FREQUENCY OF RECURRENT LARYNGEAL NERVE INJURY AFTER SURGERY FOR PATENT DUCTUS ARTERIOSUS

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ABSTRACT

OBJECTIVE: To determine the frequency of recurrent laryngeal nerve injury after surgery for patent ductus arteriosus.

METHODOLOGY: This Descriptive study was conducted in the Cardiovascular Department, of a tertiary care hospital in Khyber Pakhtunkhwa over a period of six months.

Infants with patent ductus arteriosus and failed medical treatment were selected from outpatient setting and admitted in surgical ward of the hospital for further workup. After written informed consent, all the infants were put on next OT list for surgical closure of PDA which were performed by single experience cardiothoracic surgeon using standard left posterolateral thoracotomy approach. At the time of exudation anesthetist looked for any Vocal cord paralysis.
Post operatively all infants were kept in ward for the next one day and symptoms on the basis of mother of the child complaining of stridor (on history and physical examination),coughing and choking while feeding and hoarseness of voice were assessed 24 hrs after the surgery.

RESULTS: The frequencies and percentages for of recurrent laryngeal nerve injury were 12 (11.42%) after PDA surgery.

CONCLUSIONS: This study documented recurrent laryngeal nerve injury after patent ductus arteriosus ligations. The percentage suggests that a higher proficiency in patent ductus arteriosus ligations needs to be ensured in pediatric surgery training programs.

KEYWORDS: Laryngeal Nerve Injury, Patent ductus arteriosus, Congenital Heart Diseases (CHD)

INTRODUCTION

The congenital diseases of the heart (CHD) are the most common among congenital anomalies (1) and it accounts for 25-30% of all congenital malformations (2).

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Incidence of congenital heart diseases between 4 and 10 per 1000 live births. It is responsible for significant mortality in the first year of life (3). Congenital heart disease is divided into 2 types: Cyanotic and Acyanotic heart disease. The most common acyanotic heart disease are septal defects of the ventricles (VSD), septal defects of the atria, a congenital patent ductus arteriosus (PDA) and stenosis of the pulmonary valve. The most common cyanosis causing heart disease is tetralogy of fallot and transposition of great arteries. Acyanotic conditions are the more common (4).

In very low birth weight preterm neonates, the incidence rate of a patent ductus arteriosus is as high as 30%. This is not without consequences and is a major factor in determining their survival (6). A surgical intervention to close the ductus is thus necessary (7).

A common complication of congenital heart surgery (CHS) is post-operative vocal cord

dysfunction. This commonly presents with many gastrointestinal and respiratory complications that could warrant further surgical intervention (8). A 1.7% to 67% incidence rate of vocal cord paralysis (VCP) is reported following cardiac, yet it is indicated to be less than 9% by most of the studies (9).

Iatrogenic trauma of the recurrent laryngeal nerve (RLN) is usually caused indirectly by intubation or directly on the nerve during the operation (10). It is challenging to discern which mechanism is involved after CHS. Because it lies in the surgical dissection plane, the left-RLN is more at risk for VCP than the right one, especially during surgeries involving the aortic arch (11).

In one study, 11% of patients developed recurrent laryngeal nerve injury following surgical ligation for patent ductus arteriosus. In another study 17.1% of patients incurred injury to the recurrent laryngeal after ligation for patent ductus arteriosus (12).

This study was conducted with the objective to determine the frequency of recurrent laryngeal nerve injury after surgery for patent ductus arteriosus.

MATERIALS AND METHODS

This Descriptive study was carried out in the Cardiovascular Department, of a tertiary care hospital in Khyber Pakhtunkhwa over a period of six months. The **s**ample size was determined to be 105 using 11% proportion of RLN injury after PDA surgery, 95% confidence interval and 6% absolute precision. Consecutive sampling (non-probability) was utilized to induct the infants who met the inclusion criteria into the study. These included all infants (age 1 to 60 days of both genders) in whom medical treatment had failed to close PDA. We excluded Neonates with history of any type of intervention received for PDA or Neonates with additional CHDs on echocardiography as these conditions may act as confounders and could introduce bias in the results of the study.

Recurrent Laryngeal Nerve Injury was diagnosed on the basis of vocal cord paralysis (VCP) was detected in post-operative patients on the basis of mother of the child complaining of stridor (on history and physical examination), coughing and choking while feeding and hoarseness of voice, and indirect laryngoscopy will reveal no movements in the vocal cords which was unilateral or bilateral, which will assessed 24hrs after the surgery.

The study was approved by the institutional ethical committee and CPSP. Infants with PDA and history of a failed medical treatment, were recruited form the OPD and were admitted after an initial examination and their legal guardians were educated about the procedure and its post-op complications. An informed written consent was then obtained. All the infants were put on next OT list for surgical closure of PDA which was performed by single experience cardiothoracic surgeon using standard left posterolateral thoracotomy approach. At the time of extubation anesthetist will look for any Vocal cord paralysis. Post operatively all infants was kept in ward for the next one day and symptoms on the basis of mother of the child complaining of stridor (on history and physical examination),coughing and choking while feeding and hoarsness of voice was assessed 24 hrs after the surgery. The exclusion criteria were strictly followed to check bias and confounders. Predesigned forms were used to record all the information.

All the data was registered on a windows-based computer into SPSS Ver-22.0. Mean and Standard deviation of mean was calculated for all the numerical variables like age, birth weight, APGAR score. Frequencies and percentages were calculated for categorical variables like gender, low birth weight and low APGAR score and RLN injury. RLN injury was stratified among age, gender, low birth weight, mode of delivery and low APGAR score; to see the effect modifications Chi-Square test was used. A P value below 0.05 was taken as significant.

RESULTS

This study had 105 patients at the Cardiovascular Department, of a tertiary care hospital in Khyber Pakhtunkhwa. As per frequencies and percentages for age wise distribution, 54 (51.42%) patients were recorded in 01-30 Days Group whereas 51 (48.57%) patients were recorded in 31-60 Days Age Group (Table-1).
In the gender distribution, 72 (68.5%) patients were males whereas 33 (31.42%) were female patients. As per descriptive statistics, Mean and SD for Age was recorded 30 Years $\pm$ 9.9, Mean and SD for Birth Weight was 2500 Grams $\pm$ 45.4

and Mean and SD for Apgar Score was recorded as 7.0±0.33. (Table No. 2)
As per frequencies and percentages for RLN injury, 12 (11.42%) had RLN injury after PDA surgery (Table-3). RLN injury is further stratified by gender and age in Table-4 and 5 respectively.

TABLE 1: AGE DISTRIBUTION (n=105)

AGE GROUP	FREQUENCIES	PERCENTAGES
01-30 Days	54	51.42%
31-60 Days	51	48.57%
Total	**150**	**100%**

TABLE NO. 2: DESCRIPTIVE STATISTICS (n=105)

QUALITATIVE VARIABLES	MEAN & SD
Age	30 Years ± 9.9
Birth Weight	2500 Grams ± 45.4
Apgar Score	7.0±0.33

TABLE NO. 3: FREQUENCIES AND PERCENTAGES FOR RLN (n=105)

RLN	FREQUENCIES	PERCENTAGES
Yes	12	11.42%
No	93	88.57%

TABLE NO. 4: STRATIFICATION OF RLN WIHT AGE (n=105)

AGE	RLN	FREQUENCY	PERCENTAGE	P VALUE
01 to 30 Days	**YES**	**06**	**5.71%**	**0.916**
	NO	**48**	**45.71%**	
31 to 60 Days	**YES**	**06**	**5.71%**	
	NO	**45**	**42.85%**	

TABLE NO. 5 STRATIFICATION OF RLN WITH GENDER (n=105)

GENDER	RLN	FREQUENCY	PERCENTAGE	P VALUE
MALE	**YES**	**02**	**01.90%**	**0.241**
	NO	**31**	**29.52%**	
FEMALE	**YES**	**10**	**09.52%**	
	NO	**62**	**59.04%**	

DISCUSSION

Congenital heart disease is the most common group among congenital anomalies (1) and it accounts for 25-30% of all congenital malformations (2). Incidence of congenital heart diseases between 4 and 10 per 1000 live births. It is responsible for significant mortality in the first year of life (3). Congenital heart disease is divided into 2 types: Cyanotic and Acyanotic heart disease. The most common acyanotic heart disease is ventricular septal defects (VSDs), patent ductus arteriosus (PDA), atrial septal defects (VSDs), and pulmonary valve stenosis. The most common cyanotic heart disease is tetralogy of fall out and transposition of great arteries. Acyanotic group is the most common group (4).

Although the incidence of PDA is variable from different studies because of differences in methodology and related to the population which is studied, age, and the method of detection. PDA is the most common heart condition and occurs 30% of times in low weight infants when born preterm and may lead to serious conditions (6). A surgical intervention is usually inevitable (7).

Post-op dysfunction of the vocal cords is not an uncommon complication after congenital heart surgeries (CHS) which is sometimes related to several gastrointestinal and respiratory complications. These complications can often be so severe as to warrant further surgical intervention (8). Post op vocal cord paralysis is reported most of the times to be less than 9%, however there are studies that have reported it as high as 67% (9) which as comparable to this study whereas per frequencies and percentages for RLN, 12 (11.42%) had RLN injury after PDA surgery (Table3).

The trauma to the recurrent laryngeal nerve (RLN) is usually caused indirectly by intubation or directly on the nerve during the operation (10). It is challenging to discern which mechanism is involved after CHS. Due to the surgical plane of dissection, the left RLN is more at risk for VCP than the right one, especially during aortic arch procedures (11).

In one study, 11% of patients developed recurrent laryngeal nerve injury after surgical ligation for patent ductusarteriosus which as compared to my study whereas per frequencies and percentages for RLN, 12 (11.42%) had RLN after PDA surgery. (Table No. 3).

In another study 17.1% of patients developed recurrent laryngeal injury after ligation for patent ductusarteriosus(12) which as compared to my study where per as frequencies and percentages for RLN, 12 (11.42%) had RLN after PDA surgery. (Table No. 3).

CONCLUSION

This study documented recurrent laryngeal nerve injury after patent ductus arteriosus ligations. The percentage suggests that a higher proficiency in patent ductus arteriosus ligations needs to be ensured in pediatric surgery training programs.

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