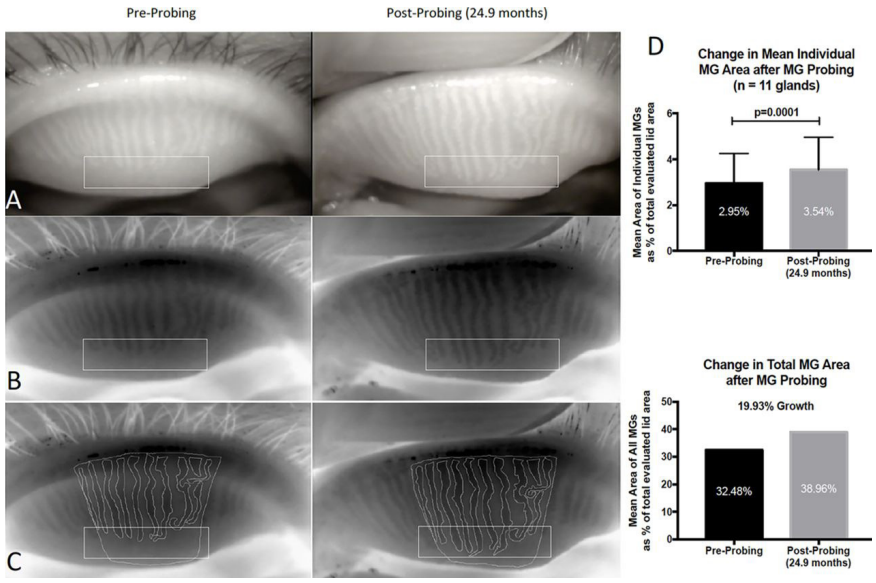
Research finds meibomian gland growth after probing technique

by Liz Hillman EyeWorld Staff Writer



The rectangles in A, B, and C highlight the atrophic area where growth occurred. Pre-probing and post-probing image capture from IR meibography video (A) and after being processed through Adobe Photoshop to desaturate and invert the color image (B). (C) Shows traces of individual meibomian glands. Pre-probing images show proximal atrophy with shortened gland length while post-probing shows a lengthening of these glands.

Source: British Journal of Ophthalmology

Meibomian gland probing in obstructive MGD found to spur gland growth

A study published in the *British Journal of Ophthalmology* suggests that probing meibomian glands in patients with meibomian gland disease (MGD) could lead to growth and regeneration of gland tissue.[1]

Steven Maskin, MD, Dry Eye and Cornea Treatment Center, Tampa, Florida, first described meibomian gland probing (MGP)—using a sterile stainless steel wire (Maskin Meibomian Gland Intraductal Probe, Rhein Medical, St. Petersburg, Florida) passed into the gland to relieve obstructions—in 2010.[2] Since then, several studies have been published that suggest MGP improves symptoms of obstructive MGD.[3–10]

Dr. Maskin and coauthor **Whitney Testa**, Dry Eye and Cornea Treatment Center, described an increase in meibomian gland tissue area and growth of previously atrophied glands after MGP.

"Evidence suggests scar tissue wrapped as a tight sheath around the gland, squeezing the meibomian gland duct, [can create] a fixed, unyielding intraductal obstruction," Dr. Maskin said, going on to describe how periductal fibrosis can raise intraductal pressure that can cause gland atrophy proximal to the obstruction.

"We found approximately 75% of upper lid glands and 55% of lower lid glands have such fixed obstruction," he said.

Even if a gland is expressible, a deep obstruction could still lead to a short or truncated gland as the proximal tissue behind the obstruction undergoes atrophy, Dr. Maskin said.

"This type of obstruction is fixed and unyielding and requires the intraductal passage of the probe to successfully relieve. The patient and physician both feel and hear the belt of scar tissue 'pop' off the duct as sequestered meibum is seen flowing out through the orifice along the wire probe," he said of the procedure.

Recently, there have been newer MGD treatments coming to the market that heat and/or use pressure to relieve MGD and related dry eye symptoms, but Dr. Maskin said he thinks in the case of an unyielding, fixed obstruction, these techniques could exacerbate the problem in the long run. He explained that while these techniques might deliver meibum from a non-fixed obstruction, using it in the case of a fixed obstruction could increase intraductal pressure, inflammation, and potentially cause increased symptoms and/or secondary atrophy behind the obstruction, even if meibum is released from in front of the obstruction, providing lubrication and some initial symptom relief.

"This is why probing should be performed as first-line therapy to establish and/or confirm a patent outflow tract," Dr. Maskin said. "Probing relieves, unequivocally, all obstruction, non-fixed and fixed."

His recent MGP research was a retrospective study that compared meibography results in patients with obstructive MGD pre- and post-MGP treatment. Thirty-four lids of 19 patients with pre- and post-MGP data were examined between 4.5 and 12 months post-MGP with 41% showing signs of gland growth, though four lids were excluded for meibographies with light artifacts, lid distortion, or hordeolum. Ten remaining lids from nine patients showed 116 glands total, which the study authors noted was a 4.87% increase in mean individual glandular area (MIGA). Four patients showed a MIGA increase of 10.7–21.1%. Between 12 and 25 months post-MGP in nine additional patients, three lids were eligible for quantitative analysis with a total of 33 glands showing an increase in MIGA.

"Collectively, for all 13 lids of the 149 glands studied, we found a significant increase of 6.38% in total glandular area (p=0.0447) and a significant increase of 6.23% in MIGA (p=0.0003)," Dr. Maskin said.

Four types of gland growth were observed, including lengthening of shortened glands (which the study authors describe as reversal of proximal atrophy), partial restoration to faded glands, appearance of new glands, and restoration of a continuous gland from discontinuous segments of MG tissue.

"Successful MG growth is essential to fully restore full, functional, healthy and resilient MG lid populations," the study authors wrote. "Healthy whole glands are preferable to functional yet partially atrophic glands. Whole glands can experience subsequent partial atrophy and still retain functionality, while already partially atrophic glands with obstruction may lead to whole gland atrophy. There is clinical value to the resilience of a restored gland."

The research also included several case-specific examples that showed gland growth after clearing obstructed glands with MGP. As for the 59% of lids that did not show growth, the researchers wrote these patients still experienced relief from their symptoms.

What's spurring gland growth? "One possibility to explain our findings is that the establishment of a patent orifice and duct permitted or perhaps promoted growth. This may be related to removal of the suppressive effect of elevated intraductal pressure on the proximal MG. Alternatively, probing may activate MG stem cells with a direct mechanical intraductal stimulus," study authors wrote.

As for why some probed glands grew but not others, one suggestion is surface inflammation and progressive atrophy that occurs with aging and with other comorbidities that continue to affect glands post probing.

Joseph Tauber, MD, Tauber Eye Center, Kansas City, Missouri, who started performing MGP in 2009 and has treated more than 1,200 unique patients in the time since then, said he thinks the phrase "growth" in this study is speculative, and "recanalization" might be a more appropriate term.

As for his experience with MGP, he began performing the procedure because he saw a clinical need for control of MGD symptoms and found current treatment regimens inadequate. "I began only with obstructive MGD but have more recently used it in highly symptomatic, less obstructed patients," Dr. Tauber said, anecdotally seeing 70–75% relief of patient symptoms.

Dr. Maskin said a patient at any stage of MGD could benefit from probing. "Clearly, patients with lid tenderness, which suggests elevated intraductal pressure behind an obstruction, would benefit, as well as patients with lids showing non-expressible glands and eyes with lipid tear deficiency. Also, lids showing MG atrophy on infrared meibography or transillumination would benefit from MGP. Earlier detection of symptomatic MGD with grade 1 atrophy may allow for earlier intervention with relief of symptoms and reversal of atrophy. In asymptomatic patients with atrophic changes, MGP may promote MG growth, thus preventing onset of symptoms or possibly reversing subclinical

symptoms only apparent after treatment. I have also managed patients with neuropathic dry eye-like pain with MGD who did not have lid tenderness, did have expressible glands but on probing were found to have greater than 92% of glands with occult deep obstruction. Probing helped reverse symptoms. The lesson here is that only probing can establish or confirm a patent duct/orifice outflow tract with positive physical proof of outflow patency. All patients with MGD should be probed to open and/or maintain a patent outflow tract."

Dr. Maskin recommends patients have an annual evaluation as clinical benefits can decline over a year after MGP. Dr. Tauber said he recommends retreatment within the first 8 weeks of the first MGP and follow-up as needed thereafter. **EW**

References

1. Maskin SL, et al. Growth of meibomian gland tissue after intraductal meibomian gland probing in patients with obstructive meibomian gland dysfunction. *Br J Ophthalmol.* 2017 June 7. Epub ahead of print.
2. Maskin SL. Intraductal meibomian gland probing relieves symptoms of obstructive meibomian gland dysfunction. *Cornea.* 2010;29:1145–52.
3. Nakayama N, et al. Analysis of meibum before and after intraductal meibomian gland probing in eyes with obstructive meibomian gland dysfunction. *Cornea.* 2015;34:1206–8.
4. Ma X, et al. Efficacy of intraductal meibomian gland probing on tear function in patients with obstructive meibomian gland dysfunction. *Cornea.* 2016;35:725–30.
5. Sik Sarman Z, et al. Effectiveness of intraductal meibomian gland probing for obstructive meibomian gland dysfunction. *Cornea.* 2016;35:721–4.
6. Syed ZA, et al. Dynamic intraductal meibomian probing: A modified approach to the treatment of obstructive meibomian gland dysfunction. *Ophthal Plast Reconstr Surg.* 2017;33:307–309.
7. Fermon S, et al. Intraductal meibomian gland probing for the treatment of blepharitis. *Arch Soc Esp Oftalmol.* 2015;90:76–80.
8. Dongju Q, et al. Clinical research on intraductal meibomian gland probing in the treatment of patients with meibomian gland dysfunction. *Chin J Optom Ophthalmol.* 2014;16:615–21.
9. Wladis EJ. Intraductal meibomian gland probing in the management of ocular rosacea. *Ophthal Plast Reconstr Surg.* 2012;28:416–8.
10. Cardenas Diaz T, et al. Efficacy of intraductal probing in meibomian gland dysfunction. *Revista Cubana de Oftalmologia.* 2017;30:1–12.

Editors' note: Dr. Maskin has patents on methods and devices for intraductal diagnosis and treatment of MGD. He has financial interests with Rhein Medical. Dr. Tauber has no financial interests related to his comments.

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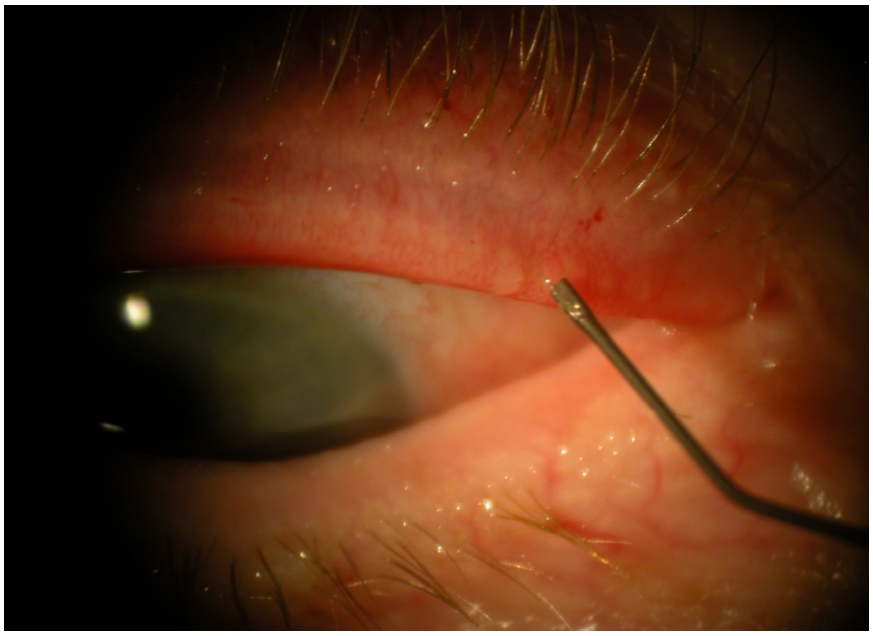
Meibomian gland probing: The who, what, where, when, and why

by Liz Hillman EyeWorld Staff Writer



Meibomian gland intraductal probing of the upper lid to relieve fixed and non-fixed obstructions
Source: Steven Maskin, MD

The scoop on the technique that aims to relieve obstructive meibomian glands

Steven Maskin, MD, Dry Eye and Cornea Treatment Center, Tampa, Florida, first introduced the idea of inserting a wire probe into meibomian glands to relieve obstructions that could be causing discomfort and dry eye in 2010.[1] Since then research has shown it to be, what he called, a "paradigm shift" in successful treatment of obstructive meibomian gland disease.[2–4]

Dr. Maskin gave *EyeWorld* an in-depth look at his tips and tricks on meibomian gland probing (MGP).

EyeWorld: What is MGP?
Dr. Maskin: Meibomian gland probing is the introduction of a wire instrument to the gland orifice with insertion through the orifice and into the ductal outflow tract.

EyeWorld: What's the purpose of probing?
Dr. Maskin: Probing establishes and confirms with positive physical proof a patent outflow channel including duct and orifice. Probing, by relief of intraductal obstruction, is therefore able to equilibrate intraductal pressures within the duct and promote removal of sequestered and other retained intraductal contents. At times, the introduction of intraductal lavage or microtube injection of pharmaceutical will act to remove material that was not released with probing and subsequent expression alone. In summary, initial and maintenance probing: (1) relieves obstruction, (2) maintains patency of outflow channel, and (3) is associated with growth of meibomian gland tissue.

EyeWorld: What are the indications?
Dr. Maskin: Probing has become a first-line treatment for MGD in my practice to eliminate intraductal resistance to meibum flow from all types of obstruction. This includes fixed, unyielding obstruction such as periductal fibroses as well as non-fixed obstruction such as thickened meibum and hyperkeratinization. I also use it for gland maintenance to help prevent initial or progressive atrophy similar to a dental analogy of periodic prophylactic tooth scaling and cleaning. Now that we have seen and published on growth of gland tissue after probing, we are also exploring the use of probing with adjunctive injection therapies to further stimulate gland growth and restoration of a full, functional, healthy, and resilient meibomian gland lid population.[5]

I use probing on patients with lid tenderness over the meibomian glands (indicating elevated intraductal pressure). Probing dramatically and immediately relieves lid tenderness from elevated intraductal pressures. I use probing to restore functionality to non-meibum expressing glands, as well as to relieve symptoms of lipid tear deficiency. I also use probing to stimulate growth of gland tissue from glands with dropout or atrophy on meibography.

EyeWorld: Can you describe the probes used for MGP?
Dr. Maskin: The stainless steel probes are 76 µm in diameter with lengths of 1, 2, 4, and 6 mm. The probes are non-sharp to minimize alteration of tissue and allow the physician to better feel the tissue and resistance during the probing procedure rather than sharp blades that would slice their way through the tissue without yielding diagnostic information about the type and extent of resistance as well as likely cut through the duct wall, creating a false passage. Stainless steel is important to give the probe a stiffness to allow safe and quick penetration through the orifice and into the duct.

EyeWorld: How do you anesthetize a patient for this procedure?
Dr. Maskin: I use my patented jojoba-based anesthetic ointment (JAO) containing 8% lidocaine available from O'Brien Pharmacy (Mission, Kansas). After placing one drop of topical anesthetic into the inferior fornix, I place a bandage contact lens on the eye and a generous amount of JAO on the lower lid margins. The eye is closed for 10–15 minutes during which time both upper and lower lid margins are anesthetized. The eye is opened and a second drop of topical anesthetic is placed in the inferior fornix. If the patient's lids are still sensitive after probing has begun, a second round of JOA applied to the lid margin is typically successful in making the procedure well tolerated. After probing is completed, the contact lens is removed and the ocular surface is copiously irrigated with sterile preservative-free saline. Then a cotton-tipped applicator is used to remove any residual JAO from eyelashes.

EyeWorld: Are there different approaches to anesthesia?
Dr. Maskin: An alternative approach uses topical proparacaine on the ocular surface followed by a corneal protective shell and a cotton pledget soaked in 4% lidocaine placed into the fornix for 5 minutes. Then 1% lidocaine with epinephrine is injected using a transconjunctival approach into the fornix centrally, medially, and laterally with supplemental subcutaneous injection near the eyelid margin.[4]

EyeWorld: How is the patient positioned during the procedure?
Dr. Maskin: While anesthetic is applied in a reclined position for MGP, I position the patient at the slit lamp for virtually all my probing. An assistant is there to support the back of the head, if necessary. Other physicians may prefer reclining a patient on a surgical chair and using an operating microscope.

EyeWorld: MGP can involve different probe lengths; how is probe length selected?
Dr. Maskin: I always begin with the 1-mm probe. The 1-mm probe is the shortest and stiffest and therefore most likely to penetrate through orifice or distal duct fibrosis or other unyielding fixed obstruction.

Longer probes are used if there is persistent lid tenderness over a gland suggesting deeper obstruction with elevated intraductal pressure. Longer probes can also be used to reach into a developing hordeolum to promote drainage. When using longer probes, always use progressively longer increments. After the 1-mm, use 2-mm, and then 4-mm probes, if necessary.

EyeWorld: How do you decide which glands are probed?
Dr. Maskin: I probe all orifices. This is important as I have seen glands with minimal associated acini restored to functionality after probing and start expressing meibum. Furthermore, now that we know there can be post-probing growth of meibomian gland tissue from previously atrophic glands, it is important to stimulate growth associated with all orifices and/or glands.[5]

Watch Dr. Maskin perform meibomian gland probing on several patients.

Watch a patient's testimonial of this procedure.

EyeWorld: What techniques do you use to identify the gland orifice and insert the probe?
Dr. Maskin: It is usually not difficult to identify orifices. Some physicians use red-free light to assist. Transillumination or meibography can reveal location of glands as well.

Rest the tip of the 1-mm probe on the orifice. Using a dart-throwing motion, try to insert the probe into and through the orifice. This is done by holding the probe handle as you would hold a dart and using a short jab motion of 1–2 mm to penetrate through the orifice into the duct. The probe will enter the duct naturally and the duct itself will guide the probe, similar to your arm entering the sleeve of a shirt.

If you meet resistance, try a different entry angle for the dart-throw motion. The orifices and distal ducts may be dragged posteriorly or fibrosed in a way that requires an altered entry angle.

EyeWorld: Could the probe create a false passage?
Dr. Maskin: Probing does not create a false passage. When you penetrate the orifice and enter the gland, the effect is tantamount to passing your arm into your shirtsleeve. The probe simply follows the duct in the same fashion.

EyeWorld: What is the importance of probes being "non-sharp"?
Dr. Maskin: Probing is both a first-line treatment as well as a diagnostic test looking at the frequency and type of gland resistance, which may correlate with severity of symptoms. It is important when probing to do so effectively with minimal unnecessary disturbance of gland tissue. It should be noted that a post-probing confocal microscopy study has shown no degenerative changes in morphology of meibomian gland acinar units or meibomian gland scars.[3]

EyeWorld: What are the procedural findings of probing?
Dr. Maskin: When the probe is inserted through the orifice and into the central duct, you quickly encounter orifice and/or ductal resistance. This resistance may be relieved by advancing with the probe, generating an audible and tactile sensation of a "pop" or multiple pops causing an audible and tactile "gritty" sensation. The also patient hears and feels the pops and gritty sensation and can appreciate the instant relief of elevated intraductal pressure as the obstruction is relieved, intraductal pressures equilibrate, and meibum flow is restored with relief of tenderness.

Lid tenderness is dramatically and immediately relieved. Persistent lid tenderness suggests deeper obstruction requiring probing with a 2-mm or 4-mm probe.

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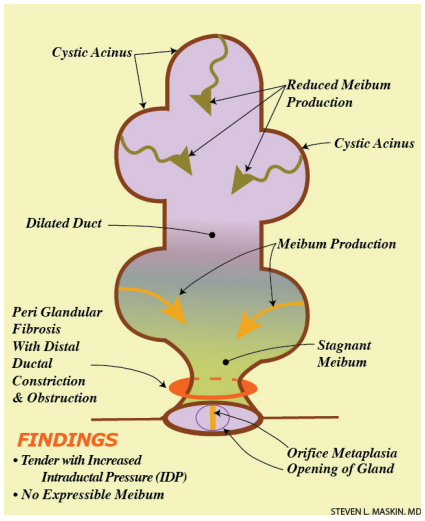
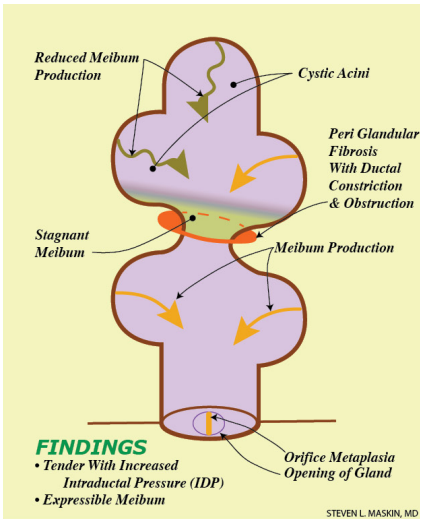
Meibomian continued from page 115

See Dr. Maskin release trapped meibum with meibomian gland probing.

EyeWorld: Is trapped meibum released?
Dr. Maskin: As the intraductal obstruction is relieved, you frequently see sequestered meibum release along the wire probe to exit through the now patent outflow channel and through the orifice.

EyeWorld: What about hemorrhages?
Dr. Maskin: Dot hemorrhages frequently appear at the orifice. These hemorrhages are self-limited and do not need pressure or any treatment.
EyeWorld: Is MGD something a tech could do?





Complete distal obstruction (left), as indicated by the orange band around the meibomian gland illustration, and complete proximal obstruction (right) show two different types of gland atrophy that could result from an obstruction and subsequent meibum buildup and pressure.
Source: British Journal of Ophthalmology/Steven Maskin, MD

Dr. Maskin: I can see the day when a trained physician assistant could do it.

EyeWorld: Is there any way to inject medication into glands after probing?
Dr. Maskin: Yes. With 110 and 152 µm tubes, we can deliver medication directly inside the gland, such as dexamethasone or small particle suspensions. Injections directly into the gland enable targeted treatment of gland dysfunction as well as removal of stagnant secretions with an irrigation or lavage approach. Early studies suggest we have found an adjunct microtube injection treatment to prolong onset of recurrent intraductal obstruction and reduce orifice hemorrhage upon retreatment probing. This would be meibomian gland orifice and duct reconstruction. We are also exploring the use of probing with adjunctive injection therapies to further stimulate gland growth and restore a full, functional, healthy, and resilient meibomian gland lid population.

EyeWorld: What should you be looking for on follow-up visits?
Dr. Maskin: It is important to remember that MGD with progressive gland atrophy can and will occur at a subclinical level without symptoms. Patients with symptoms relieved after probing who have become asymptomatic need to be monitored on every visit to detect early reobstruction with progression of disease even if the patient is symptom-free. This can include checking for lid tenderness and expressible glands on every exam plus meibography every few months. Symptom relief from MGP should last about 1 year. If symptoms reappear earlier or if there is a decrease in the number of expressible glands or increase in lid tenderness, there is an unrecognized or inadequately treated local, regional, or systemic comorbid disease. Probing provides positive physical proof of patency, but once achieved the patent outflow channel must be defended against all comorbid sources of inflammation that would reobstruct the outflow tract. **EW**

References
1. Maskin SL. Intraductal meibomian gland probing relieves symptoms of obstructive meibomian gland dysfunction. *Cornea*. 2010;29:1145–52.
2. Maskin SL. Intraductal meibomian gland probing: A paradigm shift for the successful treatment of obstructive meibomian gland dysfunction. In: Kazuo Tsubota, ed. *Diagnosis and Treatment of Meibomian Gland Dysfunction*. Tokyo, Japan: Kanehara;2016:149–167.
3. Dongju Q, et al. Clinical research on intraductal meibomian gland probing in the treatment of patients with meibomian gland dysfunction. *Chin J Optom Ophthalmol*. 2014;16:615–21.
4. Syed ZA, et al. Dynamic intraductal meibomian probing: A modified approach to the treatment of obstructive meibomian gland dysfunction. *Ophthal Plast Reconstr Surg*. 2017;33:307–309.
5. Maskin SL, et al. Growth of meibomian gland tissue after intraductal meibomian gland probing in patients with obstructive meibomian gland dysfunction. *British J Ophthalmol*. 2017 June 7. Epub ahead of print.

Editors' note: Dr. Maskin owns patents on devices and methods of intraductal meibomian gland diagnosis, treatments, and topical therapies. He has financial interests with Rhein Medical (St. Petersburg, Florida).

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