LONG-TERM EFFECTS OF INFANT COLIC: A SURVEY COMPARISON OF CHIROPRACTIC TREATMENT AND NONTREATMENT GROUPS

Joyce E. Miller, DC,a and Holly Lane Phillips, MChirob

ABSTRACT

Objective: Investigation into the alleviation of long-term effects of infant colic on the toddler is a neglected area of research. The aim of this study was to document any behavioral or sleep disturbances experienced by post-colicky toddlers who were previously treated with chiropractic care vs those who had not experienced this treatment as an infant.

Methods: Two groups of children were sampled from clinic records from a chiropractic clinic and from a child care center in similar regions of England. Patients were classified in the treatment group if they had been treated for infant colic with routine low-force chiropractic manual therapy. The nontreatment group consisted of post-colicky children in the same age group who had received no chiropractic care for their diagnosed colic as infants. A survey of parents of 117 post-colicky toddlers in a treatment group and 111 toddlers in the nontreatment group was performed.

Results: Toddlers who were treated with chiropractic care for colic were twice as likely to not experience long-term sequelae of infant colic, such as temper tantrums (relative risk, 2.0; 95% confidence interval, 1.3-3.0) and frequent nocturnal waking (relative risk, 2.0; 95% confidence interval, 1.5-2.8) than those who were not treated with chiropractic care as colicky infants.

Conclusion: Untreated post-colicky infants demonstrated negative behavioral patterns at 2 to 3 years of age. In this study, parents of infants treated with chiropractic care for excessive crying did not report as many difficult behavioral and sleep patterns of their toddlers. These findings suggest that chiropractic care for infants with colic may have an effect on long-term sequelae. (J Manipulative Physiol Ther 2009;32:635-638)

Key Indexing Terms: Manipulation; Chiropractic; Infantile Colic; Sleep; Crying

Infant colic has traditionally been defined as crying in an otherwise healthy infant for more than a total of 3 hours a day for more than 3 days a week, and the infant is considered to be “seriously fussy” if crying persists more than 3 weeks.1 This condition is now described widely as persistent crying and it is thought that up to 21% of infants experience infant colic or persistent crying and it is the most common complaint for which parents seek professional advice in the first year of life.2,3

Research into the natural clinical history of infant colic is rare without clear results, using small low-powered sample sizes and with short follow-up periods. Probably the most rigorous study was a prospective examination of 60 crying babies who presented for clinical care and were compared with a control group of 47 infants without crying complaints but with the same demographic profiles.4 Sixty percent of the crying babies continued to have significantly increased daily duration of crying, decreased daily duration of sleep, and positive correlations with fussiness rating index surveys after 12 and 24 weeks of age. There were also significant differences in neurologic developmental assessments with the cry-babies performing consistently more poorly.4 Two other studies into the natural history of infant colic suggest that about half of colic is transient and remits during early infancy and that 51.4% will continue to have colicky symptoms past 3 months of age.5,6 In summary, it has been documented that 51.4% to 60% of colicky infants continue to have symptoms past 3 months of age. Perhaps it should no longer be referred to as “3-month colic,” as it is not reliably transient in nature.
Both prospective and retrospective studies have documented behavioral sequelae in colicky infants up to 3 1/2 years of age. Mothers reported that their post-colicky children had more temper tantrums and sleeping difficulties at 3 years of age than other children in 3 retrospective studies and that their children were more difficult than other children. All of these studies used unvalidated maternal questionnaires, which required recall of earlier infant behavior (thus introducing possible memory bias), but current recall of toddler behaviors (with maternal report) is considered accurate.

A well-designed prospective study corroborated these findings with additional caveats that post-colicky toddlers were described as being independent, “bossy,” unable to compromise, immature, emotionally labile (“explosive”), and having severe temper tantrums with uncontrolled activity levels. Such parental concerns were not found among mothers of non-colicky children. This study adhered to principles of scientific rigor, using 2 investigators to conduct independent interviews to establish credibility, transferability via sample selection, and confirmation with member checks.

Research into the characteristics of school-aged children who had colic concluded that post-colicky children have consistently more “temper tantrums.” At least 11 studies show that infants with untreated colic grow to toddlerhood and school age with higher risks of difficult behavior. Randomized trials have suggested that chiropractic treatments including spinal manipulative therapy have had beneficial results for infants who have colic. It has been documented that parents reported significant reduction in the child’s colic symptoms with chiropractic treatment over a 14-day period, with less time spent crying on a day-to-day basis and reduced amount of sleep disturbances.

The current research shows that chiropractic treatment may offer short-term relief to those experiencing infant colic. It is unclear if any long-term benefits accrue with chiropractic care. This study aimed to examine the differences between children with colic who had received chiropractic care as an infant vs those who did not. This study was carried out at the Anglo European College of Chiropractic Clinic (AECC), Bournemouth, England, and at 4 sites of a franchised child care center in Plymouth, England.

Methods

Two groups of children were sampled and, for the purposes of this study, were classified into 2 groups (ie, a treatment group and a nontreatment group). Subjects were classified as being in the treatment group if their file was kept in the chiropractic clinic archives (selected in alphabetical order from the year 2004), had been treated for infant colic with routine low-force chiropractic manual therapy associated with remission of presenting symptoms (by parent report and crying diary), and released from care before 12 weeks of age, in compliance with the treatment plan. Survey questionnaires were sent to the parents of this convenience sample of 117 former colic patients who were currently between 2 and 3 years of age. This constituted the treatment group. Parents were given 2 weeks to complete and return the surveys. Informed consent was given by completion of the survey, which was anonymous. No follow-up surveys were sent.

The nontreatment group consisted of post-colicky children in the same age group who had received no chiropractic care for their diagnosed colic as infants. These children attended child care centers in a similar region of England. One hundred eleven surveys were given to the senior nursery nurse to distribute at each site with request to the parents to return the surveys within 2 weeks. Parents of all children who attended the child care centers were given a survey. Each survey was numbered to avoid duplicating data. Inclusion criteria for the nontreatment group were (1) child currently 2 to 3 years of age, (2) parents reported that child had experienced infant colic, and (3) child had never been treated with chiropractic manual therapy. Parents were asked to complete the survey instrument and did not know that they were in a “nontreatment” group. As in the treatment group, consent was given by completion of the survey. All data were anonymous.

Each group was given 2 weeks to return the surveys. We felt that any bias that this timeline introduced into the study would be equal in both groups. There was no collection of cointervention data, believing these would have been similar in each group because the families were subject to the same socioeconomic milieu.

The survey instrument was a simple questionnaire based on the literature that describes the range of toddler behavior patterns. The parents were asked to tick boxes that described the frequency of temper tantrums, how well the child interacted with other children, how quickly they fell asleep at night, and how frequently they awakened and returned to sleep in the night. The questions were informed by and based on the relevant domains as discussed in the research literature. There were no validated surveys covering these issues available for use at the time.

The statistician was blinded as to the meaning of the treatment group and nontreatment group. Data were entered into an Excel worksheet, examined using SPSS version 17, and Pearson χ² and relative risks were calculated. Relative risk informs you about a risk, measured at the time. Relative risks were calculated as we knew that the exposure to chiropractic care at the beginning was accurate and we felt that relative risks are easier for the clinician to interpret and, thus, more useful in practice. Also, we felt that, because of the nature of this study, confounders could not be adjusted and, therefore, there was no reason to use odds ratios.
practic care has been reported to be effective in infants with withstood the rigors of scientific testing. However, chiro-

Table 1. Differences in proportions between treatment and control groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Treatment group (n = 50) (%)</th>
<th>Control group (n = 45) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temper tantrums</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rare/never</td>
<td>60</td>
<td>27</td>
</tr>
<tr>
<td>1-2 daily</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>&gt;3 daily</td>
<td>10</td>
<td>37</td>
</tr>
<tr>
<td>Falling to sleep</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20 min</td>
<td>78</td>
<td>38</td>
</tr>
<tr>
<td>&gt;20 min</td>
<td>22</td>
<td>62</td>
</tr>
<tr>
<td>Sleeps through night</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>68</td>
<td>33</td>
</tr>
<tr>
<td>No</td>
<td>32</td>
<td>67</td>
</tr>
</tbody>
</table>

All variables significantly different at the P < .05 level.

The study was approved by the AECC Research Ethics Sub-Committee. There were no funding sources or competing interests.

RESULTS

Forty-two percent (n = 50) and 53% (n = 45) of the treatment and nontreatment groups, respectively, completed and returned the surveys. Age, sex, and socioeconomic characteristics were similar between the 2 groups of children in the study. Table 1 shows differences between the groups.

Temper tantrums were more common in the nontreatment group than in the treatment group with 36% of the nontreatment group (n = 16) having 1 to 2 temper tantrums per day. Another 31% (n = 14) had temper tantrums 3 to 5 times a day and 7% (n = 3) had more than 5 temper tantrums a day. This was contrasted with the treatment group where more than half (60%, n = 30) rarely had temper tantrums and only one child had up to 5 per day. Children in the treatment group were twice as likely to fall into the category of never or rarely having a temper tantrum compared to the nontreatment group (relative risk [RR], 2.0; 95% confidence interval [CI], 1.3-3.0).

There were also significant differences in sleep patterns, with children in the treatment group being twice as likely to sleep through the night compared to children in the nontreatment group (RR, 2.0; 95% CI, 1.5-2.8). The same relationship held true in the frequency of nocturnal waking with the treatment group being more likely not to wake at night. Children in the treatment group also settled more easily within 20 minutes compared to those in the nontreatment group (RR, 1.5; 95% CI, 1.13-2.37).

DISCUSSION

There is a bewildering array of interventions proposed as panaceas for persistent crying of infancy. Few of these have withstood the rigors of scientific testing. However, chiropractic care has been reported to be effective in infants with functional disturbances of the vertebral column associated with excessive crying. Chiropractic manual therapy was the treatment in this study and was evaluated for its long-term effects rather than its short-term effects on persistent crying, which have been previously established.

Long-term behavioral effects in post-colicky children have been investigated. These are considered disorders of behavioral and emotional regulation and having had colic as an infant increases the risk of these disorders. This was corroborated in our study where children in the nontreatment group had more temper tantrums than children in the treatment group. This reflects the previous research in this area, demonstrating that ex-colicky infants tend to have more temper tantrums as toddlers. The low number of temper tantrums in the treatment group has not previously been demonstrated.

Difficulty in falling asleep and staying asleep is fodder for angst in many parents of toddlers. Poor sleep is not only a hallmark of infant colic but also of post-colicky children. In our sample, this previous research was corroborated as the children in the nontreatment group had more sleep difficulties than those in the treatment group. The literature suggests that toddlers should take 20 minutes or less to fall asleep in the evening and this was the case with 78% of the treated group. Our study further suggests that toddlers treated for infant colic by chiropractic intervention take a shorter period to fall asleep at night compared to the nontreatment group and waken less frequently. The results of our study also corroborate previous research showing that post-colicky children tend to wake during the night, especially between midnight and 5:00 AM. Children in the nontreatment group were more than twice as likely to awaken during the night compared to children in the treatment group. Infants with infant colic expose the entire family to stress and strain, which may disrupt the parents which in turn can disrupt the infant’s normal behavioral and sleep patterns. Some research studies have shown these traits affect the child until he is 8 to 10 years of age.

Further rigorous research is required to determine whether chiropractic treatment of infant colic can reduce the long-term effects on other behavior problems for a larger sample as well as for older age groups.

Limitations

There are many limitations of this study. It was a convenience sample with no attempt at randomization and, thus, may suffer from selection bias. It serves only as a real-world sampling of post-colicky toddlers and their behaviors as reported by their parents. It is a small study and, therefore, has little power to exclude with confidence any confounding variables that are not evident. We gave the parents only 2 weeks to respond to the survey; there may be a difference between quick responders, slow responders and, of course, nonresponders; and this was not taken into account. However, both groups were given the same response times.
Identification of baseline characteristics between the 2 groups was relatively limited. There is a possibility that the groups were not similar and that other issues would be differentially distributed between groups. No adjustments were made for possible confounders of maternal age, parity, or feeding methods, although it can be noted that none of these variable have previously been found to be significant in colic or post-colic syndromes. We did not measure a wide enough array of variables to address confounders. The geographic areas of study were similar areas in the UK. However, by the reason that some children presented to a chiropractic clinic for colic treatment may mean there is a difference in the populations. Furthermore, there was no investigation of other interventions that might have been used by the families of these subjects. We know that mothers are likely to search for a well-known set of interventions, and it may be reasonably assumed that these may be equally distributed between both groups; however, this cannot be known with any certainty. The only variable under study was whether post-colic children had received chiropractic care as an infant. Many other variables may have been involved, which were not uncovered in this study. We found these data of interest and hoped that it might serve as a catalyst to develop well-designed long-term outcome studies.

**Conclusion**

In this study, chiropractic treatment of infant colic was the variable tested relative to long-term behavior problems in children. The children who had received chiropractic intervention for infant colic had fewer temper tantrums, fell asleep more quickly, and stayed asleep longer than the untreated control subjects. This study corroborated the research that shows post-colic infants seem to have stressful behavioral and sleep patterns at least up to 2 to 3 years of age. It further demonstrated that a group of children treated by chiropractic manual therapy for infant colic seems to have averted these particular negative behavioral and sleep patterns during toddlerhood compared to those children who did not receive chiropractic care.

**Practical Application**

- This study shows some evidence that late effects of colic are fewer in toddlers who had been treated with chiropractic care as infants than in a control group.

**Funding Sources and Potential Conflicts of Interest**

The authors reported no funding sources or conflicts of interest.

**References**