Pediatricians' attitude about the use of infant walkers

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ABSTRACT
Infant walkers are still very popular even though their use might cause injuries. A survey was carried out to obtain information about attitudes and pediatricians' approach regarding the use of infant walkers. Two hundred and forty seven pediatricians who attended the 44th Turkish Congress of Pediatrics and Europediatrics (2008) were invited to reply to a questionnaire prepared by the authors. Two hundred and twenty six questionnaires replied in full were included.
The median age of participants (119 women) was 39 years old (range: 29-58 years old). Out of the total, 4% recommended the use of a walker; 32.2% left the decision to parents' judgment, and 63.7% did not recommend its use. A hundred and five had previously treated an infant who had an injury associated to the use of the walker; out of them, 73.3% did not recommend its use and 57.1% stated that there should be a ban on the sale and manufacture of walkers.
Conclusions. Out of the total number of surveyed pediatricians, 4% recommend the use of infant walkers and over 30% leave this decision to parents. Those pediatricians who took care of babies who had an injury associated to the use of a walker were less prone to recommending it.
Key words: *walker, pediatrician, child injury prevention.*

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INTRODUCTION

Infant walkers are still very popular in all the world even though they might cause home accidents, burns and poisonings.[1,2] Parents might consider that walkers are safe because they keep the infant quiet and happy, they provide exercise, promote walking and encourage mobility, and hold the infant during feeding while the mother is able to do household chores.[2-5]

Although the rate of use of infant walkers varies around the world, reported rates are very high: 50% in the United Kingdom,[3] 70% to 90% in the United States,[6,7] 55% in Dublin, Ireland,[8] 54.5% in Iran,[9] 90% in Singapore[4] and 75.4% in Turkey.[1] Injuries are associated to the use of walkers in 12% to 40% of children who use them.[3,4,10,11] Besides, 34 infant walker-related deaths were reported in the United States between 1973 and 1998.[11] These deaths are usually caused from head injuries when infants fall down the stairs.[11] There is a four-fold increase of risk of an injury for a fall down the stairways and a two-fold increase of the risk of fracture because of this fall when using a walker.[12] Considering these risks, the American Academy of Pediatrics recommends a ban on the manufacture and sale of infant walkers,[13] as it has happened in Canada since 2004.[14]

From 25% to 50% of parents whose children had an injury associated to the use of a walker have continued using it; it is necessary that pediatricians guide parents more convincingly.[15-17] To our knowledge, there are few studies about pediatricians' attitude in this regard. The objective of the present study was to obtain information concerning pediatricians' attitudes about the use of infant walkers and the approach to this subject with parents.

MATERIAL AND METHODS

The study included pediatricians that attended the 44th Turkish Congress of Paediatrics held in Istanbul in June 2008. After providing information about the study to all attendees, they were asked to complete the questionnaire of 23 questions prepared by the authors. Pediatricians'age, sex, degree, affiliation and attitudes regarding the use of an infant walker were recorded, reading of scientific papers about the subject, experience in the treatment of patients with injuries associated to its use, and attitudes towards the manufacture and sale of infant walkers.

The study was approved by the Ethics Committee of the School of Medicine of the Fatih University.

Data were analyzed with the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA.), version 13.0. The χ^2 test was used to compare paired or multiple categorical outcome measures. A value of $p< 0.05$ was considered significant.

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RESULTS

Two hundred and forty seven pediatricians were invited to participate. Questionnaires with incomplete replies were excluded (n= 21). Questionnaires corresponding to 226 pediatricians were analyzed. The median age of participants (107 men and 119 women) was 39 years old (range: 29-58 years old). Demographic characteristics of participants are described in *Table 1*.

Replies to the questionnaire are detailed in *Table 2*.

Those pediatricians who assisted an infant who had an injury associated to the use of an infant walker support, in a greater proportion than the rest, a ban on the sale and manufacture of walkers (57.1% versus 24.8%, $p < 0.001$, *Table 3*).

Regarding the question: "Do you recommend parents to use an infant walker?" when comparing pediatricians who recommend its use versus those who leave the decision to parents,

TABLE 1. *Demographic characteristics of participating pediatricians*

Characteristics	
Age, years	39
Sex	
Female	119 (52.6)
Position	
Resident	56 (24.8)
Specialist	138 (61.1)
Assistant Professor	16 (7.1)
Associate Professor	12 (5.3)
Professor	4 (1.8)
Affiliation	
Private sector	76 (33.6)
Ministry of Health	97 (42.9)
University hospital	53 (23.5)

Data presented as median ± standard deviation or n (%), when applicable.

TABLE 2. *Pediatricians' attitudes and approach in relation to the use of infant walkers*

Questions about pediatricians' attitudes and approach	**n (%)**
Do you recommend parents the use of infant walkers for their children?	
Yes	9 (4)
Leave the decision to parents after providing an explanation	73 (32.3)
No	144 (63.7)
If you recommend the use of an infant walker, at what age should infants start using it?	
6 months old	19 (23.2)
8 months old	41 (50)
10 months old	19 (23.2)
12 months old	3 (3.6)
Should parents be told about the use of infant walkers during follow-up visits?	
Yes	212 (93.8)
No	14 (6.2)
Do you read scientific articles about infant walkers?	
Yes	80 (35.4)
No	146 (64.6)
Have you ever treated an infant because of an injury associated to the use of an infant walker?	
Yes	105 (46.5)
No	121 (53.5)
If you have a child, has your baby ever used an infant walker?	
Yes	73 (47.7)
No	80 (52.3)
Do you believe that the manufacture and use of infant walkers should be banned?	
Yes	91 (40.3)
No	135 (59.7)
Do you think that educating parents about the risks associated to the use of an infant walker will result in a significant decrease in its use?	
Yes	204 (90.3)
No	22 (9.7)

a significant difference was found in previously having treated an infant with an injury associated to the use of an infant walker (p= 0.016). Among those who leave the decision to parents, the rate of pediatricians who had previously not treated any cases was 67.1% while among those who do not recommend its use, the rate of pediatricians who assisted an infant with injuries associated to its use was 53.5%. On the other hand, there were no significant differences between groups as far as sex, reading of scientific papers about infant walkers and affiliation *(Table 4)*.

DISCUSSION

In the present study, 63.7% of pediatricians do not recommend the use of infant walkers and 32.2% leave the decision to parents' judgment after providing a relevant explanation. Although only 4% of pediatricians participating in this study recommend it, the high rate of use (75.4%) in Turkey[1] suggests that a significant number of parents ignore or are not aware of risks, or that pediatricians are not able to provide guidance convincingly.

In spite of warnings against infant walkers, their use and associated injuries continue; for this reason authorities have proposed a ban on their manufacture and sale. Canada was the first country in the world to adopt this measure.[14] In France, Claudet, et al.[18] examined 178 hospital admissions to the department of pediatric urgencies due to injuries associated

TABLE 3. *Approach of pediatricians who previously treated an infant because of an injury associated to the use of a walker*

	Have you ever treated an infant because of an injury associated to the use of an infant walker?		*p*
	Yes n (%)	**No n (%)**	
Manufacture and use of infant walkers			
Should be banned	60 (57.1)	30 (24.8)	<0.001
Should not be banned	45 (42.9)	91 (75.2)	
Total	**105 (100)**	**121 (100)**	

TABLE 4. *Distribution of pediatricians' replies to the question "Do you recommend the use of infant walkers?" according to different parameters*

	Do you recommend the use of infant walkers?			
	Recommend (n= 9) n (%)	**Leaves the decision to parents (n= 73) n (%)**	**Does not recommend (n= 144) n (%)**	*p*
Treated an infant with an injury associated to the use of a walker				
Yes (n= 105)	4 (3.8)	24 (22.8)	77 (73.3)	0.016
No (n= 121)	5 (4.1)	49 (40.4)	67 (55.3)	
Sex				
Male (n= 107)	6 (5.6)	34 (31.7)	67 (62.6)	NS
Female (n= 119)	3 (2.5)	39 (32.7)	77 (64.7)	
Have you read scientific articles about infant walkers?				
Yes (n= 81)	3 (3.7)	21 (25.9)	57 (70.3)	NS
No (n= 145)	6 (4.1)	52 (35.8)	87 (60)	
Affiliation				
Private sector (n= 76)	3 (3.9)	26 (34.2)	47 (61.8)	NS
Ministry of Health (n= 97)	4 (4.1)	28 (28.8)	65 (67)	
University hospital (n= 53)	2 (3.7)	19 (35.8)	32 (60.3)	

NS: not significant.

to the use of infant walkers during 2 years. Seventy eight percent of those children had fallen down the stairs. The author concludes that the use of infant walkers should be banned in France because it is unsafe and dangerous. Another study conducted in Greece regarding the occurrence of 44/1000 falls per year, 9 every 1000 resulted from the use of an infant walker or were associated to falls from the stairs, and sometimes to severe injuries.[19] Although infant walkers are less used because of warnings and bans, consequences are still present.[20-22] Desapriya, et al.[23] say that the ban on infant walkers is not enough to prevent injuries from occurring; efforts should also be focused on making the population become aware of potential dangers. These authors suggest that parents should be told about infant walkers, especially about the fact that its use is not beneficial for the development of infants.

Apart from parents, all those who participate in the care and development of children should receive information about this issue. Different studies have shown that their level of knowledge is not enough and that evidence-based knowledge is required.[24,25] Kendrick, et al.[25] evaluated healthcare agents attitudes and knowledge about the subject and reported that 45.8% of them agreed with the ban, 13.1% believed that the use of infant walkers was beneficial, 67.2% thought that it might delay the onset of gait, and only 1.7% believed that modern infant walkers were safe for children. They also concluded that most of the healthcare agents had limited knowledge on the subject and did not discuss the rate of injuries associated to its use with parents. Therefore, they suggest that if healthcare agents and midwives knowledge improved, parents update on the subject would also increase. The same authors reported results obtained after training healthcare agents and midwives and concluded that training on injury prevention was associated to more knowledge, more negative attitudes towards infant walkers and a more positive attitude towards parents' and families' education on this subject. Trained midwives were more prone to providing guidance before birth.[26]

To our knowledge, only Rhodes, et al.[27] evaluated pediatricians' attitudes about infant walkers. They found that an improved knowledge was associated with negative attitudes towards them. In the present study, 90.3% of pediatricians said that if parents were warned, this would significantly reduce the risk of injuries associated to its use; however, the percentage of pediatricians who read one of the scientific papers about infant walkers was only 35.4%.

It should be considered that 47.7% of pediatricians use an infant walker for their children. In the study by Rhodes, et al.27 the rate was 36%. While in our study 63.7% of pediatricians do not recommend the use of infant walkers, Rhodes, et al.[27] reported that 71% of pediatricians advised parents not to use them. Particularly in this study, 74.1% of pediatricians also believed that parents education about risks was probably more beneficial than banning on its sale. Additionally, "knowledge about infant walkers and associated injuries" was a factor that was related to those who always provided guidance about infant walkers. In this study, pediatricians that assisted an infant with an injury associated to the walker were less prone to recommending its use. In view of the above mentioned facts, we consider that the reduction in the use of infant walkers, which is a significant cause of infants' injuries, can be achieved through healthcare agents and pediatricians providing parents evidence based knowledge, and also through the ban on its manufacture and sale.

As a limitation, in our study, a self-administered questionnaire was used which could result in a bias. Additionally, participants were pediatricians who attended the congress held in Istanbul. Therefore, the results of the present study should be taken into account with caution and cannot be generalized.

CONCLUSIONS

Only 4% of pediatricians in this sample recommend the use of infant walkers. On the other hand, half the pediatricians who had a child used it. Pediatricians who took care of babies who had an injury associated to the use of a walker were less prone to recommending it.■

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Mutation characterization in the GATA-1 gene in patients with Down's Syndrome diagnosed with transient abnormal myelopoiesis or acute megakaryoblastic leukemia

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ABSTRACT

Patients with Down's Syndrome have a higher risk of developing acute megakaryoblastic leukemia (AML). Ten per cent of newborn infants with this syndrome have transient abnormal myelopoiesis (TAM), indistinguishable from AML, which generally remits spontaneously. A high incidence of *GATA-1* gene mutations was described in both groups of patients.
Fourteen bone marrow DNA samples (10 ATM/4 AML) were analyzed by PCR and sequencing; these samples were obtained from 13 patients with Down's Syndrome to describe the rate and mutation characteristics of the *GATA-1* gene in the studied population and its consequences at a protein level.
Mutations were detected in 10 out of 10 TAM and in 3 out of 4 AML, which at a protein level would result in an early termination codon (n= 5), alterations in the splicing site (n= 6) or sequence change (n= 3). The high rate of *GATA-1* gene mutations was confirmed in newborn infants with Down's Syndrome and MAT or AML.

Key words: *transient abnormal myelopoiesis, megakaryoblastic leukemia, GATA-1, Down's Syndrome.*

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INTRODUCTION

Children with Down's Syndrome are more prone to developing acute leukemia, more frequently acute megakaryoblastic leukemia (AML), especially in the two first years of life.[1,2]

Additionally, during the neonatal period, 10% of children with trisomy 21 have a clonal disorder called transient abnormal myelopoiesis (TAM), indistinguishable from AML, which in most of the cases (70% to 80%) remits spontaneously within the three months of evolution. However, the remaining 20% to 30% develop AML, especially during the three first years of life.[3]

The *GATA binding protein 1* (*GATA-1)* gene encodes a 50 kDa transcription activation factor that is critical for the normal development of the ontogenesis of the erythroid and the megakaryocytic lineages.[4,5] Recently, *GATA-1* exon 2 mutations were described in children with Down's Syndrome with either TAM or AML which are undetectable when the disease is in remission.[6] It is proposed that these mutations participate in TAM or AML development in children with Down's Syndrome and that they do not present in children with Down's Syndrome and other types of acute leukemia nor in patients with AML but without Down's Syndrome.[7,8]

In the present study, results of the study of the *GATA-1* gene mutations in patients with Down's Syndrome and TAM/AML admitted to our institution are reported.

REMARKS

Eighteen patients with Down's Syndrome and TAM or AML were diagnosed and managed in our Department from 2003 to 2012. Fourteen bone marrow samples (10 TAM/4 AML), including two samples of a patient who had TAM and then AML were collected for the present study.

GATA-1 exon 2 and the intronic flanking sequences were analyzed by PCR and sequencing.[9] Clinical and laboratory data of patients with Down's Syndrome and TAM or AML at the time of diagnosis are detailed in *Table 1*. Medians and age ranges of studied populations were 9 (1 to 41) days for patients with TAM and 18 (9 to 27) months for patients with AML.

A patient with TAM developed AML 9 months after having achieved complete spontaneous remission of TAM (cases 6 and 12).

Results of G-banding cytogenetic studies are shown on *Table 2*. In the patient with TAM who developed AML new cytogenetic abnormalities were found at the time the latter one was diagnosed.

TABLE 1. *Clinical and laboratory data of patients with Down's Syndrome and transient abnormal myelopoiesis or megakaryoblastic leukemia at the time of diagnosis*

Case	Age*	Diag	Sex	WBC (x109/l)	Hb (g/dL)	Plat. (x109/l)	Liver enlargement	Spleen enlargement
1	4 d	TAM	M	45	15.1	25	Yes	Yes
2	22 d	TAM	F	35.1	9.8	55	Yes	Yes
3	13 d	TAM	M	120	16.5	186	Yes	Yes
4	9 d	TAM	M	83.6	18.8	56	Yes	Yes
5	1 m	TAM	F	8.4	9.3	23	Yes	Yes
6**	6 d	TAM	M	47.2	16.3	195	Yes	No
7	40 d	TAM	M	57	8.7	144	Yes	Yes
8	9 d	TAM	M	30	12.3	102	Yes	Yes
9	1 d	TAM	F	40	8.5	531	Yes	Yes
10	5 d	TAM	M	34.9	15.5	44	Yes	Yes
11	9 m	AML	F	6.9	10.2	84	Yes	No
12**	11 m	AML	M	4.7	7.5	18	No	No
13	25 m	AML	M	9.3	4.4	23	Yes	Yes
14	27 m	AML	F	25.4	3.7	10	Yes	Yes

WBC: white blood cell count. *Age: d (days), m (months). ** Same patient.
TAM: transient abnormal myelopoiesis. AML: acute megakaryoblastic leukemia.

Detected mutations are described in *Table 3*, including their consequences at a protein level and their classification according to what Kanezaki, et al. proposed.[10]

Eight (62%) of the 13 mutations identified in the TAM and AML samples corresponded to insertions/deletions/duplications and 5 (38%), to base substitutions. Mutations were detected in all patients with TAM; the types of characterized mutations were duplications (*n*= 5), simple nucleotide substitutions (*n*= 4) and deletion (*n*= 1). In 3 of the 4 patients with AML the presence of duplications (*n*= 2) or simple nucleotide substitution (*n*= 1) were evidenced.

Computational analysis of the consequences of mutations at a protein level revealed the presence of an early termination codon of the translation in 5 samples (TAM= 4/AML= 1), the loss of exon 2 due to modifications in splicing sites in 6 cases (TAM= 5/AML= 1) in which mutations involved critical sites of signal recognition (*Figure 1*). In two cases mutations were translated in a change of the amino acid sequence.

During the evolution of the 10 patients with TAM, 8 achieved complete remission spontaneously without receiving any type of chemotherapy. A patient died before achieving complete remission because of an acute respiratory infection, and one patient was lost to follow-up. Three out of the 8 patients who achieved complete remission remain disease-free with +48, +55 and +90 months of follow-up. Out of the remaining 5 patients who achieved complete remission, one developed AML after 9 months in complete remission, 3 died in complete remission (2 cases due to sepsis and 1

FIGURE 1. *Schematic representation of exon 2 of the GATA-1gene, where the location of the detected mutation sites are pointed out. The symbol indicates the type of outcome at a protein level. Loss of exon 2 because of a splicing error, change in the amino acid sequence, early termination codon of the translation in exon 2 and early termination codon of the translation in exon 3*

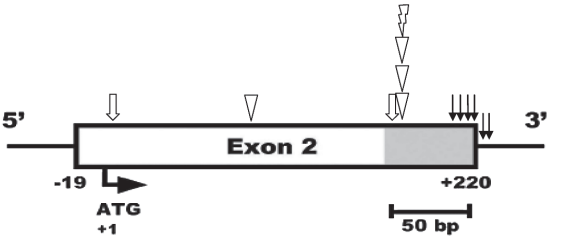

TABLE 2. *Result of the cytogenetic studies of the 13 patients with Down's Syndrome and transient abnormal myelopoiesis or megakaryoblastic leukemia in the bone marrow*

Case	Diagnosis	Karyotype
1	TAM	47,XY,+21c[20]
2	TAM	47,XX,+21c[20]
3	TAM	47,XY,+21c[20]
4	TAM	46,XY,-19,+21c[3]/47,XY,+21c [14]
5	TAM	47,XX,+21c[20]
6*	TAM	47,XY,+21c[20]
7	TAM	47,XY,+21c[20]
8	TAM	47,XY,+21c[20]
9	TAM	46,XX,+21c,der(21;21)(q10;q10)c[20]
10	TAM	47,XY,+21c[20]
11	AML	47,XX,+21c[20]
12*	AML	47,XY, -7, +21c, +mar[10]/48, XY, idem, +21[6]/47, XY, +21c[4]
13	AML	47,XY,i(7)(q10),+21c[4]/47,XY,+21c[16]
14	AML	46,XY,der(15)t(9;15)(q11;q11.2), -17,add(19)(p13.3),der(21)t(17;21)(q11.2;p13),+mar[16]/47,idem,+21c[4]

* Same patient.

TAM: transient abnormal myelopoiesis. AML: acute megakaryoblastic leukemia.

TABLE 3. *Summary of the GATA-1 gene mutations in the studied bone marrow samples and predicted outcome at a protein level*

Case	Diagnosis	Mutation*	Outcome of the mutation	Mutation subtype**
1	TAM	c.214_218dup	Splicing error	Spl
2	TAM	c.5A>G	Glu2Gly	NA
3	TAM	c.90_91delAG	(Val32Phe) + 38Stop	PTC 1-5′
4	TAM	c.220+1G>A	Splicing error	Spl
5	TAM	c.151_184dup	Tyr62Stop	PTC 1-5′
6#	TAM	c.150_184dup	Tyr62Stop	PTC 1-5′
7	TAM	c.219A>G	Splicing error	Spl
8	TAM	c.217_220del	Splicing error	Spl
9	TAM	c.220+2T>C	Splicing error	Spl
10	TAM	c.169_184dup + c.184_185insG	Tyr62Trp + 142Stop	PTC 1-3′
11	AML	c.149_183dup	Tyr62Arg	NA
12#	AML	c.150_184dup	Tyr62Stop	PTC 1-5′
13	AML	WT	WT	NA
14	AML	c.220 G>A	Splicing error	Spl

* Nucleotide number 1 corresponds to the A of the ATG codon at the onset of the translation located in exon 2 of the GATA-1 gene according to the sequence of reference (NM_002049.3).

** Classification as per Kanezaki, et al. Spl.: splicing error; NA not applicable.

Same patient.

TAM: transient abnormal myelopoiesis. AML: acute megakaryoblastic leukemia.

due to heart disease decompensation). A patient was lost to follow-up 31 months ago.

As far as the 4 patients with AML, all achieved complete remission. One of them had an early relapse, a second treatment was administered but died due to infectious complications. The 3 remaining patients live in complete remission at +22, +46 and +65 months after their diagnosis.

DISCUSSION

Hematological disorders associated to *GATA-1* gene mutations are evidenced at an early age and therefore the intrauterine origin of these abnormalities, during fetal development, is speculated. This is in accordance with the liver enlargement observed in all the TAM cases analyzed at the time of the diagnosis since the liver plays a fundamental role during fetal hematopoiesis.

The first event or genetic abnormality is the presence of trisomy 21, which predisposes hematopoietic cells to the acquisition of *GATA-1* gene mutation that would account for the appearance of the TAM syndrome even though the pathophysiology of the spontaneous remission observed in these cases is unknown.

GATA-1 mutations were detected in all patients analyzed who had been diagnosed with TAM. Concerning the patient with the diagnosis of TAM who had a spontaneous remission and 9 months later developed AML, although the presence of the same mutation was proved in both samples of *GATA-1*, the cytogenetic test reveals the acquisition of new abnormalities in the leukemic clone. These findings strengthen the theory that both conditions involve the same population of hematopoietic cells and suggest that the progression of TAM to AML could be the consequence of the acquisition of additional mutations.

It is important to consider the age of onset of the clinical condition, a piece of information relevant to the differential diagnosis between TAM and AML, because 80% of TAM cases remit spontaneously before the first three months of life without the need of a treatment. Even though

TAM diagnosis is based on the clinical and hematological characteristics of the patient, and mainly on the progress to spontaneous remission, the demonstration of the presence of mutations in the *GATA-1* gene by molecular biology techniques could be used to guide the diagnostic suspicion of patients with Down's Syndrome without clinical or hematological manifestations.

Some authors propose the preventive administration of low-dose chemotherapy to patients with TAM,[11] but morbidity and mortality of these treatments to newborn infants diagnosed with Down's Syndrome should be taken into account and leave the treatment for those infants who have life-threatening clinical complications.

As far as we know, this is the first study conducted in Argentina, study in which *GATA-1* gene mutations are characterized in patients with Down's Syndrome diagnosed with TAM and AML. The high rate of mutations found in newborn infants with Down's Syndrome and TAM suggest the convenience of examining for its presence in all the newborn infants with Down's Syndrome so as to individualize those at a higher risk of developing TAM or AML. These latter patients would have to be strictly followed-up from a clinical standpoint than those newborn infants with Down's Syndrome who do not have it, with the aim of making an early diagnosis to avoid the complications related to this condition. Additionally, the serial evaluation of detected mutations would allow to monitor those patients with TAM to check the kinetics of the disappearance of the preleukemic clone and predict an eventual progression to AML at an early stage.

The present study has enabled to confirm the high published rate of *GATA-1* gene mutations in newborn infants with Down's Syndrome and TAM or AML.[8,10,12] The knowledge of these mutations will contribute to a better understanding of these diseases in children with Down's Syndrome which will favor the detection of potential therapeutic targets for future treatment strategies. ■

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