



Surgical Management of Very Low Birth Weight (VLBW) and Extremely Low Birth Weight (ELBW) Premature Infants with Inguinal Hernia: Timing of Repair, Type of Anaesthesia and Postoperative Outcome

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Abstract

Introduction: Very low birth weight (VLBW; <1500 g) and extremely low birth weight (ELBW; <1000 g) premature infants need special care. This study evaluates the timing of surgery, the type of anaesthesia, and the postoperative outcome in VLBW and ELBW premature infants with inguinal hernia.

Materials and Methods: This is a retrospective review of VLBW and ELBW premature infants undergoing inguinal hernia repair from 2013 to 2016. They underwent inguinal herniorrhaphy at a body weight of 1600 g-2000 g, by experienced surgeons, under awake caudal anaesthesia, before discharge from the neonatal intensive care unit (NICU).

Discussion and Results: This study included 31 premature infants, of which 12 were ELBW infants, and the lowest birth weight was 445 g. There were significantly more males in the whole study. There were 11 patients that had bilateral, 14 patients had right-sided and 6 patients had left-sided inguinal hernias. All patients underwent surgical repair under awake caudal anaesthesia. One patient required general anaesthesia. After a median follow up of eight months, one recurrence had occurred. There were no perioperative surgical complications, and no postoperative respiratory problems.

Conclusion: Inguinal hernia repair is one of the most common surgical procedures in paediatric surgery. Premature babies reveal special conditions, such as a high incidence of inguinal hernias and increased risk of postoperative apnoea. We favour herniorrhaphy under awake caudal anaesthesia for these patients, and the timing of surgery should be before discharge from the NICU.

Keywords: Inguinal hernia; Very low birth weight; Extremely low birth weight; Caudal anesthesia

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Introduction

Inguinal hernias occur frequently in newborns, and are even more prevalent in preterm children [1-3]. Conventional inguinal hernia repair is considered a very common operation in paediatric surgery, but requires special considerations in preterm infants [4]. Prolonged stay at the NICU, complications related to anaesthesia, as well as early surgical complications need to be weighed against the risk of incarceration along with testicular atrophy or bowel necrosis. In VLBW neonates, the risk of incarceration while awaiting elective surgery is stated to be up to 39% [5]. It is currently debated whether early surgical repair prior to hospital discharge or elective hernia repair upon scheduled readmission is the most beneficial choice. In terms of anaesthesia, general anaesthetic versus regional anaesthetic (generally caudal anaesthesia) is discussed. Advancements in neonatal anaesthesia and perioperative care have reduced morbidity and mortality in surgical procedures. In this study, we discuss a standard of care for VLBW and ELBW preterm children with inguinal hernia, which considers the timing of surgery, the operative method, anaesthesia, postoperative surveillance and follow-up.

Materials and Methods

The retrospective study was conducted at Innsbruck Medical University. There were 31 preterm infants that underwent inguinal hernia repair between 2013 and 2016, of which 19 were VLBW (<1500 g) and 12 were ELBW (<1000 g). The lowest birth weight was 445 g (Table 1). Upon diagnosis,

Table 1: Patient characteristics (N=31).

[HIS: Hernia Inguinalis Sinistra, HID: Hernia Inguinalis Dextra]

VLBW: n=19

ELBW: n=12

Body weight	m	f	HIS	HID	bilateral
900	X			x	
1354		X	X		
680	X				X
1115	X				X
1260	X			X	
600	X				X
1320	X		X		
1110	X				X
1157	X			X	
980		X			X
700	X				X
1460	X			X	
1320	X			X	
680	X				X
1480	X		X		
1410	X			X	
1450	X		X		
970	X				X
568	X		X		
445	X		X		
1370		X			X
1450		X			X
620		X		X	
1125		X		X	
1230	X			X	
600	x			X	
1400	X			X	
1300	X			X	
1200	X				X
1420	X			X	
640	X			X	
n= 31	n=25	n=6	n=6	n=14	n=11

hernias were carefully reduced manually. Irreducible hernias were operated immediately. Children underwent conventional inguinal hernia repair once they had increased their body weight to 1600 g to 2000 g. Surgery was performed by a consultant paediatric surgeon and an experienced paediatric anaesthetist. All patients received awake caudal anaesthesia: after topical surface anaesthesia, a 25G needle was inserted at the sacral hiatus. Ropivacaine was infused at a maximum concentration of 3 mg/kg 20 min prior to surgery. Sensible and motor functions, as well as vital signs were monitored throughout the procedure. If needed, additional sedation with ketamine or midazolam was administered i.v. One patient received caudal anaesthesia together with general anaesthesia. Postoperatively, all patients were followed at least overnight with pulse oximetry monitoring, or at the NICU.

Results

There were 19 VLBW and 12 ELBW neonates included in the study. Of these 31 patients, 11 had bilateral hernias, 14 were right-sided, and 6 were left-sided. Inguinal hernias were more common in male children compared to females: 25 males versus 6 females were treated. Conventional inguinal hernia repair was performed only on the affected side(s); no exploration of the clinically unaffected side was performed. No intraoperative or early postoperative surgical complications were reported. Anaesthesia was performed as awake caudal anaesthesia in all patients; in one patient it was necessary to switch to general anaesthesia during the procedure. No case of postoperative respiratory problems occurred. Awake caudal anaesthesia allowed to surgeon approximately 45 minutes comfortable working time and mean operating time by the senior surgeons in this study was 20 min. Median follow-up was eight months. In one case, recurrence of the hernia was noted. No cases of testicular atrophy were reported.

Discussion

The questions of timing, operative method, screening for metachronous hernia, and anaesthesia are still debated for treating premature infants with inguinal hernias. In the present study, we summarize our experience with early hernia repair in VLBW and ELBW children. The children were operated at a body weights between 1600 g – 2000 g, when the patient would ordinarily have been ready for hospital discharge. The why of this timing are at first surgical, after 1500 g regarding our experience, the inguinal anatomy become sufficient mature for surgical manipulations. Secondly, the timing of hernia repair avoids psychosocial and financial consequences. The fear of incarceration negatively affects preterm children's families, and insecurities of primary care practitioners often lead to emergent re-admissions. According to a U.S. nationwide registry, more than half (55.6%) of preterm children with inguinal hernias were operated during their initial hospitalization, whereas around 44% were discharged from the hospital and operated electively during the first year of life [2]. It is argued that delayed herniotomy allows the child to recover from the initial hospital stay and to grow, in order to minimize perioperative complications. As often stated, the risk of postoperative apnoea in preterm infants is up to 49% [6,7], especially in children with pre-existing apnoea or RDS [8]. However, with advances in anaesthesia, newer studies present a far more favourable picture – with apnoea rates ranging around 5% [6]. In addition, financial motives have been stated to advocate for delayed surgical repair [2]. Conversely, delaying surgery puts the child at risk of incarceration. Especially with preterm infants, the risk of incarceration within the first year of life is reported to be around 39% [5], but a greater risk has also been reported [9]. Testicular atrophy is a major complication of incarcerated hernias, and is reported in up to 10% of patients [10,11]. Recurrence of inguinal hernia occurred in one case of our patients. In the literature, recurrence rates are stated to be around 5%, and are higher after incarcerated hernia [10,11]. The fear of incarceration negatively affects preterm children's families, and insecurities of primary care practitioners often lead to emergent re-admissions. With an early approach in hernia repair, we can avoid these psychosocial and financial consequences. In our study, 11 of 31 patients had bilateral inguinal hernias. This is in accordance with data from the literature [12]. In our centre, only clinically symptomatic groins were operated. The topic of metachronous inguinal hernia is still an issue for debate. Some authors recommend routine contralateral groin

exploration [13,14], while we and others [15,16] dismiss the approach of operating on a clinically unaffected side because of the risk of vas and vessel injury. In our study consisting of 31 VLBW and ELBW patients, conventional hernia repair was performed prior to discharge from the hospital under awake caudal anaesthesia. No perioperative complications were observed.

Awake caudal anaesthesia is an established method in preterm infants [17]. It may significantly contribute to less postoperative apnoea, as well as less invasive follow-ups. Depending on birth weight/gestational age, pre-existing phases of apnoea or RDS, and other comorbidities, we either observed the children at the NICU or at the regular surgical ward.

Conclusion

As a conclusion for hernia repair in preterm babies, the concept of early surgery is weighed against delayed surgery the risk of incarceration versus clinical stability of the preterm child. We therefore recommend the early approach in favour of delayed hernia repair, to avoid long-term morbidity related to incarcerations, and using awake caudal anaesthesia to minimize postoperative apnoea problems.

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