Patients Preferences for the Treatment of Lumbar Disk Herniation: a discrete choice experiment

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CLINICAL ARTICLE

Patient preferences for treatment of lumbar disc herniation: a discrete choice experiment

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OBJECTIVE Lumbar discectomy is a frequently performed procedure to treat sciatica caused by lumbar disc herniation. Multiple surgical techniques are available, and the popularity of minimally invasive surgical techniques is increasing worldwide. Clinical outcomes between these techniques may not show any substantial differences. As lumbar discectomy is an elective procedure, patients' own preferences play an important role in determining the procedure they will undergo. The aims of the current study were to determine the relative preference weights patients apply to various attributes of lumbar discectomy, determine if patient preferences change after surgery, identify preference heterogeneity for choosing surgery for sciatica, and calculate patient willingness to pay for other attributes.

METHODS A discrete choice experiment (DCE) was conducted among patients with sciatica caused by lumbar disc herniation. A questionnaire was administered to patients before they underwent surgery and to an independent sample of patients who had already undergone surgery. The DCE required patients to choose between two surgical techniques or to opt out from 12 choice sets with alternating characteristic levels: waiting time for surgery, out-of-pocket costs, size of the scar, need of general anesthesia, need for hospitalization, effect on leg pain, and duration of the recovery period.

RESULTS A total of 287 patients were included in the DCE analysis. All attributes, except scar size, had a significant influence on the overall preferences of patients. The effect on leg pain was the most important characteristic in the decision for a surgical procedure (by 44.8%). The potential out-of-pocket costs for the procedure (28.8%), the wait time (12.8%), need for general anesthesia (7.5%), need for hospitalization (4.3%), and the recovery period (1.8%) followed. Preferences were independent of the scores on patient-reported outcome measures and baseline characteristics. Three latent classes could be identified with specific preference patterns. Willingness-to-pay was the highest for effectiveness on leg pain, with patients willing to pay €3133 for a treatment that has a 90% effectiveness instead of 70%.

CONCLUSIONS Effect on leg pain is the most important factor for patients in deciding to undergo surgery for sciatica. Not all proposed advantages of minimally invasive spine surgery (e.g., size of the scar, no need of general anesthesia) are necessarily perceived as advantages by patients. Spine surgeons should propose surgical techniques for sciatica, not only based on own ability and proposed eligibility, but also based on patient preferences as is part of shared decision making.

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KEYWORDS lumbar disc herniation; preferences; discrete choice experiment

Even though sciatica caused by lumbar disc herniation has a favorable prognosis with conservative treatment, lumbar discectomy remains a frequently performed procedure by spine surgeons.[1,2] Annually, over 480,000 lumbar discectomies are performed in the US.[3] The current surgical procedure of choice is conventional open microdiscectomy (OM).[4,5] During OM, the herniation is removed through a transflaval approach with or without the use of magnification by loupes or microscope.

Throughout the years multiple surgical techniques have

ABBREVIATIONS COMI-back = Core Outcome Measures Index for back pain; DCE = discrete choice experiment; MNL = multinomial logit; NRS = numeric rating scale; OM = open microdiscectomy; PELD = percutaneous endoscopic lumbar discectomy; PTED = percutaneous transforaminal endoscopic discectomy.

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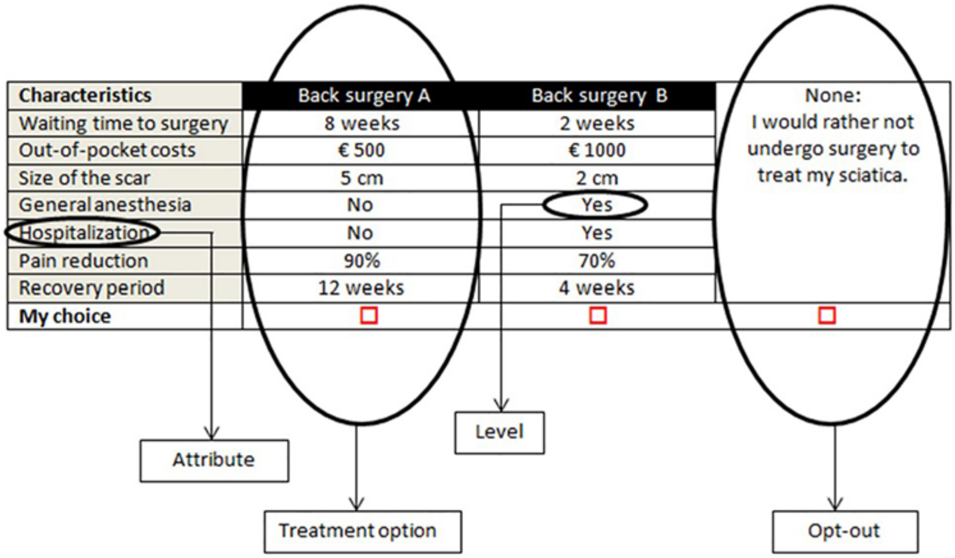

FIG. 1. Example of a choice set of the DCE. Figure is available in color online only.

become part of the surgical armamentarium, mainly due to the refinement of surgical instruments and the development of endoscopes.[6] Therefore, less-invasive techniques were introduced. The aim of these more recent surgical techniques is to reduce the surgical invasiveness of OM and improve patient outcomes, such as leg pain, back pain, and recovery time. Examples of surgical techniques that were intended to be less invasive are tubular discectomy and percutaneous transforaminal endoscopic discectomy (PTED).[7–9] During tubular discectomy, the disc herniation is removed by using a tubular retractor system that splits the back muscles. During PTED, which is performed by using instruments through an incision of approximately 8 mm with the patient under local anesthesia, the disc herniation is removed through the neuroforamen. In recently reported meta-analyses authors have analyzed and pooled the outcomes of studies comparing tubular discectomy and PTED with conventional OM[10,11] and concluded that the results of tubular discectomy and OM are largely comparable and that endoscopic discectomy might have some advantages in outcomes compared to OM, such as blood loss, duration of hospitalization, and time until return to work. These advantages, however, were of uncertain clinical relevance and the evidence in favor for these advantages might be hampered by a high risk of bias. Therefore, high-quality studies comparing PTED and OM are warranted.

Because outcomes of patients undergoing different surgical techniques for disc herniation are comparable, the application of these techniques is subject to practice variation. A recent survey among 817 spine surgeons employed worldwide showed that in the treatment of sciatica more than 80% of the surgeons usually performed OM.[12] Tubular discectomy was only performed routinely by 14% of the surgeons while percutaneous endoscopic lumbar discectomy (PELD; including PTED) was routinely performed by less than 5% of the surgeons. Aside from the lack of evidence in favor of tubular discectomy and PELD, previous research has shown that the risk of complications, the risk of recurrent disc herniation, and the effect on leg pain were the most important factors in deciding which surgical procedure is offered by surgeons.[13] Aside from the surgeons' preferences in offering certain techniques to treat sciatica, patients' own preferences might also play an important role in determining the procedure they will undergo. Currently it is unknown which characteristics of the different surgical techniques (e.g., size of the scar, ability to undergo surgery under local anesthesia) determine the preferences patients have for elective surgery for sciatica. Therefore, the aims of the current study were to 1) determine the relative weights of preference patients give to various attributes of lumbar discectomy, 2) determine the trade-offs patients were willing to make between these various attributes, 3) determine if patients' preferences change after surgery, and 4) identify preference heterogeneity for choosing surgery for sciatica.

Methods

Discrete Choice Experiment

A discrete choice experiment (DCE) was developed. A DCE is a survey method that is most often used to elicit preferences by analyzing how patients weigh and trade off characteristics of treatments.[14] The theoretical foundation of a DCE is that when choices are made for different treatment modalities, characteristics (i.e., attributes) of the treatment options are traded off against each other. For instance, back surgery interventions can be characterized by whether general anesthesia is required or not and by the size of the scar (e.g., 1, 2, or 5 cm). By making choices based on these treatment attributes or their alternative levels, preferences can be measured (Fig. 1).

Attributes and Attribute Levels

Based on the literature, a list of potential attributes with their potential levels was made.[15–17] Subsequently, interviews were held with patients at the outpatient clinic to evaluate these potential attributes and identify any additional attributes. In the next stage, a focus group session was held with a neurosurgeon and a senior and a junior researcher in spine surgery. During this focus group session, all potential attributes were discussed and ranked. Eventually, a list of seven attributes with two to four levels was finalized (Table 1). These attributes were 1) waiting time for surgery, 2) out-of-pocket costs, 3) size of the scar, 4) use of general anesthesia, 5) need for hospitalization, 6) effect on leg pain, and 7) duration of the recovery period. It was hypothesized that patients would prefer surgery with no waiting time, no out-of-pocket costs, small size of the scar, no use of general anesthesia, the largest effect on leg pain, and the shortest recovery period.

Questionnaire Design

Based on the seven attributes and the two to four levels, 1296 treatment profiles ($2^2 \times 3^4 \times 4^1$) were possible. Because it would not be feasible to present patients with all potential treatment profiles, a Bayesian efficient design maximizing D-efficiency was used to estimate all coefficients.[18,19] Eventually 24 choice sets were created which were divided in two versions with 12 choice sets to further reduce the response burden to patients. An unlabeled DCE design was applied to avoid bias that may be associated with the name of an intervention. For example, asking patients to choose between procedure A, open discectomy, and procedure B, endoscopic discectomy, may already evoke a preference aside from the attributes. Therefore, the procedures were described as "back surgery A" and "back surgery B." Because lumbar discectomy is an elective procedure, an opt-out option was added. If, based on the attributes of option A and option B, patients would decide to rather not undergo surgery, they could choose to opt out. Both versions with 12 choice sets were randomly distributed to the patients. After pilot testing these two versions, the design was updated to increase the statistical efficiency of the DCE. It was estimated that at least 84 respondents were required to perform reliable preference analyses.[20]

Both versions of the DCE were accompanied with an extensive instruction and the Core Outcome Measures Index for back pain (COMI-back).[21,22] The COMI-back is a 7-question patient-reported outcome questionnaire used to measure the severity of back disorders on a scale ranging from 0 (best status) to 10 (worst status). The COMI-back is based on the domains function, symptom-specific well-being, quality of life, disability, and both back and leg pain. Back and leg pain were measured on a numeric rating scale (NRS) ranging from 0 (no pain) to 10 (worst pain that I can imagine). The version of the questionnaire for the postsurgery group contained two 7-point Likert scales on satisfaction with treatment and recovery and symptoms. The current study incorporated a pilot design which required at least 10% of the attempted sample size to complete the DCE. Based on the pilot testing, the data would be analyzed in order to optimize the efficiency of the design.

Study Sample

In order to estimate patient preferences before and after surgery, two independent patient groups were approached for inclusion: a presurgery and a postsurgery group. Subsamples of both groups participated at the study pilot. The presurgery group consisted of patients with sciatica scheduled for surgery who were prospectively included at two clinics during a 3-year period. Patients would receive surgery within 1 to 2 weeks after their consultation with the neurosurgeon. The postsurgery group consisted of patients who underwent discectomy at one of those two clinics during a 3-year period prior to the start of the study. In general, patients were considered candidates for surgery when they had the following indications: 1) at least 6 weeks of radiating leg pain, 2) an MRI-confirmed lumbar disc herniation, and 3) sciatica that was unresponsive or insufficiently responsive to conservative treatment with or without motor loss. All patients were approached through regular mail and returned the questionnaires by using included prestamped return envelopes. All patients gave their written informed consent prior to study inclusion. The Medical Ethical Committee of the Erasmus MC—University Medical Center Rotterdam gave approval for the conduction of this study.

TABLE 1. Attributes and levels of the surgical options used in the DCE

Attributes & Levels
Pt waiting time for op, wks
2
4
8
Pt out-of-pocket cost for procedure, €
None
500
1000
2000
Size of back scar after op, cm
1
2
5
General vs local anesthesia
Yes
No
Hospitalization 1–2 days vs outpatient
Yes
No
Leg pain reduction postop
70%
80%
90%
Postop duration to return to normal activities, wks
1
4
12

Pt = patient.

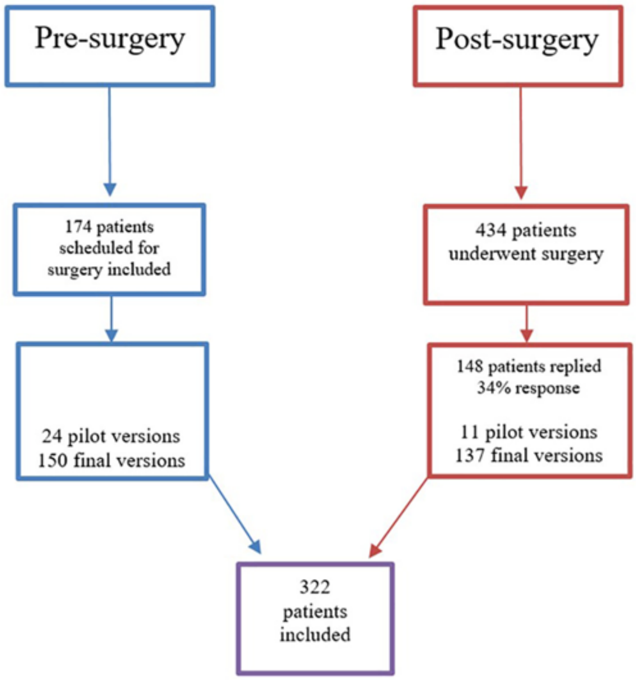

FIG. 2. Flowchart of the study procedures. Figure is available in color online only.

Surgical Techniques

Patients in the postsurgery arm underwent surgery either by OM or PTED, based on preferences of both the surgeon and the patient. Surgery was performed by surgeons that had extensive experience in PTED and OM.[19]

The PTED technique has been described previously.[8] In brief, PTED was performed with the patient under local anesthesia. With the use of anteroposterior and lateral fluoroscopy, a needle and subsequently a guidewire was placed to the superior articular process of the lower involved disc levels. After introduction of conical rods and enlarging the neuroforamen with a drill, an endoscope and forceps were introduced via a working channel. After removal of the disc fragments, all instruments were removed and the skin was closed.

General anesthesia was used for conducting OM. After verification of the disc level with fluoroscopy, a paramedian incision was performed and indications of the lamina, ligamentum flavum, and optional parts of the lamina were removed. After identification of the nerve root, the disc herniation was removed. The wound was closed in layers.

Patients were discharged as soon as medically responsible, which was usually a few hours after PTED and 1 day after OM.

Statistical Analyses

Descriptive statistics were used to demonstrate demographics and patient-reported outcomes with mean and standard deviation (SD) for continuous variables. Categorical variables were encoded by effects coding[23] and presented using valid percentages. The two 7-point Likert scales were analyzed by dichotomizing the options of fully recovered/satisfied and almost fully recovered/satisfied as a good outcome and the remaining options as a bad outcome. Only questionnaires with all 12 DCE choice sets completed were included in the DCE analysis. Biogeme 3.2.6 was used to estimate two discrete choice models, namely 1) a multinomial logit (MNL) model and 2) a latent class logit (LCL) model. Whereas the MNL allows estimation of the average preferences across the patient groups, the LCL takes preference heterogeneity into account by identifying (latent) groups with identical preference patterns. In this case the optimal number of latent classes in LCL was determined by the best model fit based on the Bayesian information criterion.

The optimal utility function was derived by estimating the MNL model first. Based on the likelihood ratio test, the most parsimonious MNL model was selected, which led to this optimal utility function: $V_{nsj|c} = \beta_{0|c} + \beta_{1|c}\text{waiting time(4 wks)}_{nsj|c} + \beta_{2|c}\text{waiting time(8 wks)}_{nsj|c} + \beta_{3|c}\text{costs}_{nsj|c} + \beta_{4|c}\text{scar size}_{nsj|c} + \beta_{5|c}\text{general anesthesia(no)}_{nsj|c} + \beta_{6|c}\text{hospitalization(no)}_{nsj|c} + \beta_{7|c}\text{effectiveness(80\%)}_{nsj} + \beta_{8|c}\text{effectiveness(90\%)}_{nsj} + \beta_{9|c}\text{recovery period}_{nsj|c}$, where $V_{nsj|c}$ represents the observable utility that respondent n belonging to class segment c has for alternative j in choice set s; $\beta_{0|c}$ represents an alternative specific constant for a certain class; and $\beta_{1-9|c}$ are class-specific parameter weights (coefficients) associated with each attribute (level) of the DCE.

In this model, costs (scaled per €100), scar size (scaled per cm), and recovery period (scaled per week) were included as linear variables. All other variables were included as categorical variables.

The probability of belonging to one of the identified latent classes in association with the respondents' demographic characteristics and score on the COMI-back, NRS for leg pain and NRS for back pain were estimated. The cutoff value for the COMI-back score and NRS for back and leg pain was 6.0, indicating that patients who scored higher than 6.0 had a functional impairment or disabling pain.

Coefficients were calculated. Coefficients with a p value < 0.05 indicated that an attribute had a significant effect on the choice for a treatment modality or opt out. Positive coefficients indicated a positive effect of the attribute on the preferences for a treatment, while a negative coefficient indicated a negative effect on the preferences for a treatment.

For all latent classes and these classes combined, importance scores were calculated for the attributes. An importance score of 1 indicated the highest ranked attribute, and a score of 7 indicated the lowest ranked attribute. In order to compare the preference weights of the different attributes between the pre- and postsurgery patient groups, a prespecified subgroup analysis was conducted. Last, as PTED was not reimbursed in the Netherlands, patient willingness to pay out of pocket was calculated.[24,25] To calculate these trade-offs, the ratio of one of the coefficients of the other attributes was taken as the numerator with willingness to pay as the denominator.

Results

Patient Enrollment

Figure 2 gives an overview of the study procedures. During the actual study's enrollment period, 150 patients scheduled for lumbar discectomy were recruited. Adding the questionnaires of the 24 patients that were included in the pilot study led to a total of 174 patients in the "pre-surgery group." Of the 434 patients in the postsurgery group, 148 patients replied (34%). Eleven of these replies were received during the pilot study. Combining both the pre- and postsurgery patient groups resulted in 322 patients that filled in questionnaires with 287 being suitable for the DCE analysis because they had no missing data in the DCE tasks.

Demographics and Patient-Reported Outcome Measures

Table 2 gives an overview of the demographics and patient-reported outcome measures at the time of measurement. Except for the use of analgesics and for the patient-reported outcome measures, data were comparable between the pre- and postsurgery patient groups. Overall, patients (n = 322) had a mean age of 49.4 ± 13.7 years. Among all patients, 64.3% had a paid job and 36.7% had a high level of education.

In the presurgery patient group, the mean summary scores were 7.4 ± 1.6 on the COMI-back, 7.4 ± 1.8 on the NRS for leg pain, and 5.8 ± 2.7 on the NRS for back pain. In the postsurgery group, the mean summary scores were 2.7 ± 2.6 on the COMI-back, 2.4 ± 2.8 on the NRS for leg pain, and 2.7 ± 2.8 on the NRS for back pain. Of the 148 patients in the postsurgery group, 68.9% underwent OM and 31.1% PTED. At follow-up in the postsurgery group, 95.6% of the patients were satisfied with the treatment and 82.7% were fully recovered from symptoms.

Mean Preference Weights and Importance Score

The results of the MNL model are presented in Supplementary Table 1. Except for the size of the scar (p = 0.09), all attributes had a statistically significant effect ($p < 0.05$) on the preference for lumbar disc surgery. Figure 3A gives an overview of the mean preference weight of the different attributes among all patients. In general, patients opted for a surgical procedure with a short waiting time, no out-of-pocket costs, a small scar size (albeit not statistically significant), the requirement for general anesthesia and hospitalization, a high effect on leg pain, and a short recovery period.

Overall, effect on leg pain was ranked to be of the highest importance as it determined the choice for a procedure by 44.8% (Table 3). Out-of-pockets costs followed as the second most important, determining the preference by 28.8%. The waiting time to surgery, necessity of general anesthesia, necessity for hospitalization, and length of the recovery period were ranked third (12.8%), fourth (7.5%), fifth (4.3%), and sixth (1.8%), respectively.

Preference weights were not affected by any of the baseline characteristics (e.g., relationship status, job, education level, patient-reported outcome measures, etc.). Furthermore, preferences did not differ between patients who still had to undergo surgery and those who already had undergone surgery.

Latent Classes

Table 3 gives an overview of the results of the latent class analysis. Based on the DCE analysis, 3 latent classes were identified. 1) Class I with a probability of 51.2% for belonging to this class. For patients in this class, their decision was determined 34.9% by the costs, 30.8% by effectiveness, 13.4% by the waiting time to surgery, 11.9% for the necessity of general anesthesia, 6.9% for the size of the scar, and 2.0% for the recovery period. The necessity for hospitalization did not affect the preference pattern in this class. 2) Class II with a probability of 26.3%. Preferences were determined 89.1% by effectiveness and 10.9% by waiting time for surgery. None of the other attributes influenced the preferences for this class. 3) Class III with a probability of 22.5%. Preferences were mainly determined by the out-of-pocket costs (53.2%) and effectiveness (28.6%). The necessity of general anesthesia (9.6%), wait time to surgery (7.4%), and the recovery period (1.2%) de-

TABLE 2. Characteristics and patient-reported outcome measures of 174 patients before undergoing lumbar discectomy and 148 patients after lumbar discectomy

Characteristic	Preop (n = 174)	Postop (n = 148)
Age, yrs	48.2 ± 14.6	50.8 ± 12.5
Relationship status	(n = 173)	(n = 147)
Married/partnered	125 (72.3%)	127 (86.4%)
Single	48 (27.7%)	20 (13.6%)
Job	(n = 173)	(n = 147)
Paid job	104 (60.1%)	103 (70.1%)
No job	69 (39.9%)	44 (29.9%)
Level of education	(n = 172)	(n = 147)
Low	47 (27.3%)	39 (26.5%)
Intermediate	73 (42.4%)	43 (29.3%)
High	52 (30.2%)	65 (44.2%)
Smoker	57 (32.8%)	37 (25.2%)
Use of medication	(n = 174)	(n = 147)
Antidepressants	20 (11.5%)	14 (9.5%)
Muscle relaxants	12 (6.9%)	11 (7.5%)
Analgesics	123 (70.7%)	38 (25.9%)
Pt-reported outcome*		
COMI-back summary	7.4 ± 1.6	2.7 ± 2.6
NRS leg pain	7.4 ± 1.8	2.4 ± 2.8
NRS back pain	5.8 ± 2.7	2.7 ± 2.8
Surgical procedure		
OM	—	102/148 (68.9%)
PTED	—	46/148 (31.1%)
Clinical condition at follow-up‡		
Satisfied with treatment	—	129/135 (95.6%)
Recovered from symptoms	—	110/133 (82.7%)

Values presented as number (%) of patients or mean ± SD unless otherwise indicated.

* COMI-back, NRS for leg pain, and NRS for back pain measure functional status due to back problems, leg pain intensity, and back pain intensity, respectively. Scores ranged from 0 to 10, with 10 being the worst clinical condition or worst pain imaginable.

‡ Satisfaction with treatment and recovery from symptoms were assessed using 7-point Likert scales. Good status (satisfied or recovered) calculated by dichotomizing the options fully versus almost fully satisfied/recovered.

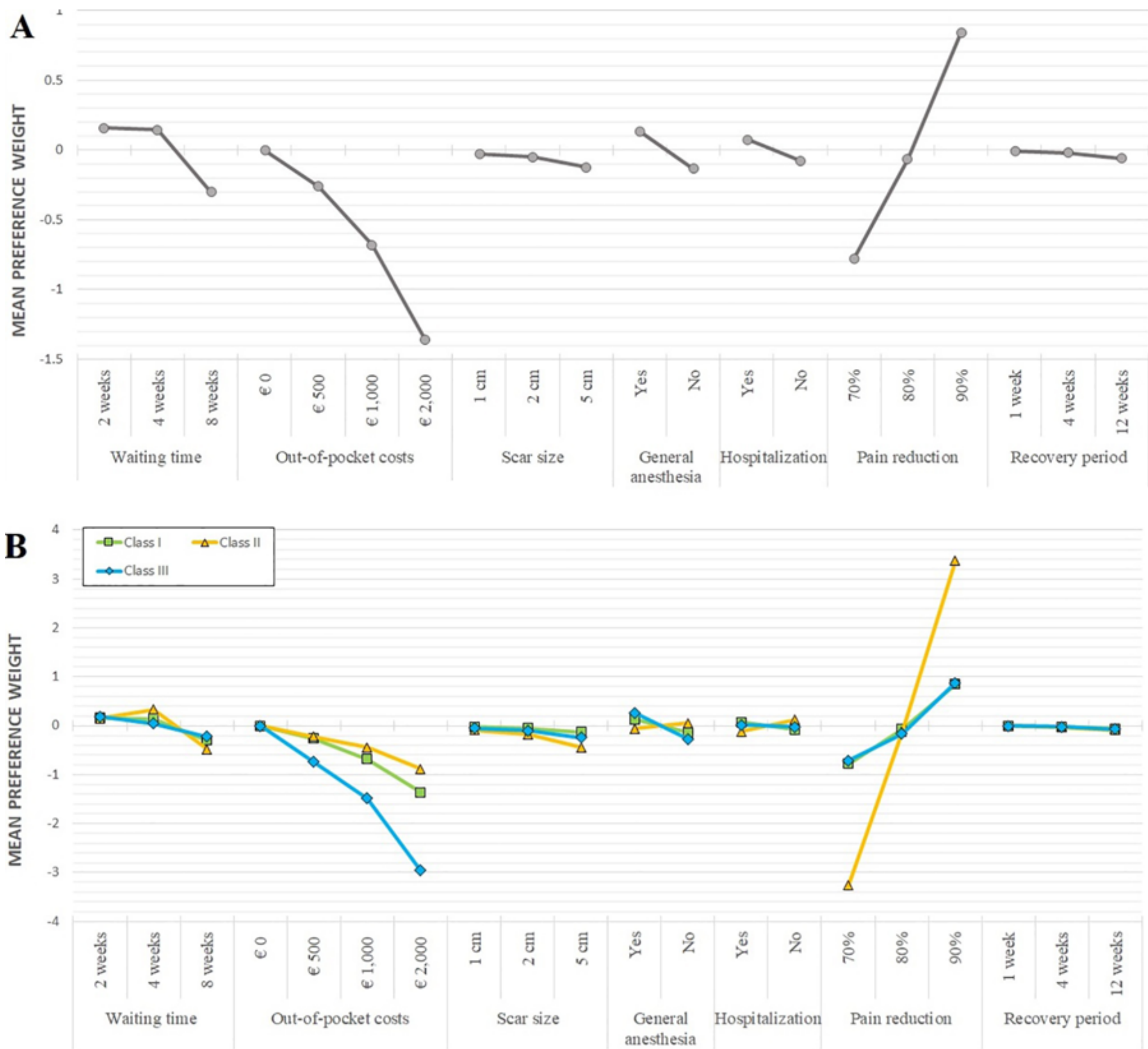

FIG. 3. Mean preference weights for patients before and after surgery. Figure is available in color online only.

termined the preference to a lesser extent, while the necessity for hospitalization did not affect the preference pattern.

Figure 3B presents a graphic overview of the preference patterns of the 3 latent classes.

Trade-Offs Affecting Patient Decisions

Table 4 gives an overview of patients' willingness to pay out of pocket for different attributes of lumbar disc surgery. For instance, patients were willing to pay €894 to receive a treatment with a waiting time of 2 weeks instead of 8 weeks. The most substantial willingness to pay was for pain reduction; on average patients were willing to pay €1764 to receive a treatment with 90% reduction of leg pain instead of a treatment with 80% pain reduction, while they were willing to pay €3133 to receive a treatment with 90% compared to 70% pain reduction.

Discussion

The results of this study show that all of the investigated attributes, except for the scar size, had a statistically significant influence on the overall treatment preferences of patients. The effect on leg pain was the most important characteristic in the patients' decision for a surgical procedure, followed by out-of-pocket costs, wait time, need for general anesthesia, need for hospitalization, and the recovery period. Preferences did not appear to differ between patients before and after surgery and also seemed not to differ based on scores on patient-reported outcome measures. Three latent classes could be identified with specific preference patterns. The results of the willingness-to-pay analysis show that patients were prepared to pay substantial amounts (e.g., €1764) to receive a treatment with a 10% higher effect on leg pain.

Comparison With Other Studies

In a previous DCE among 641 surgeons, preferences in offering lumbar discectomy were measured.[13] In that analysis, surgeons deemed the risk of complications to be of the most importance, followed by the risk of recurrent disc herniation, effect on leg pain, postoperative back pain du-

TABLE 3. Results of the latent class analysis among all patients (n = 287)

	Latent Class I (probability 51.2%)		Latent Class II (probability 26.3%)		Latent Class III (probability 22.5%)		Overall Importance, % (rank)
	Coefficient	Importance, % (rank)	Coefficient	Importance, % (rank)	Coefficient	Importance, % (rank)	
Wait time to op, wks		13.4 (3)		10.9 (2)		7.4 (4)	12.8 (3)
2	0.295		0.147		−0.711		
4	0.064		0.329*		−0.168*		
8	−0.359**		−0.476		0.879**		
Out-of-pocket costs, per €100	−0.085**	34.9 (1)	−0.044		−0.148**	53.2 (1)	28.8 (2)
Scar size, per 1 cm	−0.084**	6.9 (5)	−0.089		−0.048		
General anesthesia		11.9 (4)				9.6 (3)	7.5 (4)
Yes	0.289		−0.058		0.267		
No	−0.289**		0.058		−0.267**		
Hospitalization							4.3 (5)
Yes	0.033		0.121		0.021		
No	−0.033		−0.121		−0.021		
Effectiveness		30.8 (2)		89.1 (1)		28.6 (2)	44.8 (1)
70%	−0.685		−3.249		−0.711		
80%	−0.146*		−0.123		−0.168*		
90%	0.831**		3.373**		0.879**		
Recovery period, per 1 wk	−0.009**	2.0 (6)	−0.007		−0.006**	1.2 (5)	1.8 (6)
Alternative specific constant	−5.217**		−6.230**		−0.979**		

Significance: * $p < 0.05$; ** $p < 0.001$.

ration, and length of the recovery period. In the DCE study reported here, risk of complications, risk of recurrent disc herniation, and the postoperative duration of back pain did not receive a high enough ranking by patients to be included as attributes. Furthermore, in the current study the effect on leg pain determined patient preferences by 38.5%, whereas it determined surgeon preference by 18.8%. This discrepancy can be explained by the differences in perspectives of patients and surgeons. On one hand, patients are suffering from disabling leg pain and want to recover from it, preferably without spending out-of-pocket costs. On the other hand, surgeons think from the "first do no harm" perspective and prefer to offer a surgical option with a low complication rate and low recurrence risk, before preferring a procedure with high effectiveness and a short recovery period.

Study Strengths and Limitations

Some limitations of this study have to be acknowledged. First is the 34% response rate of the retrospective patient group, which can be deemed average. Low response rates may have a higher risk of introducing selection bias, e.g., specific groups of patients replying. However, as the retrospective group covers a time span of 3 years and the patient preferences for this group were our main outcome, selection bias may only be of limited concern. Furthermore, the clinical outcome data of the retrospective group seem to be comparable to those reported in the literature, with higher follow-up rates.[19] Another form of selection bias may have been introduced due to the change in reimbursement of fully endoscopic procedures in the Netherlands. In the retrospective patient group, PTED was not reimbursed and therefore selection bias may have played a role as patients who could afford the procedure would be more likely to undergo PTED. In contrast to this, PTED was reimbursed for the group of prospective patients, and this form of bias may not have been introduced in this group. Nevertheless, no differences in preferences were detected between the two patient groups, which suggests that this

TABLE 4. Results of the linear trade-offs in willingness to pay for other attributes

Characteristic	Amount Pt Willing to Pay, €	Treatment Result
Waiting time to op	29	2 vs 4 wks
	894	2 vs 8 wks
Leg pain reduction	1764	90% vs 80% effectiveness
	3133	90% vs 70% effectiveness
Size of scar	48	1 vs 2 cm
	191	1 vs 5 cm
General anesthesia	522	General vs local anesthesia
Hospitalization	302	Clinical vs outpatient setting
Recovery period	35	1 vs 4 wks
	105	1 vs 12 wks

form of selection bias may have had only limited impact on the results.

Another limitation may be the introduction of recall bias due to the inclusion of a retrospective patient group. Furthermore, there may also be some concerns regarding the national or international generalizability of the study results. This study was conducted at two Dutch hospitals and was therefore conducted based on the Dutch healthcare system, in which fully endoscopic procedures for sciatica were previously not reimbursed. Both clinics treated patients with similar indications for surgery based on national guidelines, which included at least 6 weeks of treatment-resistant sciatica or progressive motor loss. From an international perspective, between-country differences in policies for reimbursement of endoscopic procedures and cultural differences may limit the generalizability. Another limitation may be that not all presented DCE scenarios reflect actual scenarios in clinical practice. Previous research, however, has shown that most DCEs in health research have not shown significant hypothetical bias.[26] Another potential area of improvement for this study is the use of a within-group design, in which the patients in the prospective group answered the DCE again after surgery. The option to include a second questionnaire was omitted, however, to reduce the burden on patients. Strengths of this study include the use of a pilot design, the attainment of the calculated sample size, the unlabeled design of the DCE, and the inclusion of both patients who underwent open surgical procedures and patients who underwent endoscopic procedures.

Conclusions

The findings of the current study further illustrate patient perceptions of the benefits of minimally invasive spine surgery. For instance, in general proposed advantages of minimally invasive surgery are the ability to perform the technique on an outpatient basis and the increased likelihood of a shorter recovery period, smaller scar size, and lower rate of postoperative back pain compared with open surgery, among others.[13] In this study, patients preferred hospitalization and did not necessarily seem to be influenced in their choices by the size of the scar. These results imply that a shared decision should be made by the patient and neurosurgeon based on a discussion of surgical characteristics with patients, and that not all patients would prefer minimally invasive surgery.[15,24] The effect on leg pain is of the most importance for patients in deciding to undergo surgery for sciatica. Furthermore, this study shows that not all proposed advantages of minimally invasive spine surgery (e.g., size of the scar, no need of general anesthesia) are necessarily perceived as advantages by all patients and that surgical techniques for sciatica should be offered, not only based on own ability and proposed eligibility by spine surgeons, but also based on specific patient preferences.

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Disclosures

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

Author Contributions

Conception and design: Gadjradj, de Jong, de Bekker-Grob, Harhangi. Acquisition of data: Gadjradj, de Jong, Depauw, Harhangi. Analysis and interpretation of data: Gadjradj, Smeele, van Tulder, de Bekker-Grob. Drafting the article: Gadjradj. Critically revising the article: Smeele, de Bekker-Grob, Harhangi. Reviewed submitted version of manuscript: all authors. Approved the final version of the manuscript on behalf of all authors: Gadjradj. Statistical analysis: Gadjradj, Smeele, de Bekker-Grob. Administrative/technical/material support: Gadjradj, de Jong, Depauw, van Tulder. Study supervision: van Tulder, de Bekker-Grob, Harhangi.

Supplemental Information

Online-Only Content

Supplemental material is available with the online version of the article.

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