

RESEARCH NOTE

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Early adoption of triamcinolone acetonide suprachoroidal injection for uveitic macular edema: a physician survey

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Abstract

Objective To obtain physicians' "real-world" perspectives on early experiences with triamcinolone acetonide suprachoroidal injection (SCS-TA) for treatment of patients with uveitic macular edema (UME).

Results Twelve retina/uveitis specialists in the United States were surveyed about SCS-TA injection procedure and patient outcomes. Survey participants administered ≥ 291 SCS-TA injections to 243 patients with UME with various disease characteristics (etiologies, chronicity, and anatomical subtypes). Commonly reported reasons for SCS-TA adoption included potential for lowering the risk of steroid-associated intraocular pressure elevations versus intravitreal injections or implants (100%), potential for longer duration of action versus intravitreal steroid injections or implants (92%), and desire to use a new delivery modality (83%). Nearly all participants (92%) found injection procedure relatively easy post-training, with most (75%) procedurally comfortable after completing 2–5 injections. 58% of participants indicated that their patients gained 2–3 lines of vision by first follow-up visit, and 92% reported having patients who experienced 100–150 μm or greater reduction in central subfield thickness. Overall, 92% of participants were satisfied with SCS-TA treatment outcomes. Findings from this survey of early adopters of SCS-TA indicate that the suprachoroidal injection technique was easy to learn and resulted in favorable patient outcomes consistent with clinical trial data.

Keywords Uveitis, Macular edema, Retina, Treatment, Suprachoroidal injection, Survey

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Introduction

Uveitis is characterized by inflammation of the uveal tract and adjacent structures. Uncontrolled inflammation remains a leading cause of blindness among patients with uveitis [1, 2]. Macular edema is a common vision-threatening complication of uveitis [3]. Uveitic macular edema (UME) results from decreased integrity of the blood-retinal barrier, allowing accumulation of extracellular fluid in the intraretinal or subretinal space [1]. Local corticosteroids (including topical drops, periocular injections, intravitreal injections, and/or intravitreal implants) are a mainstay of treatment for UME because of their robust anti-inflammatory and edema-reducing properties; however, their use may be limited by ocular adverse events, most notably cataract progression and intraocular pressure (IOP) elevation [4, 5].

The suprachoroidal space (SCS) represents a new target for drug delivery to the posterior segment [6]. A 4 mg/0.1 mL suspension of triamcinolone acetonide (SCS-TA; Xipere®, Bausch & Lomb Americas Inc., Bridgewater, NJ, USA) was developed for administration as a suprachoroidal injection using a proprietary SCS Microinjector® (Clearside Biomedical, Alpharetta, GA, USA). A 900- μ m needle is provided and should be used; however, a longer 1100- μ m needle is also provided if resistance is experienced while injecting with the 900- μ m needle [7, 8]. SCS-TA provides targeted steroid delivery to the posterior choroid while minimizing drug exposure in nontargeted tissues [6, 9]. Results from the randomized, controlled, phase 3 PEACHTREE study demonstrated improvement in visual acuity, a decrease in central subfield thickness, and a favorable safety profile with SCS-TA treatment in patients with UME [10]. Results from PEACHTREE along with a long-term extension (MAGNOLIA) and an open-label safety study (AZALEA) supported approval of SCS-TA by the US Food and Drug Administration in 2022 for the treatment of patients with UME [7, 11, 12].

As the SCS-TA administration technique is fundamentally different from that used for other ocular injections, this survey sought to evaluate the perceptions and early experience with the SCS-TA injection procedure among early adopters. Additionally, the survey queried users regarding their patient outcomes following the SCS-TA procedure.

Methods

The survey was sent to 12 retina/uveitis specialists who had completed ≥ 5 suprachoroidal injections of SCS-TA (November 1 to December 30, 2022). The survey included 37 questions spanning the topics of patient selection, user experience with the SCS-TA injection procedure, patient experience and outcomes, adverse events, and overall satisfaction with the SCS-TA treatment (survey included in **Appendix**). The survey was

sent to participants ahead of virtual meetings. Six of the predefined survey questions encouraged further discussion during the meetings to explore participants' clinical experiences. Survey responses, including additional comments obtained during the meetings, were pooled and summarized descriptively.

Results

A total of 12 retina/uveitis specialists were invited and participated in the survey. Participants had treated a total of 243 patients with UME with SCS-TA (mean, 20 patients/specialist; range, 5–40) and performed ≥ 291 SCS-TA injections (mean, 24 injections/specialist; range, 5–46). Survey participants reported treating a diverse population of patients with UME as summarized in the Table 1. Participants most often reported treating patients with chronic or recurrent uveitis involving the posterior segment (posterior uveitis, intermediate uveitis, or panuveitis). Slightly less than half (41.7%) of participants treated patients with anterior uveitis and UME. During the virtual meetings, participants estimated that approximately 15% of patients had postsurgical uveitis/UME. Few patients were new to therapy (24%), and most (64%) were on concurrent uveitis medications (Fig. 1). Concurrent systemic therapies for uveitis included anti-metabolites, biologics, and steroids, while topical agents included IOP-lowering medications, nonsteroidal anti-inflammatory drugs, and steroids.

When asked to give reasons for using SCS-TA, all 12 participants cited the potential for lower risk of steroid-associated IOP elevations compared with intravitreal steroid injections or implants (Fig. 2). Other commonly cited reasons for adoption included the potential for a longer duration of action compared with intravitreal steroid injections or implants (91.7%), having an interest in trying a new delivery modality (83.3%), and the potential for a rapid onset of action (58.3%).

Of the 12 participants, 6 (50.0%) reported being somewhat or very confident in their ability to successfully inject SCS-TA into the suprachoroidal space prior to receiving formal training on the injection technique (i.e., administration into a dummy eye). This may be, in part, because several of the participants were involved in SCS-TA clinical trials and had prior experience with this technique. After training, all participants were somewhat or very confident in their ability to successfully inject SCS-TA, and almost all (91.7%) indicated that the injection procedure was somewhat or very easy. Most participants (75.0%) were comfortable with the procedure after completing 2 to 5 injections; others were comfortable after 1 to 2 injections (16.7%) or more than 5 injections (8.3%).

With regard to the actual injection technique, 5 of the 12 participants (41.7%) reported using only subconjunctival anesthesia, while 4 (33.3%) reported using only

Table 1 Responses from 12 survey participants about demographic and disease characteristics of patients who received SCS-TA

Characteristic of patients receiving SCS-TA	Participant response, n (%)
Age range, y ^a	
<40	9 (75.0)
≥40–64	12 (100)
≥65	9 (75.0)
Sex ^a	
Male and female	9 (75.0)
Female	2 (16.7)
Male	1 (8.3)
Race ^a	
White	12 (100)
Black	8 (66.7)
Asian	4 (33.3)
Other	3 (25.0)
Comorbidities ^{a, b}	
Autoimmune disease	11 (100)
Cardiovascular disease	7 (63.6)
Diabetes	6 (54.5)
Obesity	3 (27.3)
Disease duration/chronicity ^c	
Acute uveitis	2 (16.7)
Chronic uveitis	9 (75.0)
Recurrent uveitis	8 (66.7)
Combination of acute/chronic/recurrent uveitis	9 (75.0)
Anatomical location ^c	
Anterior uveitis	5 (41.7)
Intermediate uveitis	10 (83.3)
Posterior uveitis	11 (91.7)
Panuveitis	10 (83.3)
Diagnoses ^d	
Idiopathic uveitis	12 (100)
Pars planitis	8 (66.7)
Sarcoidosis	6 (50.0)
Birdshot retinochoroidopathy	7 (58.3)
HLA-B27-related	4 (33.3)
Reactive arthritis	1 (8.3)
Vogt-Koyanagi-Harada syndrom	3 (25.0)
Postsurgical, serpinginous, postvitrectomy	3 (25.0)

^aSurvey response to question “What was the typical medical history of patients you treated with SCS-TA?” “Age,” “sex,” “race,” and “comorbidities.” “Check all that apply.”

^bn=11 respondents

^cSurvey response to question “Of the patients you treated with SCS-TA for UME, which specific disease characteristics did you see most often in each of the following categories? “Disease duration/chronicity” and “anatomical location.” “Check all that apply.”

^dSurvey response to question “What specific diagnosis did you see amongst patients you treated with SCS-TA?” “Check all that apply.”

SCS-TA=triamcinolone acetonide suprachoroidal injection; UME=uveitic macular edema

topical anesthesia and 3 (25.0%) used both methods. Triamcinolone acetonide injectable suspension comes with a microinjector and 2 needles (900 µm and 1100 µm). Most participants (75.0%) reported using the 900-µm needle first, which is consistent with the administration instructions in the package insert, before considering use of the 1100-µm needle. Almost all (91.7%) had used the 1100-µm needle for 1 or more of their patients, citing an inability to reach the suprachoroidal space as the

reason for using the 1100-µm needle. Among the 12 participants, the most common injection site was the superior temporal quadrant (41.7%), followed by the inferior temporal quadrant (33.3%) and a mix of the superior and inferior temporal quadrants (25.0%). One aspect of the SCS-TA injection procedure is compressing the sclera to create a dimple on the ocular surface; most participants (83.3%) found this to be very easy or somewhat easy (others were neutral).

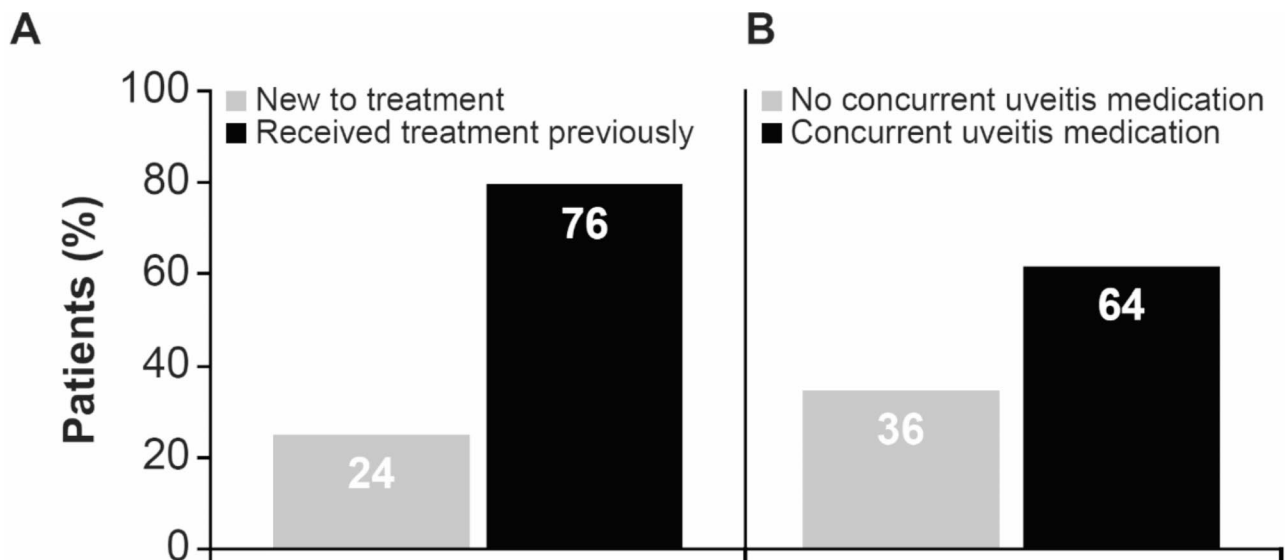


Fig. 1 Patient treatment profile. (a) New to treatment or previously received treatment. (b) Concurrent uveitis medication use

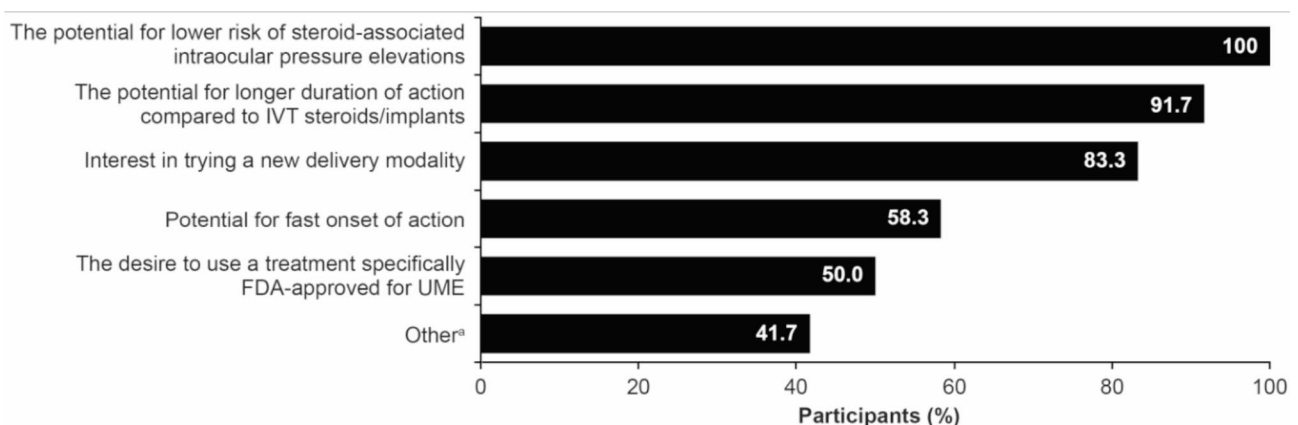


Fig. 2 Reasons participants chose to use SCS-TA. ^aAphakia or open posterior capsule; unicameral eyes (not suitable for IVT implants); unresponsive to other treatments. FDA = US Food and Drug Administration; IVT = intravitreal; SCS-TA = acetonide suprachoroidal injection; UME = uveitic macular edema

Participant experience with the injection procedure was favorable, with 8 of 12 (66.7%) participants indicating that SCS-TA was easy to inject. Nine participants (75%) indicated that they were always able to inject the entire contents of the syringe, with 3 participants (25%) reporting a little drug reflux during or after the injection. The SCS-TA injection procedure was rated as slightly or moderately more difficult than intravitreal injection (e.g., triamcinolone) or intravitreal implant (e.g., dexamethasone) by 11 (91.7%) and 10 (83.3%) participants, respectively.

The majority of participants (91.7%) warned patients of the potential for discomfort during the injection procedure. Survey participants recalled that approximately two-thirds (62.3%) of patients expressed no discomfort during the SCS-TA injection procedure.

Participants typically reported following up with patients 1 month (66.7%) to 6 weeks (25.0%) after treatment, with 1 participant (8.3%) indicating a preference to see patients as early as 1 week after treatment. More than half (58.3%) of participants recalled patients gaining, on average, 2 to 3 lines of vision by the first follow-up visit. The majority (91.7%) reported an average reduction in central subfield thickness of 100–150 μ m or greater. The reinjection rate was 17.7%, with reinjection occurring within approximately 3 to 6 months, with one participant reporting reinjection at 8 months. Chronic uveitis (66.7%) was the most common disease characteristic among patients who were reinjected, with posterior uveitis (75%) and panuveitis (66.7%) the most common anatomical sites for reinjection. Only 1 of 12 participants reported having any patients who had > 1 reinjection.

When asked about their overall satisfaction with SCS-TA treatment, 11 of 12 participants (91.7%) reported that they were somewhat or very satisfied. No participants reported being somewhat or very dissatisfied; 1 participant was neutral. In the virtual meetings that followed the survey, participants expressed particular interest in using SCS-TA for younger patients, steroid responders, and patients with postsurgical UME.

Discussion

SCS-TA is the first drug approved by the US Food and Drug Administration for delivery into the SCS. Overall, findings of this survey of early adopters of SCS-TA found that suprachoroidal injection was easy to learn and applicable to a broad range of patient types. Respondents observed clinically meaningful improvements in vision and macular edema, which aligned with findings from clinical registration trials [10, 11].

Findings regarding patient outcomes were consistent with those obtained from the PEACHTREE study, which reported that patients receiving SCS-TA injections at day 0 and week 12 experienced improvement in visual acuity and reduction in macular edema after 24 weeks compared with patients receiving sham injections [10]. Though PEACHTREE did not evaluate patient satisfaction, only 4 of 96 patients randomly assigned to SCS-TA injection discontinued the study [10]. Further, in the 6-month non-interventional MAGNOLIA extension study for patients who successfully completed PEACHTREE without using rescue therapy, efficacy and safety were maintained for up to 9 months in half the patients receiving SCS-TA injection in PEACHTREE [12].

Perceptions and experiences of early adopters serve to provide real-world evidence and reveal potential challenges in adopting new technology. Most novel approaches to drug delivery, including the SCS injection technique, will require additional training for providers. Intravitreal injection of pharmacological agents has gained widespread uptake since its introduction and is now used routinely by retina specialists [13, 14]. A 2011 survey showed approximately two-thirds of retinal specialists performing 10 to 50 intravitreal injections per week [13], and a 2018 survey showed approximately 80% of retinal specialists performing ≥ 30 intravitreal injections weekly [15].

Clinical challenges with regard to SCS-TA injections include those inherent in learning a new ocular procedure and successfully reaching the SCS. Clinicians may encounter resistance to SCS-TA injection, a phenomenon that does not typically occur with intravitreal injection. Procedures used by the authors to address resistance include switching from the 900- μm needle to the 1100- μm needle, ensuring that the needle is fully embedded within the sclera (by gently dimpling the sclera), rotating

the needle by 90 to 180 degrees to adjust the orientation of the bevel, and performing the injection in a different quadrant. Reflux of the triamcinolone acetonide suspension may occur if the needle is not fully embedded in the sclera and is more likely when injecting eyes with hypotony. For highly myopic eyes, the clinician should be cognizant of the thinner sclera and start with less initial pressure during dimpling to avoid inadvertent introduction of medication into the vitreous cavity. Preparatory comments to the patient regarding the potential need to switch needles and the sustained pressure that they may experience during the procedure are recommended to increase patient comfort with this novel ocular injection.

In the current survey, the majority of respondents became comfortable performing the SCS-TA injection procedure after 2 to 5 injections, and rated it as only slightly or moderately more difficult than an intravitreal injection. Although the questions presented herein differ from similar user surveys, the overall findings regarding ease of use are consistent with survey data from providers participating in the AZALEA clinical study, which indicated that 100% of 23 participants who completed injection with the 900- μm needle had no difficulty with the procedure, while 66.7% of 15 participants who switched to the 1100- μm needle had no difficulty [8]. Further, the survey of providers participating in AZALEA demonstrated that 95.4% and 66.7% of participants who completed the procedure using the 900- μm and 1100- μm needles, respectively, cited no new challenges with suprachoroidal injection compared with other types of injections [8], lending further support for greater uptake of SCS-TA injection among providers.

The demonstrated utility and efficacy of SCS-TA injections for patients with UME suggests that this treatment has potential applications for patients with other ophthalmic conditions, wherein a precise application of the drug to posterior ocular structures may result in improved safety, efficacy, and durability of response over current therapies. Indeed, in one clinical study, SCS-TA improved visual acuity as early as 1 week posttreatment, and for up to 3 months, in patients with macular edema associated with retinal vein occlusion and was associated with a favorable safety profile [16]. Further, a case report highlighted the improvements in vision following treatment with SCS-TA in a patient with posterior scleritis who had experienced minimal improvement with numerous other therapies [17].

In the current survey report, the SCS-TA injection technique was considered relatively easy to administer and incorporate into clinical practice. Therefore, this novel method of drug delivery has real potential for transforming current uveitis practice patterns, and introducing other targeted therapies in the clinical setting, including gene and cell therapies [5]. Findings of

this survey support increasing adoption of SCS-TA in clinical practice and the advancement of suprachoroidal injection technology for other ophthalmic applications in future clinical trials.

Limitations

Findings of this study are limited by its small size (12 survey participants), and results may not be generalizable, given that early adopters of a new treatment may not be reflective of current or future users of SCS-TA. A further limitation of the survey is its lack of individual patient data and capturing of categorical or yes/no data from respondents rather than detailed information. The value of gaining insight into a new therapy from the perspective of early adopters cannot be overlooked because their favorable opinions regarding administration and patient outcomes could encourage practicing retina/uveitis specialists who may be considering integrating SCS-TA into their clinical practice.

Abbreviations

FDA	US Food and Drug Administration
IOP	Intraocular pressure
IVT	Intravitreal
SCS-TA	Acetonide suprachoroidal injection
UME	Uveitic macular edema

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s13104-024-06969-4>.

Supplementary Material 1

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Author contributions

CRH contributed to the conception and design of the survey; data acquisition, analysis, and interpretation; and drafting and critical review of the manuscript. SDW contributed to data acquisition and interpretation and critical review of the manuscript. PYC contributed to data acquisition and interpretation and critical review of the manuscript. DJW contributed to data acquisition and interpretation and critical review of the manuscript. PEN contributed to data acquisition and interpretation and critical review of the manuscript. KJB contributed to data acquisition and interpretation and critical review of the manuscript. TB contributed to data interpretation and critical review of the manuscript. MY contributed to data interpretation and critical review of the manuscript. MSD contributed to data acquisition and interpretation and critical review of the manuscript. VRR contributed to data acquisition and interpretation and critical review of the manuscript. LMR contributed to data acquisition and interpretation and critical review of the manuscript. MS contributed to data acquisition and interpretation and critical review of the manuscript. MAS contributed to the conception and design of the survey; data acquisition, analysis, and interpretation; and drafting and critical review of the manuscript. All authors read and approved the final manuscript.

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Data availability

All relevant data are within the manuscript and its supporting information files. The datasets used and/or analyzed for this survey are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable; this is a physician survey completed by the authors of this manuscript; therefore, no ethics approval or participant consent is required.

Consent for publication

Not applicable.

Competing interests

Competing interests: CRH reports being a consultant for Allergan, Alimera, Bausch + Lomb, Clearside Biomedical, Inc., and EyePoint Pharmaceuticals. SDW reports being a speaker for Apellis, Bausch + Lomb, Genentech/Roche, Regeneron, and Spark Therapeutics. SDW reports being a consultant for Allergan, Astellis/Iveric Bio, Bausch + Lomb, Castle Biosciences, EyePoint Pharmaceuticals/Alimera, Genentech/Roche, Ideaya Biosciences, Lupin, Novartis, and Regeneron. PEN reports receiving research and consulting fees from EyePoint Pharmaceuticals and Genentech. PEN is supported by the Knights Templar Eye Foundation, Inc. Career Starter grant. MAS reports receiving consulting fees from Aerie, Alimera, Allegro, Allergan, EyePoint, Genentech, Kodiak, Novartis, Regeneron, and Santen; serving on the speakers' bureau for Allergan, Apellis, Genentech, Mallinckrodt, Novartis, Regeneron, and Spark; and performing contracted research for Aerie, Allegro, Allergan, DRCR, Genentech, Ikon, Ionis, KalVista, Kodiak, Novartis, Opthea, Optos, Regeneron, Santen, Senju, and Sydnexis. Survey participants (CRH, SDW, PYC, DJW, PEN, KJB, MSD, DSC, VRR, LMR, MS, and MAS) received an honorarium from Bausch + Lomb Americas, Inc. TB and MY are employees of Bausch + Lomb, Bridgewater, NJ.

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