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Original Article

Endoscopic totally extraperitoneal inguinal hernia repair versus open tension-free inguinal hernia repair for inguinal hernia

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Abstract: Objective: The aim of this study was to compare the efficacy of endoscopic totally extraperitoneal (TEP) inguinal hernia repair and conventional open tension-free inguinal hernia repair in the treatment of inguinal hernias. Methods: Seventy-seven patients with unilateral inguinal hernias, admitted to the Department of General Surgery in Qingdao Center Hospital, between January 2016 and October 2017, were enrolled and randomly assigned to undergo endoscopic TEP inguinal hernia repair (endoscopic group, n=40) or conventional open tension-free inguinal hernia repair (conventional group, n=37). Operative duration, intraoperative bleeding, postoperative hospital stays, time to postoperative ambulation, total hospitalization costs, postoperative pain, and scores of quality of life at one month and three months, postoperatively, were recorded and compared. Results: Operation duration, intraoperative bleeding, postoperative hospital stays, and time to postoperative ambulation of patients were more greatly improved in the laparoscopic group than those in the conventional group (all P<0.05), though total hospitalization costs were higher in the laparoscopic group (P<0.05). Rate of postoperative 24-hour pain was lower in the laparoscopic group (P<0.05), however, rates of postoperative chronic pain and postoperative complications were generally similar (both P>0.05). Regarding postoperative quality of life, items including physiological functioning (PF), role-physical (RP), social functioning (SF), role-emotional (RE), and bodily pain (BP) of patients, 1 month after surgery, were more greatly improved in the laparoscopic group (all P<0.05), as were items of PF, SF, and RE at 3 months (all P<0.05). Conclusion: Endoscopic TEP inguinal hernia repair is superior to conventional open tension-free inguinal hernia repair for management of inguinal hernias. Endoscopic TEP inguinal hernia repair resulted in more rapid postoperative recovery, shorter hospital stays, lower pain rate at 24 hours after surgery, and higher quality of life. Endoscopic repair is worthy of extensive clinical use though it is associated with higher hospitalization costs.

Keywords: Endoscopic totally extraperitoneal inguinal hernia repair, conventional open tension-free inguinal hernia repair, efficacy, quality of life

Introduction

Inguinal hernia (IH) is a common disease, with a morbidity of approximately 1%-5% [1]. Among all hernia diseases, IH is one of the most common clinical disorders, accounting for 90% of all idiopathic diseases [2]. IH is not capable of self-cure and surgery is the only effective method for treatment of this condition. Additionally, due to the high morbidity of IH, the technique of inguinal hernia repair has become one of the most popular surgeries in the world. Each year, approximately 3 million IH patients undergo inguinal hernia repair in China and 15 million around the world [3, 4]. IH is primarily caused by weakness or partial defection of the abdominal walls in the groin area [5]. Accordingly, surgery for IH is targeted to repair weak tissue or partial defection in the groin area. There have been three phases in the development of inguinal hernia repairs. In the first phase, tissue repair, also called tension repair, was developed. However, it has resulted in a high rate of recurrence [6, 7]. In the second phase, with the introduction of biological mesh, tension-free repairs began to be applied in clinical practice, significantly reducing rates of recurrence and complications when compared with tension

repairs [8]. The Lichtenstein repair is a representative technique of tension-free repairs. Subsequently, based on the Lichtenstein repair, the innovative Millikan tension-free repair was developed and extensively used in clinical practice [9]. In the 1990s, laparoscopy began to be applied in the management of inguinal hernias, marking the beginning of the third phase of inguinal hernia repairs. In the beginning, rates of operative failure and postoperative complications were extremely high. With a growing understanding of anatomy, laparoscopic totally extraperitoneal (TEP) inguinal hernia repair and TAPP inguinal hernia repair were developed by integrating rationales of the endoscopic technique and Stoppa method [10]. Due to lower costs and lower rates of recurrence and complications, TEP inguinal hernia repair has been more frequently used in clinical practice than TAPP inguinal hernia repair [11].

However, since there are various options for performing inguinal hernia repairs and no gold standard yet, researchers are still striving to develop the best surgical technique [12-14]. In previous studies, researchers have proposed the anatomic concept of "myopectineal orifice". Indirect, direct, and femoral inguinal hernias have been associated with the myopectineal orifice and only conventional open mesh tension-free and endoscopic TEP inguinal hernia repairs can result in complete suture of the myopectineal orifice [15-17]. The two repair techniques may provide long-term protection of the myopectineal orifice. Nevertheless, no systematic assessments have been conducted regarding their safety and efficacy in clinical use.

Since a prospective randomized controlled study is optimum for evaluating clinical efficacy for surgery, this prospective randomized controlled study compared the clinical efficacy of laparoscopic TEP inguinal hernia repair with conventional open tension-free inguinal hernia repair (Millikan), aiming to provide more evidence for planning clinical protocols in the management of IH.

Materials and methods

Patients

Seventy-seven patients with unilateral inguinal hernias, admitted to the Department of General Surgery of Qingdao Center Hospital, between January 2016 and October 2017, were recruited in this study. Among them, 44 patients were male and 33 were female, with ages ranging from 19-64 years (mean, 38.44±8.67 years). All enrolled patients were subject to randomization. They were randomly assigned to receive laparoscopic TEP inguinal hernia repair (laparoscopic group, n=40) or conventional tension-free inguinal hernia repair (conventional group, n=37). Of the 40 patients in the laparoscopic group, 22 were male and 18 were female, with a mean age of 38.01±8.96 years. Indirect inguinal hernia occurred in 34 patients and direct inguinal hernia in 6. On the other hand, of the 37 patients in the conventional group, 22 were male and 15 were female, with an average age of 38.81±8.45 years. A total of 32 patients had indirect inguinal hernia and 5 had direct inguinal hernia. All patients, in both groups, were followed up for 3 months. All patients provided written informed consent and this study was approved by the Hospital Ethics Committee.

Inclusion and exclusion criteria

Patients were eligible for enrollment if they had primary unilateral inguinal hernia, with an age ranging from 18-65 years [18]. Patients were ineligible if they had a surgery history in the hypogastrium, severe heart disease, liver and the kidney disease, reduced quality of life due to mental disorders or cerebrovascular disease, or severe coagulopathy. Patients that were difficult, inconvenient to follow up, or unsuitable for surgery were also ineligible for enrollment.

Surgical methods

Laparoscopic TEP inguinal hernia repair

All patients underwent general anesthesia as follows: Each patient was instructed to wear a mask to inhale oxygen at 6-8 L/min and were intravenously injected with midazolam at 0.05-0.10 mg/kg, propofol at 1-1.5 mg/kg, sufentanil citrate at 0.2-0.3 μg/kg, and cisatracurium at 0.15-0.2 mg/kg; after three-minute mechanical ventilation, general anesthesia was performed, followed by induction of tracheal intubation; five minutes prior to skin incision, patients received an intravenous injection of sufentanil citrate (a dose of 10-20 μg). After

completion of anesthesia, a 1 cm-long arc incision was made at the site 0.5 cm away from the inferior border of the umbilicus to expose the anterior sheath of rectus abdominis. The anterior sheath of rectus abdominis was incised longitudinally and the rectus abdominis was then pulled toward the affected side to expose the posterior sheath. A dissection rod was employed to dissect along the posterior sheath to the preperitoneal space, which was fully dilated with a balloon, followed by placement of a 10-mm trocar. Pneumoperitoneum was established, into which a laparoscope was inserted to observe the affected side. After observation under the laparoscope, the preperitoneal space was isolated downward to the retropubic space and, ultimately, to the anterior superior iliac spine to search for a hernia sac, which was then disassociated. After complete disassociation with the spermatic cord, hernia sac was put back into the abdominal cavity. Subsequently, the peritoneum was disassociated again to the level of the anterior superior spinous process of the psoas major muscle. Myopectineal orifice and spermatic cords were adherent to the muscular layer of the abdominal wall. Some polyester mesh (Covidien, US), matching the affected size, were laid flat to cover the myopectineal orifice completely. After placement of mesh in the right position, artificial pneumoperitoneum outside of the peritoneum was removed. After removal of the pneumoperitoneum, spontaneous reduction of the peritoneum resulted in fixation of the mesh. The anterior rectus sheath was sutured, while the skin was sutured interruptedly. Key points of this surgery were establishment of pneumoperitoneum, search for the hernia sac, dissociation from surrounding tissue, and placement and fixation of the mesh [19].

Conventional open tension-free inguinal hernia repair (Millikan)

Patients received induction of continuous epidural anesthesia. Before anesthesia, some lactate Ringer's solution and gelatin solution (500 mL; Wanhan, China), at a ratio of 2:1, were rapidly injected into open veins for volume expansion. Placed in a lateral position, epidural puncture was performed on patients, according to specifications. After successful puncture, a catheter (3-5 cm) was inserted toward the direction of the head for fixation. The study dose was 3 mL of 2% lidocaine. If, 1-5 minutes later, the level of anesthesia appeared and no signs of spinal nerve blocks were present, patients were injected with 0.75% ropivacaine (8-10 mL). Five to fifteen minutes after injection, the level of anesthesia was tested. Surgery could be initiated if anesthesia was satisfactory. A conventional 7-cm incision was made on the affected side from the skin to the subcutaneous tissue and the external oblique aponeurosis was cut along the direction of the fibers. The outer ring was cut open to expose inguinal ligaments, the arch lower border, and conjoined tendon. Nerves surrounding the surgical site were carefully isolated. Subsequently, the spermatic cord was fully disassociated to expose the pubic tubercle. A longitudinal incision in the cremaster muscle was made to search for a hernia sac. When hernia sac was found, it was fully and completely stripped off until the inner ring. The hernia sac was put back into the abdominal cavity; the abdominal transverse fascia of the inner ring was cut open and fully disassociated around the preperitoneal space. Polypropylene mesh (Herniamesh, Italy) was placed at the defection in the preperitoneal space. Afterward, the mesh and adjacent transversalis fascia were sutured closely for fixation. The inner ring was constricted so narrowly that only the spermatic cord could pass through, then thorough hemostasis was performed at the distal hernia sac. Some mesh were plated on the posterior wall of the inguinal canal to cover approximately 2 cm of the pubic tubercle. Pubic tubercle, inguinal ligament, and conjoined tendons were fixed together with mesh using sutures and end parts of the mesh were sutured after overlapping. They were laid flat below the external oblique aponeurosis. After hemostasis, the spermatic cord was relocated. External oblique aponeurosis was stitched and the outer ring was rebuilt in the size of 1*2 cm. Then, skin and subcutaneous tissue were sutured sequentially. Key points of this surgery included careful disassociation after the surgical incision, search for the hernia sac, mesh placement after isolation of adjacent tissue, and tissue reposition and suturing [19].

To guarantee the quality of surgery, the following programs were taken: operating surgeons of all surgeries were experienced; the same mesh and suture materials were used for same kind of surgeries; patients of the two groups

Table 1. Demographic and baseline characteristics of patients

Variable	LG	CG	χ^2/t	P
Sex				
Male	22	22	0.390	0.697
Female	18	15		
Age	38.01±8.96	38.81±8.45	0.357	0.722
IIH	34	32	0.474	0.798
DIH	6	5		
GH	72.25±4.34	72.26±4.01	-0.107	0.874
MH	89.41±3.01	89.26±2.94	1.147	0.684
PF	70.95±3.04	71.36±3.01	-0.362	0.451
RP	60.41±6.13	59.21±6.24	1.248	0.532
SF	68.23±5.21	67.36±5.84	1.458	0.421
RE	60.58±5.69	59.67±5.95	1.541	0.436
BP	34.62±4.26	34.26±4.21	0.159	0.789
VT	85.69±3.54	86.14±3.47	1.145	0.694

Note: LG denotes laparoscopic group, CG conventional group, IIH indirect inguinal hernia, DIH direct inguinal hernia, GH general health, MH mental health, PF physiological functioning, SF social functioning, RP role-physical, RE role-emotional, BP bodily pain, and VT vitality.

received consistent treatment and nursing, before and after surgeries; intraoperative bleeding was stopped by corresponding methods and routine infection prevention was made at the postoperative incisions; follow-up schemes were similar in the two groups.

Outcome measurement

Primary outcome measures

Operative duration: Operative duration was defined as time from the beginning of skin incision to end of the suture.

Intraoperative bleeding: Intraoperative bleeding was defined as the amount of bleeding from the beginning of surgery to completion of the surgical suture.

Postoperative hospital stays: Length of postoperative hospital stay was defined as number of days from hospitalization after surgery to discharge.

Postoperative pain: Visual analogue scale (VAS) was applied to quantify the subjective pain of patients. A 10-cm scale bar, ranging from 0 to 10, was used, with 0 indicating no pain and 10 indicating the most severe pain experienced by a patient. Patients chose from 0 to 10 points, according to their degree of pain. Measurement values of the chosen points were expressed as VAS scores. Pain rates were calculated based on the events of postoperative pain occurring at 2 hours, 6 hours, 24 hours, 1 week, and 1 month after surgery, respectively [20]. Pain rate = number of patients with pain/total number of patients * 100%.

Secondary outcome measures

Time to postoperative ambulation: Time to postoperative ambulation was defined as the time when patients could ambulate in the ward, for more than 30 minutes, without a sense of discomfort. Times were calculated by the hour [21].

Postoperative complications: Postoperative complications included wound infections, hematoma, scrotal edema, intraperitoneal adhesion, and urine retention. The number of cases was recorded. Complication rate = number of patients with complications/total number of patients * 100%.

Hospitalization costs: Hospitalization costs covered all expenses encountered during hospital stay.

Follow up: MOS 36-Item Short-Form Health Survey (SF-36) consists of one multi-item scale that assesses eight health concepts. These include general health (GH), mental health (MH), physiological functioning (PF), role-physical (RP), social functioning (SF), role-emotional (RE), bodily pain (BP), and vitality (VT) [22]. The SF-36 scale could be generalized into a physical component summary (PCS) and mental component summary (MCS). Face-to-face interviews were given to patients that met the inclusion criteria. Patients answered questions and investigators recorded answers. Scores of each dimension ranged from 0 to 100. PCS was the mean score of the four dimensions of PF, RP, BP, and GH, whereas MCS was the mean score of the four dimensions of VT, SF, RE, and MH. Higher scores indicated higher quality of life of patients. Postoperative follow ups were planned for 1 month and 3 months after surgery. During postoperative follow up, scores of each item were recorded for evaluation of the postoperative quality of life of patients. The basic steps were as follows: Step 1, items of the scale were edited for both groups; Step 2,

Table 2. Surgery-associated outcomes of patients

Variable	LG	CG	t/Z	P
OD (min)	48.59±5.19	64.45±5.94	-12.212	0.001
IB (mL)	27.70±3.39	33.18±3.41	-7.074	0.001
PHS (d)	3.35±1.05	6.45±1.53	-10.432	0.001
TPA (h)	24.63±2.20	43.91±4.07	-7.559	0.001
THC (yuan)	8425.27±473.71	5457.64±400.98	39.549	0.001

Note: LG denotes laparoscopic group, CG conventional group, OD operative duration, IB intraoperative bleeding, PHS postoperative hospital stay, TPA time to postoperative ambulation, and THC total hospitalization cost.

Table 3. Postoperative complications and pain rates of patients

Variable	LG	CG	χ^2	P
Postoperative complication	1 (2.5%)	4 (10.81%)	-3.89	0.085
24-hour pain	9 (22.5%)	22 (59.4%)	-3.13	0.002
Chronic pain	2 (5%)	5 (13.5%)	-1.134	0.257

Note: LG denotes laparoscopic group, CG conventional group.

Table 4. Quality of life of patients at 1 month postoperatively

Variable	LG	CG	t	P
GH	75.10±3.28	75.19±3.29	-0.119	0.906
MH	91.50±3.34	90.22±2.85	1.084	0.750
PF	90.05±2.81	74.19±3.17	23.203	<0.001
RP	76.73±6.46	65.85±6.15	7.764	<0.001
SF	85.35±5.46	73.35±5.46	9.627	<0.001
RE	79.65±6.22	66.81±9.87	6.878	<0.001
BP	37.18±4.03	32.14±4.28	5.139	<0.001
VT	91.50±3.34	90.22±2.85	1.804	0.750

Note: LG denotes laparoscopic group, CG conventional group, GH general health, MH mental health, PF physiological functioning, SF social functioning, RP role-physical, RE role-emotional, BP bodily pain, and VT vitality.

items of the scale were scored in each group; and Step 3, scores of all items were totaled and converted.

The basic formula was as follows: Score conversion = ((Actual score-Potential lowest possible score)/(Potential highest score-Lowest score)) * 100.

Statistical analysis

Statistical data were analyzed with the application of SPSS statistical software, version 17.0. Continuous variables are presented as mean ± standard deviation. Continuous variables with normal distribution and homogeneity of variance were compared using t-test, expressed as t, while those without normal distribution and homogeneity of variance were compared with using rank sum test, expressed as Z. Count data were compared using Pearson's Chi-square test and Fisher's exact test, expressed as the Chi square. P<0.05 was deemed as statistically significant.

Results

Demographic and baseline characteristics of patients

In the laparoscopic group, there were 40 patients (22 males and 18 females), with a mean age of 38.01± 8.96 years. Indirect inguinal hernia occurred in 34 patients and direct inguinal hernia in 6. Thirty-seven patients (22 males and 15 females) were in the conventional group, with an average age of 38.81±8.45 years. Indirect inguinal hernia was reported in 32 patients and direct inguinal hernia in 5. Patients of the two groups were generally well-balanced in age, sex, disease type, and scores of each item of the SF-36 scale (P>0.05). Results are shown in **Table 1**.

Surgery-associated outcomes of patients

Operation duration, intraoperative bleeding, postoperative hospital stays, time to postoperative ambulation, and total hospitalization costs of the laparoscopic group and conventional group were 48.59±5.19 min vs. 64.45± 5.94 min, 27.70±3.39 mL vs. 33.18±3.41 mL, 3.35±1.05 d vs. 6.45±1.53 d, 24.63±2.20 h vs. 43.91±4.07 h, and 8425.27±473.71 yuan vs. 5457.64±400.98 yuan, respectively. The above outcomes differed substantially between the two groups (all P<0.05, **Table 2**).

Postoperative complications and pain rates of patients

Regarding postoperative complications, peritoneal adhesion was reported in 1 patient (2.5%) in the laparoscopic group, whereas 4 patients (10.81%) in the conventional group had postoperative complications (2 patients had poor healing incision, one scrotal edema, and one urinary retention). Rates of postoperative com-

Table 5. Life quality of patients at 3 months postoperatively

Variable	LG	CG	t	P
GH	91.68±2.81	92.19±2.37	-0.862	0.391
MH	91.50±3.34	90.22±2.85	1.084	0.750
PF	96.53±1.60	93.43±1.78	8.007	<0.001
RP	94.98±2.40	95.14±2.25	-0.301	0.764
SF	94.43±2.44	90.57±2.08	7.408	<0.001
RE	96.23±2.66	90.62±3.80	7.533	<0.001
BP	38.35±3.06	37.62±3.09	1.038	0.303
VT	94.28±1.60	94.03±1.72	0.654	0.515

Note: LG denotes laparoscopic group, CG conventional group, GH general health, MH mental health, PF physiological functioning, SF social functioning, RP role-physical, RE role-emotional, BP bodily pain, and VT vitality.

plications differed insignificantly between the two groups (P>0.05). At 24 hours after surgery, pain was reported in 9 patients (22.5%) in the laparoscopic group and in 22 patients (59.4%) in the conventional group, remarkably different between the two groups (P<0.05). Chronic pain occurred in 2 patients (5%) in the laparoscopic group and 5 patients (13.5%) in the conventional group, insignificantly different between the two group (P>0.05). No recurrence was observed among patients in either group (**Table 3**).

Quality of life of patients 1 month postoperatively

For postoperative quality of life at 1 month, PF, RP, SF, RE, and BP of the laparoscopic group and conventional group were 90.05±2.81 vs. 74.19±3.17, 76.73±6.46 vs. 65.85±6.15, 85.35±5.46 vs. 73.35±5.46, 79.65±6.22 vs. 66.81±9.87, and 37.18±4.03 vs. 32.14±4.28, respectively. Substantial differences were noted between the two groups (all P<0.05). This suggests that the laparoscopic group was superior to conventional group in PF, RP, SF, RE, and BP. Nevertheless, the two groups differed mildly in GH, MH, and VT (all P>0.05). Results are shown in **Table 4**.

Quality of life of patients 3 months postoperatively

Concerning the quality of life of the patients at 3 months postoperatively, PF, SF, and RE (96.53±1.60 vs. 93.43±1.78, 94.43±2.44 vs. 90.57±2.08, and 96.23±2.66 vs. 90.62±3.80, respectively) were remarkably different between the laparoscopic group and conventional group (all P<0.05), indicating the laparoscopic group was advantageous over the conventional group in PF, SF, and RE. Conversely, the two groups were largely similar in GH, MH, RP, BP, and VT (all P>0.05). Results are reported in **Table 5**.

Discussion

Inguinal hernia is a clinically common disease, with inguinal hernia repairs evolving over a hundred years. Early tension inguinal hernia repairs resulted in high recurrence, slow recovery, and local pain at the operative sites, perplexing clinicians [23]. With a growing understanding of the anatomic concept of myopectineal orifice, tension-free inguinal hernia repair and endoscopic inguinal hernia repairs were developed [24, 25]. In the 1990s, application of synthetic biomaterials improved the nature of tension-free repairs. Compared with tension inguinal hernia repairs, tension-free repairs are characterized by lower recurrence and improved postoperative comfort. As a result, tension-free repairs have developed greatly [26-29]. Studies have demonstrated that mesh result in no evident rejection in humans and have an anti-infective effect. These lower risks of infection and accelerate postoperative recovery in patients [30]. With further development of science and technology, laparoscopic inguinal hernia repairs have achieved rapid development. Among them, laparoscopic TEP inguinal hernia repair is characteristic of operating outside the peritoneum, thereby exerting a small impact on the abdominal viscera. As a result, it has become one of the standard techniques for laparoscopic hernia surgery [31-33]. Nevertheless, the clinical efficacy of laparoscopic TEP inguinal hernia repair versus conventional tension-free inguinal hernia repair has been hotly debated.

In this current randomized controlled study, operative duration, intraoperative bleeding, postoperative hospital stays, time to postoperative ambulation, total hospitalization costs, postoperative complications, and rates of 24-hour pain and chronic pain were compared between patients with laparoscopic TEP inguinal hernia repairs and those with conventional tension-free inguinal hernia repairs. Additionally, after surgery, all patients attended 3-month follow ups to investigate their quality of life. Different anesthetic methods were induced in

the two groups. Patients in the laparoscopic group underwent general anesthesia, which took a shorter time, whereas those in the conventional group received continuous epidural anesthesia, taking a longer time. Although the required time varies for different ways of anesthesia, operative duration was not affected since it was defined as the time from skin incision to suturing. Operative duration was remarkably shorter in the laparoscopic group than conventional group (P<0.05). Moreover, much less intraoperative bleeding, shorter postoperative hospital stays, and shorter time to postoperative ambulation were observed in the laparoscopic group (all P<0.05). Total hospitalization costs, however, were higher in the laparoscopic group (P<0.05). Higher costs of the laparoscopic group might be related to the different mesh used in the two groups and establishment of pneumoperitoneum in the laparoscopic group, consuming more materials. With advances in technology, hospitalization costs may be decreased. This is consistent with previous findings in the literature [21].

Regarding postoperative recurrence, a previous study revealed that recurrence rates of the two study groups were 1-2%, hence, the differences were insignificant [34]. On one hand, as laparoscopic TEP inguinal hernia repair was performed outside the peritoneum, patients in the laparoscopic group were prone to have peritoneal adhesion. On the other hand, because conventional open tension-free inguinal hernia repair was an open surgery associated with more surgical trauma and damages to adjacent tissue, patients in the conventional group were more likely to have poor incision healing, scrotal edema, urinary retention, and other complications. However, in this present study, patients in the laparoscopic group and conventional group differed insignificantly in postoperative complications (P>0.05). With increasing attention paid to the postoperative pain of patients in clinical research, postoperative pain has gradually become one of the markers for surgical treatment [20]. In this current study, rates of 24-hour postoperative pain were lowered considerably in the laparoscopic group compared to the conventional group (P<0.05). The two groups differed slightly, however, in rates of chronic pain (P>0.05), similar to the results of a previous study [35].

With advances in science and technology, ideas and attitudes of patients towards health have been changing. Growing attention has been paid to the prevention of diseases. Accordingly, in numerous clinical trials, quality of life scales have been employed to evaluate patient quality of life, of which, the SF-36 scale is the most popular [22]. In this current study, considering quality of life at 1 month after surgery, patients in the two groups were strikingly different in scores of PF, RP, SF, RE, and BP (all P<0.05), but generally similar in scores of GH, MH, and VT (all P>0.05). This might be due to the fact that patients in the laparoscopic group had smaller trauma and faster recovery, whereas those in the traditional group had greater trauma and slower recovery, exerting certain impact on patient physiological, psychological, and social function. In this case, intensive postoperative guidance should be given to patients to eliminate their physical and mental disorders. At 3 months after surgery, there were remarkably different PF, SF, and RE (all P<0.05), but similar GH, MH, RP, BP, and VT (all P>0.05) observed among patients in the two groups. The higher rate of chronic pain in the conventional group might have some detrimental effect on the mental status and health-related outcomes of patients. As a result, patients should be communicated with more often to make them more active and their family members should be encouraged to help them. In this way, physical and mental pain can be effectively diminished or even eliminated and their quality of life can also be improved. The results of this study indicate that laparoscopic TEP inguinal hernia repair is associated with better physical and mental health compared with conventional open tension-free inguinal hernia repair. It also significantly improves the quality of life of patients. This corresponds to results of a previous study, in which the quality of life of patients in the laparoscopic group was greatly improved at 1 month after surgery but differed mildly at 3 months, compared with that of the conventional group [36].

However, there were some limitations to this study. The sample size was small. Future studies should expand the sample size. Moreover, the follow up duration was short, hence, future studies should prolong follow-up duration in investigating the effects of surgeries on quality of life of the patients.

In summary, laparoscopic TEP inguinal hernia repair was more effective than conventional open tension-free inguinal hernia repair. The

former was associated with faster postoperative recovery, shorter hospital stays, lower rate of 24-hour pain, and higher postoperative quality of life. Although laparoscopic TEP inguinal hernia repair resulted in higher hospitalization costs for patients, it is worthy of extensive use in clinical practice.

Disclosure of conflict of interest

None.

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