

Spinal Endoscopy: Just a Recurring Fad?

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The idea that spinal endoscopy is “just a fad” is not new. It is a label that reappears cyclically, every time a new technology promises to “revolutionize” the treatment of degenerative spinal disorders. Today the question is whether endoscopy is truly a recurring fad, destined to resurface and then deflate, or whether it has reached a form of selective maturity, in which it becomes a stable tool in the armamentarium without claiming to be the new dogma.

To answer this question, we must start from what endoscopy cannot change: the natural history of disc herniation and the fact that no technique has been shown to be superior to simple discectomy in terms of long-term clinical outcomes.

A broad review by Delgado-López and colleagues [1] recalls that the natural history of sciatica due to lumbar disc herniation is often favourable: in many cases, pain regresses within weeks, and surgery primarily aims to provide faster relief than conservative treatment. Importantly, the authors emphasize that no surgical technique has proven clearly superior to standard discectomy for pain control and neurological recovery; neither microdiscectomy nor minimally invasive variants have demonstrated a durable advantage.

Against this background stands the entire field of “minimally invasive” techniques, including endoscopy. The Cochrane review by Rasouli *et al.* [2], comparing minimally invasive discectomy procedures with microdiscectomy/open discectomy, suggests potential benefits in terms of less blood loss, reduced early postoperative pain, and shorter hospital stay, but the overall quality of the evidence is limited and the differences in medium-to long-term functional outcomes are modest. In other words, the technique does not transform the disease, nor does it overturn the rules for surgical indication.

About endoscopy, data from earlier randomized trials have often tempered the more ideological enthusiasm. Righesso

and colleagues [3] compared open discectomy with microendoscopic discectomy (MED) in a randomized trial and reported comparable clinical and neurological outcomes at 24 months; the only significant differences concerned incision length and hospital stay (both reduced in the MED group), at the cost of longer operative times.

In another randomized study, Teli *et al.* [4] found that MED, while maintaining comparable functional results, is associated with a significantly higher risk of dural tears and recurrent herniation than microdiscectomy and traditional open discectomy.

These data must be considered alongside more pathophysiological evidence. Huang *et al.* [5] showed that, for similar clinical outcomes, the systemic inflammatory response, interleukin-6 (IL-6) and C-reactive protein (CRP), is significantly attenuated after microendoscopic discectomy compared with open discectomy: the “surgical trauma” measured by biomarkers is lower, despite a steeper learning curve. This is the prototype of what one expects from a truly minimally invasive technique: not necessarily “better” Numerical Rating Scale (NRS) or Oswestry Disability Index (ODI) scores at one year, but less tissue aggressiveness to achieve the same result.

In recent years, the evolution of spinal endoscopy has clearly accelerated. Kim *et al.* [6] outline a trajectory that goes from the first systems with a “coaxial” channel to modern high-definition endoscopes, with increasingly refined interlaminar and transforaminal approaches and indications extended to stenosis and multilevel degenerative disease. Park’s editorial [7], tellingly entitled “The Successful Evolution of Endoscopic Spine Surgery: Coincidence or Human Spirit?”, captures the point well: what once appeared to be a technological “ugly duckling” is now a mature platform, the result of surgical perseverance more than of a passing fashion.

However, the question in the title remains relevant because, alongside this technological evolution, comparative data do not describe a revolution in outcomes. Prospective and retrospective studies on contemporary cohorts confirm that endoscopy offers advantages mainly “at the margins” less early postoperative pain, shorter hospital stays, smaller scars, reduced muscular trauma. Zhao *et al.* [8], comparing percutaneous transforaminal endoscopic discectomy and fenestration discectomy for selected lumbar her-

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nations, reported that both approaches are effective and safe; endoscopy reduces early postoperative pain and length of hospitalization, but at follow-up clinical results are essentially comparable. A subsequent study by Apaydin *et al.* [9], comparing microendoscopic discectomy with conventional microdiscectomy, reached similar conclusions: the endoscopic technique improves some perioperative parameters and quality-of-life measures in the first weeks, without diverging meaningfully in long-term outcomes.

More recently, narrative and systematic reviews on unilateral endoscopic variants, such as percutaneous transforaminal endoscopic discectomy (PTED), unilateral biportal endoscopy (UBE), and other biportal techniques, have highlighted an interesting point: what is evolving is not so much the “philosophy” of the operation (removing the offending fragment and decompressing the root), as the ability to modulate approaches and trajectories according to anatomy and the migration pattern of the herniation [10].

Perhaps the most convincing evidence in favour of endoscopy as a technique “here to stay” comes from large real world data series. Perez-Albela and colleagues [11], based on a large administrative database with propensity score matching (2618 patients), showed that endoscopic discectomy is associated with a significantly lower risk of dural tears, wound infections, and wound-related complications compared with open discectomy, with two-year reoperation rates that are substantially comparable. This is not a spectacular result in clinical terms, but a concrete advantage in safety and perioperative morbidity, particularly in frail, comorbid populations.

How, then, can these elements be reconciled with the perception, at times, of a “recurring fad”? Probably by acknowledging some real risks:

- The steep learning curve: lumbar endoscopy is not just “a smaller incision” but requires complete retraining of the surgical gesture: triangulation, orientation in a narrow field, management of bleeding and complications in a confined space. Reports of higher rates of dural tears and recurrences during early phases of experience (e.g., Teli *et al.* [4]) are a warning not to trivialize the training phase.
- Case selection: the idea that “everything” can be treated endoscopically fuels unrealistic expectations. Even the most impressive endoscopic series often select patients with contained, non-calcified herniations in a relatively capacious canal. When indications are stretched, to massively migrated herniations, congenitally narrow canals, overt instability, the risk increases that endoscopy will truly become a fad, destined to be abandoned after some striking failures.
- The temptation of identity: in some settings, one can observe polarization between “pure endoscopists” and “defenders of open surgery”, as if the choice of technique were an identity marker rather than a clinical decision.

It is precisely here that the risk of “fashion” is greatest: when the technique becomes ideology rather than a tool.

Some important concepts to highlight are:

- It is not the scar that is minimally invasive, but the reasoning: the truly minimally invasive approach is the one that sacrifices as little as possible (bone, muscle, operative time, economic resources) while giving the patient the best combination of pain relief, function, and safety. Sometimes this ideal point is a standard microdiscectomy performed quickly, with a limited but adequate exposure; in other cases, it is a custom-made interlaminar endoscopic approach; in still other cases it is the courage not to operate and to prolong conservative therapy.
- Endoscopy is not a universal gold standard, but neither is it a mere fad: the available data, from randomized trials to meta-analyses and large databases, converge on a sober message: endoscopy offers clinical outcomes comparable to traditional discectomy, with a profile of invasiveness and wound-related complications that is often more favorable, at the price of a non-negligible learning curve and organizational investment [2–5,8,9,11]. It is hard to call it a “fad” when a technique spans three decades of development, multiple continents, and much of the spinal surgery community, while maintaining this consistency of results.
- There is a need for selective maturity: this means stopping asking whether endoscopy will “win” over microdiscectomy, and starting to ask for which patients, in which settings, and with which resources it truly provides added value. It also means accepting that a peripheral center with low volumes, no experienced mentoring, and limited ability to manage complications does not necessarily have to “convert” to endoscopy to feel up to date. Conversely, centers that have already developed endoscopic expertise and infrastructure should commit to generating high-quality data: registries, pragmatic prospective studies, cost-effective analyses, and assessments of impact on return to work.

In conclusion, in response to the question “Spinal endoscopy: just a recurring fad?” the answer, considering current evidence, is twofold. It has indeed been experienced as a fad in its initial waves, when promises and marketing preceded the data. But what remains today is a set of mature techniques, capable of reducing surgical invasiveness for equivalent results, in expert hands and appropriately structured settings. It is not (and probably will never become) a universal panacea or a new dogma; it is, more simply, one more language the spine surgeon should master, to choose each time not the “fashionable” technique, but the right one for that patient, at that particular point in their natural history.

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Not applicable.

Author Contributions

RD, DF, BB, CGG and CZ contributed to the conception of the work. RD wrote the manuscript. All authors have been involved in revising the manuscript critically for important intellectual content. All authors gave final approval of the version to be published. All authors have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to its accuracy or integrity.

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Conflict of Interest

Cesare Zoia is serving as one of the Editorial Board members of this journal. We declare that Cesare Zoia had no involvement in the review of this article and has no access to information regarding its review. Other authors declare no conflicts of interest.

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