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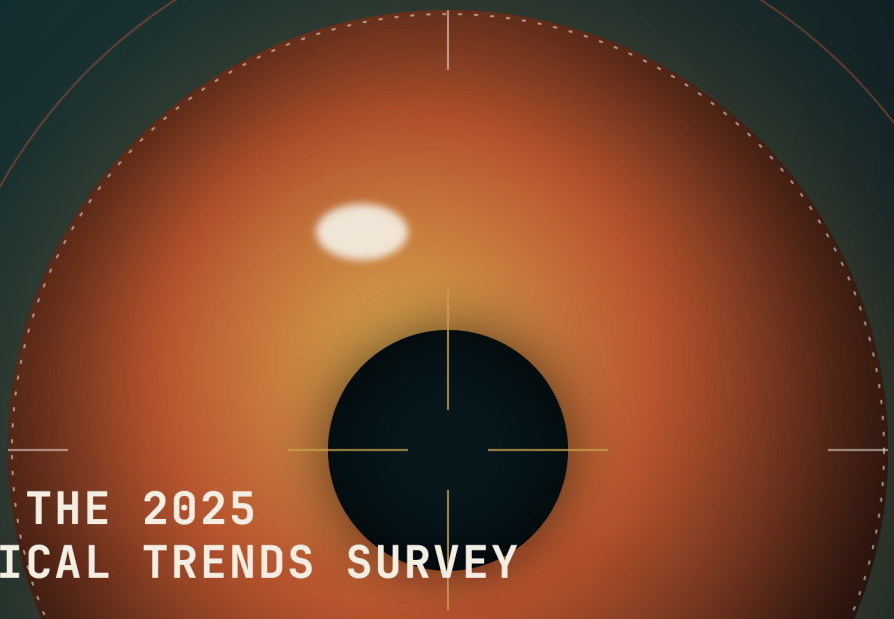
EURETINA EDUCATION PLATFORM



INSIGHTS FROM THE 2025
EURETINA CLINICAL TRENDS SURVEY

Vitreoretinal *Surgery* & Digital Visualisation

Expert insights on surgical practice, technique, and the adoption of digital visualisation technologies among EURETINA members.

BY

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On behalf of the EURETINA Vitreoretinal Surgery Section

Vitreoretinal Surgery and Digital Visualisation

In this edition of the EURETINA Clinical Trends Series, Prof. Siegfried Priglinger, a member of the EBO-EURETINA Exam Committee and the Vitreoretinal Surgery Subspecialty Section, provides expert insights into key findings from the 2025 EURETINA Clinical Trends Survey.

This report focuses on vitreoretinal surgery and the adoption of digital visualisation technologies among EURETINA members, placing these trends within the broader context of global retinal care. It also explores their implications for clinical practice, surgical techniques, and the future integration of digital visualisation systems.

INSIDE THIS ISSUE

Evolving Landscape of Vitreoretinal Surgery

Vitreoretinal surgery continues to evolve rapidly, driven by ongoing developments in surgical techniques, instrumentation, and clinical decision-making.

Improvements in small-gauge vitrectomy systems, fluidics, illumination, and visualisation have significantly enhanced both safety and efficiency, allowing surgeons to manage complex cases with greater precision.

At the same time, clinical decision-making has become more nuanced. Rather than relying on standardized approaches, surgeons are increasingly tailoring interventions to individual patient characteristics, including anatomical features, disease duration, and functional status. This shift toward more personalized care reflects broader trends across medicine and is particularly relevant in retinal surgery, where outcomes are highly dependent on timing, technique, and case selection.

In this context, emerging technologies such as digital visualisation systems are beginning to play an increasingly important role. While their adoption remains variable, they represent a significant step forward in how surgery is performed, taught, and experienced.

SURGICAL VOLUME AND ITS IMPLICATIONS

Surgical volume provides important context for interpreting practice patterns and the adoption of new technologies. According to the 2025 EURETINA Clinical Trend Survey, 55% of respondents reported performing vitrectomy procedures, with an average annual volume of 102 procedures among those who performed them **(Figure 1)**. Similarly, 46% reported performing primary detachment procedures, with an average annual volume of 95 procedures among those who perform them.

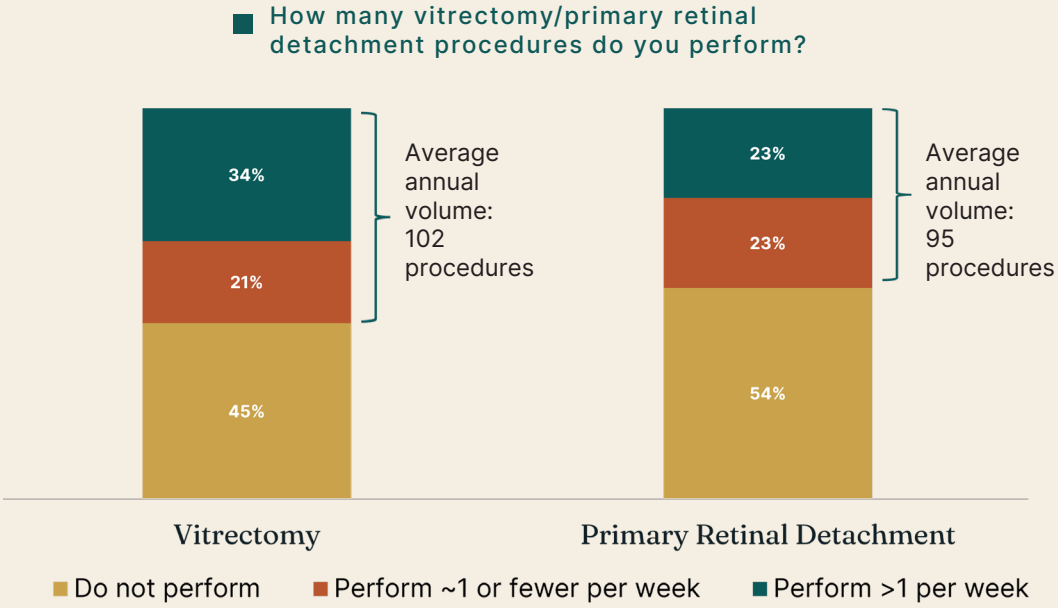

Figure 1. Around half of respondents perform vitrectomy (45%, left) and primary retinal detachment procedures (54%, right). On average, they perform 102 vitrectomies and 95 primary retinal detachment procedures annually; however, among those performing the procedures, a notable proportion (21% and 23%, respectively) perform only one or fewer per week.

Among respondents who perform vitrectomies, 39% report performing fewer than one procedure per week on average. Similarly, among those who perform primary detachment procedures, half report performing approximately one procedure per week or fewer. This wide variation in surgical volume suggests that vitreoretinal surgery is distributed across multiple centres, with a substantial proportion of surgeons performing relatively low case volumes. This pattern raises important questions about the distribution of expertise and access to specialized care.

This is particularly relevant given that surgical proficiency is closely linked to volume and repetition. Vitreoretinal surgery has a steep learning curve, and meaningful progress requires consistent exposure over time. Regular surgical activity allows refinement of technique, improved intraoperative decision-making, and greater confidence in managing complications. Even after many years of practice, continuous learning is driven by regular surgical activity.

Lower individual case volumes may also have implications for training. When experienced surgeons perform fewer procedures, it becomes challenging to provide adequate hands-on training and mentorship. This may ultimately affect the development of future generations of surgeons, impacting not only surgical quality but also consistency of outcomes.

High-volume environments naturally support this process, offering both surgeons and trainees the opportunity to refine their skills more effectively. A certain degree of centralization may, therefore, be beneficial, not only for maintaining high standards of care but also for strengthening surgical training and facilitating the adoption of new technologies. At the same time, individual learning curves vary, and some surgeons may achieve proficiency more rapidly than others.

> *"Having more cases concentrated in high-volume centers has advantages for both surgical quality and surgeon education."*

Retinal Detachment Management

TIMING OF SURGERY

The survey highlights differences in urgency between macula-on and macula-off detachments. For macula-on cases, 52% of respondents report operating on the same day or within one day, compared with 25% for macula-off cases **(Figure 2)**. Importantly, timing remains highly case-dependent.

In macula-on detachments, urgency is driven by proximity to the fovea, particularly in superior detachments where rapid progression is more likely. In these cases, surgery on the same day is often preferable whenever possible. In contrast, more peripheral detachments, especially inferior ones where positioning may help stabilize the retina, may allow for short delays without compromising outcomes.

In macula-off detachments, surgical timing is largely guided by the duration of foveal involvement. When the macula has only recently detached, early surgery is critical, as "every day counts." While robust evidence comparing very short delays (e.g., hours versus one day) remains limited, emerging prospective data suggest clinically meaningful differences not only in visual acuity but also in metamorphopsia.

Specifically, both the extent and duration of central retinal detachment appear to influence the risk of postoperative visual distortion. In cases where detachment has been present for several days, urgency becomes less critical, and surgery can be scheduled within a reasonable timeframe.

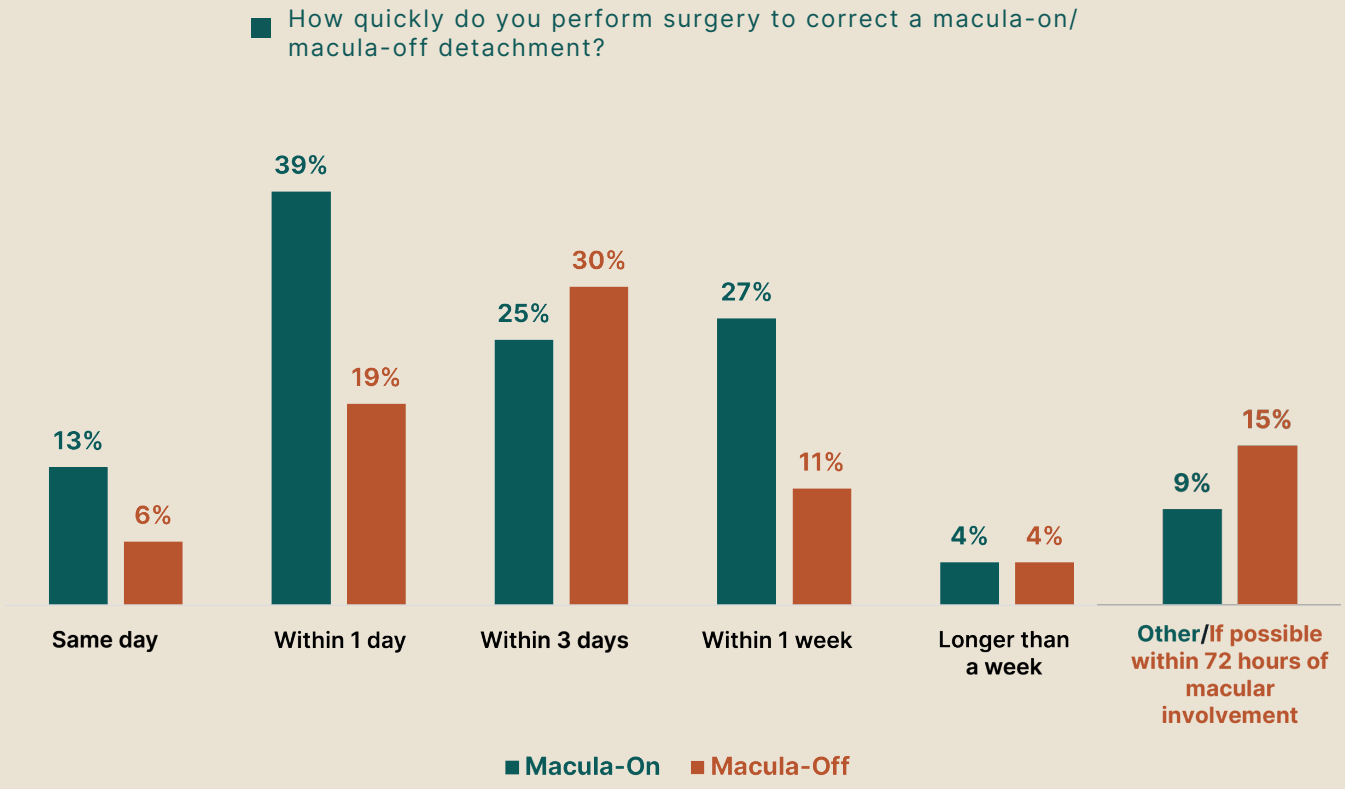

Figure 2. Surgery is generally performed earlier for macula-on cases, with 52% of respondents operating on the same day or within one day, compared with 25% for macula-off cases.

73%

of retinal detachments are repaired by primary vitrectomy.

14%

of primary phakic retinal detachments are repaired by buckling surgery alone.

14%

of primary rhegmatogenous retinal detachments with breaks in the superior hemisphere are repaired by pneumatic retinopexy.

20%

of primary phakic retinal detachments are repaired by combined vitrectomy and encircling band.

PREFERRED SURGICAL TECHNIQUES

The survey clearly suggests that primary vitrectomy is the dominant surgical approach for retinal detachment repair. On average, respondents report using primary vitrectomy in 73% of cases, while 14% are managed with primary scleral buckle.

Several factors may be driving this strong preference for vitrectomy:

- **Training patterns:** Younger surgeons are often less experienced with indirect ophthalmoscopy and scleral buckling techniques, which are essential for traditional buckling surgery.
- **Surgical control:** Vitrectomy provides a more controlled and standardized surgical environment.
- **Immediate feedback:** the retina is typically reattached at the end of the procedure, offering a clear and immediate sense of surgical success. In contrast, with scleral buckling, the retina may not be fully attached immediately, and outcomes may only become apparent in the postoperative period.
- **Perceived success rates:** Reported anatomical outcomes are generally higher, reinforcing confidence, particularly among surgeons performing a lower case volume.

Despite these trends, scleral buckling remains an important technique in selected clinical scenarios. In my practice, I still consider this technique in pediatric cases, inferior or chronic detachments, and localized retinal detachments associated with retinal holes. In such cases, it may provide effective anatomical outcomes and more physiologic retinal reattachment, with potentially lower rates of postoperative metamorphopsia.

Combined approaches, such as vitrectomy with an encircling band, are used less frequently in my practice. In most cases, a cerclage is not necessary when vitrectomy is performed thoroughly, with complete vitreous removal and careful management of retinotomies or retinectomies. With adequate surgical technique, vitrectomy alone is usually sufficient to achieve retinal reattachment without the need for additional encircling elements.

Pneumatic retinopexy remains an effective option in selected cases, particularly for superior retinal breaks. However, it is less commonly performed in many European settings. This may reflect differences in healthcare organization and workflow, with a preference for single definitive interventions rather than staged, outpatient-based approaches.

Hybrid approaches may help address some of the limitations of traditional techniques. The use of wide-angle visualisation systems combined with chandelier illumination allows improved intraoperative visualisation during scleral buckling, potentially making the technique more accessible and reproducible.

TAMPONADE CHOICE

The choice of tamponade remains a key component of retinal detachment repair. The EURETINA survey indicates that expandable gases are the most commonly used tamponade for inferior retinal detachments without proliferative vitreoretinopathy (PVR) **(Figure 3)**.

Tamponade selection is largely dictated by the underlying pathophysiology and, in particular, the extent to which vitreoretinal traction has been relieved during surgery. When traction is adequately addressed and there is no significant PVR, even air tamponade may be sufficient in selected cases. However, in my practice, and especially for less experienced surgeons, gas tamponade is generally preferred, as it provides a greater margin of safety.

Silicone oil remains essential in more complex situations. In eyes with PVR, even after careful removal of epiretinal and subretinal membranes, structural retinal changes may prevent complete traction relief without more extensive procedures such as retinectomy. In these cases, silicone oil provides more stable, long-term tamponade. It is also particularly useful in cases with large or multiple retinal breaks, including giant retinal tears, where the risk of complications such as retinal slippage is increased. In addition, silicone oil may be necessary in patients who are unable to maintain appropriate postoperative positioning.

With advances in surgical techniques and instrumentation, tamponade preferences are gradually evolving. As surgeons become more effective at safely removing vitreous and relieving retinal traction, there is a growing tendency toward the use of shorter-acting tamponades, including gas, and in selected cases air.

Overall, tamponade selection should remain individualized, taking into account case complexity, residual traction, and patient-specific factors, while balancing safety and surgical efficiency.

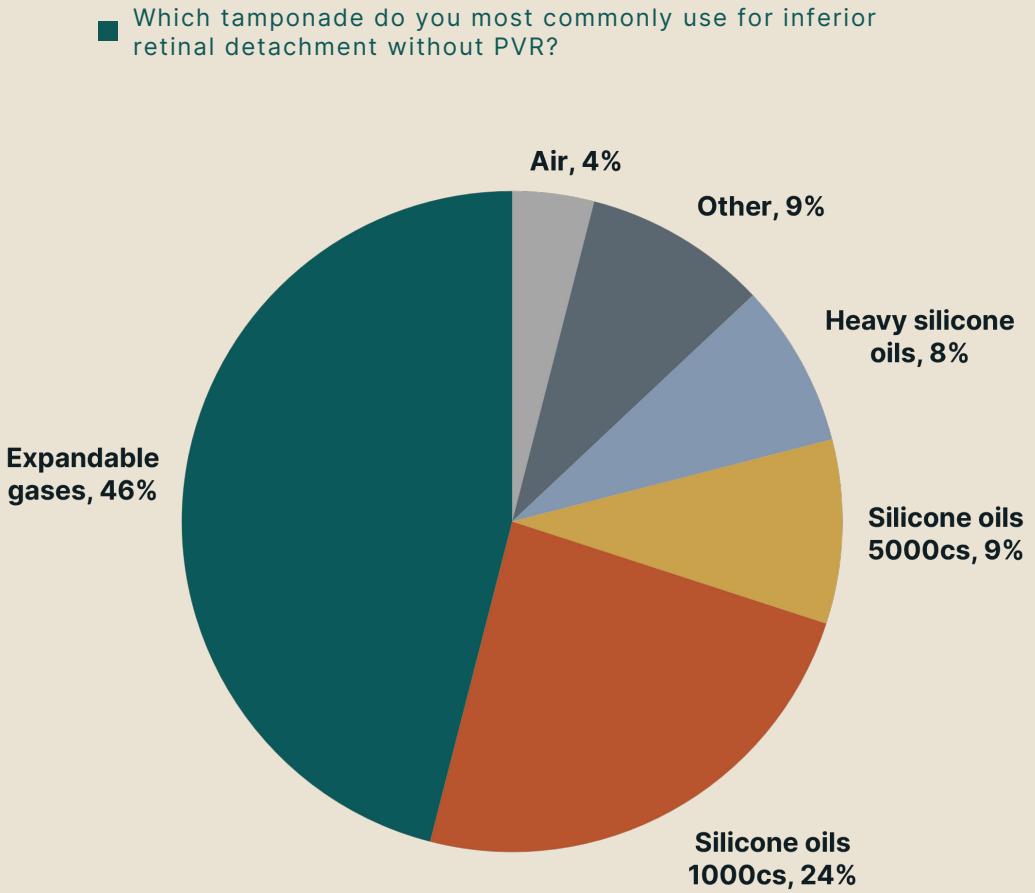

Figure 3. Expandable gases (46%) are the most commonly used tamponade for inferior retinal detachment without PVR, followed by silicone oil (24%).

Vitrectomy Technique and Surgical Optimization

UNDERSTANDING FLUIDICS

Optimizing fluidics is fundamental to safe and efficient vitrectomy. However, the EURETINA survey found that only 38% of respondents feel they have a strong understanding of fluidics **(Figure 4)**, highlighting an important area for continued education.

In practice, fluidics management is less about theoretical understanding and more about maintaining stable and controlled intraoperative conditions. The primary goal is to ensure a controlled intraocular environment, particularly with respect to pressure and flow. When stability is compromised, surgical control becomes more difficult, especially in complex cases.

This is particularly evident in conditions such as proliferative vitreoretinopathy or highly mobile retinal detachments, where even small fluctuations can significantly influence retinal behaviour and increase the risk of unintended traction. Achieving the right balance between cutting speed and aspiration is, therefore, critical, allowing effective vitreous removal while minimizing stress on delicate retinal tissue. This is a skill that develops with experience and familiarity with the surgical system.

Modern vitrectomy platforms have significantly improved fluidics management, providing more stable intraocular pressure, faster response times, and more precise flow control. Higher cutting rates and refined aspiration settings reduce turbulence and enhance surgical safety. Compared to earlier systems, which were less predictable and more difficult to control, current platforms provide a far more stable and controlled surgical environment.

Despite these advances, a solid understanding of fluidics remains essential. Surgeons must be able to adapt system parameters to different surgical scenarios, and this skill develops through experience and continued training.

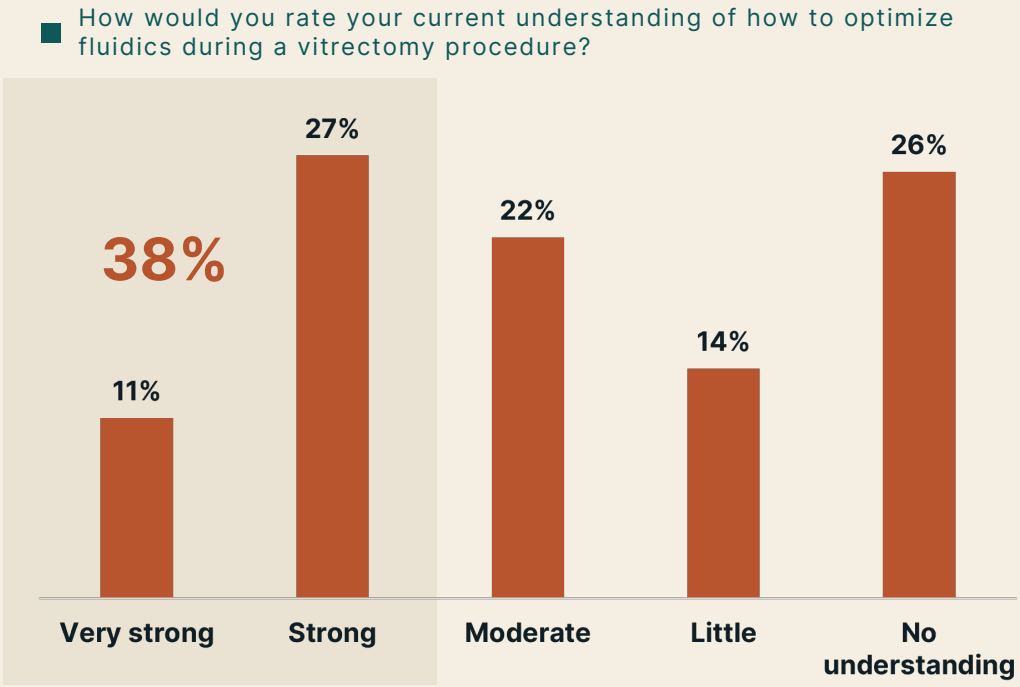

Figure 4. Only 38% of respondents report a strong or very strong understanding of how to optimize fluidics during vitrectomy, while 62% indicate moderate, little or no understanding.

GAUGE SELECTION

Smaller-gauge vitrectomy systems have become standard in modern practice. The EURETINA survey shows that nearly all respondents (88%) prefer a 23- or 25-gauge system **(Figure 5)**.

While 27-gauge instrumentation can be useful in selected, less complex cases, it is generally not preferred for more demanding procedures. Larger-gauge systems, such as 20-gauge, are now rarely used and have largely been replaced by modern small-gauge platforms.

Several factors influence gauge selection in clinical practice. In some settings, particularly in private centers, surgeons may standardize on a single gauge system for logistical and economic reasons, simplifying equipment requirements and workflow. In more complex cases, such as tractional retinal detachment, instrument rigidity becomes an important consideration, with many surgeons preferring 23-gauge systems for improved control.

Additional considerations include surgical efficiency, as 23-gauge systems may enable faster vitreous removal in more demanding or time-sensitive procedures; technological convergence, with advances in fluidics and cutter design reducing performance differences between gauge sizes; and surgeon familiarity, with preferences often influenced by training background and routine practice patterns.

> *"While gauge selection remains an important technical consideration, it has become less of a defining factor in surgical outcomes."*

In my own practice, I do not typically use 27-gauge instrumentation for complex cases. When complete vitreous removal is required, particularly with scleral indentation, instrument rigidity remains essential, and smaller gauges may limit surgical control. However, with the continued evolution of 27-gauge instrumentation, this limitation is likely to become obsolete in the near future.

With ongoing improvements in instrumentation and surgical platforms, differences between gauge systems continue to diminish. As a result, gauge selection is increasingly guided by surgeon preference, case complexity, and practical considerations rather than strict technical limitations.

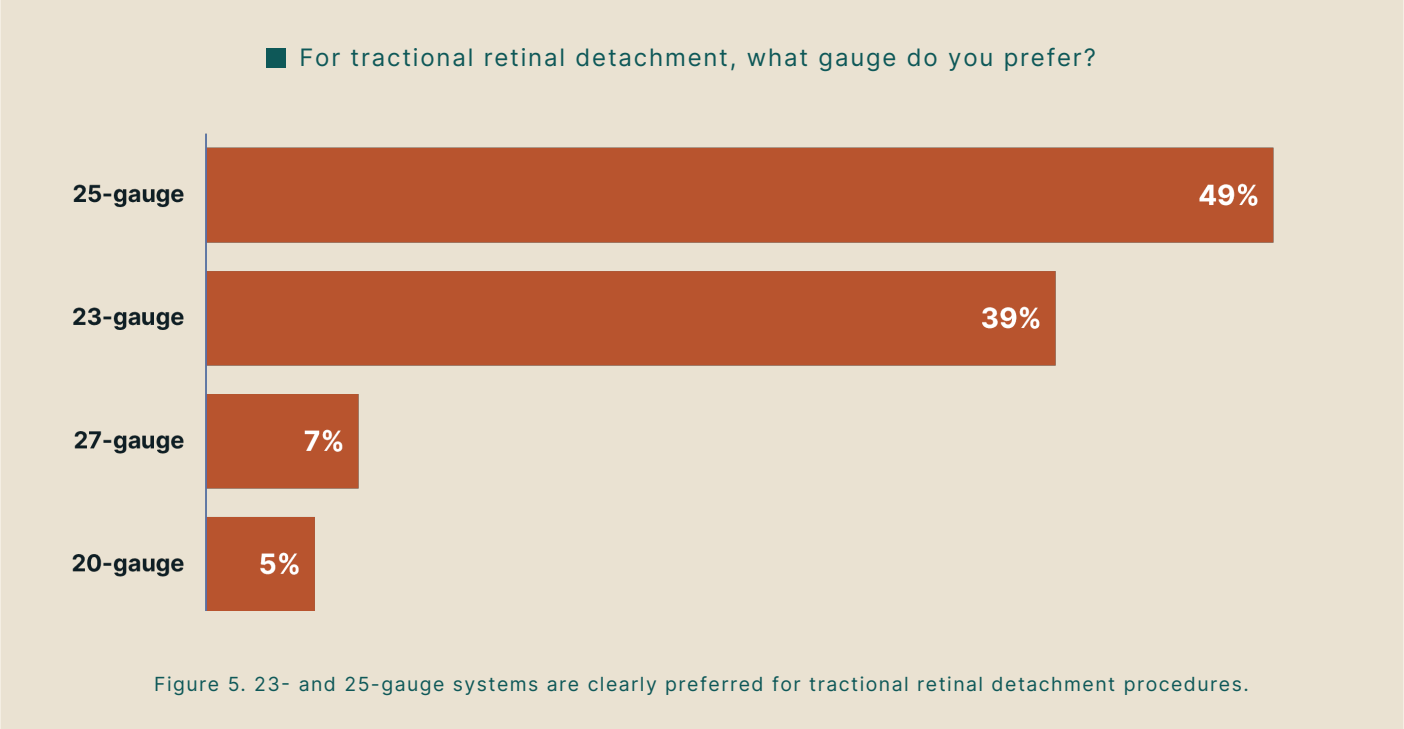

Figure 5. 23- and 25-gauge systems are clearly preferred for tractional retinal detachment procedures.

VITRECTOMY INDICATIONS BEYOND RD

Vitrectomy is now the most commonly performed procedure for retinal detachment repair; however, its indications have expanded considerably. It is increasingly used for conditions that were previously managed conservatively, such as symptomatic vitreous opacities (floaters) that significantly impair patients' quality of life.

The EURETINA survey explored preferred management strategies for severe non-hemorrhagic vitreous opacities, showing that 60% of respondents favor vitrectomy, while 31% opt for no treatment, with smaller proportions selecting laser vitreolysis or other approaches **(Figure 6)**.

Advances in vitrectomy technology, particularly small-gauge instrumentation and improved fluidics, have significantly enhanced both the safety and predictability of the procedure. As a result, the threshold for offering surgery in selected patients has evolved. Concerns that previously limited its use, such as the risk of retinal detachment or endophthalmitis, are now less prominent in routine decision-making, particularly when surgery is performed in experienced hands.

In contrast, laser vitreolysis is generally not considered an optimal solution for these patients. While it may fragment floaters, it does not eliminate them and may even increase visual disturbance. In addition, when floaters are located close to the retina, there is a potential risk of retinal injury.

From a clinical perspective, patient selection remains central to decision-making. In many cases, reassurance and observation are appropriate initial strategies, as patients may experience symptomatic improvement over time due to neuroadaptation. However, in cases where floaters are persistent, centrally located, and significantly impair visual function or quality of life, vitrectomy can be a reasonable and effective option.

When proceeding with surgery, meticulous technique is essential to minimize risk. This includes performing a thorough vitrectomy, carefully assessing the peripheral retina for degenerations or breaks, and addressing any predisposing factors.

Overall, modern vitrectomy has evolved into a safe and effective option for carefully selected patients with symptomatic vitreous opacities. However, appropriate patient selection, surgical expertise, and careful risk-benefit assessment remain essential.

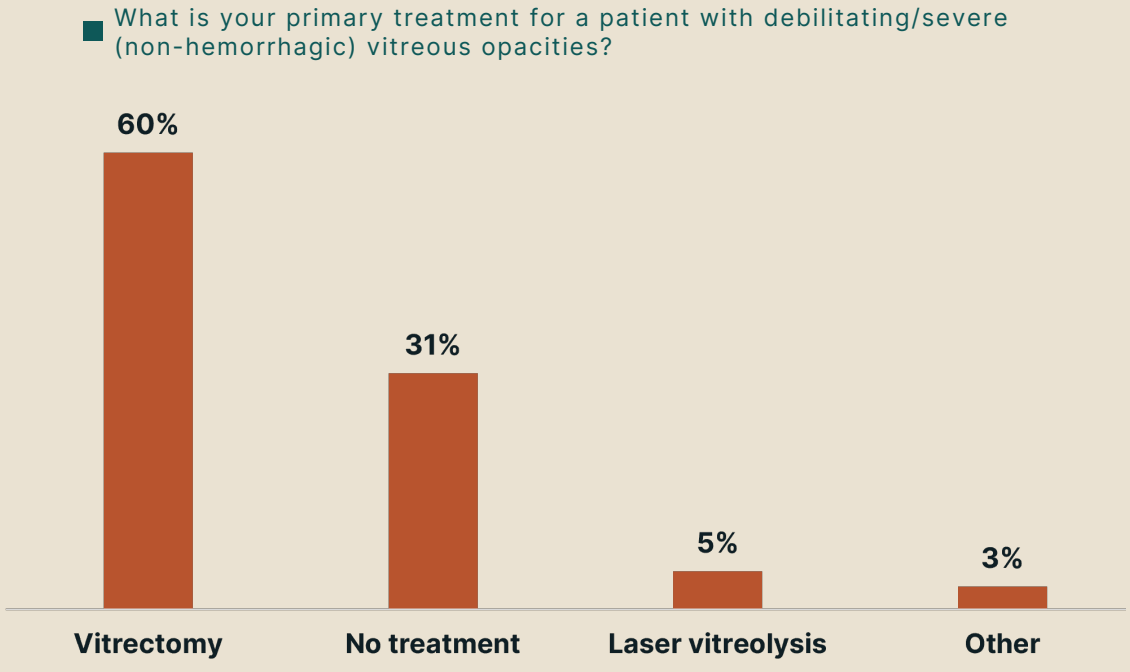

Figure 6. Vitrectomy is considered the primary treatment for patients with debilitating or severe (non-hemorrhagic) vitreous opacities by 60% of respondents.

The Rise of the Digital Visualisation

ADOPTION OF DIGITAL VISUALISATION SYSTEMS

Digital visualisation systems and digital operating rooms (DOR) represent a significant technological advancement in vitreoretinal surgery. However, the EURETINA survey highlights a clear gap between innovation and real-world adoption, with nearly 40% of surgeons reporting no access to these technologies in their surgical practice **(Figure 7)**.

From my perspective, this adoption gap is driven primarily by practical and economic considerations rather than a lack of perceived clinical value. The substantial cost difference between conventional microscopes and advanced digital systems makes widespread implementation challenging, especially outside high-volume centers.

At the same time, adoption is also influenced by perceived need. Surgeons who are not experiencing ergonomic strain or who are less involved in teaching may not immediately recognize the added value of digital platforms. As a result, uptake remains variable across institutions and practice settings.

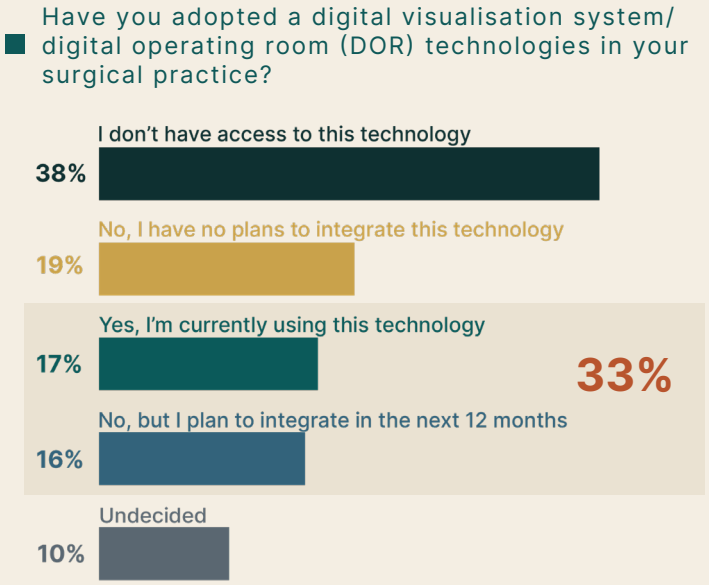

Figure 7. Only 33% of respondents currently use or plan to adopt digital visualization/DOR technologies within the next 12 months; 38% report no access, while 29% do not plan to integrate them or remain undecided.

> *"Despite clear benefits in ergonomics, safety, and teaching, adoption of 3D heads-up visualization remains limited."*

CLINICAL VALUE: ERGONOMICS, VISUALISATION, AND EDUCATION

Retinal surgery is physically demanding and often requires prolonged periods of looking into a microscope. According to the EURETINA survey, more than half of surgeons (55%) report always or occasionally experiencing pain or soreness related to surgical posture **(Figure 8)**, and improved ergonomics is cited as the main advantages of DORs **(Figure 9).**

In my experience, digital visualisation systems, particularly 3D heads-up platforms, offer a meaningful improvement in ergonomics. Transitioning away from conventional microscope viewing can significantly reduce physical strain, including neck and back discomfort, with potential benefits for long-term surgeon well-being and career sustainability.

Another key advantage lies in education/training and communication, which was cited by 42% and 26% of respondents, respectively. Digital systems allow the entire surgical team, including trainees, to share the same high-quality, real-time view of the procedure. This enhances teaching, facilitates intraoperative communication, and allows supervision to identify and address challenges more effectively during surgery.

Some of these advantages directly translate into improved outcomes for the patient. For example, digital visualisation enables reduced intraoperative light exposure, which may enhance retinal safety. This advantage was cited by 26% of respondents. While improvements in depth of field and magnification are often highlighted, the ergonomic benefits and the potential for safer illumination, are, in my view, more clinically relevant in daily practice.

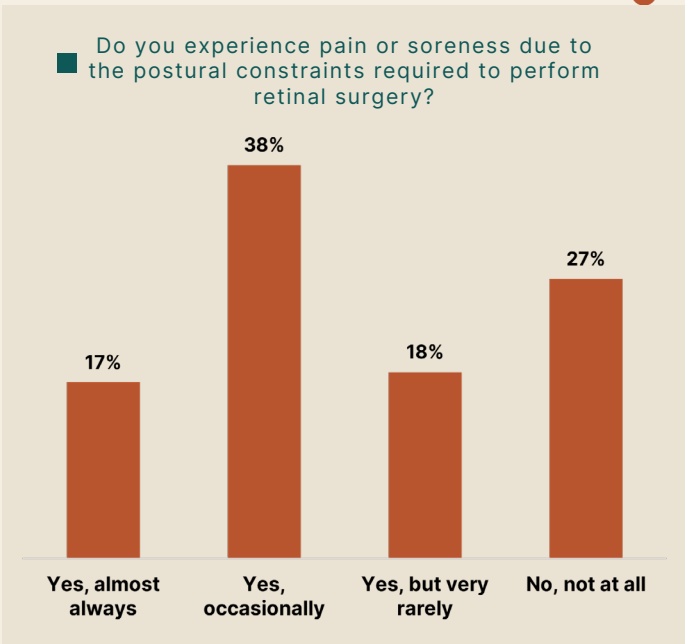

Figure 8. Fifty-five percent of surgeons always or occasionally experience pain or soreness due to the postural constraints required during retinal surgery.

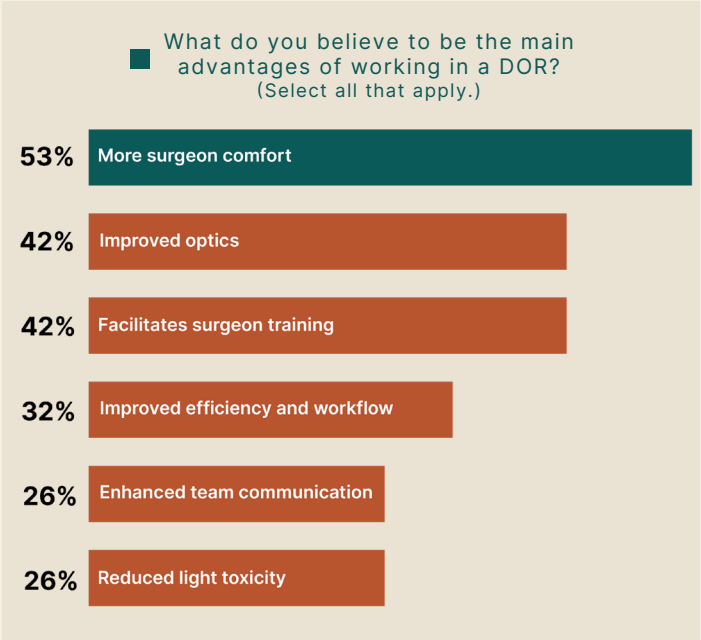

Figure 9. Main advantages of working in a DOR include improved surgeon comfort during procedures (53%), enhanced training capabilities (42%), and improved optics (42%).

BARRIERS TO ADOPTION AND FUTURE DIRECTIONS

Despite these advantages, adoption of DOR technologies remains limited, as discussed earlier. The EURETINA survey clearly identifies cost as the primary barrier, with a large majority of respondents citing it as the most significant limiting factor **(Figure 10).**

This data reinforces my view that if cost were not a limiting factor, adoption would be substantially higher. A practical approach in the current environment may be the gradual integration of digital systems, allowing surgeons to gain experience while maintaining conventional setups.

> *"The benefits of 3D digital visualization are clear, but the price gap remains the decisive barrier."*

Emerging technologies may help address some of these barriers. Head-mounted display systems, for example, offer a more compact and potentially cost-effective alternative to traditional 3D platforms. These systems do not require large external displays and may be particularly suitable for smaller operating rooms. They also allow greater freedom of movement, although surgeons must adapt their posture to fully benefit from these ergonomic advantages.

In my opinion, broader adoption will likely depend not only on improved affordability but also on stronger clinical evidence demonstrating patient benefit. For instance, robust data showing that reduced intraoperative light exposure translates into improved retinal safety could serve as an important driver for wider implementation.

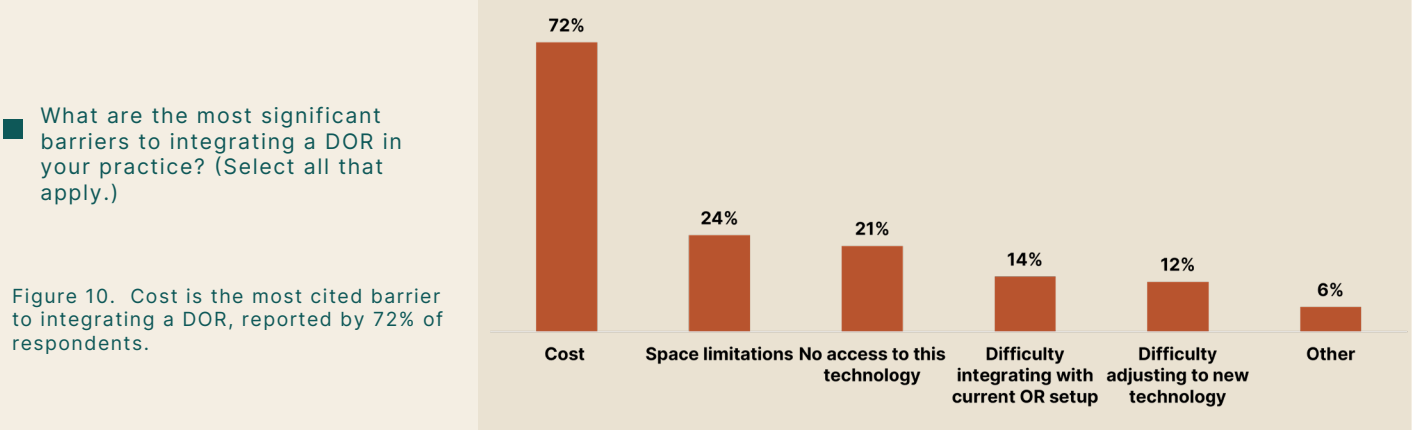

Figure 10. Cost is the most cited barrier to integrating a DOR, reported by 72% of respondents.

SURGEON CONFIDENCE AND TRAINING

Confidence in using digital visualisation systems remains variable among surgeons **(Figure 11)**, reflecting differences in exposure, training, and access.

Confidence is closely linked to experience. Digital visualisation systems provide a particularly strong advantage in training environments, allowing trainees to observe procedures with the same level of detail as the primary surgeon but without the limitations of traditional secondary oculars. This facilitates more effective teaching and enables supervisors to monitor and guide trainees more closely, potentially improving both learning outcomes and patient safety.

The future role of digital visualisation in retinal surgery will likely depend on both training and accessibility. As more surgeons gain exposure during fellowship and early clinical practice, confidence and adoption should increase.

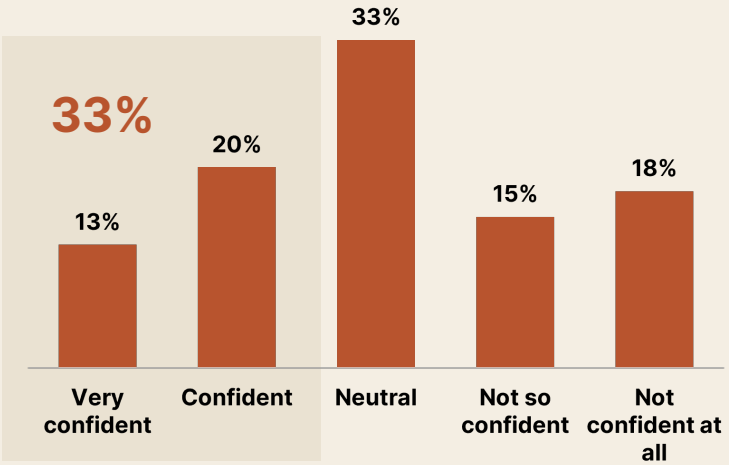

Figure 11. Only 33% of surgeons report feeling confident in utilizing digital visualization/DOR technologies in their surgical practice.

CONCLUSION

The 2025 EURETINA Clinical Trends Survey highlights a field in transition, where established surgical approaches continue to evolve alongside advances in technology and clinical practice. Vitrectomy remains the dominant technique for retinal detachment repair, with increasing emphasis on individualized decision-making based on case complexity and surgeon experience.

The survey also reveals marked variability in surgical volume, which has important implications for both surgical proficiency and training. Ensuring sufficient case exposure remains critical, and this variability raises important questions about how best to develop and sustain surgical expertise.

Advances in instrumentation, fluidics, and small-gauge surgery continue to improve safety and efficiency, while expanding surgical indications. At the same time, digital visualisation systems offer clear benefits in ergonomics, visualisation, and education, although their adoption remains limited, largely due to cost and access.

Overall, the findings underscore the need to balance innovation with practical implementation. Continued progress in technology, training, and accessibility will be essential to support the future of vitreoretinal surgery and ensure continued improvement in patient outcomes.

> *"3D heads-up systems transform surgical training by giving trainees the exact same view as the surgeon."*

Meet the *Author*

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Clinically, he specializes in lens, retina (including ophthalmic gene therapy), and corneal surgery. He is widely regarded as one of the most renowned ophthalmologists in the German-speaking region and has authored over 450 original publications. The professional magazine Focus has recognized him as one of the most important ophthalmologists in the German-speaking world.