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Research Article

Intensive Care Associated Experiences of Extremely Premature Infants Who Die

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Abstract

Objective: Pain and quality of death are important considerations in treatment choices for children. Our objective is to assess the intensive care-associated experiences of 22-25 weeks gestational age (GA) infants who die despite intensive care treatment.

Study Design: In a 1:1 case-control study, medical records were screened for all inborn 22-25 weeks GA infants who received intensive care treatments between 2014 and 2020. Cases were all infants who died. Each case was matched by GA and birth weight to an infant who survived to discharge (control). Data was collected on cases and controls for a matched timeframe based on the case's duration of intensive care treatment. Information collected included intensive care-associated negative experiences (invasive procedures, surgeries, use of pain medication) and positive experiences (enteral feedings, being held by family).

Results: The cases (n=20) survived for 0 to 93 days, with median (IQR) survival 8 (5, 24) days. The mean (SD) number of invasive procedures was higher for cases than controls, 34 (30) vs. 24 (22), p=0.004. Cases underwent 8 surgeries compared to 4 in the controls. Additionally, compared to controls, cases spent more time receiving pain medications (64% vs. 27%, p<0.001) and without being fed (54% vs. 39%, p<0.001). Half of cases were never held by parents until the day they died.

Conclusion: Extremely premature infants who die despite intensive care face more treatment burdens than the survivors. Larger studies are needed to confirm these findings and gather information necessary for informed decisions about intensive care treatment of these infants.

Keywords: Premature Birth; Periviable Birth; Bioethics; Invasive Procedures; Quality of Death; Treatment Burden

Introduction

Birth between 22-25 weeks gestational age (GA) is considered periviable [1,2]. There is equipoise regarding the benefit and harm of intensive care treatment for periviable infants. In the Neonatal Research Network (NRN), 54% of the 2,997 infants born at 22-25 weeks GA died with intensive care, [3] yet information on treatment-associated experiences of infants who die is mostly absent from the literature. The child's pain [4-6] and quality of death [7,8] are important considerations when parents and clinicians decide whether or not to use intensive care. We conducted a single center evaluation of treatment-associated positive and negative experiences of periviable infants who die despite intensive care treatments.

Methods

We designed a 1:1 nested case-control study and obtained Institutional Review Board approval. We screened medical records of all inborn 22 to 25 weeks GA infants admitted to our level IV neonatal intensive care unit (NICU) between January 2014 and March 2020, excluding infants with birth defects. Identified cases were all infants who died after a period of intensive care treatment. By selecting medical records of all eligible case infants, we were able to minimize the risk of selection bias. Each case was matched blindly to an infant of closest GA and birthweight who survived to NICU discharge (control). In the situation of multifetal gestation, the case was matched to a control from the same pregnancy when possible. Data for cases was collected for the period of intensive care treatment. Data for controls was collected for the same timeframe as their matched case. For example, if a case died after 16 days, receiving intensive care treatment for 15 days and comfort care for 1 day, data for both case and control was collected for the first 15 days of life. Data collected on treatment-associated positive experiences included receiving enteral feedings and being held by the family. To measure feeding status (i.e., if NPO), the medical record was analyzed to see if the infants were fed enterally. If infants did not receive any enteral feedings throughout a 24-hour period, this was counted as being not fed. However, if infants received any enteral feedings in that period, this was counted as being fed. Nursing record was used to assess how often infants were held. If the infant was held at all in a 24-hour period, this was counted as being held, and if there was no record of infant being held by parents, that data was recorded as not held. Treatment-associated negative experiences included the number of invasive procedures and surgeries. Our classification of invasive procedures was informed by Carbajal et al. (2008) and their criteria that the procedures "invaded the neonate's bodily integrity" (p. 61) [9]. Invasive procedures therefore consisted of heel-stick, chest tube attempts, lumbar puncture attempts, peripheral arterial line, peripherally inserted central catheter, and peripheral intravenous line. [9,10] In addition, we collected information about analgesic use as a correlate for infant discomfort and pain. We reviewed the medication administration record to quantify analgesic use. If infants received any analgesic pain medication in a 24-hour period, they were recorded as receiving pain medication for that day. After calculating descriptive statistics, we used paired t-tests to compare cases and controls on continuous variables and chi-square tests of independence to compare on categorical variables. A p-value of < 0.05 was considered statistically significant.

Results

Over the study period, 20 cases were identified and these were matched to 20 controls. Infant and family demographics were similar (Table 1). The cases had lower birth weight than the controls, though the difference was not significant (p=0.17). The cases' survival ranged from 0 to 93 days, with median (IQR) survival of 8 (5, 24) days. The mean (SD) number of invasive procedures was higher for the cases than the controls, 34 (30) vs. 24 (22), $p = 0.004$ (Figure 1A and 1B). In addition, the cases underwent 8 surgeries compared to 4 in the controls. Surgeries included laparotomy, thoracotomy, peritoneal drain, and ventricular reservoir. Over a similar timeframe, cases received pain medications for more days than the controls, 64% vs. 27%, $p < 0.001$, and spent more days in intensive care without being fed than the controls, 54% vs. 39%, $p < 0.001$. Half of the cases were never held by parents until the day they died.

Variables		Cases n = 20	Controls n = 20
GA	22	2	1
	23	6	5
	24	6	8
	25	6	6
Birthweight (g)	Mean (SD)	590 (±128)	649 (±140)
Sex	Female	14	12
	Male	6	8

Table 1: Characteristics of the cases and controls.

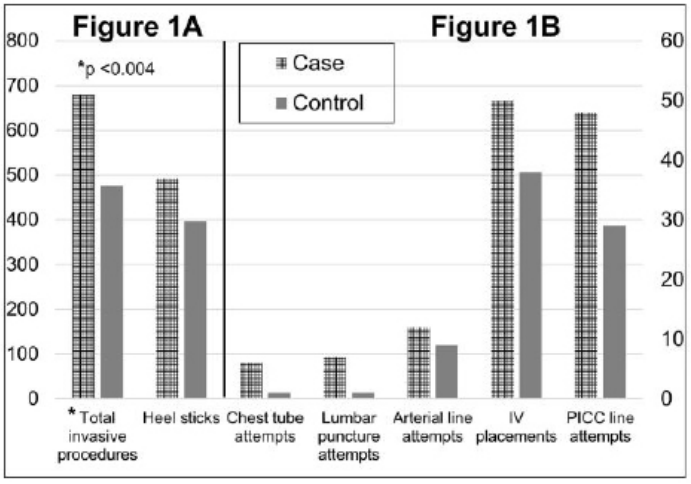

Figure 1A & 1B: Figures are separated by line to maintain scale. For Figure 1A, the y-axis scale is on the left, and for Figure 1B, the y-axis scale is on the right. Bars represent the frequencies of the invasive procedures performed on cases and controls. Cases underwent more invasive procedures (1A), mean 34±30 vs. 24±22, $p<0.004$.

Discussion

In most U.S. hospitals, parent-clinician shared decision-making drives resuscitation decisions at the edge of viability [11].

Knowledge of benefits and harms of intensive care treatment informs these decisions [12]. In this single center pilot study, we found that over a matched timeframe, actively treated periviable infants who die experience more invasive procedures and surgeries and received more pain medications than similar infants who survive. Positive experiences, such as being fed, occurred less often in infants who died and half of them were never held by family until the day they died. To our knowledge, no other study has examined intensive care treatment-associated experiences of actively treated periviable infants who die. Infants' pain and its uncertainties can cause deep distress for parents, leading families to call for research in this area [13]. What research has previously been done on neonatal intensive care treatment burden [9,10,14] looks at infants collectively, without assessing the subgroup of infants who die. Our results extend this past work, but our method of counting invasive procedures, given its retrospective nature, may also be more conservative than these prospective studies. For example, we were not able to reliably report adhesive removals or gastric tube insertions as done in Carbajal et al. (2008) [9]. Therefore, our frequencies of invasive procedures for both survivors and non-survivors are likely underestimations. The NICHD Extremely Preterm Birth Outcomes Tool [15] is frequently used to guide parent and clinician decisions regarding whether or not to pursue intensive care treatment [16]. The NICHD Tool almost exclusively provides health outcomes for survivors. Since its inception, thousands of periviable premature infants have been treated in NRN sites and according to one publication, 54% of them died [3,17]. Yet the only information shared in the tool about infants who die after intensive care is how many days they lived, effectively not discussing outcomes for over half of their patients. This omission is important as the NICHD data heavily influences practice guidelines, clinician decisions, and the information presented to families for treatment decision-making [11,16,18]. Without information on burden of intensive care treatment, decision-makers may assume that periviable infants who die after active treatment live for a few days, the use of umbilical lines prevents the need for needle pokes, and the only invasive treatment they are exposed to is mechanical ventilation. The lack of this data in a decision-making tool essentially removes evidence-based consideration of pain and quality of death from decision-making. Given the recent calls for universal resuscitation and push to remove parent choice [19,20], this incomplete selection of outcome information reflects an urgent need for data reflecting the burden of intensive care for periviable infants who die. The generalizability of our findings is limited by the single-center, small sample size, and retrospective data. Additionally, we did not collect data on infants who received intensive care in the delivery room but did not survive to NICU admission. Despite these limitations, this study identifies a deficiency in evidence available regarding extremely premature infants. Further studies evaluating the experience of periviable infants who die after intensive care are needed to ensure that these infants' experience is adequately represented and that parents and clinicians have a full understanding of the benefits and burdens of intensive care to make informed treatment choices.

Conclusions

Periviable infants who die appear to experience greater treatment burden than those who survive. Given parents often make treatment decisions based on anticipated pain of their child, more data is needed to provide families information on the experience of all infants in the NICU, including those that die.

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Conflict of Interest: None declared.

References

1. Raju TN, Mercer BM, Burchfield DJ, Joseph Jr GF (2014) Periviable birth: executive summary of a joint workshop by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, American Academy of Pediatrics, and American College of Obstetricians and Gynecologists. American journal of obstetrics and gynecology. 210: 406-417.
2. Leuthner SR (2014) Borderline viability: controversies in caring for the extremely premature infant. Clinics in perinatology. 41: 799-814.
3. Myrhaug HT, Brurberg KG, Hov L, Markestad T (2019) Survival and Impairment of Extremely Premature Infants: A Meta-analysis. Pediatrics. 143.
4. Harrison H (1993) The principles for family-centered neonatal care. Pediatrics. 92: 643-650.
5. Coughlin KW, Hernandez L, Richardson BS, da Silva OP (2007) Life and death decisions in the extremely preterm infant: What happens in a level III perinatal centre? Paediatr Child Health. 12: 557-562.
6. Fortney CA, Baughcum AE, Moscato EL, Winning AM, Keim MC, et al (2020) Bereaved Parents' Perceptions of Infant Suffering in the NICU. J Pain Symptom Manage. 59: 1001-1008.
7. Fortney CA, Steward DK (2014) A new framework to evaluate the quality of a neonatal death. Death Studies. 38: 294-301.
8. Tucker Edmonds B, Hoffman SM, Laitano T, et al (2020) Values clarification: Eliciting the values that inform and influence parents' treatment decisions for periviable birth. Paediatric and Perinatal Epidemiology. 34: 556-564.
9. Carbajal R, Rousset A, Danan C, et al (2008) Epidemiology and treatment of painful procedures in neonates in intensive care units. Jama. 300: 60-70.
10. Carbajal R, Rousset A, Danan C, et al (2008) Epidemiology and treatment of painful procedures in neonates in intensive care units. Jama. 300: 60-70.

11. Cummings J (2015) Antenatal counseling regarding resuscitation and intensive care before 25 weeks of gestation. Pediatrics. 136: 588-595.

12. Informed Consent and Shared Decision Making in Obstetrics and Gynecology: ACOG Committee Opinion, Number 819. Obstet Gynecol. 137: e34-e41.

13. Ward H (2019) Family reflections: prematurity. Pediatric Research. 86: 411-412.

14. Cruz MD, Fernandes A, Oliveira C (2016) Epidemiology of painful procedures performed in neonates: a systematic review of observational studies. European Journal of Pain. 20: 489-498.

15. NICHD Extremely Preterm Birth Outcomes Tool. Updated 3/2/2020. Accessed 2023.

16. Myers P, Laventhal N, Andrews B, Lagatta J, Meadow W (2017) Population-Based Outcomes Data for Counseling at the Margin of Gestational Viability. J Pediatr. 181: 208-212.e204.

17. Rysavy MA, Li L, Bell EF, Das A, Hintz SR, et al (2015) Between-hospital variation in treatment and outcomes in extremely preterm infants. N Engl J Med. 372: 1801-1811.

18. Obstetricians ACo, Gynecologists, Medicine SfM-F (2017) Obstetric care consensus No. 6: periviable birth. Obstetrics and gynecology. 130: e187-e199.

19. Lee CD, Nelin L, Foglia EE (2022) Neonatal Resuscitation in 22-Week Pregnancies. New England Journal of Medicine. 386: 391-393.

20. Batton DG, DeWitte DB, Pryce CJ (2011) One hundred consecutive infants born at 23 weeks and resuscitated. American Journal of Perinatology. 28: 299-304.