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The role of IL-6, IL-10, and PGE2 in the treatment of intervertebral disc herniation by dual-channel endoscopic lumbar discectomy

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ABSTRACT

is the This study aimed to explore the role of IL-6, IL-10, and PGE2 in the treatment of intervertebral disc herniation with dual-channel endoscopic lumbar discectomy. For this purpose, we selected 182 patients with intervertebral disc herniation in our hospital and randomly divided them into the control group and the study group according to the order of admission, of which 85 cases were in the control group, 97 cases in the study group, and control group was treated with conventional lumbar discectomy; the study group was treated with dual-channel spine endoscopic lumbar discectomy to observe and compare the operation-related indexes, lumbar function indexes, clinical effects, serum-related indexes and the evaluation value of the two groups of patients. Results showed that the operation time, incision length, intraoperative blood loss, hospital stay, and postoperative pain scores of the study group were lower than those of the control group ($p<0.05$); the ODI and RMQ scores of the study group after treatment were lower than those of the control group ($P<0.05$). The excellent and good rate of the study group was 89.69% higher than that of the control group 77.65% ($p<0.05$); the levels of IL-6 and PGE2 in the study group after treatment were lower than those of the control group, and the IL-10 level was higher than that of the control group. ($P<0.05$); Using the lumbar spine function score as the comparison standard: IL-6, IL-10, PGE2 for the evaluation value of dual-channel endoscopic lumbar discectomy for the treatment of intervertebral disc herniation: sensitivity 96.18%, specificity 96.27%, the accuracy of 97.06% was higher than the single diagnosis result ($P<0.05$. It is worthy of clinical promotion. IL-6, IL-10, PGE2 predict dual-channel spine Endoscopic lumbar discectomy for the treatment of intervertebral disc herniation has high prognostic sensitivity and accuracy, which can provide references for clinical treatment and prognostic medication.

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Introduction

gram-positive Lumbar disc herniation (LDH) is mainly caused by repeated bending and twisting of the spine and excessive load pressure, which leads to disc hardening. With the increase of age, the water content of the annulus fibrosus and nucleus pulposus decreases, resulting in loss of elasticity and moisture, disc rupture, protrusion of the annulus fibrosus, nucleus pulposus and endplate, and stimulation of adjacent nerve roots, resulting in clinical syndromes such as lumbago, osteoneuralgia and cauda equina syndrome (1-3). In clinical patients with lumbago and leg pain, LDH patients account for 20%, and 80% of the incidence in young and middle-aged men, white-collar workers, students, pregnant women and so on. Clinically, surgical treatment and non-surgical treatment are adopted according to the pathological characteristics, clinical manifestations and physical status of patients (4). Non-surgical treatment of drugs and traction therapy, reduce disc pressure, relieve spasms and pain, cannot fundamentally correct the herniated disc joint, easy to cause recurrent attacks, seriously affect the quality of life of patients. Surgical treatment is often taken under percutaneous endoscopic lumbar disc resection, with a small incision, which can significantly reduce the disc pressure, eliminate the pathological lumbar disc nucleus pulposus, and relieve the compression of the herniated disc on the peripheral nerve tissue. However, the surgical field of vision and the mobile range of the operating channels are limited, which makes it difficult to remove the diseased nucleus pulposus tissues and easy to damage the normal joints (5, 6). Double-channel spinal endoscopic lumbar discectomy is performed through two channels: operation and observation. The observation channel

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used spinal endoscopy to expose the surgical site and expand the surgical field of vision. The operation channel was operated by conventional decompression, traction tools and high-frequency ion radiofrequency electrotome. The dual-channel surgery does not affect each other, widens the surgical field, and is convenient to operate, thus achieving the effect of open fiber surgery (7, 8). Domestic studies on the treatment of LDH by dual-channel endoscopic lumbar discectomy are limited, and the effects of surgery are mostly evaluated by lumbar function indicators, while there are few studies on the changes of IL-6, IL-10 and PGE2 levels during surgery (9). In this study, a dual-channel endoscopic lumbar discectomy was used to treat LDH patients, aiming to investigate the surgical effect and changes of IL-6, IL-10 and PGE2 levels.

Materials and methods

General Information

A total of 182 patients with disc herniation admitted to our hospital from December 2015 to August 2021 were selected as the study subjects and were randomly divided into control group and study group according to the order of admission. There were 85 cases in the control group and 97 cases in the study group. There was no significant difference in gender, age, disease course and other general information between the two groups (P>0.05), indicating comparability. The control group was treated with percutaneous endoscopic lumbar discectomy, while the research group was treated with dual-channel endoscopic lumbar discectomy. This study was approved by the medical ethics committee of the hospital.

Inclusion and exclusion criteria

Inclusion criteria: Meet the diagnostic criteria of lumbar disc herniation in "Comprehensive Diagnosis and Treatment of Lumbar hyperosteogeny" (10); The diagnosis was confirmed by CT and MRI imaging examination of the lumbar intervertebral disc; First lumbar spine surgery; have a significant history of lumbago; Complete clinical imaging data and treatment data; No surgical contraindications; Patients and their families were informed of the study content and voluntarily signed informed consent.

Exclusion criteria: Patients with severe dysfunction of heart, lung, kidney and other organs; Complicated with severe lumbar fracture, lumbar spondylolisthesis, scoliosis, spinal stenosis or lumbar muscle strain; polytuberous lumbar disc protrusion; Pregnant and lactating women; Patients with malignant tumors, infectious diseases and mental diseases; Poor compliance, midway lost visitors.

Research Methods

All subjects underwent CT, MRI imaging and blood examination of the lumbar disc after admission, and were informed of the precautions before surgery. In the control group, percutaneous endoscopic lumbar disc resection was performed. After local anesthesia, the operation was performed in the prone position, and the median line of the spinous process, the projection lines of both sides of the body surface, and the connecting line between the upper edge of the articular process and the lumbar L5-S1 protrusion target were located and marked. The puncture point was opened 12-14cm beside the posterior median line of the spinous process. With 1% lidocaine (Chongqing di Kang Changjiang pharmaceutical co., LTD., approved by H50020860) line after the local anesthetic, adjust the needle under the C arm machine perspective Angle and position, the needle on the S1 articular process, placing godet, pull out the needle, the puncture point 0.8 cm incision, slowly put expansion pipe sleeve to the appropriate location, connection endoscope, The surrounding soft tissues were rinsed and stained, the dural sac and nerve roots were probed, the blue stained protruding nucleus pulposus tissue was removed, and the blue stained protruding nucleus pulposus tissue was examined again after rinsing. After confirming the complete resection, bipolar radiofrequency hemostasis was performed, the annulus fibrosus was repaired, the dilated cannula was removed, and the incision was sutured.

The study group underwent double-channel endoscopic lumbar discectomy. After general anesthesia, take the prone position, pad the two sides of the torso, so that the abdomen is suspended. Adjust the posture of the lumbar spine, hip joint and knee joint to establish a reasonable dual-channel position. The body surface position was marked through c-arm fluoroscopy, and a longitudinal marking line was

drawn at the medial edge of the pedicle on the operative side. All openings were made 1.5cm away from the marking line, which was the working incision (1.0cm) and the observation incision (0.6cm). A working incision was made, the skin, subcutaneous tissue and fascia were incised, an extender was inserted into the lamina, and the lamina soft tissue and muscles were removed. After observation, the incision was placed into the endoscopic sheath (including endoscope), and saline perfusion was performed. The position and direction of the arthroscope were adjusted, and a 90° radiofrequency ablation electrode was used for hemostasis and soft tissue cleaning. The upper and lower lamina edges were exposed, and part of the lamina to the hemostatic site of the proximal ligamentum flavum was treated with power grout or lamina biter. Detach the ligamentum flavum and expose the dural sac. Decompression along the lateral side of the dural sac and nerve root and l-type nerve retractor was used to pull the dural sac or nerve root to expose the nucleus pulposus tissue. The protruding nucleus pulposus tissue was removed with nucleus pulposus forceps, and hemostasis was performed on nucleus pulposus and surrounding bleeding points with a radiofrequency knife tip. After the nerve root and radiofrequency knife tip were confirmed to have no obvious bleeding, the instrument and endoscope were withdrawn, and physiological saline was rinsed again for incision suture. Both groups were treated with antibacterial and anti-infective therapy.

Observation Indicators

Clinical indicators: Operation time, incision length, intraoperative blood loss, length of hospital stay and postoperative pain score were observed and compared between the two groups. The postoperative pain score was evaluated by visual ana-Logue Scale (11) (10cm scale). A scale of "0" to "10" means "no pain" to "intense pain." (2) Lumbar function indicators: Oswestry disabilityindex (12) (Oswestry disabilityindex, ODI) and The Roland Morris Disability Questionnaire (13) (The Roland Morris Disability Ques Tionnaire, RMQ) to assess The lumbar function of patients before and after treatment. The ODI scale reflected the severity of lumbar protrusion, including pain, daily life, lifting, walking, sitting, standing, sleep, sexual life, social activities, travel and other 10 dimensions, with a total of 60 items. Cronbach's α coefficient was 0.953, indicating that the score was positively correlated with lumbar dysfunction. The RMQ score was 24 points in total, Cronbach's α coefficient was 0.84, and the score was positively proportional to the degree of lumbar dysfunction. (3) Clinical surgical effect: the modified MAC-NAB standard (14) was used to measure the surgical treatment effect: the best was the waist pain, complete disappearance of physical signs, no movement disorder, and no impact on work and daily life. Good for the waist pain and signs disappear, occasionally attack, can carry out light physical labor. It can be the improvement of waist pain and signs, the indirect pain in daily life or work, or the clinical symptoms and signs without improvement or even aggravation. Excellent and good rate =(excellent + good) cases/total cases ×100%. (4) Sero-related indicators: 5mL of fasting venous blood was taken from patients before and in the morning after treatment after admission and centrifuged for 10 min at 3 000 r/min. Supernatant was taken and refrigerated for examination. The levels of interleukin-6 (IL-6), interleukin-10 (IL-10) and prostaglandin E2 (PGE2) were detected by enzyme-linked immunoassay. The detection kit was provided by Shanghai Enzyme-linked Biotechnology Co., LTD. Strictly follow kit testing standards. (5) The receiver operating characteristic (ROC) curve was drawn to determine the value of IL-6, IL-10 and PGE2 in the postoperative evaluation of lumbar disc herniation treated by dual-channel spinal endoscopy.

Statistical analysis

SPSS 24.0 statistical software was used. The measurement data conforming to normal distribution were expressed as ± S, and t-test was used for comparison between groups. Statistical data were expressed in terms of the number of cases (n) and percentage (%), $\chi 2$ test was used for comparison between groups, and Area under the Receiver Operating Characteristics (AUC) was adopted. The evaluation value of IL-6, IL-10 and PGE2 in the postoperative treatment of disc herniation by dual-channel spinal endoscopy was analyzed, and $P<0.05$ indicated that the difference was statistically significant.

Results and discussion

Comparison of general data

The results showed that there was no statistical significance in gender, age, course of the disease, body mass index, lumbar spine protrusion position, straight leg elevation test and other general data between 2 groups (P>0.05) (Table 1).

Table 1. Comparison of general data between the two groups

Group		Control group (n=85)	Study group (n = 97)	Statistics	P
Gender (case)	Male	48 (56.47)	56 (57.73)	2.041	0.067
	Female	37 (43.53)	41 (42.27)		
Age (years)		43.36 ± 6.08	47.01 ± 7.65	0.192	0.075
Course of disease (month)		16.44 ± 3.02	14.96 ± 2.97	0.088	0.062
Body mass index (kg/cm^2)		18.42 ± 0.91	19.30 ± 0.86	1.109	0.157
Lumbar protrusion position	$L_{3\sim4}$	6 (7.06)	7 (7.23)	3.617	0.059
	$L_{4\sim5}$	46 (54.12)	51 (52.58)		
	L_5-S_1	33 (38.82)	39 (40.21)		
Straight leg elevation test	Positive	27 (31.76)	26 (26.80)	1.726	0.093
	Negative	58 (68.24)	71 (73.96)		

Clinical indicators

The results showed that the operative time, incision length, intraoperative blood loss, length of hospital stay and postoperative pain score in the study group were all lower than those in the control group, with statistically significant differences (P <0.05), as shown in Table 2.

Table 2. Comparison of clinical surgical indicators between the two groups (± S)

Group	Control group (n=85)	Study group (n = 97)
Operation time (min)	69.34±12.14	42.08±9.36$^{\#}$
Incision Length (cm)	2.94±0.49	1.03±0.27$^{\#}$
Intraoperative blood loss (mL)	36.26±5.39	20.52±3.54$^{\#}$
Length of hospital stay (D)	9.63±2.26	4.27±1.08$^{\#}$
VAS (points)	6.29±2.05	3.43±1.68$^{\#}$

Compared with the control group, #P<0.05.

Comparison of lumbar function indicators

The results showed that there was no significant difference in ODI and RMQ scores between 2 groups before treatment (P>0.05). ODI and RMQ scores in the study group were significantly lower than those in the control group after treatment, with statistically significant differences (P<0.05), as shown in Figure 1.

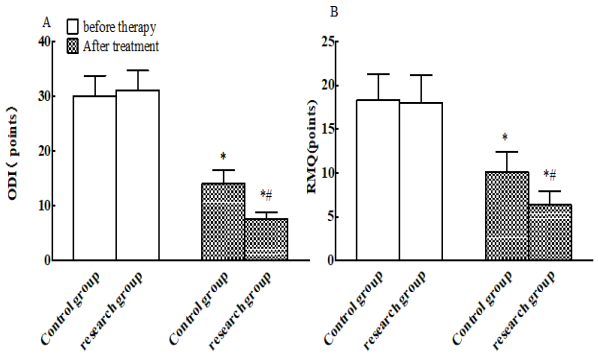

Figure 1. Comparison of Lumbar Function Index (A: ODI; B: RMQ, Compared with before treatment and the control group, $^{*\#}$P<0.05.)

Comparison of clinical surgical results

The results showed that the excellent rate of 89.69% in the study group was significantly higher than that of 77.65% in the control group, and the difference was statistically significant (P <0.05), as shown in Table 3.

Table 3. Comparison of clinical operation results (cases, %)

Group	Control group (n=85)	Study group (n = 97)	χ2	P
Optimal	36 (42.35)	48 (49.48)	-	-
Good	30 (35.29)	39 (40.21)	-	-
General	11 (12.91)	6 (6.19)	-	-
Poor	8 (9.41)	4 (4.12)	-	-
Total	77.65%	89.69%	2.306	0.010

Comparison of serum related indicators

The results showed that there was no significant difference in the levels of IL-6, IL-10 and PGE2 before treatment between 2 groups (P>0.05). After treatment, il-6 and PGE2 levels in the study group

were significantly lower than those in the control group, while IL-10 levels were significantly higher than those in the control group, with statistically significant differences (P<0.05), as shown in Table 4.

Table 4. Comparison of serum related indicators (± S)

Group	Time	Control group (n=85)	Study group (n=97)
IL-6 (μg/L)	Before the treatment	138.22 ± 12.17	140.96 ± 13.74
	After the treatment	105.31 ± 9.94*	83.02 ± 7.58*#
IL-10 (ng/mL)	Before the treatment	39.61 ± 6.79	40.81 ± 6.62
	After the treatment	53.38 ± 5.30*	76.81 ± 3.58*#
PGE2 (mmol/L)	Before the treatment	76.12 ± 16.31	78.49 ± 15.84
	After the treatment	40.85 ± 11.06*	25.33 ± 8.75*#

Note: Compared with before treatment, *P<0.05; Compared with the control group, #P<0.05.

The evaluation value of IL-6, IL-10 and PGE2 in the postoperative treatment of disc herniation by dual-channel endoscopic lumbar disc excision

Taking lumbar function score as the comparison standard, the evaluation value of IL-6, IL-10 and PGE2 in the postoperative treatment of disc herniation by dual-channel spinal endoscopy with lumbar disc discectomy is as follows: Sensitivity 96.18%, specificity 96.27% and accuracy 97.06% were all significantly higher than single diagnosis results, with statistically significant differences (P<0.05), as shown in Table 5. The area under ROC curve AUC=0.984 (95%CI: 0.893~0.974), as shown in Figure 2.

Table 5. The evaluation value of IL-6, IL-10 and PGE2 in the postoperative treatment of disc herniation with dual-channel endoscopic lumbar disc discectomy; Group (A), Sensitivity (B), Specificity (C), Accuracy (D)

A	B	C	D	AUC	95%CI
IL-6	89.37	88.33	91.03	0.863	0.814 ~ 0.891
IL-10	90.04	87.37	89.67	0.907	0.807 ~ 0.896
PGE2	87.13	90.04	86.72	0.916	0.816 ~ 0.902
Joint	96.18	96.27	97.06	0.984	0.893 ~ 0.974

LDH is mainly due to the deformation of the lumbar disc, the rupture of the annulus fibrosus and the compression of the sinus vertebral nerve and cauda equina nerve caused by the protrusion of the nucleus pulposus. Clinical manifestations are mostly waist and leg pain, more than long-term desk work, accumulated strain and other related (15, 16).

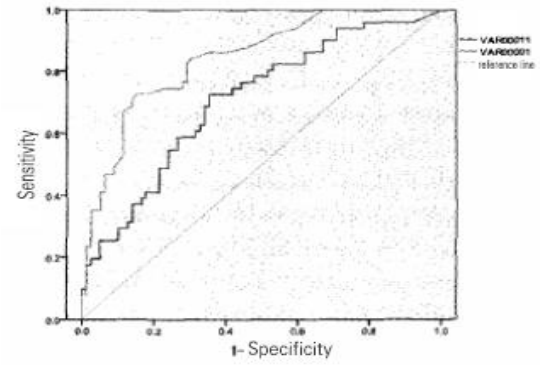

Figure 2. ROC curve for the diagnosis of a dual-channel endoscopic lumbar discectomy with serum IL-6, IL-10 and PGE2 values

Relevant data statistics show that LDH patients in China are as high as 200 million person-times, accounting for 15.2% of the total number of people in China, among which the incidence of adults over 35 years old is about 2.5% ~ 4.8%. With the change of lifestyle, the incidence of LDH is gradually getting younger, the recurrence rate of the disease is high, there is significant pain and daily activity restriction. The quality of life and economic status of patients are seriously affected (17). Clinical surgery in the treatment of LDH with percutaneous disc resection under endoscopic treatment, can effectively reduce bleeding and postoperative infection, but in the same channel in observation and instrument operation, due to the complexity of vertebral body structure, blood vessels and nerves, difficult to completely remove free nucleus pulposus tissue, in the process of operation, a surgical instrument is small, the operation experience of high technical requirements, Especially for the treatment of ligamentum flavum and bone form of the sympathetic pit, the failure rate is high (18). Dual-channel endoscopic excision of the lumbar spine by working in the ipsilateral to establish channels and observation can close observation in the operation degree of diseased tissue and nerve compression, using high-pressure infusion, obviously improved the view definition, provide convenience for surgical instruments operation, improve the severe intervertebral disc herniation and high success rate of patients with iliac spine surgery (19). Patients with the lumbar intervertebral disc are often accompanied by the inflammatory stress response, and serum-related indicators will increase significantly. There are

limited clinical studies on the evaluation of serum-related indicators of dual-channel endoscopic lumbar intervertebral disc discectomy for LDH patients (20). In this study, dual-channel endoscopic lumbar discectomy was used to treat LDH patients, and IL-6, IL-10, PGE2 and other indicators were used to evaluate the efficacy of surgical treatment, as discussed below.

Due to long-term overload pressure, LDH causes lumbar degeneration, nucleus pulposus loss of water, and annulus fibrosus relaxation causes compensatory changes in lumbar curvature. By external violence, protruding nucleus pulposus compresses nerves, causing lumbar pain and decreased lumbar function and quality of life. ODI and RMQ scores can reflect patients' clinical lumbar spine condition, postoperative recovery and psychological state. Ito et al. (21) treated LDH patients with double-hole endoscopic spinal laminectomy and microscopic endoscopic laminectomy respectively. Among them, a double-orifice endoscopic spinal laminectomy can shorten the duration of surgery, largely preserve bilateral normal joints, reduce the incidence of postoperative hematoma paralysis and other complications, significantly reduce VAS and ODI scores, and improve the lumbar function of patients. Park (22) retrospective analysis of unilateral two-door endoscopic techniques such as treatment of L5 and S1 intervertebral foramen, the lesion site may be less invasive outside into the intervertebral foramen, the lesion site to avoid normal nerve root and dural injury, significantly improve the patient's waist VAS and ODI, reduce the surgical complications, can be used as alternative surgical therapy of far outside the syndrome. The results showed that the operative time, incision length, intraoperative blood loss, length of hospital stay and postoperative pain score in the study group were all lower than those in the control group. ODI and RMQ scores in the study group were significantly lower than those in the control group. The excellent and good rate of the study group was significantly higher than that of the control group. This is consistent with the results of Ito and Man et al. Conclusion The treatment of LDH patients with lumbar discectomy by dual-channel endoscopic spine can obtain a clear surgical field and reduce the damage of nerve dura, peripheral nerves and facet joints by establishing unilateral and dual-channel endoscopic spine and observing the channel through spinal endoscopy combined with saline lavage. Conventional surgical instruments were used to decompress nerve roots and dural sac through an intervertebral foraminal approach or an interlaminar approach to reduce the risk of surgical complications. The combination of dual channels can establish a broader and clear field of vision, provide convenience for surgical operation, shorten the operation time and hospital stay, improve the postoperative pain degree and lumbar function of patients, reduce the occurrence of the inflammatory stress response, promote the recovery of clinical signs, and achieve ideal clinical efficacy.

LDH patients are mostly due to cervical disc degeneration, resulting in fiber damage or rupture, under external pressure or excessive traction, resulting in complete or partial fracture of the annulus fibrosus, causing nucleus pulposus tissue into the spinal canal, compression of peripheral nerves and spine, resulting in abnormal expression of serum related factors. Including IL-6, IL-10, and PGE2. Il-6 effectively promotes lymphocyte expression and induces acute response synthesis in the acute inflammatory response induced by infection. In addition, it can stimulate osteoclast activity and keratinocyte growth, and promote osteoblastic differentiation and calcium formation of human aortic valve stromal cells. Il-10 can inhibit the activation, migration and adhesion of inflammatory cells and inhibit inflammatory factors by down-regulating the expression of monocyte surface antigen. In addition, PGE2 and inflammatory cytokines can be inhibited. PGE2 is an important factor in cell growth regulation, as well as pain transmitter, and has immunosuppressive and anti-inflammatory effects (23, 24). Koerner et al. (25) measured IL-6 level, ODI and VAS scores of LDH patients undergoing lumbar fusion before and after treatment. Il-6 level was positively correlated with VAS scores before and after surgery. The results showed that abnormal IL-6 expression can accurately assess the prognosis of patients with disc degeneration. The results showed that the levels of IL-6 and PGE2 in the study group were significantly lower than those in the control group, and the levels of IL-10 were significantly higher than those in the control group. Taking lumbar function score as the comparison standard, the evaluation value of IL-6, IL-10 and PGE2 in the postoperative treatment of disc herniation by dual-channel spinal endoscopy with

lumbar disc discectomy is as follows: The sensitivity, specificity and accuracy were 96.18%, 96.27% and 97.06%, respectively. The area under ROC curve WAS AUC=0.984 (95%CI: 0.893~0.974). This is consistent with Koerner's findings. These results indicate that il-6, IL-10 and PGE2 levels have high accuracy and sensitivity in the evaluation of prognosis of patients with LDH treated by dual-channel spinal endoscopy with lumbar disc excision. LDH patients after treatment with endoscopic dual-channel spinal disc excision technique, largely remove free nucleus pulposus tissue, the release of nerve and normal spinal compression, reduce the patients pain degree, reduce the risk of stress reaction, reduce the IL - 6 and PGE2 level, improve the level of IL - 10, improve body immunity, and predict the clinical therapeutic effect.

In conclusion, dual-channel endoscopic lumbar disc enucleation for LDH patients can effectively improve clinical symptoms and signs, enhance lumbar spine function, and improve patient satisfaction with treatment. In addition, the expressions of IL-6, IL-10 and PGE2 can accurately predict the prognosis of LDH patients treated with dual-channel endoscopic lumbar disc enucleation, which is worthy of further clinical investigation.

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None.

Interest conflict

The authors declare no conflict of interest.

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