



# Can Birth Trauma Cause Vocal Fold Immobility? A Systematic Review and Pooled Analysis

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## ABSTRACT

**Objectives:** To describe the present understanding of birth trauma-related vocal fold immobility (BTVFI) and quantitatively compare BTVFI with idiopathic congenital vocal fold immobility (ICVFI) to determine if BTVFI is a discrete entity.  
**Study Design:** Systematic review and pooled analysis.  
**Methods:** A systematic review of the Pubmed and Ovid databases from 1946 to July, 2015, was performed. English-language, observational or experimental studies involving infants diagnosed by laryngoscopy with ICVFI or BTVFI were included. BTVFI diagnoses were based on determination by each study's authors that immobility occurred secondary to traumatic birth. Data from these studies were pooled with our institution's VFI database, and the resultant ICVFI and BTVFI cohorts were compared regarding baseline characteristics and outcomes of immobility.  
**Results:** The search returned 288 articles, 24 of which met inclusion criteria. Of series reviewing all-cause infant vocal fold immobility (VFI), 88.9% identified BTVFI as a distinct etiology, though several different definitions of birth trauma and mechanisms of BTVFI were proposed. Subjects from these 24 studies combined with our institution's database yielded a total of 188 ICVFI and 113 BTVFI patients. BTVFI patients compared to ICVFI patients had a higher proportion of unilateral immobility (63.7% vs 27.7%,  $p<.001$ ) and rate of resolution (80.4% vs 56.9%,  $p=.0025$ ).  
**Conclusion:** While the definition and mechanism of BTVFI warrant further investigation, these quantitative findings suggest that it is a distinct entity from ICVFI, with a unique presentation and natural history. This highlights the importance of birth history in infants with otherwise unexplained VFI, and offers vital information for counseling regarding patients with presumed BTVFI.

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## INTRODUCTION

- VFI (vocal fold immobility) from birth trauma mentioned in several studies over 4 decades
- Appears to be accepted etiology
- Mechanism remains unclear
- Definition of birth trauma varies widely
- Study designed to examine understanding of birth trauma VFI (BTVFI) and to quantitatively compare it to idiopathic congenital VFI (ICVFI) to determine if it is clinically distinct entity (as evidenced by different pattern of immobility and outcomes)

## METHODS AND MATERIALS

### SYSTEMATIC REVIEW:

- Pubmed and Ovid, 1946-July, 2015
- Search terms: obstetric vocal cord paralysis (VCP), birth trauma VCP, idiopathic pediatric VCP, congenital pediatric VCP. Substituted vocal fold paralysis, vocal fold immobility, laryngeal paralysis for VCP in subsequent searches.
- Inclusion criteria: English-language, observational or experimental, patients with BTVFI or ICVFI
- ICVFI, if not explicitly described by study authors, defined by symptoms at birth or VFI diagnosed within 1<sup>st</sup> month, without other etiology
- BTVFI based on each study's authors' conclusion that VFI due to known birth trauma. No strict criteria for birth trauma definition.

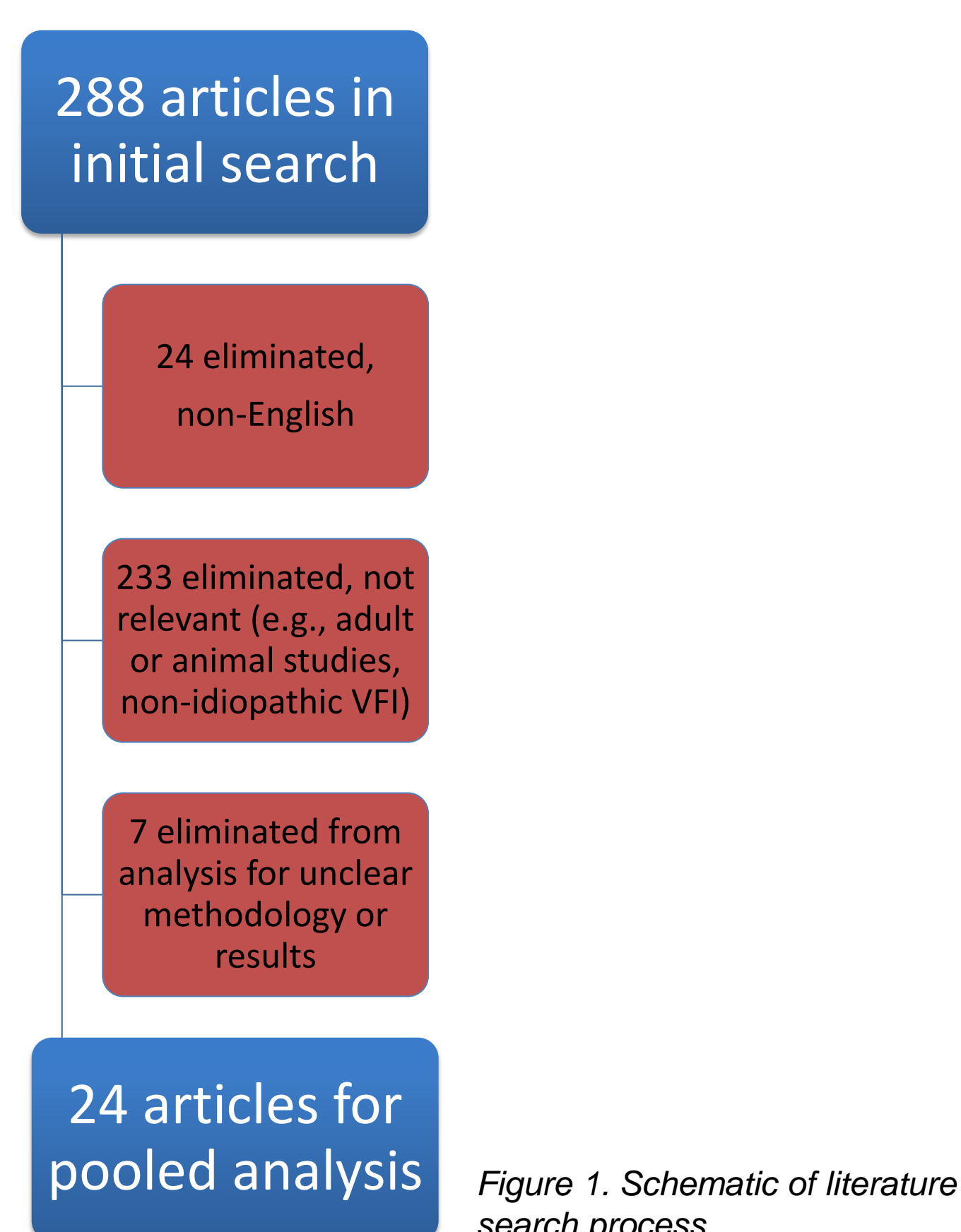


Figure 1. Schematic of literature search process

### POOLED ANALYSIS:

- Patients from above studies combined with patients from Children's Hospital of Wisconsin (CHW) VFI database
- Birth trauma in own database defined as breech delivery, vacuum/forceps assistance
- BTVFI and ICVFI cohorts compared for differences in natural history, outcome

## RESULTS

- Multiple definitions for birth trauma, including forceps delivery (most common), breech, vacuum assist, emergent C-section; several do not specify mechanism of trauma
- 8/9 studies that examine all-cause infant VFI view birth trauma as distinct etiology
- 24 studies included in pooled analysis
- 188 ICVFI patients, 113 BTVFI patients

Table 1. Summary of studies examining ICVFI included in pooled analysis.

Study	N	Unilateral ICVFI	Bilateral ICVFI	Resolution
Lesnik et al, 2015	26	0	26	17/26
Maturo et al, 2011	1	0	1	1/1
Berkowitz et al, 2009	1	0	1	0/1
Lagier et al, 2009	3	0	3	n/a
Kuo et al, 2008	7	0	7	4/6
Scott et al, 2008	3	1	2	2/3
Berkowitz, 2007	3	0	3	0/3
Hasniah et al, 2006	7	0	7	n/a
Kaushal et al, 2005	1	0	1	0/1
Miyamoto et al, 2005	18	0	18	7/17
Patel et al, 2003	1	0	1	0/1
Manaligod and Smith, 1998	3	0	3	0/3
de Guadamar et al, 1996	42	23	19	27/35
Zbar and Smith, 1996	7	4	3	7/7
Gentile et al, 1986	6	4	2	3/5
Cunningham et al, 1985	2	0	2	n/a
Emery and Fearon, 1984	10	5	5	2/10
CHW data	47	15	32	21/41
<b>Total</b>	<b>188</b>	<b>52</b>	<b>136</b>	<b>91/160</b>

Table 2. Summary of studies examining BTVFI included in pooled analysis.

Study	N	Unilateral BTVFI	Bilateral BTVFI	Resolution
Garcia-Lopez et al, 2013	1	1	0	n/a
Forbes et al, 2010	1	1	0	1/1
Miyamoto et al, 2005	1	1	0	0/1
Daya et al, 2000	5	0	5	1/3
de Guadamar et al, 1996	24	19	5	19/19
Narcy et al, 1990	37	30	7	n/a
Rosin et al, 1990	3	1	2	n/a
Greenberg et al, 1987	1	1	0	1/1
Emery and Fearon, 1984	5	4	1	3/3
Gentile et al, 1986	5	1	4	2/4
Cohen et al, 1982	19	7	12	6/9
CHW data	11	6	5	8/10
<b>Total</b>	<b>113</b>	<b>72</b>	<b>41</b>	<b>41/51</b>

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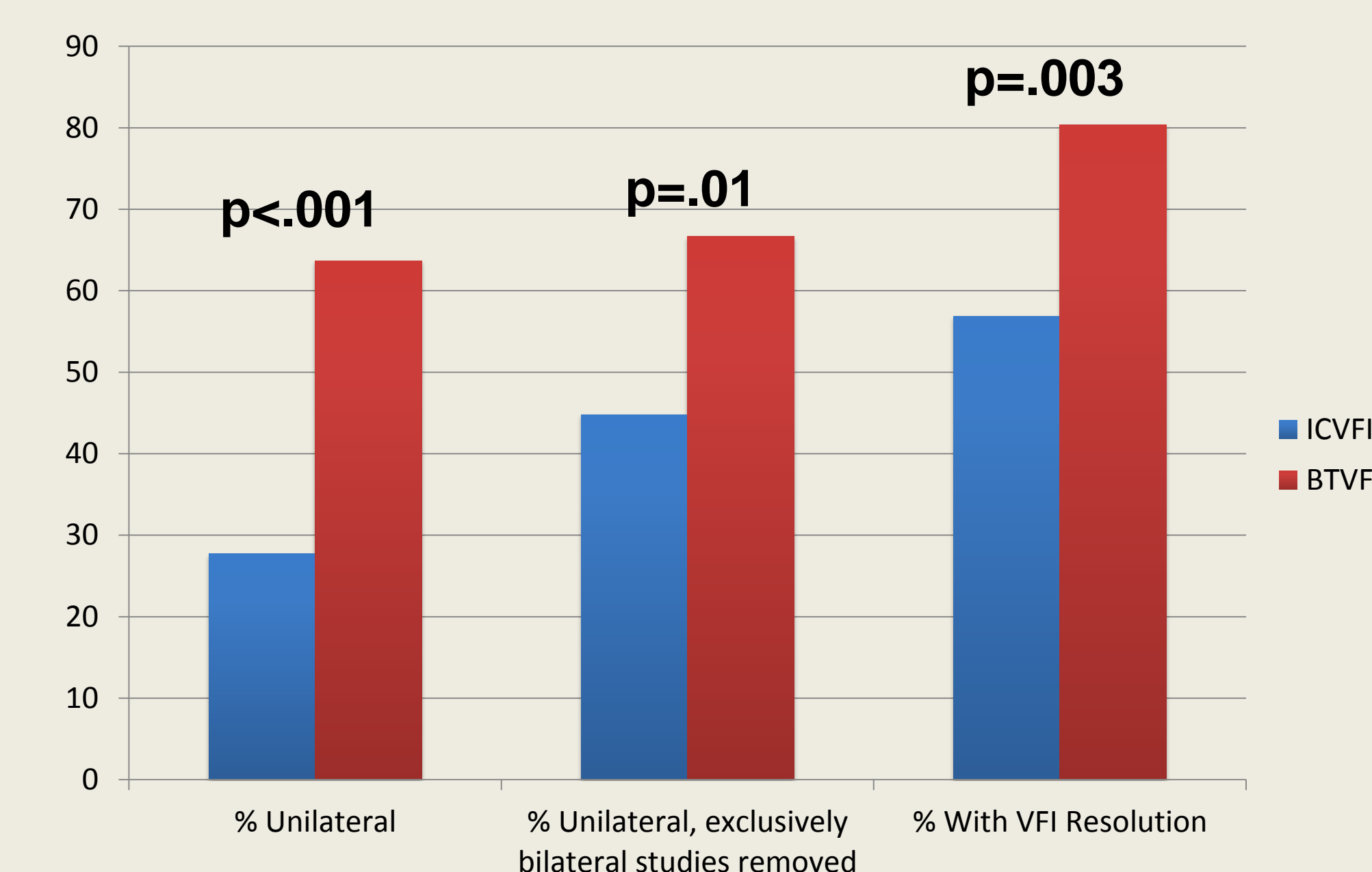


Figure 2. Comparison of pattern of VFI and rate of resolution between ICVFI and BTVFI cohorts. All comparisons significant.

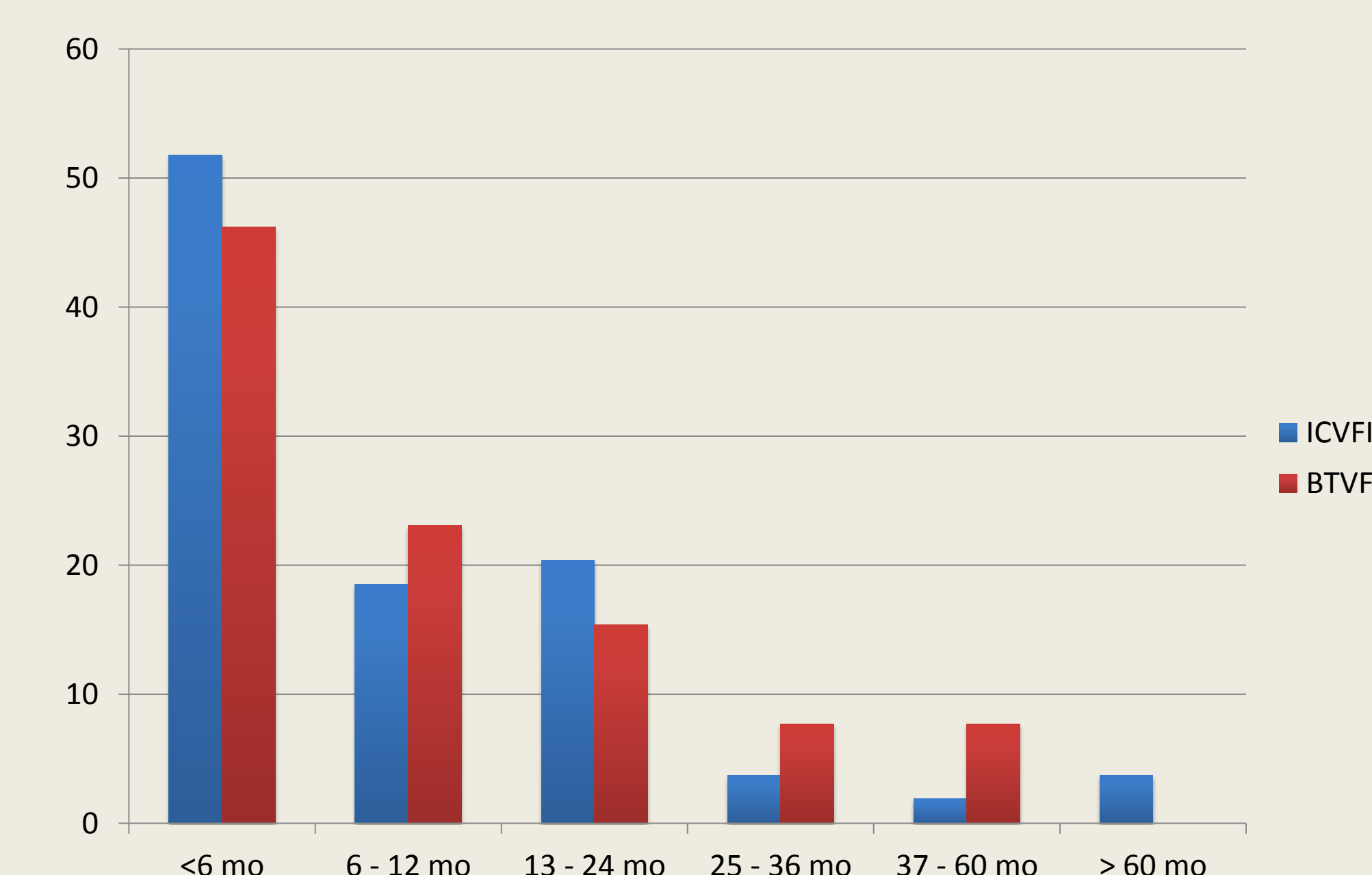


Figure 3. Comparison of time to VFI resolution between ICVFI and BTVFI cohorts. All comparisons non-significant.

## DISCUSSION

- Exhaustive review of literature discussing BTVFI shows mechanism of injury still unclear
- Differences in pattern of immobility and rate of resolution suggest BTVFI is different from ICVFI
- No difference in time to resolution
- Limitations include significant variability between studies in terms of definitions of birth trauma and quality of follow-up. Comparative analyses through pooled data limited to few discrete results common to majority of studies.
- Unknown what proportion of patients who experience traumatic birth sustain VFI
- Better understanding of mechanism (and potential avoidance) would likely require experimental studies, but rarity of this condition coupled with high rate of resolution for BTVFI limit utility of such studies

## CONCLUSIONS

- While mechanism for BTVFI remains unclear, it does appear to be distinct entity from ICVFI, and a reasonable potential etiology for VFI
- Important for follow-up and management of infants with VFI in setting of known birth trauma and no other VFI etiology
- Valuable for counseling of caregivers of infants with VFI after birth trauma