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Overnight observation in former premature infants undergoing inguinal hernia repair

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Abstract

Background: Overnight observation for apneic events is standard practice in former preterm infants. However, the literature supporting current protocols is dated. Therefore, we retrospectively evaluated the post-anesthetic risks in these patients.

Methods: A retrospective review was conducted on former preterm infants admitted after an inguinal herniorrhaphy between 1/00 and 10/09. The protocol for overnight admission was for patients born before 37 weeks gestation who are less than 60 weeks post-conceptional age (PCA).

Results: There were 363 patients, of which 23 were <40 weeks PCA (group 1), 244 were 40 to 49.9 weeks PCA (group 2), and 96 were 50 to 60 weeks PCA (group 3). Events registered by alarms occurred in 4 patients (1.1%), 2 from group 1 and 2 from group 2. In Group 1, one occurred during nasogastric tube placement and resolved spontaneously. In group 2, one was apnea-induced bradycardia that resolved spontaneously, and one was in a patient on home monitors with an event similar to home reports. There were no events in group 3.

Conclusion: Conservative guidelines for overnight observation after inguinal hernia repair could be set for patients born before 37 weeks gestation who are under 50 weeks PCA.

Postoperative events related to apnea are more common in former preterm infants. Hospital admission for overnight observation after elective operations under general anesthetic is standard practice in former preterm infants. The post-conceptional age that triggers admission for observation is debated, and the literature supporting current protocols is dated. Therefore, we reviewed our experience with overnight observation to assess the current post-anesthetic risks in former premature patients.

1. Methods

After obtaining institutional review board approval, a retrospective review was conducted on all former preterm patients who were admitted for observation after an inguinal herniorrhaphy from January 2000 to October 2009. Our protocol for overnight admission includes patients born before 37 weeks gestation who are less than 60 weeks post-

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conceptional age (PCA). All patients had continuous cardiorespiratory monitoring postoperatively throughout their hospital stay with a combination of continuous recording devices, impedence pneumography with alarms, and nursing observation. As a retrospective study, the anesthetic technique was not fixed and practitioner dependent including variables such the use of narcotics, use of muscle relaxants, and the timing of extubation. Data recorded included demographics, surgery details, factors associated with apnea, bradycardia, and desaturation, and their outcomes. An apneic event was counted by either documentation of apnea by anesthesia or nursing notes through visual observation or documented pauses ≥15 seconds. Severe apnea was defined as a desaturation of ≤85% or requiring mask assistance for apnea.

Patients were divided into 3 groups for analysis. Group 1 was composed of patients less than 40 weeks PCA, group 2 was between 40 and 49.9 weeks PCA, and group 3 was between 50 and 60 weeks PCA. Comparison among groups was performed using analysis of variance for continuous variables and χ^2 for categorical variables. Significance was defined as $P < .05$.

2. Results

There were 363 patients included in the study who were former premature infants at the time of surgery. Mean PCA was 47 weeks (33.3-59.9 weeks) and mean weight at operation was 4.6 kg (2.1-8.9 kg) for the study population. There were 23 patients in group 1, 244 in group 2, and 96 in group 3. Demographics and operative details for each group are listed in Table 1.

The immediate postoperative course was eventful. In the whole population, 41.9% (151 patients) had an isolated episode of apnea, bradycardia, or desaturation postoperatively while in the recovery room. The breakdown of recovery room courses by group is outlined in Table 2.

After the patients were discharged from the recovery room and admitted to the general surgery service, there were events registered by cardiorespiratory alarms in 4 patients, resulting in an overall incidence of 1.1%. The events occurred with 2 patients in group 1 and 2 patients in group 2, the details of these events are outlined in Table 3. The oldest gestational age for any of the 4 infants was 33 weeks.

Table 1 Patient characteristics

	Group 1	Group 2	Group 3	*P*
	<40 wk PCA	40-49.9 wk PCA	50-60 wk PCA	
No. of patients	23	244	98	
Mean PCA (wk)	38.4	45	54.0	
Mean weight (kg)	3.5	4.2	5.9	<.0001
Mean OP time (min)	34.3 ± 12.9	35.5 ± 17.2	41.6 ± 24.3	.05

Table 2 Recovery room course

	Group 1	Group 2	Group 3	*P*
Extubated in RR	65.2 %	59.0%	58.2%	.8
Desaturation	56.5%	43.4%	29.6%	.02
Apnea	43.5%	20.9%	16.3%	.0004
Severe apnea (<85%)	26.1%	19.2%	9.2%	.03
Bag mask ventilation	17.4%	10.7%	10.2%	.28
CPAP	17.4%	4.9%	3.1%	.01
Bradycardia	0	4.9%	2%	.07
Mean RR time (min)	71.9 ± 44.2	63.0 ± 26.8	57.6 ± 20.7	.16

RR indicates recovery room; CPAP, continuous positive airway pressure.

3. Discussion

There is a long-standing practice to admit former preterm infants after an anesthetic. The initial documentation of postoperative apnea in former premature infants recovering from general anesthesia appeared in 1982 [1]. In the years to follow, a debate developed centered entirely around the postconceptional age at which infants remain at risk. Some have suggested that the likelihood of apnea was nearly absent by 44 weeks PCA [2], whereas others reported that the risk of apnea persisted until as late as 60 weeks PCA [3-5]. The 1995 meta-analysis of 8 small series used the widely variable incidences reported in these series to establish a predictive curve, which pointed to a significant reduction in the incidence of apnea at 52 to 54 weeks PCA, with an incidence of apnea to less than 1% at 54 weeks PCA [4]. The curve created by this model possessed an upper confidence interval that drags out to 60 weeks PCA, which represents the most conservative interpretation for a safety margin from these data. Although some debated the validity of this conservative estimate at the time suggesting it would be safe to set more liberal criteria [6], many centers including ours established protocols to admit former preterm infants under 60 weeks PCA. An additional variable posed at the time was anemia [4]; however, patients now rarely have blood draws now before an elective hernia repair.

The debate is clouded by the quality and amount of data available. The data are flawed by variable means of monitoring, definitions of events, and the lack of current evidence. Variability in the technology used to detect events also creates bias, and expectedly, the lowest incidence of reported events have been in studies that used the least sophisticated technology including nursing observation [2,4,7]. Higher rates of events are reported with the utilization of continuous recording devices [3,4].