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Microneedling with Triamcinolone acetonide versus Intralesional Triamcinolone acetonide in treatment of Alopecia Areata

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ORIGINAL ARTICLE

Microneedling With Triamcinolone Acetonide Versus Intralesional Triamcinolone Acetonide in the Treatment of Alopecia Areata

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Abstract

Background: **Alopecia areata (AA) is a widespread, nonscarring skin illness, triggered by T-cell-mediated autoimmune responses targeting hair follicles at the anagen stage. AA is a relatively frequent disease with a worldwide incidence of 1−2%. However, AA is among the most prevalent autoimmune disorders. In general, there is no sex preference. It often affects children and young people. The scalp is the place that is most frequently impacted, but any area that bears hair might also be affected. Severe forms can be present as alopecia totalis or alopecia universalis. This study aimed to compare the effectiveness of intralesional triamcinolone acetonide versus microneedling (MN) with triamcinolone acetonide for AA treatment.**

Patients and methods: **In all, 50 patients with localized AA is included in this comparative study, all of whom were recruited from the Dermatology Outpatient Clinic of Al-Azhar University Hospitals.**

Results: **The collected data was tallied and statistically analyzed. The findings revealed a statistically significant reduction of the SALT (Severity of Alopecia Tool) score and all dystrophic hair markers of AA by dermoscopy at the end of the study versus baseline in both groups. The difference between the MN group and the intralesional group concerning clinical response was statistically insignificant.**

Conclusion: **MN is an effective collagen induction therapy in treating AA, especially when combined with triamcinolone acetonide, as it provides a comparatively inexpensive, safe, less painful, and less invasive tool with no serious complications.**

Keywords: Alopecia areata, Intralesional, Microneedling, Triamcinolone acetonide

1. Introduction

Alopecia areata (AA) is a comparatively prevalent disorder that impacts hair follicles, with an accumulative lifetime prevalence of ~2%. Usually, it shows up as well-defined, circular regions of alopecia that emerge suddenly and do not have any signs of inflammation on the scalp.[1] Strong evidence leads us to conclude that it is an autoimmune disorder, even though its pathogenesis is still poorly understood.[1]

Triamcinolone is a steroid solution used for more than 50 years for the treatment of AA through injection into the scalp and seems to have some efficacy for patients with mild to moderate AA. Intralesional corticosteroids (ILCs) are the first-line treatment for the condition's characteristic, patchy, and localized appearance.[1]

Percutaneous collagen induction therapy, sometimes referred to as microneedling (MN), is a comparatively recent therapeutic option in dermatology.[2]

This study aimed to compare the effectiveness of intralesional triamcinolone acetonide versus MN with triamcinolone acetonide for AA treatment.

2. Patients and methods

2.1. Patients

In all, 50 patients with localized AA is included in this comparative study, all of whom were recruited

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from the Dermatology Outpatient Clinic in Al-Azhar University Hospitals.

The study fulfilled all approvals by the ethical committee of al azhar university and patient consenting was obtained before being recruited into the study.

Patients will be split into two groups, each with 25 patient.: Group A: 25 patients with localized AA will be treated with MN using a Derma Pen having 12 needles of 1.5-mm length in vertical and horizontal directions for 4–5 times with topical application of triamcinolone acetonide (TrA) (10 mg/ml) before and after MN. Group B: 25 patients presenting with localized AA will be injected intralesionally by TrA (10 mg/ml) at 1 cm intervals using a 0.05–0.1 ml injection volume/site. An insulin syringe with a 30-gauge needle will be used to inject a maximum of 2 ml (20 mg) for each session.

Treatment will be used once every 3 weeks for a maximum of four sessions, with follow-up assessment using a dermoscope and photography before and after every session and after the therapy course.

2.2. Inclusion criteria

Patients with localized AA ranged in age from 18 to 40 years, both sexes, and had not received any AA therapy in the previous 3 months.

2.3. Exclusion criteria

Patients with extensive types (alopecia totalis and alopecia universalis), patients with infected or scarring alopecia, pregnant and lactating women, patients under the age of 18 years, people with chronic hepatic or hematological diseases, immunocompromised patients, and those with a history of prior treatment with any MN.

2.4. Methods

The following will be administered to all patients: full history taking, a general and dermatological examination, and assessing the degree of AA clinically and dermoscopic evaluation (DL 4) and imaging will be done before and after every session.

2.4.1. Clinical evaluation of the AA degree

As per the degree of Alopecia SALT score, the scalp is divided into four quadrants. Visually, determine the percentage of scalp loss of hair for each quadrant and add the numbers together for a maximum score of 100%.[3]

2.4.2. Potential endpoints

Change in SALT score based on terminal hair growth from the baseline.

2.4.3. Triamcinolone acetonide preparation

Injection of Epirelefan was at a concentration of 10 mg/ml with a session maximum volume of 2 ml. The vial of steroids contains 40 mg/ml diluted with 3 ml of saline.

2.4.4. Microneedling device (Derma Pen)

Derma Pen is an automated MN device for fractional mechanical resurfacing that uses disposable needles and guides to alter needle length. Nine to forty-two needles are arranged in rows at the tip.

2.4.5. Statistical analysis of the data

The IBM SPSS software package version 20.0 has been used to analyze the data fed into the computer. Utilizing numbers and percentages, qualitative data has been described. The Shapiro–Wilk test was used to verify the distribution's normality. Range (minimum and maximum), mean, SD, median, and interquartile range (IQR) were used to describe quantitative data. The significance of the obtained findings has been determined at a 5% level.

The following tests have been used: the χ^2-test is used to compare different groups of categorical variables. Monte–Carlo correction: χ^2 correction when greater than 20% of cells have an anticipated count of less than 5. The McNemar test is used to determine the significance of various stages. A Student *t*-test is used to compare two groups of normally distributed quantitative variables. The Mann–Whitney test is used to compare two groups under study for quantitative variables with abnormal distributions. The Wilcoxon-signed rank test is used for comparing two periods with abnormally distributed quantitative variables.

3. Results

Table 1 shows that there was statistically insignificant difference between the two studied groups as regards SALT score before ($P = 0.174$) or after treatment ($P = 0.562$).

Table 2 shows that there was statistically significant difference between the two studied groups as regards regrowth score ($P = 0.001$).

Table 3 shows that there was statistically significant difference between the two studied groups as regards EX M (before) and VH (after). There was statistically insignificant difference between the two studied groups as regards YD, BD, EX M (after), BH, VH (before), and TH.

Table 4 shows that there was highly statistically significant difference between the two studied groups as regards the satisfaction score ($P = 0.004$).

Table 1. Comparison of the two study groups based on the SALT score.

SALT score	Microneedling TrA ($n = 25$)	Intralesional TrA ($n = 25$)	U	P
Before treatment				
Minimum–maximum	0.36–12.0	1.20–16.0	242.50	0.174
Mean ± SD	3.70 ± 3.27	4.68 ± 3.54		
Median (IQR)	2.40 (1.26–4.80)	3.60 (2.20–6.0)		
After treatment				
Minimum–maximum	0.0–8.40	0.0–2.40	283.0	0.562
Mean ± SD	1.64 ± 2.33	0.55 ± 0.58		
Median (IQR)	0.27 (0.0–2.70)	0.48 (0.10–0.81)		
Z (P_1)	3.644* (<0.001*)	4.373* (<0.001*)		

IQR, interquartile range; TrA, triamcinolone acetonide.

3.1. Illustrative cases

Figs. 1 and 2.

4. Discussion

AA is an autoimmune illness that causes defined patches of nonscarring loss of hair on normal-looking skin. AA is found in populations all over the world. The prevalence among the general population in the United States was estimated to be between 0.1 and 0.2%.[4]

Even though the etiopathogenesis of AA is not well understood, most researchers believe it is linked to immune processes.[5]

The target of treating AA is to reduce the disease's activity. Different therapeutic approaches could be divided into topical and systemic treatments; topical therapies include minoxidil, ILCs, and topical corticosteroids. Systemic therapy includes systemic corticosteroids, photochemotherapy, and other immunosuppressive agents. Up to 80% of patients having limited patchy loss of hair and of short-term (<1 year) duration experience spontaneous remission.[6]

For adult AA patients, ILCs, preferably TrA, are considered the first-line treatment. Corticosteroids are used to decrease inflammation in AA lesions. The primary mechanism of action is immunosuppression. The T-cell-mediated immunological attack on hair follicles is suppressed by corticosteroids.[7]

Collagen induction treatment, commonly known as MN, is a procedure that involves repeatedly puncturing the skin with sterile microneedles. The basis of MN is based on physical trauma. It was suggested that the trauma caused by a needle puncture to the skin triggers dermal regeneration.[8]

In the current study, the scalp was the main site of AA; these results are more in line with the findings of Kaur et al.[9] who found that the scalp was the most often afflicted region in AA.

Concerning clinical response (determined by terminal hair regrowth), in the MN group, at the end of the study, 21 patients (84%) showed terminal hair regrowth with a high statistically significant difference versus baseline ($P < 0.001$). There has been a statistically insignificant difference between the MN and intralesional groups in terminal hair regrowth, which was positive in 25 patients (100.0%) in the intralesional group versus 21 patients (84%) in the MN group ($P < 0.001$).

To our knowledge, no prior research has been conducted to assess MN TrA in AA except for Hafiz *et al.*[10] whose study comprised 40 patients having patchy AA and split them into two groups. The TrA

Table 2. Comparison of the two study groups based on regrowth score.

Regrowth score	Microneedling TrA ($n = 25$) [N (%)]	Intralesional TrA ($n = 25$) [N (%)]	Test of significance	P
A0	4 (16.0)	0	$\chi^2 = 16.328$*	$^{MC}P = 0.001$*
A1	1 (4.0)	0		
A2	4 (16.0)	0		
A3	3 (12.0)	3 (12.0)		
A4	4 (16.0)	16 (64.0)		
A5	9 (36.0)	6 (24.0)		
Minimum–maximum	0.0–100.0	70.0–100.0	$U = 238.50$	0.144
Mean ± SD	62.80 ± 39.37	89.40 ± 9.30		
Median (IQR)	80.0 (30.0–100.0)	90.0 (85.0–97.0)		

IQR, interquartile range; MC, Monte–Carlo; TrA, triamcinolone acetonide.

Table 3. Comparison of the two study groups based on dermoscopy.

	Dermoscope	Microneedling TrA ($n = 25$) [N (%)]	Intralesional TrA ($n = 25$) [N (%)]	χ^2	P
YD	Before				
	No	18 (72.0)	18 (72.0)	0.000	1.000
	Yes	7 (28.0)	7 (28.0)		
	After				
	No	23 (92.0)	20 (80.0)	1.495	$^{FE}P = 0.417$
	Yes	2 (8.0)	5 (20.0)		
	$^{McN}P_0$	0.180	0.500		
BD	Before				
	No	5 (20.0)	8 (32.0)	0.936	0.333
	Yes	20 (80.0)	17 (68.0)		
	After				
	No	22 (88.0)	22 (88.0)	0.000	$^{FE}P = 1.000$
	Yes	3 (12.0)	3 (12.0)		
	$^{McN}P_0$	<0.001[a]	0.001[a]		
EX M	Before				
	No	15 (60.0)	6 (24.0)	6.650[a]	0.010[a]
	Yes	10 (40.0)	19 (76.0)		
	After				
	No	22 (88.0)	21 (84.0)	0.166	$^{FE}P = 1.000$
	Yes	3 (12.0)	4 (16.0)		
	$^{McN}P_0$	0.039[a]	<0.001[a]		
BH	Before				
	No	18 (72.0)	18 (72.0)	0.000	1.000
	Yes	7 (28.0)	7 (28.0)		
	After				
	No	23 (92.0)	21 (84.0)	0.758	$^{FE}P = 0.667$
	Yes	2 (8.0)	4 (16.0)		
	$^{McN}P_0$	0.125	0.375		
VH	Before				
	No	6 (24.0)	8 (32.0)	0.397	0.529
	Yes	19 (76.0)	17 (68.0)		
	After				
	No	4 (16.0)	12 (48.0)	5.882[a]	0.015[a]
	Yes	21 (84.0)	13 (52.0)		
	$^{McN}P_0$	0.727	0.289		
TH	Before				
	No	20 (80.0)	17 (68.0)	0.936	0.333
	Yes	5 (20.0)	8 (32.0)		
	After				
	No	4 (16.0)	0	4.348	$^{FE}P = 0.110$
	Yes	21 (84.0)	25 (100.0)		
	$^{McN}P_0$	<0.001[a]	<0.001[a]		

FE, Fisher's exact test; MC, Monte–Carlo test; TrA, triamcinolone acetonide.
[a] Statistically significant at $P \leq 0.05$.

group included 20 patients, with 18 males (90%) and two females (10%). They ranged in age from 19 to 50 years. They were treated by TrA at 10 mg/ml with MN. The Bimatoprost group included 20 patients, 18 males (90%) and two females (10%). They ranged in age from 21 to 44 years. They were treated with bimatoprost 0.03% solution with MN.

Sessions were repeated every 3 or 2 weeks in the TrA group or the bimatoprost group, respectively, for 3 months.

Our results are also similar to her results regarding MN TrA (terminal hair regrowth was 85% in this group) as we had the same concentration of TrA (10 mg/ml), same number of sessions, and same MN device (Derma Pen), New Bodylife Cosmetics, Dalang Village, Shijing Street, Baiyun District, Guangzhou Province.

In disagreement with Hafiz et al.[10] in the number and age of patients, there was no affection on the result.

As in the current study, we had 25 patients in the MN group and their age range was from 18 to 40 years, and the mean age was 30.28 ± 7.08 years and the median age is 32 years.

In the current study, regarding the intralesional group, there was excellent hair regrowth in 25 patients (100%). Our findings were not similar to Alblat and Ebrahim,[11] who conducted a study on 80

Table 4. Comparison of the two study groups based on satisfaction scores and side effects.

	Microneedling TrA ($n = 25$) [N (%)]	Intralesional TrA ($n = 25$) [N (%)]	χ^2	^{MC}P
Satisfaction score				
1	5 (20.0)	0	13.411[a]	0.004[a]
2	4 (16.0)	0		
3	3 (12.0)	3 (12.0)		
4	4 (16.0)	13 (52.0)		
5	9 (36.0)	9 (36.0)		
Side effect				
No	21 (84.0)	17 (68.0)	12.065[a]	0.001[a]
Pain	0	6 (24.0)		
Burning	0	1 (4.0)		
Telangiectasia	0	1 (4.0)		
Erythema	4 (16.0)	0		

MC, Monte–Carlo test; TrA, triamcinolone acetonide.
[a] Statistically significant at $P \leq 0.05$.

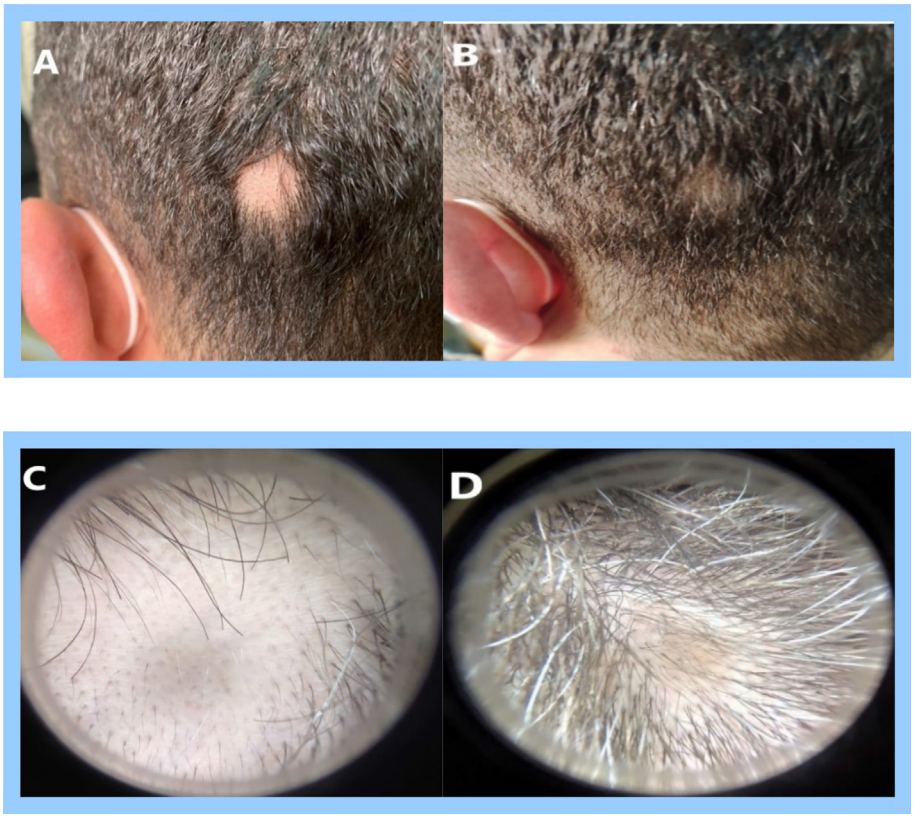

Fig. 1. A male patient of 38 years old with AA in the left temporal area. Treated with microneedling TrA. (A) Before treatment, SALT = 0.36%. (B) At the end of sessions, SALT = 0%, regrowth score was 100% (A5). (C) Dermoscopy before treatment, (BD = black dots) (VH = vellus hair). (D) Dermoscopy at the end of sessions.

patients classified into two groups, one group treated by intralesional TrA (5 mg/ml) and another group treated by platelet-rich plasma (PRP) for five sessions 2 weeks apart. According to their findings, 29 patients (72.5%) in the PRP group experienced an improvement of more than 70% versus 26 patients (65%) in the ILC group. There is no statistically significant difference between the two groups ($P = 0.469$). Following therapy, there has been a very statistically significant enhancement in SALT scores in both ILCs and PRP groups (0.50 ± 0.75, 0.40 ± 0.71) ($P < 0.00$).

Our findings concerning the clinical response to ILCS therapies were not similar to those of

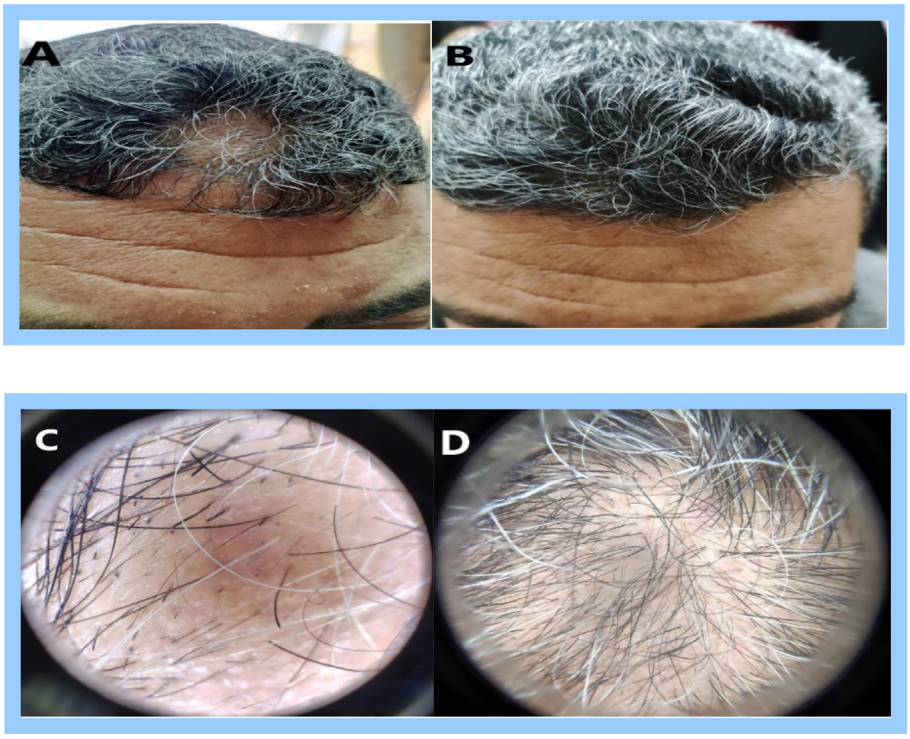

Fig. 2. A male patient of 38 years old with AA in the frontal area. Treated with intralesional TrA. (A) Before treatment, SALT = 4%. (B) At the end of sessions, SALT = 0%, regrowth score was 100% (A5). (C) Dermoscopy before treatment (BD = black dots) (BH = broken hairs) (VH = vellus hair). (D)Dermoscopy at the end of sessions.

Alkhalifah et al.[12] in 2011, who found that hair regrowth occurred in 71% of patients with AA managed with TrA injections three times every 2 weeks as compared with 7% of control participants, who received isotonic saline injections. Ranawaka et al.[13] also conducted a cohort study on 290 patients with AA and found that improvement occurred in 61% of patients following 1–2 intralesional steroid injections and El-Taweel and Akl[14] used ILC injection at a 10 mg/ml concentration every 3 weeks for five sessions, and hair regrowth was observed in 64% of cases.

In the current study, according to the disease severity, which was evaluated by SALT score reduction in cases with scalp involvement, there were statistically insignificant differences between the MN group and the intralesional group before treatment ($P = 0.174$) or after treatment ($P = 0.562$).

There was high statistical significance of the MN TrA group as regards the SALT score ranging between 0.36 and 12.0 with a mean ± SD of 3.70 ± 3.27, median (IQR) of 2.40 (1.26–4.80) before treatment, and the SALT score ranging between 0.0 and 8.40 with a mean ± SD of 1.64 ± 2.33, median (IQR) 0.27 (0.0–2.70) after treatment with P less than 0.001.

There was high statistical significance of the intralesional TrA group as regards the SALT score ranging between 1.20 and 16.0 with mean ± SD (4.68 ± 3.54), median (IQR) 3.60 (2.20–6.0) before treatment, and SALT score ranging between 0.0 and 2.40 with mean ± SD (0.55 ± 0.58), median (IQR) 0.48 (0.10–0.81) after treatment with P less than 0.001.

In the current study according to the SALT score of the MN group, our findings were not similar to Hafiz et al.[10] who reported that the SALT score after treatment with mean ± SD of 0.51 ± 1.10.

According to the SALT score of the intralesional group, our results are similar to Alblat and Ebrahim,[11] who reported that the SALT score after treatment with a mean ± SD of 0.50 ± 0.75 are in contrast to Fawzy *et al.*[15] who reported a SALT score after treatment with a mean of 1.37 ± 1.84.

In the current study, we did not depend only on the clinical response assessment; we also relied on the dermoscopic findings. Regarding dermoscopic results, in the MN group, there has been a statistically significant reduction in yellow dots ($P = 0.180$), black dots ($P < 0.001$), exclamation marks ($P = 0.039$), broken hairs ($P = 0.125$), and vellus hairs ($P = 0.727$) at the end of sessions; similarly, in the intralesional group, there was a statistically significant decrease at the end of sessions in yellow dots ($P = 0.500$), black dots ($P = 0.001$), exclamation marks ($P < 0.001$), broken hairs ($P = 0.375$), and vellus hairs ($P = 0.289$).

By comparing the improvement of dermoscopic findings in both groups at the end of the study, we found that there had been statistically significant differences between the two groups that were studied, regarding EX M (before) and VH (after). There have been statistically insignificant differences between the two groups that were studied regarding YD, BD, EX M (after), BH, VH (before), and TH.

In the current study, we used dermoscopy to provide more objective results. There was a significant improvement in all dermoscopic findings, which was observed from the first session and became more significant at the end of the study in both groups.

In this study, it was found that the median duration of the disease in the intralesional group was 3 months. There has been a statistically significant negative connection found between hair regrowth and disease duration.

In the present research, the disease course in the intralesional group was progressive in 0 patients (0.0%) and stationary in 25 patients (100%). According to the previous history of ILC injections, no patient had received an ILC injection. According to recurrence in the intralesional group, four patients (16%) had a history of recurrence of AA.

As regards side effects, four patients complained of erythema in the MN group, but there was pain, a burning sensation during injection, and Telangiectasia at the end of the study in the intralesional group, six patients (24%) had pain, while one patient (4%) had a burning sensation during injection, and one patient (4%) had Telangiectasia at the end of research with a *P* value of 0.001.

To sum up briefly, both MN TrA and intralesional TrA seem convincing in the treatment of AA as each of them has its own advantages.

5. Conclusion

MN is an effective collagen induction therapy in treating AA, especially when combined with Triamcinolone acetonide, as it provides a comparatively inexpensive, safe, less painful, and less invasive tool with no serious complications.

Conflict of interest

Authors have no conflict of interest.

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