



BMJ Open Emotional and physical experiences of people with neovascular age-related macular degeneration during the injection process in Germany: a qualitative study

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ABSTRACT

Objectives In order to better understand the continued barriers to the provision of vascular endothelial inhibitor therapy, this study aims to investigate patients' experiences with neovascular age-related macular degeneration (nvAMD) in Germany during the injection process and how they deal with it.

Design and participants This analysis is part of the qualitative arm of a wider mixed-methods study. We recruited participants all over Germany via ophthalmologists, eye clinics, general practitioners, care bases and support groups between June 2018 and December 2020 and selected a subsample of study participants with nvAMD who were either undergoing or had previously undergone vascular endothelial growth factor inhibitor therapy. We conducted narrative, semistructured, face-to-face interviews at the participants' homes, which were audio-recorded. The interviews were thematically analysed.

Results Twenty-two participants were included in this analysis. Experiencing neovascular macular degeneration was dominated by the injection experience. Study participants perceived the treatment with vascular endothelial inhibitor injections as uncomfortable, and they described undergoing varying levels of anxiety during the whole injection process. After some years of receiving multiple injections, the pain and not experiencing any positive effects made participants with significant vision loss want to discontinue therapy. Furthermore, they narrated negative injection experiences in association with their interactions with medical staff and doctors.

Conclusion Although time in the medical setting is limited, efficient and good doctor-patient relationships seem crucial for satisfying care experiences. A respectful and humane relationship may be one key to achieving treatment adherence.

BACKGROUND

Age-related macular degeneration (AMD) is one of the major causes of blindness and visual impairment in the elderly (>60 years) in high-income countries.¹ In its early stages,

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The whole study was monitored by a scientific board composed of experts in ophthalmology, social gerontology, optometry and psychosocial counselling for people with visual impairment and blindness.
- ⇒ Due to purposeful sampling with the goal of maximum variation, it was possible to collect a great variation of experiences of people diagnosed with neovascular age-related macular degeneration (nvAMD) during the injection process.
- ⇒ Narrative, semistructured interviews allowed an understanding of the experiences of people diagnosed with nvAMD during the injection process in order to identify potential barriers in treatment provision.
- ⇒ The sample size is small, but this is not uncommon for qualitative research of this type.
- ⇒ For some of the interviewed participants, their treatment was behind them and thus their experience of the injection process could have changed retrospectively.

AMD manifests with degenerative and atrophic lesions of the retinal pigment epithelium and the neuroretina. Early AMD has no or minimal impact on visual function. These atrophic ('dry') lesions can progress into geographical atrophy, which represents the end stage of atrophic AMD. The long-term progression of atrophic AMD results in a gradual deterioration of visual function up to legal blindness. At all stages, atrophic AMD can convert into neovascular ('wet') AMD (nvAMD). Subjects affected by this conversion often experience sudden vision loss beyond the threshold of legal blindness within a few days or weeks.² Furthermore, patients with AMD lose the ability to read, to drive and to recognise faces that affect many daily activities in different domains of life. Simple everyday activities become challenging and patients

with AMD become dependent on other people and/or resources. The loss of independence often leads to a loss of self-esteem and self-worth, and this in turn can cause depressive symptoms such as sadness or frustration.^{3,4}

The Age-related Eye Disease Study suggests that vitamin supplementation can slow down the progression of atrophic AMD.⁵ However, the overall effect size of this supplementation is small. Otherwise, no treatments for atrophic AMD are available.

In contrast, nvAMD can be treated with vascular endothelial growth factor (VEGF) inhibitors, known as anti-VEGF therapy^{6–8} applied via injections in the vitreous of the eye. Before the advent of anti-VEGF therapy about 15 years ago, blindness was inevitable among people with nvAMD; today, vision can be preserved or improved in 80% of nvAMD subjects. In about a third of subjects, improvement of vision is substantial (≥ 15 "Early Treatment Diabetic Retinopathy Study"- letters).⁸

Nowadays, four anti-VEGF medications are in routine clinical application: ranibizumab,^{6,9} aflibercept^{8,10} and brolucizumab¹¹ are approved for the treatment of nvAMD; there is also substantial clinical routine and study experience with bevacizumab, though it is primarily a cancer drug and not approved for intravitreal use.^{12–15} The clinical practice with all four drugs is not substantially different: they are typically initiated with three injections 1 month apart; thereafter, the treatment interval can be extended depending on visual and anatomical outcomes. Different strategies are available to manage this interval extension: fixed treatment intervals (monthly, bi-monthly, every 3 months), treatment regimens depending on the activity of the lesions (as and when needed), and modification of the treatment interval depending on disease activity (treat and extend).¹⁶ In between treatments with anti-VEGF injections, people with nvAMD have to undergo regular controls, including retinal imaging with optical coherence tomography (OCT). Delayed beginning of therapy, missed controls and a small number of injections, among others factors (eg, poor baseline visual acuity and increased patient age), may lead under certain circumstances to a deterioration of vision up to visual impairment and blindness, despite therapy.¹⁷

Finger and Holz indicated in 2014 that Germany, in contrast to other countries with universal healthcare, but also compared with the USA, seemed to have worse treatment outcomes and treatment provision for people with nvAMD.¹⁸ Reasons suggested for these differential health outcomes have been voiced, such as the small number of injections,^{18,19} limited retinal imaging during controls,^{18,20} and therapy discontinuation or non-compliance by patients.¹⁸ Changes have been made over the past years to address potential barriers to treatment provision within the German healthcare system. Since October 2014, anti-VEGF injections are covered by health insurance, as are OCT measurements since October 2019. This overcomes system barriers and is likely to have a positive effect on treatment outcomes, as well as treatment provision for nvAMD in Germany.

Therapy discontinuation by patients diagnosed with nvAMD nevertheless remains a difficulty in the provision of treatment. A recent study investigating anti-VEGF therapy delay and discontinuation in Germany via telephone survey found out that the main reasons for therapy discontinuation were problems with transport and poor general health. Other reasons for discontinuing therapy included: feeling that therapy is not working, pain, inconvenient therapy, costs, problems with health insurances. The participants who did not give any reason for therapy discontinuation described the following problems besides transportation problems and poor general health during the course of therapy: problems during therapy, pain, fear of the injection, long waiting times and dissatisfaction with service delivery.²¹ How patients with nvAMD experience anti-VEGF therapy, seems to play an important role in therapy discontinuation and delay. As far as we know, experiences of patients with nvAMD undergoing anti-VEGF treatment in Germany have not been investigated until now. Therefore, in order to better understand the continued barriers to the provision of anti-VEGF therapy, this study aims to explore patients' experiences with nvAMD in Germany during the injection process and how they deal with it.

MATERIALS AND METHODS

Study design

The mixed-methods study entitled 'AMD-Care: Age-related macular degeneration and its effects from the perspective of people with AMD and providers' examined the barriers to and difficulties in using offers of assistance for patients with AMD. The quantitative arm of AMD-Care investigated the knowledge of providers (ophthalmologists and opticians) about support services via online surveys and the qualitative arm explored the illness experiences and coping strategies of people with AMD via interviews. AMD-Care was monitored by a scientific advisory board composed of experts in ophthalmology, social gerontology, optometry and psychosocial counselling for people with visual impairment and blindness. This analysis is part of the qualitative arm of the study.

Sampling

Sample selection for the overall study sample followed the research logic of grounded theory,²² which required a theoretically based, successive selection of study participants in different disease-related, socioeconomic, cultural and regional settings. As a sampling strategy, we have pursued the goal of maximum variation²³ in order to represent a wide range of experiences of people diagnosed with AMD. Selection criteria for interview partners included: (1) Geographical aspects (eg, urban and rural areas, different regions from Germany), (2) Social aspects (eg, living alone, married, etc) and (3) Medical aspects (time since diagnosis, form of the AMD, severity of the disease/visual impairment). We started with data analysis during the data collection (after the fifth interview).

From then on, we successively compiled our overall sample until our data showed a sufficient depth of understanding the lived experiences of people with AMD. The eligibility criteria for this study were: aged over 60 years, a diagnosis of AMD, German-speaking.

We recruited participants all over Germany via ophthalmologists, eye clinics, general practitioners, care bases and support groups between June 2018 and December 2020. The contacted institutions identified eligible participants. The first author called potential participants who expressed their interest in the study, provided further information as required, answered questions and arranged a date for the interview.

Ethical considerations

All participants were provided with information about the study, their right to withdraw at any time, the assurance of confidentiality and anonymity, and they all gave written consent to be included in the study.

Data collection

The first author conducted narrative, semistructured, face-to-face interviews at the participants' homes. AT (graduate engineer in Optometry, MSc Clinical Optometry; Master of Public Health) has long-term clinical and research experience in Optometry and is trained in qualitative research protocol. The interviews were audio-recorded with Olympus DM-720 and lasted between 26 min and 88 min. Due to the COVID-19 pandemic, three of the interviews had to be carried out over the phone.

The interviews started with a narrative prompt: 'I would like to ask you to tell me about your experiences as a patient with AMD. Please begin by telling how you noticed that your eyes had changed; go up to the present day. You can take your time'. The interview guide included further questions about interviewees' experiences with medical care (including therapy), with their social environment, with offers of assistance and what they expected for the future. After the interview, AT measured the interviewees' corrected visual acuity (lat. visus cum correctione) using the Freiburg vision test.²⁴

Data analysis

The interviews were transcribed using F4 software. To support data management and analysis, we imported transcripts into the software tool MAXQDA V.2020. AT was responsible for the analysis with support by CH and MB. After initial coding of the entire interview data of the overall sample (40 participants), we selected a subsample of 22 interview participants with nvAMD to explore the injection experience in detail. To do so, we conducted a thematic analysis in two steps. First, we identified patterns in the data referring to participants' injection experiences.²⁵ We therefore read and coded each relevant issue found in the data and grouped them into the theme 'injection experience'. Second, we used the one sheet of paper method to identify all experiences mentioned in the interviews in relation to the injection process,²⁶ from

which we developed analytical themes. In regular meetings with members of the scientific advisory board of the research project AMD-Care as well as in data meetings of our institute's internal research workshop, the analysis was monitored and the analytical themes were deepened.

Patient and public involvement

Patients or the public were not involved in the design, conduct, reporting, nor the dissemination plans of our research.

RESULTS

Participant characteristics

Twenty-two study participants (14 women; age range 70–95 years) with nvAMD undergoing or beyond treatment were included in the study. Corrected visual acuity and status of therapy are displayed in [table 1](#).

Experiencing the injection process

All of the study participants' experiences with nvAMD were strongly affected by the anti-VEGF treatment. Indeed, the experience of nvAMD was dominated by the injection experience. Four analytical themes emerged relating to the injection experience: (1) Physical experiences; (2) Emotional experiences; (3) Communication and interactions with doctors and medical staff; and (4) Dealing with the injections. We were able to order the analytical themes into three stages of the injection process: before, during and after the injection. Corresponding citations for each analytical theme are presented in [tables 2–5](#).

Physical experiences

Participants described how they were prepared for the treatment by putting on protective clothing and receiving an anaesthetic applied via eye drops, which caused blurred vision and numbness of the eye ([table 2](#)). All of the interviewees described feeling the sting of the injection, despite the anaesthetic, though their description of this sensation varied: sometimes they just sensed it as a dull sting, while other times they experienced it as very unpleasant and painful. According to the participants, the variations in the pain associated with the injection were attributed to the person applying the injection, the amount of anaesthetic given, and the time delay between the application of the anaesthetic and the injection itself.

Some participants described being 'happy' when they received more than two drops of anaesthetic, in order to experience less pain and in the hope that more drops would work for longer. As some of the participants thought that the effect of the anaesthetic decreased over time, this was a concern given that the waiting time between the application of the anaesthetic and the injection itself could sometimes be quite long.

The most-experienced side effects after the injection were burning eyes, the feeling of having a foreign body in the eye and bloodshot eyes. The intensity of these side effects ranged from bearable to very painful

Table 1 Corrected visual acuity, status of therapy and total number of injections of the interviewed participants with nvAMD (n=22)

Participant no.	Corrected visual acuity		Status of therapy ('still receiving anti-VEGF injections?')		Total number of injections
	Right eye	Left eye	Right eye	Left eye	
AMD2	n/a	0.025	No (more)	No (more)	n/a
AMD3	0.12	0.027	Yes	Yes	12
AMD5	0.096	0.78	Yes	No, dry AMD	36
AMD6	0.39	0.27	Yes	Yes	35
AMD8	0.23	0.09	No (more)	No (more)	12
AMD11	1.04	0.1	No, dry AMD	Yes	30
AMD12	< 0,014	0.01	Yes	Yes	20
AMD13	0.094	0.31	Yes	No, AMD not diagnosed	1
AMD14	n/a	0.12	Yes	Yes	40
AMD15	0.082	0.27	Yes	No, AMD not diagnosed	n/a
AMD16	0.085	0.063	Yes	Yes	40
AMD17	0.34	0.14	No, AMD not diagnosed	Yes	n/a
AMD18	0.026	< 0,014	No (more)	No (more)	3
AMD20	0.18	0.79	Yes	Yes	>10
AMD21	0.06	0.13	No (more)	Yes	20
AMD22	0.27	0.36	No (more)	No (more)	19
AMD23	< 0,014	< 0,014	No (more)	No (more)	20
AMD25	0.3	0.29	Yes	Yes	30
AMD35	n/a	n/a	No	No (more)	25
AMD37	n/a	n/a	No	No (more)	37
AMD39	n/a	n/a	No	Yes	3
AMD40	n/a	n/a	Yes	Yes	9

AMD, age-related macular degeneration; nvAMD, neovascular age-related macular degeneration; VEGF, vascular endothelial growth factor.

and unpleasant. The side effects were often described as being gone the next day, except for the bloodshot eye that needed more time to recover. For some, these side effects prevented them from conducting their daily activities. The interviewees realised a change in the sensation of the injection over time: while at the beginning of the treatment the injection and its side effects were more or less bearable, for those who received injections quite regularly, the physical experience gradually became worse.

Emotional experiences

Before the injections, most participants described how the anti-VEGF therapy gave them a feeling of hope for an improvement, stabilisation or even cure for their nvAMD (table 3).

However, before and during the injections, participants illustrated a high level of anxiety. This was mainly based on their unfamiliarity with the injection process at the time of the first injection and the physical discomfort

derived from the injection itself and its side effects. Many were terrified of their first injection, mostly because of the thought of having a needle in their eye and their unfamiliarity with the treatment process.

During the treatment, participants described becoming more anxious or irritated when they were not talked to, were not informed well about the procedure—such as when the injection site was marked without any explanation—and/or because of the associated pain of the injection. Some patients were rigid with fear and were unable to communicate their anxiety.

One participant explained that even after repeated injections and grown familiarity to the treatment process apprehension remained for every injection as the pain in between the injections varied. The appearance of unexpected side effects after the injection, especially pain and bloodshot eyes, also unsettled the participants.

Table 2 Physical experiences during and after the injection with corresponding citations

Analytical themes	Stages of the injection process	Experiences	Citations
Physical experiences	During the injection	Blurred vision and numbness of the eye caused by anaesthesia	<i>the vision is clouded by applying the drops (AMD15)</i>
		Perception of the marking of the pen	<i>then I saw they make a dot with a marker... ..a dot... (AMD6)</i>
		Seeing the needle approaching	<i>then comes the syringe towards my eye (AMD6)</i>
		Varying levels of pain caused by the puncture of the needle (despite anaesthesia)	<i>Then I noticed ... a dull sting. (AMD5)</i> <i>And one (doctor), with the injection, one is a bit better, it doesn't hurt so much, and (with) the other it hurts a lot. Then you have to scream out. (AMD16)</i> <i>I've also noticed it (pain) at times with those who really injected well. So it could basically only have something to do with the anaesthesia – I think to myself, but I don't know. The longer it (injection) takes after the anaesthetic ... that's why I always go there early. When you are the last one, someone said that as the last one he noticed everything. (AMD25)</i>
	After the injection	Perception of the fluid distribution of the anti-VEGF medication causing blurred vision	<i>Then I see the liquid coming out of the syringe and spreading in the eye. (AMD6)</i>
		Varying levels of pain, burning eyes, foreign body feeling	<i>well, you know, I sometimes got such pain after the injection - a burning sensation in my eye for a whole day. It was almost unbearable (AMD21)</i> <i>It feels as though there's something in the eye and every time you blink it hurts. But as I said, it's (only) there 1 day and one night. (AMD16)</i>
		Side effects prevent participants from conducting daily activities	<i>But in the moment, after I have had the last injection ... how should I say this ... there is, I can't even leave the house, nothing. (AMD14)</i>
Changing sensation over time	<i>Well, from the beginning I never had any difficulties ... after the injection I could get on with things or whatever. But now it just gets worse and worse with the injections. (AMD14)</i>		

AMD, age-related macular degeneration; VEGF, vascular endothelial growth factor.

After years of multiple injection cycles, however, many of the interviewed patients experienced the therapy as increasingly bothersome. Throughout the interviews, they regretted the time lost due to the treatment, including waiting times, travel and recovery. Receiving monthly injections over several years made the participants wish for a break or even for a longer-lasting medication.

Communication and interactions with doctors and medical staff

According to the participants, the interaction and communication between the participants and their doctors and the medical staff played a significant role in how they experienced the injection process (table 4).

Before the injection, many were told not to be afraid or that it would not hurt, but this did not help to calm them.

Table 3 Emotional experiences before, during and after the injection with corresponding citations

Emotional experiences		
Before the injection	Hoping for improvement, stabilisation and cure	<i>With the injections one can only hope that this somehow stabilises. (AMD11)</i>
	Fear of the first injection	<i>Ah, totally awful. Totally awful. I thought that it can't be that they would inject directly in the eye. (AMD5)</i>
During the injection	With every injection there is fear	<i>And with every injection that I get - there is always fear...you never go there without fear, because it is in the eye. ...sometimes you don't even notice when they stick it in, right? And other times it cracks (very painful). (AMD16)</i>
	Becoming more anxious when not being talked to	<i>I was totally tense, because of course they say it doesn't hurt. But that's just not true. It's very different. (AMD11)</i>
	Not being able to communicate anxiety	<i>... because first of all, when you are afraid, you're a bit stiff with fear ... you keep your mouth shut. (AMD11)</i>
After the injection	Anxiety about unexpected side effects	<i>I look, shut up and look: "oh God!" looked like a zombie. the eye was totally bloodshot, though I could see with it ...well, I called there (hospital). ...Not that anything bad happened... (AMD6)</i>
	Therapy is perceived as bothersome and frustrating Wishing for a therapy break and a medication that works longer	<i>And because now I always take the bus. it's a good hour and a half and, yeah.... Then you spend a lot of time. You get the injection quickly, it's not that long, but before I'm home again... And then I sleep a little more, yes, and when I get up, then the day is already halfway through.... So I can throw this day away, well, I don't count it anymore... But I would really like to have a break from it for half a year or so, because, like I said, sometimes it's a bit annoying.... I would also wish that they could maybe find something that lasts longer, a medication at least (AMD5)</i>

AMD, age-related macular degeneration.

Most of the participants described the atmosphere in the treatment room as very impersonal during the injection. They would lie on their operating bed next to other patients also waiting for the injection, yet the medical staff would not talk or interact with them. This caused increasing anxiety and discomfort. While some interviewees were unable to communicate their discomfort or anxiety during the treatment process, others wanted to ask about the procedure in order to ease their concerns, especially when they were not yet familiar with the treatment process. However, one participant described that he was instructed not to talk in the operating room in order to retain the aseptic atmosphere.

When the attending physicians introduced themselves and/or guided the patients through the treatment process with explanations, participants described feeling more comfortable during the treatment process and their anxiety was eased. One participant mentioned that she even entered the treatment room happily when she knew that a particular physician would be there.

The regular check-ups in between the treatments were considered unnecessary and inconvenient in some instances.

Dealing with the injections

In the interviews, the participants described various strategies of how they dealt with the injection before, during and after the treatment (table 5).

Before the injections, the interviewees were eager to do whatever it took in order to prevent a deterioration of their vision. Those who were already familiar with the injection process described how they comforted others while waiting for their injections. Anti-VEGF therapy was appreciated by the participants and they were very grateful that their health insurance bore the high costs of the treatment.

During the injection, the participants explained that they just let the injection happen and tried to convince themselves that they can get through it.

Participants dealt with the side effects after anti-VEGF therapy by contacting the medical facility, using eye drops and/or resting. In order to clarify whether the side effects, e.g. especially bloodshot eyes and burning eyes, they experienced, they contacted the medical facility. Especially those who were more familiar with the pretreatment and post-treatment process used artificial tears to ease their discomfort after the injection. Most of the interviewees indicated that they had to lie down and rest after receiving the injection, in order to ease the side effects, including burning eyes. How much rest they needed ranged from short naps to sleeping through until the next morning. Some even thought that while sleeping, the risk of getting something in the eye was lower and that the injection could have time to work.

Table 4 Communication and interactions with medical staff and doctors before, during and after the injection with corresponding citations

Communication and interactions with medical staff and doctors		
Before the injection	Medical staff said not to be afraid and ensured that the injection will not hurt but this did not help the participants in order to calm down	<p><i>Well, I just can't understand, when they... do an injection and, um, say beforehand "Don't be afraid now". That's nonsense. The fear is there. (AMD16)</i></p> <p><i>Well, they reassured me that it doesn't hurt, but you actually have a dreadful fear of it. (AMD5)</i></p>
During the injection	No greetings or introduction in the treatment room The nurses and doctors talked only among themselves	<i>That was pretty horrible. I was lying on something, I couldn't see anything. Then there were four others lying next to me. And then those (medical staff) who were there, nobody said "hello", nobody introduced themselves, no. That was pretty horrible.... And then they (the medical staff) just talked among themselves. I found that, well, to be honest, I thought that was pretty creepy ... So I really also thought, where am I, in a car repair shop or something? So not even perceived as a human. (AMD11)</i>
	Participants are not allowed to ask something	<i>And then I wanted to ask (something) at one point. "No more talking! Everything is now sterile. And when you breathe ... or speak, then the bacteria that are in your breath will perhaps get into your sterile eye, and into the syringe and then get into the eye and..." (AMD6)</i>
	Physician introduced himself and guided participant through injection process	<i>It was a doctor who made a good impression on me immediately because he introduced himself first, we exchanged a few words. And afterwards he was also simply friendly, personable. (AMD11)</i>
	Knowing the physician	<i>And when they say "Doctor(NAME 1)", then I go happily in there (the treatment room). (AMD16)</i>
After the injection process	Regular check-ups in between the treatments were considered unnecessary and inconvenient	<i>Then I have to... every now and then go for a check-up, which is annoying... I pop in and the doctor has a look again and he tells me again: "yes, there's still a little bit of moisture, still a little moisture". And... but that's already better. Better hmm... the last few times, but it'll be fine. Well, I think I find this superfluous... because it changes nothing, nothing at all. He just looks at what effect it has had, or what the result is, and then he lets me go again. (AMD15)</i>

AMD, age-related macular degeneration.

The pain of the injection itself and the side effects became almost unbearable for some participants who had received multiple injections. In addition, they described that they do not perceive an effect of the treatment. This often led to think about discontinuation of the treatment or to them seeking a second opinion on whether treatment was really still necessary.

DISCUSSION

Our study offers a comprehensive insight into the experiences of patients with nvAMD in Germany during the injection process with anti-VEGF therapy and offers hints about the barriers to treatment provision.

Study participants perceived anti-VEGF therapy as an uncomfortable treatment. According to our findings, variations in the experienced pain associated with the injection were attributed to the person administering

the injection, the amount of anaesthetic given, and the time delay between the application of the anaesthetic and the injection itself. In the narratives, study participants described experiencing varying levels of anxiety during the whole injection process. Furthermore, they narrated negative injection experiences in association with their negative interactions with medical staff and doctors.

Our findings suggest that study participants' experiences of the injection varied according to their interactions with medical staff and doctors, in that impersonal or less empathic interactions enhanced anxieties, whereas personal interactions—such as guiding study participants through the injection process with explanations—seemed to ensure a more positive experience of the treatment and alleviate anxieties. Study participants suggested that their discomfort or anxiety were not appropriately addressed or that they were unable to express them. Indeed, the

Table 5 Dealing with the injections before, during and after the injection with corresponding citations

Dealing with the injections		
Before the injection	Willing to do whatever it takes to prevent visual deterioration	<i>Well, I know someone who became blind, she has another eye disease. And she is really almost blind and that is of course a lot worse. Well, due to this I always say, be happy that such a thing as this(anti-VEGF therapy)exists and go there and take everything in your stride, and say “ok, let’s do it”. But it’s not pleasant. (AMD5)</i>
	Calming other patients	<i>He (another person with AMD) says “I am so very afraid” and I comfort them. (AMD16)</i>
	Appreciating therapy	<i>Then I thought: Good, the injections, I’m very grateful, I’m really very grateful that I live in Germany and these injections are paid for by health insurance. (AMD20)</i>
During the injection	Letting the injection happen and convincing themselves that they can get through this	<i>Well, and then you are in there (treatment room) and then you just let it wash over you. (AMD2) Oh, I had a hellish fear. I was totally tense. I really gripped onto the table there. Yes. I said (to myself): “you can get through this, you can get through this”. (AMD11)</i>
	After the injection	
After the injection	Contacting medical facility	<i>And one time they hit a vein and the blood ran out from under the thing (protective eye patch). Then I called the emergency service at the (hospital). (AMD16)</i>
	Using artificial eye drops	<i>I have a lot of these little bottles here of, um, artificial tears. And I use them a lot. (AMD5)</i>
	Resting	<i>Well, when I have the injection, then the day is over for me. Then I go home and lie in bed. Then it doesn’t itch. Then I sleep till the next day and it doesn’t itch anymore. (AMD16) And I always think that I will get the least dirt in my eye when I sleep. And the injection can maybe work the best. (AMD11)</i>
	Thinking about discontinuation of therapy	<i>And I’m no longer willing to have the injection, because it’s very painful, and second it has no effect. Not better, not worse. It’s stayed the same. (AMD21)</i>
	Getting a second opinion	<i>Besides Dr.(NAME 1)here in(LOCATION 2), I got a second opinion ... He examined me ... intensively! Well, more intensively than the ophthalmologist here. And Mr.(NAME 2)(said that) in the right eye ... injections are pointless. (AMD21)</i>

AMD, age-related macular degeneration; VEGF, vascular endothelial growth factor.

sensations that participants felt during therapy were inadequately approached in their interactions with medical staff and doctors, which led to an increasing annoyance with the therapy among the interviewees. Frustration further increased as no improvement in visual acuity was noted, despite the injections.

Two studies investigating therapy discontinuation by patients undergoing anti-VEGF treatment in Germany and Switzerland have shown that anxiety seems to be one of the main reasons leading to discontinuation of therapy over time.^{21 27} Mitigating the fear by saying ‘not to be afraid or it does not hurt’, as study participants described, did not alleviate the pain or the negative experience; rather, simple interactions such as a verbal greeting and guidance through the injection process helped to ease anxieties and discomforts during the injection process. A study investigating patient adherence in general found treatment adherence to be significantly related to the communication style of physicians.²⁸

McCloud *et al* also showed that positive relationships between patients and medical staff seem to be important in terms of decreasing anxieties regarding not only treatment, but also recovery and disease progression. Furthermore, the authors supposed that positive patient experiences seem to be related to familiar and known treatment processes. Changes to the treatment protocol, such as changing doctors, were associated with negative experiences.²⁹ Blödt *et al* also showed the importance of the humaneness of physicians—namely treating patients as individuals—for patients diagnosed with breast cancer and prostate cancer to be satisfied with their healthcare provision.³⁰ In another study that investigated the experience of patients with nvAMD undergoing anti-VEGF therapy, it is described how patients tried to build relationships with nurses during the injection process in order to alleviate the stress associated with it.³¹ Emsfors *et al* examined good nursing care actions among patients with nvAMD undergoing anti-VEGF therapy and concluded

that positive and respectful interactions with medical staff were perceived by patients as a good way to ease anxieties and the burden of treatment.³² Taylor *et al* explored the lived experiences of patients with atrophic AMD and also found that there is a need for improved communication between patients and healthcare professionals as some of their participants were not satisfied how they were 'diagnosed and/or managed' by their healthcare professionals.³³

Particularly with a treatment whose main goal is to minimise further deterioration of visual acuity (rather than to enhance it), it is likely that good communication skills are crucial for patients to remain in treatment. After some years of receiving multiple anti-VEGF injections, our study participants with nvAMD described becoming increasingly bothered by the therapy due to the time lost because of the treatment (including waiting times, travel and recovery), the worsening sensation of the injections, and the fact that they perceived little to no effect of the treatment (particularly those with significant vision loss). In our study, especially the pain of the therapy and not experiencing any positive effects made participants with significant vision loss want to discontinue the therapy. Study data show that most vision gains occur during the first one to three injections, while after the third injection vision gains are maintained.^{6–15} This typical course may lead to the perception among patients that all of the injections after the third one are having no effect. The treatment objective thus shifts over time, from gaining vision through the first few injections to maintaining vision through the later injections. Besides the improvement of vision, maintaining vision is an effective outcome of anti-VEGF therapy. This needs to be better communicated by treating physicians in order to keep patients motivated and avoid misunderstandings and disappointments.

The findings of the present study may be also important for future injections indicated for atrophic AMD. The most advanced drug candidate, pegcetacoplan, is administered intravitreally with injections every month or every second month. Pegcetacoplan is developed to preserve visual function by slowing down geographical atrophy lesion growth. Treated patients will not sense any gain in vision.³⁴ Enoch *et al*, for example, currently investigate how patients with atrophic AMD accept injections, what factors affect acceptability and how patients understand these treatment options.³⁵ Based on the findings of our study, it seems crucial to provide adequate information of what patients with atrophic AMD may expect from the injections, and to improve the organisation of how the injections are delivered to minimise barriers and improve acceptance and adherence to injections.

In Germany, injections are covered by health insurance. People's attitudes towards and experiences of treatment are influenced by the scarcity of treatment and whether it is 'free' at the point of service as well. Further research is needed, to explore how the experiences of our participants differ internationally from patients in other healthcare systems.

The sample size is small, but this is not uncommon for qualitative research of this type. For some of the interviewed participants, their treatment was behind them and thus their experience of the injection process could have changed retrospectively. Additionally, we had no access to the participants' medical documents, and therefore could not review the precise diagnoses and treatment assigned by their doctors.

Interaction and communication between the study participants and doctors and medical staff played a significant role in how participants remembered the injection process, and it strongly influenced life with nvAMD overall. Although time in the medical setting is limited, efficient and good communication strategies between doctors and medical staff and patients seem crucial for satisfying care experiences. In a situation where therapy is uncomfortable and the effects not palpable to patients, a respectful and humane relationship may be one key to achieving treatment adherence.

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