim of the work

The range of individual congenital cardiac malformations is very vast and the variety of types of cardiac disease affecting individuals early in life is large (1). Pediatric cardiac surgery are complicated, multiple and different (2). The casuistry changes from center to center, based on treated patients (2).

The incidence of congenital heart disease varies from about 4/1,000 to 50/1,000 live births (3).

Risk factors, in pediatric cardiac surgery include: surgical procedure type, primary cardiac diagnosis, univentricular status, age, weight, procedure type (bypass, non-bypass, or hybrid), groups of non-Down congenital anomalies, acquired comorbidities, increased severity of illness indicators (eg. preoperative mechanical ventilation or circulatory support) and additional cardiac risk factors (eg. heart muscle conditions and raised pulmonary arterial pressure) (4).

Jacobs ML, et al. (2) reports by the STAT (The

Society of Thoracic Surgeons European Association for Cardio- Thoracic Surgery) Mortality Category (5) and the results for a select group of representative and somewhat commonly performed procedures.

Many surgical procedures, adult and pediatric, involve the execution of a preoperative evacuation enema. The enema consists in the administration of water or other liquids in rectum and colon in order to stimulate the evacuation and empty the last section of the intestine (6).

Some studies (7, 8) have discussed this procedure, especially with regard to possible adverse effects in the pediatric population. In particular, the enema prepared with sodium phosphate has been shown to be responsible of electrolyte disturbances when administered in children (7). In fact, it should not be administered in children under two years old and should be given with extreme care in the age range between two and five years (8).

This practice was once considered a routine procedure especially in the pre-operative in adults' abdominal surgery in order to avoid the postoperative complications, but it was used also in adults' thoracic surgery to provide an advantage for postoperative complication and hospital stay (9, 10).

There is evidence in adult literature (9, 10) that the enema is no necessary in the preoperative of colon-rectal surgery because, besides not affecting the risk of infection, it results to be a waste of resources and cause of discomfort to the patient. In addition, enema may cause electrolyte disturbances in patients with cardiac or renal disease (9). It has also been shown that even in thoracic surgery, the use of the enema can be dismissed without disadvantage in the post-operative period and without affecting the time spent in hospital (10).

However, there is a gap of articles about enema in childhood for thoracic surgeries.

Therefore, a retrospective study was carried out in the Hospital of Padua, comparing the pre cardio-surgical evacuation procedure of the U.O.C. of Pediatric Cardiology and Pediatric Cardiac Surgery and Congenital Heart Disease (hereafter U.O.C. of Pediatric Cardiology) with U.O.S.D. Pediatric Intensive Care Unit (hereafter U.O.S.D. PICU), where this procedure is not adopted as the alvo is monitored daily by the nursing staff.

### *Objective of the study*

The principal objective of this study is to understand whether the administration of enema in the preparation for cardiac surgery facilitates the intestinal motility of children in post-surgery.

The secondary objective is to investigate the possible correlation between different analgosedation drugs and the use of Extracorporeal Circulation (CEC) with post-operative evacuation times.

### **Patients and Methods**

The enema with physiological solution is given to children from the U.O.C. of Pediatric Cardiology; while it is not given to children coming from the U.O.S.D. PICU since in the aforesaid the alvo is monitored daily by the nursing staff.

The data collected will evaluate the intestinal motility in the post-operative cardiac surgery, through the analysis of the following three variables: days interval of post-operative evacuation, administered analgosedative drugs, use of CEC.

For this retrospective study, authorization was requested from the Chief of the Woman's & Child's Health Department to access the archive and evaluate the data useful for the aim of the study.

The retrospective study is related to the period January-June 2017.

Sampling occurred randomly, following the order of the operating list and not on the basis of age group or basic disease. The selected children are between 10 days and 16 years old. It must be considered that in the U.O.C. of Cardiology patients include all age groups, compared to the U.S.O.D. PICU where there are mostly newborns.

Sampling stopped when it became clear that statistically no significance was shown between the two object groups of the study.

In total, 100 children affected by all the various congenital heart diseases were examined: cyanotic heart disease, acyanotic heart disease, univentricular hearts, external and internal ventricular assistance implantation.

50 children were selected who afferent to the U.O.C. of Pediatric Cardiology. The evening before

the operation, the child underwent the routine enema procedure. The patients of this group have a middle age of 30,59 months and a middle weight of 12 kg.

Another 50 children were selected from the U.O.S.D. PICU and undergoing cardiac surgery. In this group, the patients did not carry out the pre-operative enema procedure. The middle age of this group is 4,8 months and the middle weight is 4,866 Kg.

## Results

The analyzed data want to evaluate the possible impairment of intestinal motility in the post-operative cardiac surgery.

Through the Mann-Whitney Test (Table 1) data on the two population groups for age and weight (Kg) variables were analyzed.

It was not possible to stratify the analysis according to age categories because the U.O.S.D. PICU's population consists mainly in <2 years old children (11). Instead the U.O.C. of Pediatric Cardiology's population welcomes heterogeneous age groups.

Therefore the following three aspects were analyzed: range of postoperative evacuation days, administered analgesedative drugs, use of CEC.

The analysis of data on the evacuation days interval (Figure 1) shows that in the non-enema children (U.O.S.D. PICU group) the mean of the evacuation days is 2.14 and the median is 2,00 (standard deviation: 1,525).

While in children undergoing evacuation enema (U.O.C. Pediatric Cardiology group in Figure 2), the

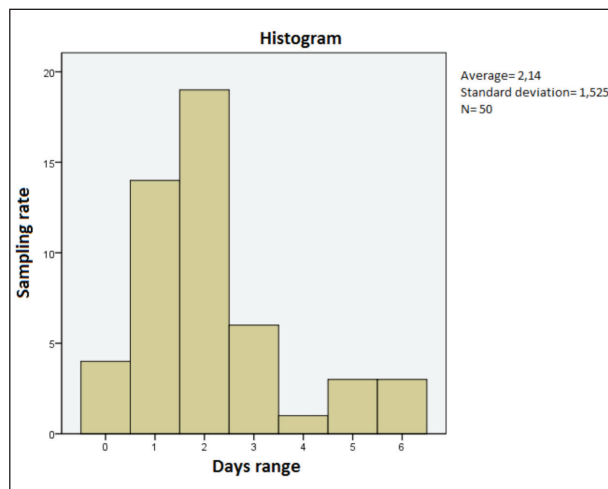


Figure 1. NO pre-operative enema

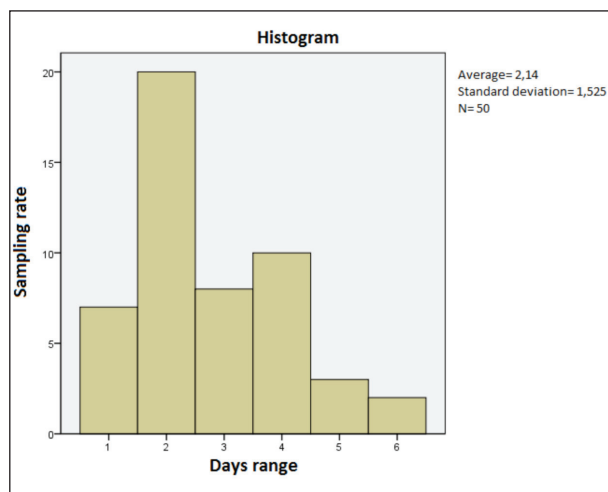


Figure 2. YES pre-operative enema

mean is 2.76 and the median is 2.00 (standard deviation: 1.318).

The second aspect, the analgesedation, was analyzed with Pearson's Chi-square statistical test. The following drugs were considered: Fentanyl (0.221), Tio-pental (0.635), Rocuronium (0.758), Sevoflurane (0.585), Midazolam (0.344), Propofol (0.915), Remifentanyl (0.356), Cisatracurium (0.239). 74% of the sample was subjected to CEC during the surgery (Table 2). We test the sample for significance the difference of CEC in Enema and not Enema groups. There is a reference value of 0.585 with the Pearson's Chi-square statistical test.

Table 1. Mann-Withney. Ranghi Test

Enema PRE	Numerosity	Medium Rank	Sum of the ranks
Kg			
No	50	30,38	1519,00
Yes	50	70,62	3531,00
Total	100		
Age			
No	50	30,81	1540,50
Yes	50	70,19	3509,50
Total	100		

**Table 2.** Contingency table CEC \* post-operative outcome

	Outcome post		Total
	No treatment post surgery	Yes treatment post surgery	
CEC			
No	22	4	26
Yes	59	15	74
Total	81	19	100

It should be noted that 19% of the total sample required evacuating interventions (suppositories, rectal probes, enema) in post-surgery, regardless of belonging group and the variables analyzed above.

The variables analyzed - interval of postoperative evacuation days, administered analgesia, use of CEC interval - do not show statistical significance.

## Discussion

Although the sampling was random, the emerged bias could reflect the diversity of the catchment area in the two contexts of U.O.C. of Cardiology and PICU: in the first case all age groups and secondly newborn infants. It is not possible to stratify the samples and to compare them for age categories, for this reason it is possible that results are partly linked to different age.

The interval of evacuation days is superimposable in the two groups, while the median of the distribution of the evacuation days result to be the same.

Referring to the use of various drugs for the induction and continuation of anesthesia, the Pearson Chi-square statistical test shows the non-significant correlation with intestinal motility in the post-operative period.

Also the last variable analyzed, concerning the correlation between the CEC and the postoperative intestinal motility, did not report statistical significance.

Therefore, the data emerged from the present study, according to the literature (10, 12) present for the adult population, seem to confirm that the practice of the pre-operative cardiac surgery enema in the pediatric patient is not necessary (13, 14) and does not influence intestinal transit in the post-operative period.

## Conclusion

The limits of the study are a scarce scientific literature on the subject and data collection of a single center. It would be desirable to extend data collection with the involvement of additional cardiac surgery centers.

There was a lack of homogeneity for the above variables, which constitutes a sampling bias (11).

The routine practice of enema as well as not having scientific basis and influence on intestinal motility, is an invasive procedure in all age groups and becomes difficult to approach especially in babyhood.

Although there is no precise and clear literature on this, it should be noted that numerous American guidelines do not include the practice of enema in the pre-operative routine of pediatric cardiac surgery, in any group of population (12-14).

Future multicenter studies will allow homogeneous sample for all age ranges, overcoming the limits due to the heterogeneity of the sample of our study.

**Conflict of interest:** None to declare

## References

- Jacobs JP, Mayer JE, Mavroudis C, et al. The Society of Thoracic Surgeons Congenital Heart Surgery Database: 2017 Update on Outcomes and Quality. *Ann Thorac Surg* 2017; 103: 699-709.
- Jacobs ML, Jacobs JP, Hill KD, et al. The Society of Thoracic Surgeons Congenital Heart Surgery Database: 2017 Update on Research. *Ann Thorac Surg* 2017; 104: 731-41.
- Hoffman JIE, Kaplan S. The Incidence of Congenital Heart Disease. *J Am Coll Cardiol* 2002; 39: 1890-900.
- Brown KJ, MMath LR, Barron DJ, et al. Incorporating Comorbidity Within Risk Adjustment for UK Pediatric Cardiac Surgery. *Ann Thorac Surg* 2017; 104(1): 220-226.
- O'Brien SM, Clarke DR, Jacobs JP, et al. An empirically based tool for analyzing mortality associated with congenital heart surgery. *J Thorac Cardiovasc Surg* 2009; 138: 1139-53.
- Badon P, Cesaro S. Assistenza infermieristica in pediatria. Seconda edizione. Milano: Casa Editrice Ambrosiana, 2015.
- Mendoza J, Legido J, Rubio S, Gisbert J.P. Systematic review: the adverse effects of sodium phosphate enema. *Alimentary Pharmacology & Therapeutics* 2007; *Aliment Pharmacol Ther* 2007; 26(1): 9-20.
- Soumoy M.P, Bachy A. Risk of phosphate enemas in the infant. *Arch Pediatr* 1998; 5(11): 1221-3.

9. Matsou A, Vrakas G, Doulgerakis M, Hatzimisios K, Zandes N, Saliangas K. Mechanical bowel preparation before elective colorectal surgery: is it necessary? *Tech Coloproctol* 2011; 5 Suppl 1: S59-62.
10. Yamazaki K, Takeo S, Maehara Y. Preoperative mechanical bowel preparation unnecessary in patients undergoing thoracic surgery. *Jpn J Thorac Cardiovasc Surg* 2004; 52(9): 407-10.
11. Amigoni A, Mondardini MC, Vittadello I, et al. Withdrawal Assessment Tool-1 Monitoring in PICU: A Multicenter Study on Iatrogenic Withdrawal Syndrome. *Pediatr Crit Care Med* 2017; 18(2): e86-e91
12. Johns Hopkins Medicine. Cardiac Surgery. A guide for patients and their families. The Johns Hopkins University, 2011.
13. Preparing for your child's heart surgery. Hassenfeld Children's Hospital, NYU Langone Medical Center.
14. Kane L.G, Faire P. Before Congenital Heart Surgery. The Patient Guide to Heart, Lung, and Esophageal Surgery. The Society of Thoracic Surgeons 2016. (<https://ctsurgerypatients.org/before-during-and-after-surgery/before-congenital-heart-surgery#planning-for-surgery>).

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