MVHS Osteopathic Teaching Day Presentation

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Article

- Osteopathic Manipulative Treatment plus Phototherapy in the Management of Neonatal Hyperbilirubinemia: A Case Report

- Zylinski BL, Stephenson CS, Rajala JW, & Miller DJ

- *American Academy of Osteopathy Journal (AAOJ),* December 2025, Volume 35, Number 4, Pages 16-21

Why I Chose to Present this Article

Introduction

- ~35,000 infants re-hospitalized following birth hospitalization in US annually for NH
  - Costs US health care system ~$361M/yr

- Physiologic & non-physiologic causes of NH
  - Pt in this case had physiologic NH (referred to simply as “NH” henceforth)

Introduction (Cont.)

- SOC for mild-moderate NH = phototherapy
  - Uses fluorescent light to make bilirubin more excretable
- Phototherapy is generally considered safe but has known complications
  - Diarrhea, rash, disruption to feeding & parent-neonate bonding, & retinopathy
- Median LOS for NH for term infants in US = 48.00 hours
  - n = 53,259,758 (2002-17)

Introduction (Cont.)

- OMT has been shown to be safe/effective in other pediatric conditions
  - Vismara & colleagues (2019): OMT plus routine care significantly reduced transition time from NG to PO feeding compared to routine care alone in preterms (n = 35 in each group, total n = 70, p = 0.042)
  - Belsky & colleagues (2020): Described case of OMT resolving vincristine-induced constipation in infantile fibrosarcoma pt
  - Cerritelli & colleagues (2014): Performed OMT safely on >2,000 NICU pts
  - No adverse affects attributed to OMT in any above studies
- However, little literature exists regarding OMT & NH

Introduction (Cont.)

- This case report describes pt w/ NH managed w/ phototherapy + OMT
- @ this time, OMT is not routinely included in mgmt of NH

Report of Case

- Pt was healthy female born via uncomplicated NSVD @ 37w4d to healthy 31yo G_3P_{2012} mom
- Mom's entry to prenatal care was delayed until 22wk due to family moving to area from different state
- Prenatal course o/w unremarkable
- Prenatal screen pan-negative
- Mom did not take any meds other than PNVs during pregnancy
- Mom denied tobacco, EtOH, or drug use during pregnancy

Report of Case (Cont.)

- Active labor length = 4hr, 48min
- Anesthesia = epidural
- Presentation = direct OA
- Apgar scores = 8 & 9
- Birth weight = 2,925g (25^{th} percentile)
- Resuscitation = routine suctioning
- Exclusively breastfed
- Poor latch noted during nursery stay
- FamHx of sibling with NH requiring phototherapy

Report of Case (Cont.)

- Discharged home w/ parents on PPD #1
- Weight = 2,830g (18th percentile) (down 3.25% since birth)
- No jaundice
- TCB (19hr of life) = 5.8mg/dL (low risk)

Report of Case (Cont.)

- Pediatrician's office @ 82hr of life
- Persistent difficulty latching
- Jaundice
- Weight = 2,679g (9^{th} percentile) (down 8.41% since birth)
- TSB = 17.5mg/dL (TCB equivalent = 18.7mg/dL) (high risk)
- Readmitted & started on phototherapy for NH

Report of Case (Cont.)

- Parents requested ONMM consult for persistent difficulty latching & constipation (last BM = ~2.5da prior to readmission)
- Parents gave consent for ONMM eval & treatment
- TCB (102hr of life) = 15.2mg/dL (intermediate risk)
- Weight = 2,705g (10^{th} percentile) (down 7.52% since birth)
- VS WNL
- PE significant for jaundice, o/w WNL

Report of Case (Cont.)

- OSE
  - Head: Cranial base compression, B/L OM membranous articular strain, R condylar compression (tx'ed w/ OCMM)
  - Cervical: OA R facet restriction, C6-7 compression (tx'ed w/ MFR)
  - Sacral: L S1-3 compression (tx'ed w/ MFR)
  - Pelvic: R intraosseous restriction (tx'ed w/ MFR)
  - Upper Extremity: R clavicle restriction, L scapulothoracic restriction (tx'ed w/ MFR)
  - Abdomen/Other: B/L hemidiaphragm restriction (tx'ed w/ MFR), liver capsular restriction (tx'ed w/ visceral manipulation)

- OMT occurred @ 102hr of life

Treatments

Head

B/L OM Membranous Articular Strain (Tx'ed w/ OCMM)

- Much of OCMM tx's used in case too advanced for purposes of this conference
- Modified for use on adults (neonates don't have OM sutures)
- Pt is supine. Operator is standing @ head of table
- Operator assesses for motion (or lack thereof) @ OM sutures
- On side(s) not moving well, operator slowly opens index & middle fingers over OM suture(s) in "V" fashion
- Recheck
- I STRONGLY recommend anyone who is seriously interested in integrating OMT into their future practice take cranial course(s)!!!!!

Cervical

C6-7 Compression (Tx'ed w/ MFR)

- Pt is supine. Operator is standing @ head of table
- Operator assesses for cervical dysfunction (e.g., C3 FRSr, C4-5 compression, etc.)
- Operator performs MFR to tissues overlying segment(s) of dysfunction
- Recheck

Sacral

L S1-3 Compression (Tx'ed w/ MFR)

- Modified for use on adults (neonates don't have fused sacra)
- Pt is supine. Operator is standing on side to be tx'ed
- Operator assesses for sacral dysfunction (e.g., R on R torsion, etc.)
- Operator performs MFR to tissues overlying area of dysfunction
- Recheck

Pelvic

R Intraosseous Restriction (Tx'ed w/ MFR)

- Modified for use on adults (neonates don't have fused pelvises)
- Pt is supine. Operator is standing on side to be tx'ed
- Operator assesses for sacral dysfunction (e.g., R anterior, etc.)
- Operator performs MFR to tissues overlying area of dysfunction
- Recheck

Upper Extremity

L Scapulothoracic Restriction (Tx'ed w/ MFR)

- Pt is supine. Operator is standing on side to be tx'ed
- Operator assesses for scapulothoracic junction restriction(s)
- Operator performs MFR to restricted scapulothoracic junction(s)
- Recheck

Abdomen/ Other

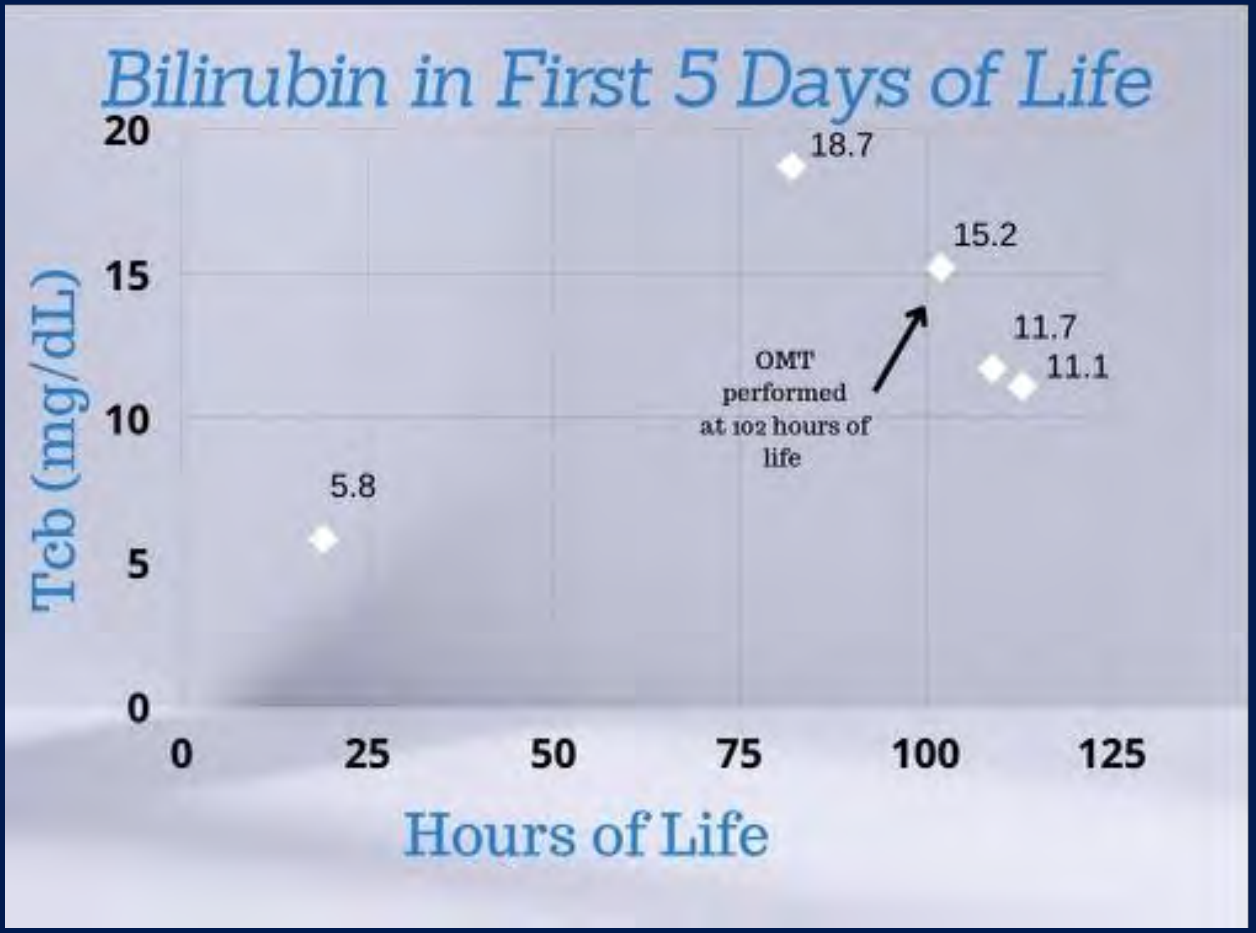
B/L Hemidiaphragm Restriction (Tx'ed w/ MFR)

- Pt is supine. Operator is standing on side favoring eye dominance (if known)
- Operator assesses for hemidiaphragm restriction(s)
- Operator performs re-doming of diaphragm
- Recheck

Report of Case (Cont.)

- Pt passed flatus while OMT was in progress
- Shortly after OMT, pt had large BM, & latch improved considerably
- TCB (109hr of life) = 11.7mg/dL (low risk)
- TCB (113hr of life) = 11.1mg/dL (low risk)
- Discharged 24.90hr after readmission
- Was under phototherapy lights continuously throughout readmission, except for brief intermittent pauses for breastfeeding (89-114hr of life)
- No jaundice @ discharge
- Didn’t need to be readmitted again

Figure 1


Bilirubin in First 5 Days of Life
20
15
10
5
0
Tcb (mg/dL)
18.7
15.2
11.7
11.1
5.8
OMT performed at 102 hours of life
0
25
50
75
100
125
Hours of Life

Report of Case (Cont.)

- F/U w/ pediatrician @ 8da of life
- Well-appearing w/o jaundice
- Feeding well
- Regular BMs
- Weight = 2,813g (18^{th} percentile) (down 2.12% since birth)

Report of Case (Cont.)

- 4mo WCC
- Gaining weight appropriately (34th percentile)
- Exclusively formula-feeding
- No signs of long-term complications of NH

Discussion

- We present case of pt readmitted w/ NH managed w/ phototherapy + OMT
- Following OMT, TCB dropped 3.5mg/dL
  - 15.2mg/dL → 11.7mg/dL
- Rates of TCB decline
  - Pre-OMT: 0.18mg/dL per hr
  - Post-OMT: 0.37mg/dL per hr
- Median LOS = 48.00hr, pt's LOS = 24.90hr
  - 23.10hr shorter

Discussion (Cont.)

- To best of our knowledge, no research addresses possible MOA of OMT w/ respect to NH

- However, existing research suggests that OMT affects ANS (SNS/PNS)

Discussion (Cont.)

- W/ respect to NH, we hypothesize OMT acts through SNS/PNS to address feeding difficulties, impaired bili conjugation, & constipation to lower bili levels
- Feeding is primarily under parasympathetic control through CNs, particularly IX, X, & XII
- These CNs exit skull near cranial base, which is often compressed during delivery
- Pt had cranial base compression & R condylar compression on OSE, which may have been related to delivery

Discussion (Cont.)

- Sympathetic innervation of upper GI tract arises from T5-9 (T6-9 for biliary system specifically) & celiac gangion
- Parasympathetic innervation of upper GI tract arises from vagus nerve
- Sympathetic innervation of hindgut arises from T12-L2 and IMG
- Parasympathetic innervation of hindgut arises from S2-4
- Pt had left S1-3 compression on OSE
- SD in these areas can impair function, can be restored via OMT

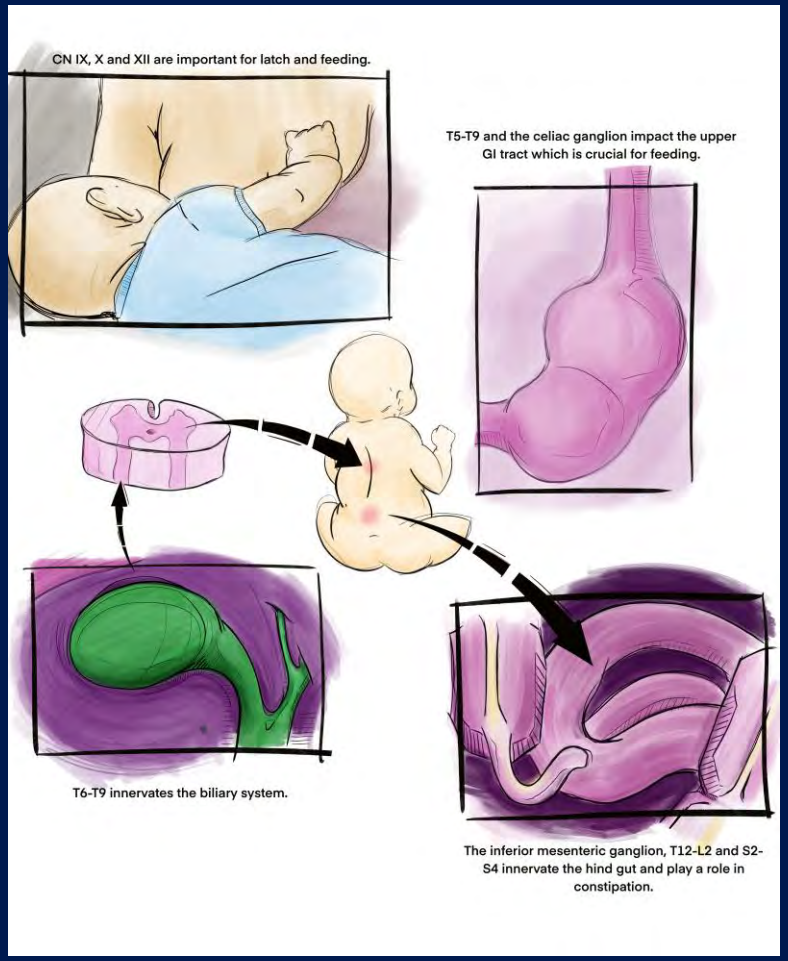
Discussion (Cont.)

- Visceral manipulation is hypothesized to act directly on dysfunctional organs to restore optimal function to such organs
- Pt had liver capsular restriction on OSE
- Visceral manipulation of fascial strain over liver could theoretically improve liver fx, potentially leading to increased enterohepatic circulation & faster resolution of NH
- However, to best of our knowledge, no studies definitively link proposed MOA of visceral manipulation (or OMT in general) to pt outcomes

Discussion (Cont.)

- Based on our proposed MOA of OMT w/ respect to NH, regions to be eval'ed (& tx'ed if SD/VD found) from OMT standpoint for NH pts should incl.:
  - Head (esp. cranial base & occipital condyles)
  - Cervical (esp. OA)
  - Thoracic (esp. T12)
  - Lumbar (esp. L1-2)
  - Sacrum (esp. S2-4)
  - Abdomen (esp. upper GI tract, biliary system, celiac ganglion, & IMG)

Figure 2


CN IX, X and XII are important for latch and feeding.
T5-T9 and the celiac ganglion impact the upper GI tract which is crucial for feeding.
T6-T9 innervates the biliary system.
The inferior mesenteric ganglion, T12-L2 and S2-S4 innervate the hind gut and play a role in constipation.

Discussion (Cont.)

- Important outcomes for pt:
  - 3.5mg/dL drop in TCB following OMT
  - Feeding difficulties & constipation improved following OMT
  - Shorter-than-expected LOS (per before)
  - No adverse events

Discussion (Cont.)

- Study is limited Bc n = 1
- No causality can be determined
- Did not link pt's outcomes w/ proposed MOA of OMT w/ respect to NH
- TSB is gold standard, not TCB

Limitations of Osteopathic Research in General

Discussion (Cont.)

- Next steps could include study focusing on most common areas of SD in o/w healthy term newborns w/ NH
  - Needs-based tx protocols are limitation from research standpoint
- Could then evolve into small pilot study, then larger cohort study, w/ hope of eventually reaching RCTs
  - TSB should be measured instead of TCB
- Special pt pop'ns (e.g., preterms, non-physiologic NH, etc.)

Conclusion

- We present case of NH pt managed w/ phototherapy + OMT
- Pt had decline in TCB of 3.5mg/dL following OMT, shorter-than-expected LOS, & no adverse events
- More research needed to further investigate relationship between OMT and NH

In Closing…

“To know of a bone in its entirety would close both ends of eternity.” -A.T. Still

Sources

- Zylinski BL, Stephenson CS, Rajala JW, Miller DJ. Osteopathic Manipulative Treatment plus Phototherapy in the Management of Neonatal Hyperbilirubinemia: A Case Report. *AAOJ* 2025(35)4;16-21.

- Google Images

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Questions?

Thank you!!!!!