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Bracing and Activity Restriction After Lumbar Discectomy Surgery: An International Survey of AO Spine Members

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Objective: Bracing after lumbar discectomy surgery (LDS) is a controversial topic with paucity of related scientific literature. Previous surveys on spine surgeons' preferences were limited both in geographical coverage and number of respondents. The aim of this study is to fill this gap in the literature.
Methods: An international online survey among AO Spine members regarding the postoperative recommendations for bracing (PoBr), activity restriction (AR), and associated factors, was performed.
Results: A total of 703 spine surgeons participated in the survey of which 34% recommended PoBr, with half of them reported usage for 4 weeks. Main influencing variables were being from Europe/South Africa region, greater extent of bony decompression, and larger amount of excised disc material. Seventy-nine percent of the respondents recommended postoperative AR. Prolonged standing, prolonged sitting, and driving were usually restricted for 2 weeks. Bending, twisting, lifting, and low-intensity physical activities for 3 months, while high-intensity physical activities and direct contact sports for 6 months were restricted.
Conclusion: Despite recent literature insights showing limited evidence of efficacy, 34% and 80% of a large cohort of international surgeons practice bracing and recommend AR after LDS for variable durations. Extensive bony decompression and radical discectomy significantly influenced the decision to brace, similarly endoscopic approaches and radical discectomy influenced the decision to restrict activity. These findings emphasize the persistent evidence-practice gap and the wide variability on the global level. More randomized controlled trials are warranted on this topic to reach an evidence-based recommendation.

Keywords: Lumbar discectomy, Bracing, Orthosis, Activity restriction, Survey

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INTRODUCTION

Low back pain is a major global public health concern, and a leading cause of disability worldwide,[1] with a prevalence up to 7.2%, affecting approximately 80% of individuals at some point in their lives.[2] The presentation of low back pain associated with pain radiating to the lower limbs is most commonly attributed to lumbar disc herniation (LDH).[3] Lumbar discectomy surgery (LDS) is usually reserved for cases in which conservative treatments have failed, with approximately 300,000 surgeries performed per year in the United States.[4] The satisfaction rates after LDS procedures are of the highest in spine surgery, uniformly exceeding 75 %[5] despite the notable variability in the surgical approaches and the postoperative management protocols implemented.[6,7]

Various recommendations have been published for postoperative care strategies after LDS, showing inconsistency in the recommendation grades of most available treatment modalities.[8,9] In particular, there is no widely accepted consensus about the actual need for postoperative bracing (PoBr), or the prespecified period of certain activity restriction (AR) after surgery.[7,10] Theoretically, bracing and certain AR would reduce excessive motion and mechanical loading on the operated intervertebral disc level and thus help to decrease postoperative pain and risk of reherniation in the immediate postoperative period.[11] However, unnecessary external immobilization and movement restriction might be associated with discomfort, skin irritation, back muscle weakness and stiffness, higher healthcare costs, delays in returning to work and resuming normal daily activities.[12,13]

Recent publications failed to prove a positive impact of bracing and AR after LDS,[10,14-16] however the current practice among surgeons tends to ignore these findings as captured by a few surveys conducted over the last 2 decades.[17-20] Unfortunately, most of these surveys were not investigating postoperative management trends pertaining specifically to LDS, but rather a broader list of fusion and nonfusion procedures addressing different spine pathologies.[17-19] Also, these surveys showed clear geographical limitations as well as critically small sample sizes. Therefore, the aim of our study was to survey an internationally diverse cohort to assess surgeon preferences regarding bracing and AR practices after LDS, with specific details regarding surgical technique and pathology.

MATERIALS AND METHODS

1. Study Design

An online survey in English language was developed by the AO Spine society Knowledge Forum Degenerative to understand the preferences of surgeons regarding management of LDH. The content and design were driven by the input of an international group of the forum's members. The survey link was distributed internationally in September 2024 to all AO Spine members registered emails. A reminder email was sent about 10 days later to encourage participation. Participants were able to review their answers while completing the questionnaire. Consent of participation was considered by voluntary completion of the questionnaire. No financial compensation was provided for participation in the survey.

2. Materials

Surgeons' demographic information was collected including geographic region of practice (Asia Pacific [AP], North America [NA], Latin America [LA], Europe and Southern Africa [E&SA], and Middle East and Northern Africa [MENA]), completion of a spine fellowship, years of practice, practice setting (academic/public or private), practice area (rural, suburban, rural), and background speciality (neurosurgery or orthopaedics). Surgical load numbers like LDH cases diagnosed per month, LDH cases operated per year, and all spine cases operated per year were also collected. Surgical technique preferences regarding approach (open, mini-open, tubular, full endoscopic, or unilateral biportal endoscopy), extent of bony decompression (laminectomy, hemilaminectomy, laminotomy, transforaminal endoscopic, interlaminar endoscopic), and amount of excised disc material (sequestrectomy, partial discectomy, radical discectomy) were collected. Surgeons were asked about their preference for bracing and its duration. Also, they were asked about their recommendations for postoperative AR regarding type and duration. The data of this cross-sectional study were reported according to the CHERRIES (Checklist for Reporting Results of Internet E-Surveys) checklist for internet surveys[21] and the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement for cross-sectional studies.[22]

The primary outcome of this study was the agreement between surgeons regarding their practices for bracing and AR. Secondary outcomes included assessment of demographic and surgical variables as potential predictors of their postoperative recommendations.

3. Statistical Analysis

We used percentages to represent the categorical data and used chi-squared test to analyse the influence of the demographic variables towards the decision for bracing and recommend post-

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operative AR in various scenarios of LDS. A p-value less than 0.05 was considered significant for demographic variables and less than 0.005 for surgical variables. Statistical analysis was performed using IBM SPSS Statistics ver. 25.0 (IBM Co., USA).

RESULTS

1. Survey Demographics

A total of 714 responses were returned of which 11 were excluded due to incomplete answers, resulting in 703 complete questionnaires which were included for analysis. The demographic characteristics of the respondents categorized in relation to their bracing practice are shown in Supplementary Tables 1–3, as well as categorized in relation to their recommendation for or against postoperative AR are shown in Supplementary Table 4.

2. Bracing Recommendation

Only 34% of all respondents (235 of 703) recommend bracing postoperatively. Among the demographic and surgical domains investigated, the region of practice ($p = 0.04$), completing a spine fellowship ($p = 0.03$), laminectomy technique ($p < 0.001$), and surgery type ($p < 0.001$) showed statistical significance among the subgroups' bracing practices. Bracing was more common among surgeons from E&SA (41%, $p = 0.02$) followed by surgeons from NA (38%, $p = 0.2$), LA (31%, $p = 0.5$), and AP (29%, $p = 0.8$) in comparison to surgeons from MENA region (26%). Non-fellowship-trained surgeons tend to recommend bracing (39%, $p = 0.03$) in comparison to fellowship-trained ones (31%). Bracing was less commonly recommended after laminotomy (29%, $p < 0.001$) and hemilaminectomy (34%, $p < 0.001$) than after laminectomy (63%). Also, Bracing was more commonly recommended after radical discectomy (57%, $p < 0.001$), and partial discectomy (33%, $p = 0.01$) than after sequestrectomy (23%). Other variables like background specialty, practice setting, practice area, years of experience, surgical load, and surgical approach did not show a significant difference in bracing preference or frequency.

Of those 235 surgeons who recommend PoBr, 90 (38%) recommended it for 2 weeks, 113 (48%) for 4 weeks, and 32 (14%) for more than 4 weeks. The length of recommended bracing did not significantly correlate with any other demographic or surgical variable (Supplementary Tables 5–7).

When considering length of stay after surgery, surgeons who recommend bracing for longer periods tend to keep their patients in the hospital longer periods. Upon comparing surgeons who brace for more than 4 weeks to those who brace for only 2 weeks, 18% discharge their patients the next day (vs. 46%) and 12% keep their patients for more than 7 days (vs. 1%) (Supplementary Table 8).

3. Activity Restriction

Most surgeons (79%, 560 of 703) advised for AR after LDS, and among the demographic and surgical domains investigated, AR was slightly more commonly recommended among surgeons from North (84%) and Latin (85%) Americas versus other parts of the world, Orthopedicians (81%) versus neurosurgeons (76%), those who attended a spine fellowship (81%) versus those who did not (77%), and among surgeons with more than 10 years of experience, however none of these mild differences showed statistical significance. AR was even common among those who did not recommend for bracing (76%, 356 of 468), with the highest percentage existed among those who advised bracing for 4 weeks (90%, 102 of 113). About the relation between AR and surgical approach and discectomy technique, AR was more recommended after endoscopic approaches (88%, $p < 0.001$), as was slightly more recommended after transforaminal than interlaminar endoscopic techniques (89% vs. 86%). Also, AR was recommended more after radical discectomy (87%, $p < 0.001$) than after partial discectomy (81%) and sequestrectomy (78%) (Supplementary Tables 9 and 10).

Considering the type of AR, prolonged standing (as advised by 194 surgeons), prolonged sitting (by 211 surgeon), and driving (by 250) were usually restricted for 2 weeks, however closely similar number of surgeons advised to extend these activities restriction further to the 3-months period (standing by 182, sitting by 192, and driving by 204). More strenuous activities were commonly restricted for a 3-month period like bending (by 328), twisting (by 302), lifting (by 337), and low-intensity physical activities (by 259). More demanding activities were further delayed till the 6-month period like high-intensity physical activities (by 213) and direct contact sports (by 229).

The percentage of surgeons who do not recommend bracing but still recommend against the return to direct contact sport and high-intensity physical activities for more than 12 months after surgery are about 2.5% and 5%, respectively. This percentage doubled to 6% and 12% respectively among surgeons who recommend for bracing for periods of more than 4 weeks (Supplementary Tables 11 and 12).

DISCUSSION

The brace or orthosis is defined as an externally applied de-

vice used to modify the structural and functional characteristics of the neuromuscular and skeletal system. Although there is limited evidence to support its efficacy,[10] bracing is routinely used after surgery for a number of spinal pathologies, including degenerative disease, fractures, and deformity, and remains a widespread and relatively common practice among surgeons. The assumed goals of this practice are to immobilize the spine, relieve pain, improve fusion rates, and remind patients to avoid certain activities that may compromise their recovery.[15]

However, the rationale for bracing is even less clear when dealing with non-instrumented surgeries like LDS because the aim of immobilizing the spine and supporting the instrumentation fusion is lacking.[23,24] Other goals like pain relief are being successfully addressed by alternative standard perioperative pain control protocols.[25] Using braces can carry its short comings, with a number of reported complications including being uncomfortable, contact dermatitis in sensitive areas such as the fresh surgical wound especially in summer, pressure ulcers, and even being relatively costly for some patients.[26]

The presence of high-quality research papers which tried to investigate the efficacy of bracing after LDS is scant. There are only 2 clinical studies that specifically investigated this controversial topic. Zoia et al.[16] in 2018 reported about their randomized control study investigating a total of 54 patients and concluded that bracing did not improve patient reported outcomes after single-level LDS at the 1- and 6-month follow-up visits, irrespective of the scale used. Similarly, Sakaki et al.[14] in a more recent publication in 2023 reported on their prospective cohort study of 42 patients in the orthosis group and 39 patients in the nonorthosis group who were followed up for at least 1-year after a single-level LDS, and they also concluded that at any follow-up period, no significant differences were observed between the 2 groups in recurrence rate, reoperation rate, or any patient reported outcomes score. Yet there seem to be a discrepancy between the recommendations driven by the scientific trials and the actual practice among surgeons.

The current survey is the first in the literature to report about spine surgeons' preference patterns regarding bracing and AR after LDS on a wide geographical range and large participant scale. Only one earlier online survey conducted by Sousa et al.[20] in 2023 among 59 Portuguese surgeons did inquire specifically about bracing practice after single-level LDS. In comparison to the AO Spine current survey, Sousa et al.[20] reported higher percentage of participants with neurosurgical background (78% vs. 37%), less tendency to brace (7% vs. 34%), shorter bracing period for those who chose to brace (100% for 3 weeks vs. 38%, 48%, 14% for 2, 4, and more than 4 weeks, respectively), and that orthopedic surgeons were statistically more prone to recommend bracing ($p = 0.03$). Three other surveys with the earliest in 2009 reported on bracing practice after various fusion and nonfusion spinal procedures.[17-19] An effort for analysis of the LDS subgroups reported within these surveys as well as highlighting the differences with the current AO Spine survey and the survey of Sousa et al.,[20] is provided in Table 1. The reported bracing practice in these surveys ranges from 10% to 13% which is lower than the AO Spine survey percentage of 34%. This might be attributed to the much larger geographical representation and the much larger number of participants in the AO Spine survey. Despite the one and half decade lapsing time interval between the first conducted survey and the current AO one, and the recent increase in number of publications arguing against the benefit of bracing, our results confirm the growing mismatch still surrounding this topic between available scientific evidence and real-life practice, which seems to be larger on the international level.

The current survey also shed some light on the possible grounds for surgeons bracing practices, a more extensive bony decompression, and a more aggressive disc material debulking seems to significantly influence the surgeons' decision to brace.

Recent studies suggest that early mobilization and graded physical activity do not increase the risk of recurrence and may even accelerate functional recovery and return to work.[27,28] In the current survey, AR after LDS emerged as a more prevalent postoperative recommendation than bracing, with up to three-quarters of the surgeons who did not opt for PoBr still recommend AR. This finding highlights that, despite limited evidence supporting the efficacy of strict postoperative restrictions, conservative advice remains widespread, possibly reflecting cautious clinical attitudes and cultural norms rather than data-driven decisions.[29] It is noted that the more cautious survey respondents who practice bracing for a comparatively longer postoperative periods of 4 weeks or more, also represent the subgroup with highest consistent recommendation for AR (89.6%, 130 of 145 vs. an overall average of 79%).

Although, one of the main presumed advantages of postoperative AR is reducing the risk of recurrent herniation, this has been challenged by several authors, e.g., Carragee et al.[30] in their prospective study of 152 patients who have undergone open discectomy without postoperative AR recommendation, with one third of their patients returned to work within one week of surgery, they reported that very early return to work did not statistically correlate with either recurrent sciatica or reoperation

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Table 1. Surveys reporting about postoperative bracing after lumbar discectomy surgery

	Bible et al.[17] (2009)	Bogaert et al.[18] (2019)	Pathak et al.[19] (2021)	Sousa et al.[20] (2023)	Current study (2025)
Targeted spine surgeons	Attending the 20th Update on Disorders of the Spine meeting (January 2008)	Affiliated to the Spine Society of Belgium	Attending the Lumbar Spine Research Society Annual Meeting (April 2019)	Affiliated to the Spine Pathology Society of Portugal and the Neurosurgery Society of Portugal	AO Spine members
Country of practice	14% were practicing outside United States	Belgium	United States	Portugal	International
Format of the survey	Single page questionnaire	Online survey	Single page questionnaire	Online survey	Online survey
No. of surgeons who completed the whole survey	88	97	73	59	714
Lumbar surgeries screened	Fusion and nonfusion surgeries	Fusion and nonfusion surgeries	Fusion and nonfusion surgeries	Single-level disc herniation	Lumbar disc herniation
Surgeons' demographics					
Orthopedicians vs. neurosurgeons	55% vs. 45%	51% vs. 49%	78% vs. 22%	22% vs. 78%	63% vs. 37%
Practice setting Academic vs. private	40% vs. 60%	26 vs. 74%	73% vs. 27%	23% vs. 22 (55% hybrid)	69% vs. 31%
Surgeons completed a spine fellowship	66%	57%	84%	-	63%
Bracing practice					
Bracing after discectomy surgery	10%	13%	11%	7%	34%
Duration	< 3 wk 45% 3–8 wk 55%	< 3 wk 4% 3–8 wk 65% 2–4 mo 30% (lumbar fusion and laminectomy)	3–8 wk 75% 2–4 mo 25%	< 3 wk 100%	< 2 wk 13% 2–4 wk 16% > 4 wk 5%
Brace prescription prevalence					
Orthopedicians vs. neurosurgeons	59% vs. 64% Not significant	73% vs. 44% Significant	27% vs. 24% Not significant	Significant Orthopedic surgeons tend to use braces more.	32% vs. 36% Not significant
Fellowship vs. nonfellowship	61% vs. 46% Significant	65% vs. 50% Not significant	27% vs. 23% Not significant	Not reported	31% vs. 39% Not significant
Academic vs. private	58% vs. 55% Not significant	56% vs. 60% Not significant	17% vs. 50% Significant	Not significant	33% vs. 35% Not significant
Years of experience	Not significant	Not significant	Not significant	Not significant	Not significant

for reherniation. This can be reflected on survey results that have shown that there is statistically significant increase in recommending AR after endoscopic approaches, which can be explained by the general perception that endoscopic discectomy approaches and techniques ought to more associated with risk of disc residual or disc reherniation.[31,32] Similarly, discectomy techniques involving larger annular fenestration as in radical discectomy are also perceived as having higher risk or reherniation.[33] This might explain the reason behind the fact that more of the survey respondents preferred to recommend AR after radical discectomy than after any other discectomy technique.

From a health care prospective, nonevidence based bracing practices after LDS indirectly give the patients the impression that bracing is to reduce the pain that "will eventually occur" and to restrict the movement that "is perceived as harmful". This is contradictory to the growing scientific concern that unrealistic fear from postoperative pain may increase avoidance of movement and early rehabilitation.[34] It has been demonstrated that kinesiophobia after LDS is associated with poorer postoperative outcomes.[35] Also, researchers investigated the possible unfavorable impact of bracing on trunk muscles activity and proprioception even for periods as short as 3 weeks.[12,36] Other important concerns are that the lack of evidence-based guidance leads to reliance on subjective opinions, with conflicting and contradictory advice among surgeons that increases re-consultations and follow ups, reduce surgeon's credibility, and might pose litigation risks. Future studies should include more contextual factors to understand different attitudes towards bracing and AR. Lack of enough pooled clinical data preclude developing tailored recommendations regarding PoBr and AR, some high-risk patients' cohorts may benefit from longer bracing and specific AR protocols without affecting the final long term functional outcome.[37]

This study has several limitations. It is descriptive and cannot provide any clinical insight into causality. And since the survey was voluntary, there is a potential for nonresponse bias. The surgeons who responded were possibly more interested in bracing or its related science, and therefore their opinions may differ of non-responders. All the received responses were included in the data set, so respondents' selection bias by demographics, type of practice, surgery volume or other variables cannot be excluded. No sample size prediction was made. Also, relying mainly on univariate (chi-square) statistical analysis misses potential confounding variables and hence fail to identify independent predictors of bracing practice. Finally, it is possible that the self-reported prescription patterns did not perfectly correlate with the actual clinical practice. However, these limitations are inherent to a survey design.

CONCLUSION

Despite recent insights into the literature showing limited evidence of efficacy, one third of a large cohort of international surgeons practice bracing after LDS for variable duration. A more extensive bony decompression, and a more aggressive disc material debulking seems to significantly influence the surgeons' decision to brace. Similarly, with equivalent lack of evidence for need or of a protective impact, recommending postoperative ARs was prevalent among 80% of the survey respondents showing substantial variability in type and duration with preferences to use after endoscopic approaches and/or after radical discectomy techniques. These findings emphasize the persistent gap between scientific evidence and daily practice in the postoperative management of LDS patients and the wide variability on the global level. It seems that fear from postoperative pain and reherniation especially after more extensive bony decompression or/and disc material excision are the main drivers of this evidence-practice discrepancies. More randomized controlled trials addressing these valid postoperative concerns are warranted to reach an evidence-based consensus recommendation establishing standardized, procedure-specific postoperative care pathways could help optimize recovery, improve patient confidence, and reduce unnecessary variability in global spine practice.

NOTES

Supplementary Materials: Supplementary Tables 1-12 are available at https://doi.org/10.14245/ns.2551622.811.

Conflict of Interest: The authors have nothing to disclose.

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