Timing of oral feeding changes in premature infants who underwent osteopathic manipulative treatment

L. Vismara a,b,c, A. Manzotti c,d, A.G. Tarantino b,c,⁎, G. Bianchi b, A. Nonis e, S. La Rocca c,d, E. Lombardi c,d, G. Lista d, M. Agosti a

a NICU – Woman and Child Department, Del Ponte Hospital, Varese, Italy
b Manima, Non-Profit Organisation Social Assistance and Healthcare, Milan, Italy
c Research Department, SOMA, Istituto Osteopatia Milano, Milan, Italy
d NICU – Department of Pediatrics, Ospedale dei Bambini “V.Buzzi”, Milan, Italy
e C.U.S.S.B, University Centre for Statistics in the Biomedical Sciences, Vita-Salute San Raffaele University, Milan, Italy

ARTICLE INFO
Keywords:
Length of stay
Fascia
Neonatal intensive care unit
Sympathetic nervous system
Osteopathic medicine

ABSTRACT

Background: The delayed transition from gavage-to-nipple feeding is one of the most significant factors that may prolong hospital length of stay (LOS). Osteopathic manipulative treatment (OMT) has been demonstrated to be effective regarding LOS reduction, but no investigations have documented its clinical validity for attaining oral feeding.

Objectives: To assess OMT utility regarding the timing of oral feeding in healthy preterm infants.

Design: Preliminary propensity score-matched retrospective cohort study.

Setting: Data were extrapolated from the neonatal intensive care unit (NICU) of Del Ponte Hospital in Varese, Italy, during the period between March 2012 and December 2013.

Interventions: Two propensity score-matched groups of healthy preterm infants aged 28+0 to 33+6 were compared, observing those supported with OMT until hospital discharge and control subjects.

Main outcome measures: Days from birth to the attainment of oral feeding was the primary endpoint. Body weight, body length, head circumference and LOS were considered as secondary endpoints.

Results: Seventy premature infants were included in the study as the control group (n=35; body weight (BW)=1457.9 ± 316.2 g; gestational age (GA)=31.5 ± 1.73 wk) and the osteopathic group (n=35; BW=1509.6 ± 250.8 g; GA=31.8 ± 1.64 wk). The two groups had analogous characteristics at study entry. In this cohort, we observed a significant reduction in TOF (-5.00 days; p=0.042) in the osteopathic group with a greater effect in very low birth weight infants.

Conclusions: These data demonstrate the utility and potential efficacy of OMT for the attainment of oral feeding. Further adequately powered clinical trials are recommended.

1. Introduction

Prematurity is one of the major factors contributing to neonatal morbidities and represents a substantial problem in perinatal medicine. Despite advances in antenatal care, reports have identified an increase in preterm births in the last few decades. Prematurity might compromise the anatomical and functional development of all organs and apparatuses, further worsened by an earlier gestational age and lower body weight. Cardio-respiratory, neurological and gastrointestinal functions are the most important features in allowing the growth and viability of preterm babies.1,2 Because of the high rate of neonatal morbidities, premature infants show a prolonged length of stay (LOS) inside neonatal intensive care units (NICU), with a negative impact on their families and society. LOS is considered one of the major factors contributing to hospitalisation costs. Preterm birth and NICU access annual costs are estimated to be 5.8 billion dollars (US), corresponding to 47% of the overall costs for all infant hospitalisations, and up to 27% of all paediatric stays in the United States.3

One of the criteria for hospital discharge is the attainment of oral feeding. In the preterm population, newborns might have difficulties

⁎ Corresponding author at: Via Nicola d’Apulia 9, 20125, Milan, Italy.
E-mail addresses: lucavisma@hotmail.com (L. Vismara), andreamanzotti@soma-osteopatia.it (A. Manzotti), andreatarantino16@gmail.com (A.G. Tarantino), giuliana.bianchi@asst-settelaghi.it (G. Bianchi), nonis.alessandro@hsr.it (A. Nonis), globulo.scric@tiscali.it (S. La Rocca), lombardi.fisio@gmail.com (E. Lombardi), gianluca.lista@asst-fbf-sacco.it (G. Lista), massimo.agosti@asst-settelaghi.it (M. Agosti).
https://doi.org/10.1016/j.ctim.2019.01.003
Received 28 October 2018; Received in revised form 7 January 2019; Accepted 7 January 2019
Available online 08 January 2019
0965-2299/ © 2019 Elsevier Ltd. All rights reserved.
with nourishment, due to gastrointestinal disorders that are frequently associated with respiratory pattern alterations. Physiological conditions required for discharge include: maintenance of body heat at room temperature, coordinated sucking-swallowing-respiration while feeding, a sustained pattern of weight gain and stable cardiorespiratory function. Osteopathic manipulative treatment (OMT) is used to treat the dysfunctions linked with preterm pathological conditions. Osteopathic clinical trials have been conducted to investigate the impact of OMT in the care of preterm infants. A multicentre study and a recent meta-analysis have shown that osteopathic treatment significantly reduced LOS and was cost-effective for a large cohort of preterm infants. LOS reduction has been suggested to have positive emotional, psychological and developmental effects for preterm infants and their families. Notwithstanding this, OMT clinical trials in this field have never investigated clinical outcomes such as the timing of oral feeding (TOF) relative to the duration of NICU residence. The aim of this study was to perform a retrospective observation of the effects of OMT on TOF in a population of very/moderately preterm infants. The secondary outcomes assessed were LOS, body weight, head circumference and body length.

2. Methods

2.1. Subject data

We conducted a preliminary propensity score-matched retrospective cohort study to compare feeding and discharge clinical data of healthy premature infants born between 28 +0 and 33 +6 weeks and with a body weight lower than 2000 g, who underwent routine OMT (OG) compared to non-treated control subjects (CG). All data were extrapolated from the NICU clinical records database of Del Ponte Hospital during the period between March 2012 and December 2013. Key exclusion criteria included: genetic disorders, congenital abnormalities, cardiovascular abnormalities, proven or suspected neurological disorders, abdominal obstruction, pre- and/or post-surgery patients, pneumoperitoneum and/or atelectasis, broncho-pulmonary dysplasia (BPD), patent ductus arteriosus (PDA), respiratory distress syndrome (RDS), neonates born from HIV seropositive and/or drug-addicted mother, infants transferred from HIV seropositive and/or drug-addicted mother, infants transferred to/from other hospitals and osteopathic treatment performed more than 14 days after birth.

2.2. Variables and measures

The variables extrapolated from patient clinical records at discharge were TOF, body weight, body length, head circumference and LOS. TOF is a time measure obtained by counting the days from birth to the achievement of complete oral feeding. LOS was obtained measuring the time passed from birth to hospital discharge.

2.3. Ethics

All the infants’ families provided signed informed consent for the use of these data for research purposes. The Provincial Ethics Committee of Varese approved the study on 02/14/2017.

2.4. Osteopathic manipulative treatment

Osteopathic medicine is a form of drug-free non-invasive manual medicine, designated by WHO as complementary and alternative medicine. It relies on manual contact for the diagnosis and treatment of somatic dysfunction (ICD-10-CM Diagnosis Code M99.00-09).

OMT is a patient-tailored therapy that has been introduced into the routine care of many NICUs, as in Varese. Its diagnostic approach is based on an anatomical, structural and functional analysis. In newborns, the structural exam is usually performed with the infant laying down on the incubator or table. Somatic dysfunctions can be found in body districts where altered tissue texture, restricted range of motion, tenderness or asymmetry are manifested. This concept must be adapted to the clinical condition of the preterm infant, as OMT is a measured and calibrated application of forces in precise areas and districts. Safety criteria are considered before the delivery of OMT, considering the patient’s stable condition, clinically defined with the following parameters:

- absence of apnoea in the preceding 48 hours
- absence of intubation
- presence of adequate blood pressure with respect to gestational age

(mean pressure = gestational age)

The palpatory assessment allows the osteopath to identify areas of greater density, tissue impairment and structure resilience. The osteopathic examination is based on the strength of anatomical and physiological evidence, by integrating the manual evaluation with clinical, specialised and instrumental exams. It is performed by a standardised palpatory analysis, which involves a two-hand grip, with the caudal hand on the sacral region and the cranial hand on the occipital region. The main goal is to analyse asymmetry through the palpatory homogeneity and range of motion patterns of the axial myo-fascial system. After that, by exploiting a light compression between the two hands, the osteopath performs a myo-fascial system stimulation, designed to check for tenderness reactions. At the end, a specific palpation of the spine, chest, abdomen and limbs is performed to focus on the examination of myofascial texture in more restricted areas. Based on this examination, the OMT procedures were designed based on a consensus between at least two osteopaths, and a treatment protocol was trialled, allowing for more reliable and safer OMT.

As mentioned above, osteopathic procedures were focused on the myo-fascial and connective tissues, prevalently in the following areas: cranial (cranial techniques) and occipital, the C1-C2-C3 areas, hyoid, sacrum, diaphragm, upper chest, scapulae, left iliac fossa and the structures connected in anatomical and physiological ways to these structures. A randomised controlled trial from Martelli et al. investigated osteopathic sham therapy and showed that no placebo effect occurs in newborns.

During the investigated period, ten osteopathic practitioners worked synergistically with one another and with NICU specialists; OMT procedures were always under the control of experienced osteopaths. OMT was started in the first two weeks of life, with a frequency of twice a week, in addition to reference standard medical treatment. Every single evaluation and treatment of OG subjects lasted at least 30 min, while CG subjects were treated with standard medical care without OMT.

2.5. Statistical analysis

To adjust for potential confounders, a propensity score matching procedure was performed at study entry, matching with a 1:1 ratio. Considering the 35 OMT subjects adherent with inclusion/exclusion criteria, to balance the patient baseline characteristics in the CG, Mahalanobis metric-matching was used, considering as confounders gestational age, gender, ventilatory support and APGAR score, with a calliper of 0.2 of the standard deviation of the logit of propensity score. Imbalance after matching was tested at baseline between groups using the chi-squared test for categorical variables and the Mann-Whitney U test for continuous variables. Variables are reported in terms of mean and standard deviation. A preliminary analysis was performed to determine whether the collected variables were normally distributed. Since this analysis did not show any evidence in this direction and the collected data showed some outliers, it was decided to proceed with a
The effects of OMT on the autonomic nervous system have been demonstrated by studies on crying frequency, sleep, heart rate variability, interoception and visceral functionality. Administration
of OMT has been shown to have parasympathetic effects as well as anti-inflammatory action, and is effective on the structures and fascial layers in close relationships with areas involved in swelling and sucking.23-25 Nevertheless, the biological effects of OMT remain under active investigation.

Improving the functionality of sucking and swallowing means abbreviating the time needed to reach full oral feeding, allowing the child to reduce nutrition with a nasogastric tube (gavage) and favouring the development of premature infants should be studied in depth.

The sample size and the absence of randomisation pose some limitations on our pilot observational study. Moreover, all enrolled were treated at a single NICU and may not be representative of the general preterm infant population. Furthermore, it is not possible to comment on the placebo effect of OMT on TOF since Martelli et al. investigated the placebo effect on LOS only. Hence, we suggest that future randomised trials should compare the placebo effect in the experimental group using a sham group. In conclusion, the results that emerged from our investigation highlight a significant relationship between OMT administration and a reduction in TOF, with different effects observed in VLBW infants compared to LBW subjects. Further clinical trials should be performed to address the effects of OMT on swallowing and sucking mechanics in correlation with respiratory parameters and the clinical effects on transition patterns of feeding procedures.

Acknowledgements

The authors are grateful to Dr Zavattaro and the entire osteopathic group that collaborated on study, and to Tincontro Associazione Genitori per la Neonatologia Varese for important contributions to the development of this research. The authors would also like to thank Ilaria Mainardi for revision of English.

References