

Infants With a Thumb-in-Fist Posture

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ABSTRACT. *Objective.* In early infancy the infant's thumb is not infrequently enclosed within the palm, ie, thumb-in-fist (TIF). This posture has received scant attention in the neurodevelopmental literature. Its prevalence, resolution, and clinical associations were investigated in this study.

Methodology. Two hundred sequentially born, apparently healthy full-term newborn infants comprised the cohort. The whole study group was followed up until the disappearance of the TIF occurred. In the first 150 of the cohort, additional data on development and the neurological status were obtained at 12 months of life.

Results. In 125 infants (62.5%) of the total cohort, a TIF was noted. The mean age of disappearance was 1.5 months, and no TIF persisted after 7 months old. No relationship was noted between the TIF resolution and abnormal neurological signs or gross or fine motor development. The only association noted between age of resolution of the TIF and the neurodevelopmental status was a delay in language attainment at the 12-month screening.

Conclusions. The TIF posture in infancy was noted in 65% of our cohort, and it had resolved in all infants by 7 months old. Therefore, a TIF posture after this age should alert the clinician to the possibility of possible neurological dysfunction. An unanticipated association of a delay in the 12-month language milestone attainment was noted in those infants with later resolution of the TIF posture. No data on language development in this group were obtained after 12 months old; therefore, the clinical significance of this finding is not yet elucidated. *Pediatrics* 2000;105(3). URL: <http://www.pediatrics.org/cgi/content/full/105/3/e41>; *thumb in fist, neurodevelopment, speech.*

ABBREVIATIONS. TIF, thumb-in-fist; SD, standard deviation.

It is not infrequent that the clinician encounters an infant that exhibits a tendency to enclose his thumb within his palm with flexed fingers (Fig 1)—the thumb-in-fist (TIF) position. In certain circumstances, this posture can be a manifestation of an upper motor neuron lesion and is sometimes referred to as a "cortical thumb."¹ However, in this setting, there are usually other clinical manifestations

such as increased muscle tone and tendon reflexes, decreased spontaneous movements of the affected limb, and the posture is usually fixed in that the infant will not open his hand spontaneously.

The question for the pediatrician is whether this hand position in an otherwise normal infant is a pathologic finding possibly indicating brain dysfunction or damage or a transient posture lacking clinical significance. A comprehensive survey of the literature did not reveal any information on this subject. The purpose of this study was twofold. First, to prospectively evaluate the incidence and evolution of this posture in apparently healthy full-term infants, and second, to note whether there was any association between the TIF posture and the neurodevelopmental status during the first 12 months of life.

METHODS

Subjects

The original study group comprised 217 sequentially born infants. Five mothers refused participation and 12 infants did not comply with the follow-up protocol; therefore, the cohort was reduced to 200 infants. Criteria for inclusion were as follows: full-term, normal pregnancies, birth weight >2500 g, normal birth with an Apgar score of at least 6/8 (at 1 and 5 minutes, respectively), no dysmorphic features or syndrome, and no family history of developmental disability. The socioeconomic classification of the families, according to the father's occupation was similar to that of the general population in the city of Haifa with 87% upper and middle class and 13% belonging to the lower socioeconomic status.² The maternal educational status was assessed according to the number of years she had studied. The mean of the total years of the mother's education was 12.9 years (2 standard deviation [SD]).

The hospital in which the study was conducted caters to the general population of the Haifa area; therefore, no referral bias was expected. The purpose of the study was explained to the parents and their agreement to cooperate with the prospective follow-up was obtained. Every mother was able to identify the TIF posture and received an illustration of the TIF position as a reference.

Procedure

Every infant was examined after birth by a pediatrician and ascertained as being healthy. The Einstein Neurobehavioral Examination³ was performed by 2 pediatricians who achieved a minimum agreement rate of .86 for the various items. This examination evaluates the infant's orientation, activity, reflexes, passive muscle tone, and summary items. A numerical score is obtained in each domain. The examination was performed in a quiet room and its duration was between 15 and 25 minutes. For the purpose of this study, a summary score was computed for each domain.

Before discharge the presence or absence of a TIF was noted and observer agreement with the mother was ascertained. The mothers received a form divided into days of the week with AM/PM periods for both the left and the right hands. They were requested to note any TIF posture when it occurred in the appro-

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Fig 1. The TIF posture.

appropriate place and at the end of each week a pediatrician telephoned the mother and she read the results of her daily observations to him. The disappearance of the TIF was concluded when it had not appeared for a period of 2 weeks, in the whole cohort of 200 infants.

To exclude neurological damage as a cause for the TIF posture, all the 200 infants were examined at 3 and 12 months old by a pediatrician. In the first 150 infants of the cohort, in addition to the neurological status, the development of the child was ascertained from data obtained from nurses screening examinations at the well-baby clinics at 3 and 12 months old (± 1 week). The developmental items were based on the mental developmental scales by Griffiths,⁴ which relate to locomotor function, personal-social, hearing, speech, eye and hand coordination, and performance.

RESULTS

The TIF posture was not observed in 75 of the 200 infants (37.5%) in the immediate postnatal period. In the remaining 125 infants, the TIF resolved over the first 7 months of life (Table 1). The mean age of TIF disappearance was 1.35 months (1.4 SD). No gender difference or hand preference was noted and no birth weight correlation was found. No correlation between TIF disappearance and developmental milestones was noted at 3 months old. No significant correlation was found between the mother's education and TIF at birth (13 ± 2 SD and 12.7 ± 1.9 SD, respectively), and the age of the TIF resolution.

TABLE 1. Resolution of TIF By Age ($n = 200$)

Age (mo)	0	.25	.5	.75	1	1.5	2	2.5	3	3.5	4	5	6	7
Number	75	6	13	6	11	18	18	11	18	10	9	3	1	1
Percentage	37.5	3	6.5	3	5.5	9	9	5.5	9	5	4.5	1.5	.5	.5

Of the 150 infants followed until 12 months old in whom the developmental screening was performed, a significant proportion of infants who had a TIF posture in the immediate postnatal period failed in the speech domain at the 12-month developmental screening test ($\chi^2 = 10.3$; $P = .001$). Of the infants who did not present with TIF in the immediate postnatal period, only 1.7% failed the language developmental screening at 12 months old. A significantly higher proportion of such failure (9%) was found among infants who presented TIF from birth to 3 months old, and an even higher proportion (29.4%) among those who presented the TIF position between 3 and 7 months old ($\chi^2 = 4.37$; $P < .05$). Furthermore, the group of infants who did not pass the speech screening at 12 months old exhibited a TIF at a significantly later age than the group of infants who attained the appropriate language level at the 12-month screening test (2.0 months: 1.5 SD and 1.2 months: 1.4 SD, respectively; $P = .03$). No effect was noted regarding the side on which the TIF occurred or the sequence in which it disappeared. No other significant differences in the 12-month developmental attainments between the infants with and without a TIF posture at birth were noted.

DISCUSSION

Gesell and Amatruda,⁵ in their pioneering work on the developmental assessment of infants and children, emphasized that during the first 2 months of life, the hands are tightly fist, and by 12 weeks they become loosely closed. This facilitates the development of self-directed visually oriented voluntary grasp or prehension. Cobb et al⁶ concluded that the elicited grasping responses in young infants which are presumed to be controlled subcortically must diminish before voluntary prehension, which is cortically controlled, can occur. They described the TIF position as a "loosely fist hand" but did not attempt to evaluate this posture independently. Our results suggest that TIF is not rare among healthy infants, and we have delineated its rate of disappearance. Conel⁷ demonstrated a relationship between the cerebral cortical anatomic structure and the functional development of the hand and upper limb and suggested that the study of the precise hand positions of the infant might shed light on the maturational process of the cerebral cortex. If this is so, it is possible that, from the neurodevelopmental standpoint, the evolution of the hand posture to the mature open position might indicate the relative maturity of that process. If one speculates, therefore, that the TIF position is a marker of the cortical maturational sequence, then it is not inconceivable that those infants manifesting a TIF might demonstrate variations in the acquisition of other neurodevelopmental milestones.

In correlating the neurodevelopmental milestones

with the rate of disappearance of the TIF, an unanticipated finding was that the language milestones were relatively frequently delayed. Furthermore, the possibly language delayed infants demonstrated the TIF position at a significantly later age than the group of infants who passed the language screening at 12 months old. No other neurodevelopmental delays were found. The explanation for this association is not evident. The language screening at 1 year old comprises the following: 1) appropriate spontaneous use of at least 3 words, 2) finger pointing to an object the infant desires, and 3) obeying a simple command such as "give me. . . ." It is possible that this screening was not sufficiently sensitive to detect language potential at this age; however, the significant difference in attainment between the TIF group and the rest and the absence of delay in the other domains does not support the possibility of an artifact. It is possible, however, that because the area of the cerebral cortex controlling hand movement and posture is neuroanatomically in close proximity to the speech area, maturational processes might play a role. It is not possible to speculate on the intriguing possibility of the relationship of cerebral dominance and speech development, because cerebral dominance becomes clinically manifest beyond the age of the infants in the study.

Neurodevelopmental examinations extending into the second year were not performed; therefore, no

data were obtained as to the eventual speech development of the children.

CONCLUSION

The conclusions that one can draw from this study are that TIF posture occurs relatively frequently and that it disappears over a well-defined period. It was not noted in infants after 7 months old. Provided that other neurological findings are not elicited and that the infant is able to spontaneously open his hand, it is probably of minimal clinical importance. The possible association with language acquisition is an intriguing one and remains to be validated in other studies.

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