

Predictors and Long-term Outcome of Sexual Function After Surgical Treatment for Single-level Lumbar Disk Herniation Among Patients in a German Spine Center

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Study Design: This is a retrospective, self-controlled cohort study, at a single center.

Objective: The aim of this study was to evaluate the long-term outcome of sexual function after surgical treatment of single-level lumbar disk herniation (LDH).

Summary of Background Data: The impact of surgical treatment on sexual activity is still unknown and not well researched.

Materials and Methods: In total, 114 patients who underwent disk surgery for LDH between 2009 and 2015 were included in the study (mean age, 46.9 y). Two separate questionnaires evaluating general health and all aspects of sexual function were administered to all patients.

Results: Satisfaction with the overall outcome of surgery was reported by 84.2% of patients. In total, 82 patients (71.9%) rated their current sexual life as normal with no additional pain, 22 (19.3%) reported a normal sex life with some additional pain, and 2 reported that (2.6%) pain prevents them from having any sex life at all. Compared with their state before LDH and spine surgery, 79 patients (69.3%) rated their sexual function as quantitatively and qualitatively the same as before surgery, 19 patients (16.7%) as better, and 16 patients (14.0%) as worse. The ability to experience orgasm, complete intercourse, experience sexual desire, and experience sexual arousal was reported to be the same as before surgery by 87 (76.3%), 75 (65.8%), 79 (69.3%), and 85 (74.6%) patients, respectively. After surgery, 16 patients (14%) explored new sexual positions. Sexual function receives insufficient attention from physicians. Women reported more general and sexual problems such as decreased sexual desire and interest, taking medication, and seeking regular medical attention. Predictors of the outcome were leg pain, the intensity of back and leg pain, and the professional status of the patient.

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Conclusions: Lumbar disk surgery has a positive effect on sexual function. The majority of patients returned to their normal sexual activities in long-term follow-up.

Key Words: lumbar disk surgery, sexual function, long-term
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The main goal of surgical treatment for lumbar disk herniation (LDH) is to improve the quality of life and enable rapid return to normal daily activities. Sexuality is an important physiological need that plays a fundamental and determinant role in human life and is recognized as an important indicator of the quality of life. Sexual activity and sexual function are important considerations for patients with degenerative spine conditions, especially for patients who are married, younger, and male.^{1,2}

LDH may affect sexual activity through low-back pain (LBP), leg pain, neural compression, and the side effects of pain therapy. LBP restricts sexual enjoyment by causing discomfort during intercourse, restricting coital movements and positions, and reducing the frequency of intercourse. All of these factors eventually decrease sexual desire over time.^{3,4}

Sexual function after LDH surgery is not well researched. Although there are many studies evaluating sexuality in chronic pain, little information is available in the literature concerning the sexual activity of patients with LDH. Available data concerning the predictors of the outcome of sexual function after LDH surgery are limited.²

Blumer and Walker⁵ proposed 2 reasons for this neglect: “Firstly, physicians are not routinely trained to explore the sex life of their patients, and secondly, there has been a stifling trend in research to investigate only what can be measured by objective methods.”⁶

Therefore, reports addressing sexuality after surgical treatment of LDH are still necessary, and more research in this field has been recommended in previously published articles.^{2,7}

The aim of this study was to evaluate long-term sexual function after surgery for single-level LDH among patients in a German Spine Center and to identify the predictors of the outcome, taking into consideration the above challenges.

MATERIALS AND METHODS

We retrospectively reviewed the records of all patients aged 20–70 years who underwent single-level lumbar disk surgery between January 2011 and March 2015. In total, 517 patients underwent a standard interlaminar microsurgery for LDH. Exclusion criteria consisted of additional spinal stenosis, secondary surgery for recurrent disk herniation or fusion for instability, and depression.

Demographic data were abstracted from the patients' medical records, outpatient reports, and mail questionnaires.

Two questionnaires were sent together to all patients. The first covered the general results of surgery including the visual analog scale (VAS), current pain situation, working status, comorbidities, and general satisfaction with surgery, similar to our previous publication.⁸

The second questionnaire abstracted from validated sexual index and designed for this study covered all aspects of sexual function including general sex life, sexual satisfaction, erection and ejaculation, achieving orgasm, sensation and lubrication in the genital area, sexual arousal, sexual desire and interest, pain associated with sex, sexual problems with the partner, sexual position, attention from the physician, and desire to have children.^{9–12}

The questionnaires were in the German language. Questionnaires and the study protocol were approved by the local research ethics committee. The first 50 questionnaires were sent to validate the questions and ensure their understandability.

Among 517 patients, 19 (3.7%) had changed their addresses, 107 (20.7%) had no sexual partners and completed only the general questionnaire, 155 (30.0%) did not complete the questionnaire, and 236 (45.6%) completed both questionnaires.

Among 236 patients who completed the 2 questionnaires, 122 were excluded from data analysis: 69 (29.2%) had removed the identification code on the reply envelope, 31 (13.1%) reported a second surgery at another clinic during the follow-up period, and 22 (13.1%) reported regular treatment for depression within the last year.

Patient Characteristics

Our analysis included 114 patients: 51 men (44.7%) and 63 women (55.3%). The mean age at surgery was 46.9 years (26–70 y), and the mean duration of follow-up was 4.1 years (1–6 y). LDH surgery was performed at level 4/5 in 49 (43%) patients, L5–S1 in 50 (43.9%) patients, L3/4 in 13 (11.4%) patients, and L2/3 in 2 (1.8%) patients. The surgery was on the left side for 53 patients (46.5%) and on the right side for 61 patients (53.5%).

Statistical Analysis

The Mann-Whitney *U* test and the paired sample *t* test were used to compare the means of variables. The paired sample *t* test was used as a parametric test to compare means that were repeated across time.

Kaplan-Meier methods were used to estimate the probability of patients improving sexual function after surgery as a function of time. Univariate analysis was used to detect factors affecting the long-term outcome of sexual function. Stepwise logistic multivariate regression model

was used to estimate the hazard ratios with 95% confidence intervals (CIs) for each risk factor. Variables of interest in this analysis were general satisfaction with surgery, LBP, leg pain, working status, general sex life, sexual satisfaction, erection and ejaculation, achieving orgasm, sensation and lubrication in the genital area, sexual arousal, sexual desire and interest, pain associated with sex, sexual problems with the partner, sexual position, attention from the physician, and desire to have children. These variables are summarized in Tables 1–3. For statistical analysis, SPSS for Windows (version 23.0; SPSS Inc., Chicago, IL) was used.

General Questionnaire Results

Overall satisfaction with the surgical outcome was reported by 96 patients (84.2%). In long-term follow-up, LBP and leg pain similar to or worse than before surgery was reported by 14 patients (12.3%) and 16 patients (14%), respectively. In total, 84 patients (73.7%) returned to work, with 74 patients (64.9%) returning to their previous occupation and 10 (11.9%) reducing their working hours (Table 1).

TABLE 1. Answers of the General Questionnaire

Variables	Males	Female	Total Significance
Are you satisfied [n (%)]			
Yes	41 (80.4)	55 (87.3)	96 (84.2)
No	10 (19.6)	8 (12.7)	18 (15.8)
Level of surgery [n (%)]			
Level 4/5	21 (42.2)	28 (44.4)	49 (43)
Level 5/S1	20 (39.2)	30 (47.6)	50 (43.9)
Level 3/4	9 (17.6)	4 (6.3)	13 (11.4)
Level 2/3	1 (2)	1 (1.6)	2 (1.8)
Side of surgery [n (%)]			
Left	22 (43.1)	31 (49.1)	53 (46.5)
Right	29 (56.9)	32 (50.8)	61 (53.5)
Mean age at surgery	46.98 ± 10.7	46.8 ± 9.3	46.9 ± 9.9
Mean duration of follow-up	4.4 ± 1.56	4.2 ± 1.4	4.3 ± 1.6
Do you have another health problem need to be regularly controlled [n (%)]	15 (29.4)	25 (39.7)	40 (35.1)
Patients who were in work [n (%)]	39 (76.5)	45 (71.4)	84 (73.7)
No change [n (%)]	32 (62.7)	42 (66.7)	74 (64.9)
Changed [n (%)]	19 (37.3)	21 (33.3)	40 (35.1)
Have you had back pain in the last 12 mo [n (%)]			
Yes	38 (40.9)	55 (59.1)	93 (81.6)
No	13 (61.9)	8 (38.1)	21 (18.4)
Have you had leg pain in the last 12 mo [n (%)]			
Yes	19 (37.3)	32 (62.7)	51 (44.7)
No	32 (62.7)	31 (49.2)	63 (55.3)
Back pain [VAS (mean)]	2.96 (0–8)	3.54 (0–10)	3.28 (0–10)
Leg pain [VAS (mean)]	1.51 (0–8)	2.22 (0–8)	1.90 (0–8)
Back pain equal or worse than before surgery [n (%)]	7 (13.7)	7 (11.1)	14 (12.3)
Leg pain equal or worse than before surgery [n (%)]	6 (11.8)	10 (15.9)	16 (14.0)

VAS indicates visual analog scale.

TABLE 2. Answers of the Sexual Function Questionnaire

Variables	n (%)									
	Male			Female						
	Same	Different-better	Different-worse	Same	Different-better	Different-worse				
Compared with before your spine surgery, how do you rate your current sex function?	35 (68.6)	10 (19.6)	6 (11.8)	44 (69.3)	9 (14.3)	10 (15.9)				
To have an orgasm	38 (74.5)	6 (11.8)	7 (13.7)	49 (77.8)	8 (12.3)	6 (9.5)				
To complete the intercourse	32 (62.7)	9 (17.6)	10 (19.6)	43 (68.3)	9 (14.3)	11 (17.5)				
Frequency and quality of sexual intercourse	33 (64.7)	10 (19.6)	8 (15.7)	42 (66.7)	10 (15.9)	11 (17.5)				
Your desire to have sexual intercourse	36 (70.6)	8 (15.7)	7 (13.7)	43 (68.3)	8 (12.7)	12 (19.0)				
Your level of sexual desire	35 (68.6)	9 (17.6)	7 (13.7)	43 (68.3)	7 (11.1)	13 (20.6)				
Rate your sexually arousal	37 (72.5)	5 (9.8)	9 (17.6)	48 (76.2)	7 (11.1)	8 (12.7)				
Have you noticed any change in sensation in your genital region?	46 (90.2)	3 (5.9)	2 (3.9)	53 (84.1)	2 (3.2)	8 (12.7)				
Male [n (%)]										
	Always	Usually	Occasionally	Hardly ever	Never	Female [n (%)]				
	Always	Usually	Occasionally	Hardly ever	Never	Hardly ever				
Do you enjoy having sexual intercourse with your partner?	1 (2.0)	6 (11.8)	7 (13.7)	7 (13.7)	30 (58.8)	4 (6.3)	5 (7.9)	20 (31.7)	10 (15.9)	24 (38.1)
Do you find your sexual relationship with your partner satisfactory?	3 (5.9)	8 (15.7)	7 (13.7)	11 (21.6)	22 (43.1)	4 (6.3)	4 (6.3)	18 (28.6)	16 (25.4)	21 (33.3)
Do you become easily sexually aroused?	10 (19.6)	20 (39.2)	15 (29.4)	6 (11.8)	0 (0)	7 (11.1)	18 (28.6)	29 (46.0)	7 (11.1)	2 (3.2)
Do you feel uninterested in sex?	0 (0)	5 (9.8)	7 (13.7)	22 (43.1)	17 (33.3)	4 (6.3)	6 (9.5)	20 (31.7)	22 (34.9)	11 (17.5)

We found a statistically significant difference between men and women in regular medication for pain in the last 12 months ($P<0.0001$) and working hours ($P<0.002$). Men had more working hours, and women took more regular pain medication.

Sexual Function Outcome

A normal sex life with no additional pain was reported by 82 patients (71.9%), whereas a normal sex life with some additional pain was reported by 22 patients (19.3%). For 2 patients (2.6%), pain prevented them from having any sex life at all (Tables 2, 3).

Compared with their status before LDH and spine surgery, 79 patients (69.3%) rated their current overall quantitative and qualitative sexual function as the same, 19 patients (16.7%) as better, and 16 patients (14%) as worse.

The same ability to have an orgasm as before LDH was reported by 87 patients (76.3%), 14 (12.3%) experienced better orgasm, and 13 (11.4%) experienced worse.

Eighteen patients (15.8%) reported an improvement in their ability to complete intercourse, 21 patients (18.4%) reported reduced ability, and 75 patients (65.8%) reported no change.

The frequency and quality of sexual intercourse were rated the same by 75 patients (65.8%), better by 20 patients (17.5%), and worse by 19 patients (16.7%).

Sixteen patients (14%) reported experiencing more sexual desire after surgery, 79 patients (69.3%) reported

TABLE 3. Answers of the Sexual Function Questionnaire

General Sex Life	n (%)	
	Male	Female
Since your spine surgery, how would you rate your current sexual function?		
My sex life is normal and causes no extra pain	40 (78.4)	42 (66.7)
My sex life is normal but causes some extra pain	6 (11.8)	16 (25.4)
My sex life is nearly normal but is very painful	1 (2.0)	1 (1.6)
My sex life is severely restricted by pain	1 (2.0)	2 (3.2)
My sex life is nearly absent because of pain	3 (5.9)	0 (0.0)
Pain prevents any sex life at all	0 (0.0)	2 (3.2)
Preferred sexual position		
Position 1	21 (41.2)	29 (46.0)
Position 2	2 (3.9)	6 (9.6)
Position 3	5 (9.8)	11 (17.5)
Position 4	7 (13.7)	4 (6.3)
	Yes	No
Did you try, but not succeed, having children before the operation?	1 (0)	20 (98.0)
After the operation, have you tried, but not succeeded in having children?	2 (3.9)	49 (96.1)
After the spine surgery, have you tried a new sex position?	7 (11.1)	56 (88.9)
	Yes	No



FIGURE 1. Kaplan-Meier graph showing the proportion of level of sexual function in male and female patients over 5 years.

the same level of sexual desire, and 19 patients (16.7%) reported worse sexual desire. In total, 85 patients (74.6%) rated their level of sexual desire as the same, 12 patients (10.5%) as better, and 17 (14.9%) as worse.

With regard to experiencing sexual disinterest, 72 patients (63.2%) selected never or hardly ever, 27 (23.7%) selected occasionally, 11 (9.6%) selected usually, and 4 (3.5%) selected always.

In the male group, the same ability to have an erection was reported by 41 patients (78.4%), 6 (11.8%) reported improved ability, and 5 (9.8%) reported decreased ability. The same ability to have an erection hard enough for penetration was reported by 39 patients (76.5%), 5 (9.8%) selected better, and 7 (13.7%) selected worse. The same ability to ejaculate was reported by 43 patients (84.3%), 5 (9.8%) selected better, and 3 (5.9%) selected worse.

In the female group, 45 patients (85.7%) reported the same level of vaginal moisture during sexual intercourse, whereas 2 (3.2%) selected better, and 7 (11.1%) selected worse. With regard to sensation in the genital region, no change was selected by 99 (86.8%), 5 patients (4.4%) reported an improvement, whereas 10 (8.8%) reported reduced sensation.

No sexual problems with the partner were reported by 61.4% of patients. Before LDH and the subsequent surgery, 8 patients (7%) tried and failed to have children. After surgery, 6 patients (5.3%) tried and failed. After surgery, 16 (14%) patients explored new sexual positions. The most common sexual positions used by the patients are presented in Figure 1.

Receiving sufficient information and attention from the surgeon regarding their sexual life after surgery was

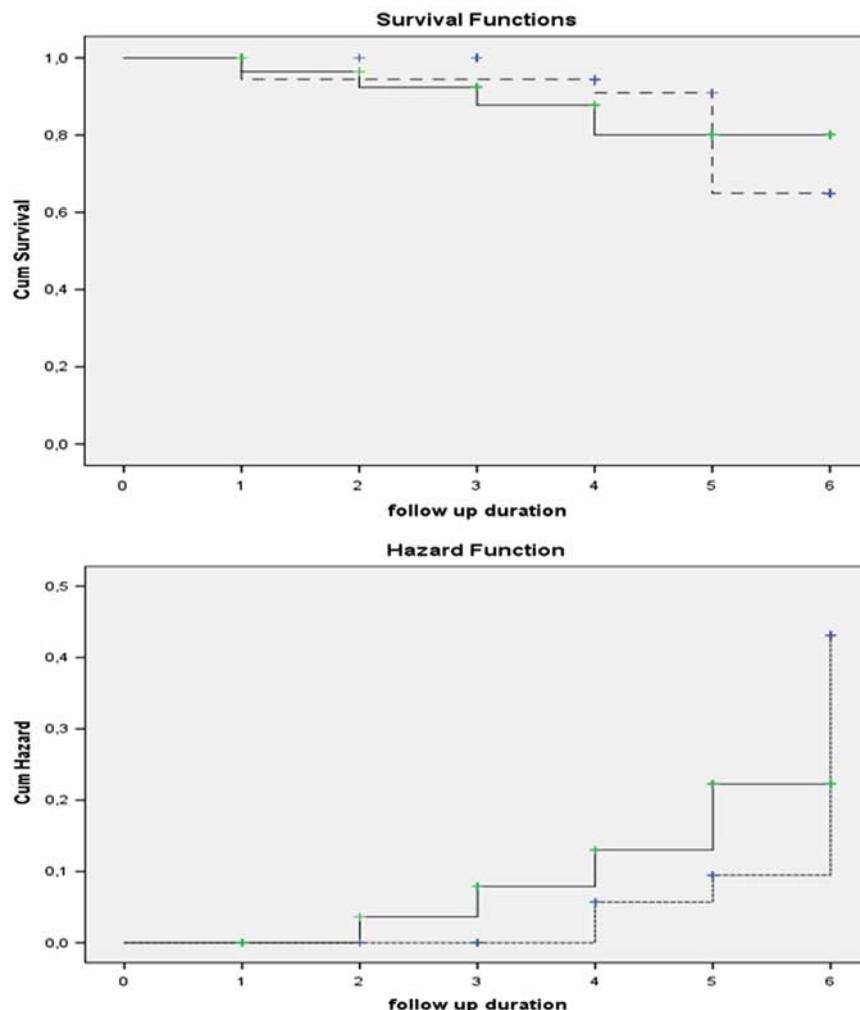


FIGURE 2. Graph showing the most frequently conducted sexual position among patients. [full color online](#)

reported by 28 (24.6%) and 19 (16.7%) patients, respectively. Receiving no information at all about this subject from any source was reported by 67 patients (58.8%).

Cox regression analysis revealed a statistically significant difference between men and women regarding back pain in the past 12 months [$P < 0.002$, Exp (B) 5.468; 95% CI, 1.860–16.070], taking regular medication for pain in the last 12 months [$P < 0.029$, Exp (B) 0.411; 95% CI, 0.185–0.912], general sexual desire [$P < 0.051$, Exp (B), 11.609; 95% CI, 0.985–136.859], sexual disinterest [$P < 0.026$, Exp (B) 0.271; 95% CI, 0.085–0.856], having children [$P < 0.044$, Exp (B) 0.214; 95% CI, 0.048–0.961], and regular medical attention [$P < 0.005$, Exp (B) 2.367; 95% CI, 1.301–4.304].

The Kaplan-Meier curve in Figure 2 shows the changes in sexual function over time for male and female patients. Personal correlation showed a negative statistical significance between sexual function and back pain ($P < 0.005$) and leg pain ($P < 0.006$). The correlation is significant at the 0.01 level (2-tailed).

Regression analysis to determine the predictors of outcome revealed the following variables: leg pain in the last 12 months ($P < 0.002$), VAS pain intensity on the pain scale ($P < 0.047$), and a change in professional situation after surgery ($P < 0.003$).

DISCUSSION

Sexuality is still an embarrassing issue for the majority of patients and, unfortunately, an issue many researchers and health care professionals have difficulty raising with their patients.¹³ In our study, we had a low response for the questionnaires, which represents the difficulty of research in this topic; on the other side our low response rate for the questionnaires is similar to that for published data, showing that few patients are willing to talk about their sexual life in Germany. Only 18% of men and 15% of women had talked to a doctor about their sexual problems. Among the German population, ~37% have no sexual partners.^{14,15}

LBP is one of the most common health problems,¹⁶ LBP which usually accompanies the LDH may affect directly and indirectly sexual activity of patients. The incidence of lumbar discectomy per 100,000 per year in Germany is about 60, in the United Kingdom 100, in Sweden 200, in Finland 350, and in the United States 450–900. It implies that there are ~50,000 operations performed in Germany every year.¹⁷ Our study brings the sexual life of the patients to the attention of spine surgeons and may help the healthcare professional to better counseling.

Our study showed that the majority of patients (82%) reported full satisfaction with the overall outcome of the surgery including sexual function. The majority of patients returned to their previous sexual activities during the long-term follow-up after surgery for LDH. The success of LDH surgery is primarily due to reducing radicular pain, reducing LBP, and facilitating a return to work.^{18,19}

In agreement with our results, published data showed microdiscectomy of LDH and surgical treatment of degenerative conditions had positive effects on the frequency of intercourse, premature ejaculation, and erectile dysfunction. All sexual problems decreased after surgery.^{2,20,21}

Predictors of sexual outcome were leg pain, VAS pain intensity, and professional situation. Women had lower sexual function compared with men and reported significantly higher sexual disinterest and desire to have children. Women also reported more LBP, regular medical attention, and taking regular medication for pain. Men reported more sexual desire, sexual interest, and working hours. Sexuality is still a sensitive and embarrassing issue, and spontaneous patient disclosure is difficult. In addition, finding a suitable and steady partner is not easy.

Predictors of the outcome in our study, specifically leg pain and intensity of pain, were also mentioned in previous short-term studies. Previously published data showed that patients reported improved sex life after surgery due to reduced pain compared with patients treated without surgery.²¹

Deterioration of sexual function by pain may be due to several factors. Leg pain and LBP hinder the ability to move freely during sexual activity, and the pain itself may cause depression, which decreases sexual desire and consequently impairs sexual function.^{22,23}

Our study showed that women experienced more frequent sexual dysfunction than men. Published data confirm that women experience more sexual problems worldwide, the most common being a lack of sexual interest, nonpleasurable sex, and lubrication difficulties.^{2,14,15,24} The third predictor in our study was the professional status of the patients. A relationship between working and sexual function has been reported previously. Unemployment and low income are social factors that compromise sexual desire.¹⁴

In our study, 14% of the patients reported deterioration of sexual life due to aging or persistent pain. The published data show a significant negative relationship between age and sexual desire, arousal, and activity.²⁵ Spine surgery may lead to deterioration of sexual function despite pain reduction.²⁶

Our patients reported low attention to their sexual problems from physicians and a lack of information. This

may be due to a virtuous circle: the patients are unwilling or too ashamed to ask, while the physician expects questions from the patient and usually has no time to spend on the issue. Discussion of this issue is also recommended by other authors.²

Limitations of This Study

Only about 25% of the discectomy patients were included in the study due to being excluded or failing to return the questionnaire, which suggests risk for response bias. Moreover, this is a retrospective study, with corresponding limitations; low response in similar studies in Germany is reported.^{14,15}

CONCLUSIONS

LDH surgery has a positive effect on the sexual function of patients in the long-term, with most patients returning to the same level of sexual function after surgery. Both improvements and deterioration after surgery were noted in our group of patients. Sexuality is still an embarrassing subject among patients and receives little attention from physicians. Consequently, patients do not receive sufficient information before and after surgery. Sex life and sexual function should receive more attention from the treatment team, and sufficient information should be routinely provided. Furthermore, sexual health should be fully integrated into LDH care.

REFERENCES

- Stock SR, Cole DC, Tugwell P, et al. Review of applicability of existing functional status measures to the study of workers with musculoskeletal disorders of the neck and upper limb. *Am J Ind Med.* 1996;29:679–688.
- Akbas NB, Dalbayrak S, Külcü DG, et al. Assessment of sexual dysfunction before and after surgery for lumbar disc herniation. *J Neurosurg Spine.* 2010;13:581–586.
- Maigne JY, Chatellier G. Assessment of sexual activity in patients with back pain compared with patients with neck pain. *Clin Orthop Relat Res.* 2001;385:82–87.
- Sidorowicz N, McGill SM. Male spine motion during coitus. *Spine (Phila Pa 1976).* 2014;39:1633–1639.
- Blumer D, Walker AE. The neural basis of sexual behaviour. In: Benson DF, Blumer D, eds. *Psychiatric aspects of neurological disease.* New York: Grune & Stratton. 1975:199–217.
- Baird AD, Wilson SJ, Bladin PF, et al. Neurological control of human sexual behaviour: insights from lesion studies. *2007;78:1042–1049.*
- Monga TN, Tan G, Ostermann HJ, et al. Sexuality and sexual adjustment of patients with chronic pain. *Disabil Rehabil.* 1998;20: 317–329.
- Lübbers T, Abuamona R, Elsharkawy AE. Percutaneous endoscopic treatment of foraminal and extraforaminal disc herniation at the L5-S1 level. *Acta Neurochir (Wien).* 2012;154:1789–1795.
- Rosen R, Brown C, Heiman J, et al. The Female Sexual Function Index (FSFI): a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther.* 2000;26: 191–208.
- Rosen RC, Riley A, Wagner G, et al. International Index of Erectile Function Questionnaire (IIEF). *Urology.* 1997;49:822–830.
- Rosen R, Brown C, Heiman J, et al. The Female Sexual Function Index: a multidimensional self-report instrument for the assessment of female sexual function. *J Sex Marital Ther.* 2000;26:191–208.
- Fairbanks JCT, Davies JB, Couper J, et al. Oswestry low back pain disability questionnaire. *Physiotherapy.* 1980;66:271–273.

13. Ambler DR, Bieber EJ, Diamond MP. Sexual function in elderly women: a review of current literature. *Rev Obstet Gynecol.* 2012;5:16–27.
14. Beutel ME, Stöbel-Richter Y, Brähler E. Sexual desire and sexual activity of men and women across their lifespans: results from a representative German community survey. *BJU Int.* 2008;101:76–82.
15. Moreira ED, Hartmann U, Glasser DB, et al. A population survey of sexual activity, sexual dysfunction and associated help-seeking behavior in middle-aged and older adults in Germany. *Eur J Med Res.* 2005;10:434–443.
16. Hoy D, Bain C, Williams G, et al. A systematic review of the global prevalence of low back pain. *Arthritis Rheum.* 2012;64:2028–2037.
17. Mayer C, Siems W. *100 Krankheitsbilder in der Physiotherapie.* Berlin, Heidelberg: Springer Berlin Heidelberg; 2011.
18. Andrews SW¹, Lavyne MH. Retrospective analysis of microsurgical and standard lumbar discectomy. *Spine (Phila Pa 1976).* 1960;15:329–335.
19. Sedighi M, Haghnegahdar A. Lumbar disk herniation surgery: outcome and predictors. *Global Spine J.* 2014;4:233–244.
20. Yazici CM, Sarifakioglu B, Guzelant A, et al. An unresolved discussion: presence of premature ejaculation and erectile dysfunction in lumbar disc hernia. *Int Urol Nephrol.* 2013;45:659–667.
21. Horst PK, Khanna K, Racine L, et al. Sex life and impact of operative intervention on sex life-related pain in degenerative spinal conditions. *Spine (Phila Pa 1976).* 2016;41:1764–1771.
22. Parker SL, Mendenhall SK, Godil SS, et al. Incidence of low back pain after lumbar discectomy for herniated disc and its effect on patient-reported outcomes. *Clin Orthop Relat Res.* 2015;473:1988–1999.
23. Ambler N, Williams AC, Hill P, et al. Sexual difficulties of chronic pain patients. *Clin J Pain.* 2001;17:138–145.
24. Sjögren K, Fugl-Meyer AR, Sjögren K. Chronic back pain and sexuality. *Int Rehabil Med.* 1981;3:19–25.
25. Schiavi RC, Schreiner-Engel P, Mandeli J, et al. Healthy aging and male sexual function. *Am J Psychiatry.* 1990;147:766–771.
26. Berg S, Fritzell P, Tropp H. Sex life and sexual function in men and women before and after total disc replacement compared with posterior lumbar fusion. *Spine J.* 2009;9:987–994.