

# Neonatal Surgical Emergencies At Seoul National University Hospital: Comparison Between the Pre- and Post-Children's Hospital Period<sup>†</sup>

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= Abstract = **Results of management of the neonatal surgical emergencies were analyzed and compared between 460 infants treated during the 1979-85 period (pre-childrens hospital) and 471 infants treated during the 1986-92 period (post-childrens hospital). No statistical difference was noted in patients population, and average mortality rate in the pediatric surgical department which has already been functioning as an independent unit since 1978. Other surgical departments have experienced 2-3 fold increases in number of patients. Patient's age at admission( delay in transfer) was not significantly improved. However, significant improvement in survival was noted in patients who required respiratory support such as gastroschisis, and esophageal atresia with tracheo-esophageal atresia. Changes in the general management plan are discussed.**

*Key Words: Neonatal emergencies, Neonatal surgery, Perinatal surgery, Newborn emergencies, Newborn surgery.*

## INTRODUCTION

The first known neonatal surgical unit which covers the Liverpool area in England, an area with a population of 3 million, was

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established at the Alder Hey Childrens Hospital (Rickham and Johnson 1969) in 1953. It is very unusual since it serves all the neonatal surgical emergencies in a single ward of one hospital. Three-thousand five-hundred babies underwent surgical operations from 700,000 newborn babies during the 1953-67 period. Eighty-six (a yearly average) newborn babies were treated annually for general surgical emergencies. Since this historic event, neonatal surgery and neonatal surgical intensive care units are commonly seen in the children's hospitals of the world.

In Korea, the first independent pediatric surgical unit was established in 1978 at Seoul National University. The first university children's hospital(denoted by CH) was established in 1985 at the same university. Developmental

**Table 1.** Number of patients: neonatal surgical emergency

	total cases	cases per yr	approximate adult cases
1963-73 <sup>#</sup> (pre PDS)	104/11 yrs	10/yr	1000 adult/yr
1978-85 <sup>@</sup> (pre CH)	676/ 8 yrs	85/yr	2000 adult/yr
1986-92 <sup>†</sup> (post CH)	741/ 7 yrs	106/yr	3000 adult/yr

<sup>#</sup> : pediatric surgical department

<sup>@</sup> : children's hospital

<sup>†</sup> : post children's hospital

staging of the pediatric surgery as well as neonatal surgery at Seoul National University can be divided into three stages: pre-pediatric surgical department (before 1978), pre-childrens hospital(1978-1985), post-childrens hospital (1986-present). Neonatal surgical emergencies were very rarely seen before the establishment of an independent pediatric surgical department. (Kim *et al.* 1974) Thus, the independent pediatric surgical unit had great impact on the volume of neonatal surgery(Table 1).

In this study, the results of management for the neonatal surgical emergencies after the establishment of the university children's hospital will be analyzed with the special emphasis on the mortality and related problems in management.

## MATERIALS AND METHODS

Four-hundred and seventy-one neonatal general surgical emergencies treated in a seven year period( 1986-92) of the CH were analyzed and compared to 460 infants treated during the 1979-85 period of pre-CH. Numbers of patients, populations of individual emergency, mortality rates were studied with statistical methods. Factors affecting mortality are also analyzed to see if there are any changes between the pre-CH and post-CH period. The mortality factors were compared between survivors and victims by statistical methods.

## RESULTS

### Incidence

Total numbers of neonatal general surgical

**Table 2.** Number of neonatal index cases.

	Pre-children's hospital (1979-85)	Post-children's hospital (1986-92)
Neonatal emergencies		
Anorectal malformations*	123	103
Neonatal Hirschsprung's	88	80
Gastroschisis/omphalocele	74	70
Atresia/stenosis of guts	68	76
Esophageal atresia	44	52
Bochdalek hernia	14	23
Midgut volvulus	23	20
Teratoma,sacro-coccygeal	23	20
Meconium peritonitis	7	9
Necrotizing enterocolitis	4	5
Total	460	471

\* :  $p < 0.05$

emergencies were not significantly changed before or after the opening of the CH (Table 2). But other surgical subspecialties such as urology, neurosurgery, cardiac, orthopedic, and plastic experienced two to three fold increases in numbers of both neonatal as well as older infants. Also the total volume of patients in the department of pediatric surgery has not changed, which probably reflects the same trend. For the individual diseases, there were no significant changes in the proportion of neonatal emergencies during each seven year period. Only anorectal malformations showed any significant change in number.

### Mortality rate

Average mortality was not significantly changed after the establishment of the CH. There were 52 deaths from 460 neonates in the pre- CH period while there were 48 deaths from 471 neonates in the post-CH period (Table 3). However, for the individual emergencies, significant improvement in survival was noted in esophageal atresia and gastroschisis, which had required rather intensive respiratory support after the correction of anomalies. Bochdalek hernias showed a marked increase in mortality.

### Factors affecting mortality

To evaluate the factors influencing mortality, the causes of death were analyzed

**Table 3.** Neonatal surgical deaths in pre-children's hospital and post-children's hospital period

	pre-children's hospital (1979-85)	post-children's hospital (1986-92)
Total neonatal emergencies	460	471
Death (p = 0.35)	52	48
Atresia/stenosis	6	6
Gastroschisis/omphalocele*	22	13
Esophageal atresia*	9	5
Bochdalek hernia*	5	9
Others	10	15

\* p < 0.05

retrospectively. Delay in diagnosis/transfer, surgical technical failure, failure in medical management, low birth weight and presence of associated severe anomalies were the known major categories of mortality factors. These mortality factors were statistically compared between survivors and victims of each disease in the two different periods. Significant changes between the two periods are investigated. (Table 4). The delay in diagnosis/transfer was improved in neonatal intestinal obstructions. Surgical management was improved during the CH period in esophageal atresia group. Medical management, mostly respiratory care improved in esophageal atresia as well as in the gastroschisis group. Changes were not significant in other diseases.

In conclusion, known reasons such as delay in diagnosis/transfer, failure in both surgical and medical management, low birth weight and associated severe anomalies played important roles in neonatal surgical mortality. Medical or respiratory management are definitely improved after the establishment of the university children's hospital. However, unlike other surgical departments, pediatric surgical emergencies are not significantly affected by the establishment of the university children's hospital in this study because it was already an independent unit and receiving patients like a regional center. Significant improvement in sur-

**Table 4.** Statistically significant mortality factors (denoted by \*) between survivors and victims in pre-/post- children's hospital period

Mortality factors	Gut atresia	Gastroschisis omphalocele	Esophageal atresia	Bochdalek hernia
delay in diagnosis/transfer	* / -	* / *	* / *	* / *
Surgical technical failure	- / -	* / *	* / -	- / -
Failure in medical management	- / -	* / -	* / -	* / *
Low birth weight	* / *	* / *	* / *	- / -
Associated severe anomalies	- / -	- / -	* / *	* / *

\* : p < 0.05

- / - : no significant mortality factor in both pre-/post-children's hospital period

\* / - : significant mortality factor only in pre-children's hospital period

\* / \* : significant mortality factor in both pre-/post-children's hospital period

vival rate is noted in esophageal atresia and gastroschisis which required postoperative respiratory therapy and modernized ICU. Delay in diagnosis/transfer still play the major role in the children's hospital, since they occur before the patient's arrival at the CH.

## DISCUSSION

For the neonatal general surgical emergencies, there were no significant changes in number or in mortality rate after the establishment of the modernized university children's hospital in this study. There are several possible explanations: first of all, the pediatric surgical department was functioning as an independent unit seven years before the CH. They had their own intensive care unit which became the nucleus of the future intensive care unit of the new CH. The number of active pediatric surgeons in the patient's draining area increased several times, thus a dilution of the patients population was expected. The drop in

the birth rate, from the order of 800,000/year to 600,000/year during the last 15 years, definitely contributed. Maintenance of the same number of patients amidst the recent phenomena of the explosion of hospital beds here in Seoul should be considered to evaluate the current status. It also emphasizes the importance of concentrating neonatal cases into one ward or one unit (Soper and Kimura 1988) or in regional centers for neonatal surgical emergencies.

Regarding the mortality, delay in transfer/diagnosis are not improved except in the case of atresia/stenosis of the gut and related intestinal obstruction such as neonatal Hirschsprung's disease. Uncontrollable risk factors, such as low birth weight and associated severe anomalies still play a major role in mortality (Kim 1992). In fact, establishment of the CH, the only university CH, resulted in a concentration of higher risk or sick neonates. Higher mortality in Bochdalek hernia cases is an example of this concentration of high risk cases. With the trend of a decreasing birth rate and the higher cost of maintaining neonatal intensive care units, concentration of sick neonates will continue for sometime in the future.

On the management or treatment aspect, the new CH has definite advantages. Its environment, the concentration of the same

age/risk groups in the same ward has a big impact on the survival of the neonate. Both neonatal and pediatric intensive care units have been a great help in increasing the level of care. Full time intensive care nurses reduce the work load of the physician, so they can be more available for other problems. Improvement of survival of EA/TEF, gastroschisis which required expensive respiratory therapy owed a lot to these factors. In surgical skill/management, there were not many changes, as can be expected from its role as a "regional or national center" from the beginning.

The importance of a regional center for neonatal surgical emergencies as well as other emergencies is again emphasized in this study.

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