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经皮椎间孔镜与椎板开窗椎间盘切除术治疗单节段 单侧腰椎间盘突出症的对比研究*

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摘要 目的:探讨经皮椎间孔镜(PTED)与椎板开窗椎间盘切除术(FD)治疗单节段单侧腰椎间盘突出症(LDH)的临床疗效。方法:选取 2015 年 1 月-2016 年 12 月来华北石油管理局总医院治疗的 120 例单节段单侧 LDH 患者,其中采用 PTED 术式治疗患者 60 例,作为 PTED 组,采用 FD 术式治疗患者 60 例,作为 FD 组。记录两组患者术中出血量、手术时间、切口长度、卧床时间、住院时间以及并发症发生率,比较两组患者术前、术后 24 h、术后 1 周、术后 3 个月、术后 6 个月、术后 12 个月的视觉疼痛模拟(VAS)评分和 Oswestry 功能障碍指数(ODI)评分,并在术后 12 个月时采用 MacNab 疗效评定标准评价治疗效果。结果:PTED 组患者在术中出血量、手术时间、切口长度、卧床时间、住院时间、并发症发生率均低于 FD 组($P<0.05$)。术后 12 个月 PTED 组患者 VAS 评分、ODI 评分均低于 FD 组($P<0.05$),术后两组患者的 VAS 评分、ODI 评分随着时间的推移越来越低,且与上一时间点相比均具有统计学差异($P<0.05$)。PTED 组优良率为 93.33%,与 FD 组的 91.67%比较差异无统计学意义($P>0.05$)。结论:两种术式治疗 LDH 患者的疗效无差异,但是采用 PTED 术式手术时间短、术中出血量少、创伤小、术后并发症少,在减轻术后疼痛和改善生活能力方面优于 FD 术式。

关键词: 椎间孔镜;椎板开窗椎间盘切除术;腰椎间盘突出症;疗效

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Comparative Study on Percutaneous Transforaminal and Fenestration Discectomy in Treatment of Single Segmental Unilateral Lumbar Disc Herniation*

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ABSTRACT Objective: To investigate the clinical efficacy of percutaneous transforaminal endoscopic discectomy (PTED) and fenestration discectomy (FD) in treatment of single segmental unilateral lumbar disc herniation (LDH). **Methods:** 120 patients with single segmental unilateral LDH who were treated in General Hospital of the North China Petroleum Administration from January 2015 to December 2016 were selected. Among them, 60 cases were treated with PTED as PTED group, and 60 cases were treated with FD as FD group. The amount of intraoperative bleeding, operation time, incision length, bed rest time, hospitalization time and complication rate of the two groups were recorded, visual analogue scale (VAS) score and Oswestry disability index(ODI) score of two groups were compared before operation and 24 h, 1 week, 3 months, 6 months and 12 months after operation, and the therapeutic effect was evaluated by the MacNab evaluation standard at 12 months after operation. **Results:** The amount of intraoperative bleeding, operation time, incision length, bed rest time, hospitalization time and complication rate in PTED group were significantly lower than those in FD group($P<0.05$). The VAS score and ODI score in PTED group at 12 months after operation were lower than that in FD group ($P<0.05$). After operation, the VAS score and the ODI score of the two groups were smaller and smaller with the time, and there were statistically significant differences compared with the previous time points ($P<0.05$). The excellent and good rate of PTED group was 93.33%, and there was no statistical difference compared with 91.67% of FD group ($P>0.05$). **Conclusion:** There is no difference in the efficacy of two kinds of surgical treatment for LDH patients, but PTED operation has shorter operative time, less intraoperative blood loss, less trauma and fewer postoperative complications. It is better than FD in relieving postoperative pain and improving life ability.

Key words: Skin intervertebral foraminoscopy; Fenestration discectomy; Lumbar disc herniation; Curative effect

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前言

腰椎间盘突出症(lumbar disc herniation, LDH)是较为常见的骨科疾患之一,主要是由于腰椎间盘腰4-骶1的纤维环破裂,髓核组织从破裂处突出(或脱出)于后方或椎管内,导致相邻脊神经根遭受刺激或压迫,从而产生腰部疼痛^[1-3]。大多数LDH患者经保守治疗后相应症状会逐渐消失,但仍有一小部分患者必须通过手术治疗才能够缓解腰部疼痛^[4]。目前临床上用于治疗LDH的主要是以下两种术式,椎板开窗椎间盘切除术(fenestration discectomy, FD)和经皮椎间孔镜椎间盘切除术(percutaneous transforaminal endoscopic discectomy, PTED)^[5-6]。FD是LDH的常用治疗方法,治疗效果较为理想,但在手术过程中,会造成较大创口,不利于患者术后康复^[7-8]。PTED是治疗LDH的一项新的微创手术,与传统开放式椎间盘切除术相比,PTED具有创口小、出血少、术后恢复快等优点,目前已经成为国内治疗LDH的主要术式之一^[9-11]。本文旨在探讨PTED与FD治疗单节段单侧LDH患者的疗效,以期对LDH患者的临床治疗提供参考依据。现报道如下。

1 资料与方法

1.1 一般资料

选取2015年1月-2016年12月来华北石油管理局总医院治疗的120例单节段单侧LDH患者,纳入标准:(1)出现站立性腰痛并伴下肢麻木且腿部出现放射性疼痛者;(2)经核磁共振检查,确诊为单节段单侧LDH者;(3)3个月保守治疗无效者;(4)患者及家属对本研究知情同意。排除标准:(1)椎管内或脊柱其它疾病引起疼痛者;(2)椎间盘突出发生钙化患者;(3)严重的肝、肾功能不全者。其中采用PTED术式治疗患者60例,作为PTED组,采用FD术式治疗患者60例,作为FD组。PTED组男38例,女22例;年龄27-48岁,平均 (38.78 ± 8.32) 岁;病程16-36个月,平均 (23.67 ± 6.89) 个月;突出节段:L₃₋₄5例,L₄₋₅49例,L_{5-S1}6例;椎间盘突出类型:突出型18例,脱出型42例。FD组男36例,女24例;年龄28-51岁,平均 (40.29 ± 10.56) 岁,病程18-35月,平均 (24.44 ± 5.76) 月;突出节段:L₃₋₄6例,L₄₋₅47例,L_{5-S1}7例;椎间盘突出类型:突出型20例,脱出型40例。两组一般资料比较差异无统计学意义($P>0.05$)。本研究方案符合华北石油管理局总医院伦理委员会相关规定,并已审批通过。

1.2 方法

FD椎间盘切除术主要参照Fager的手术方法^[12]:患者进行全身气管内麻醉,身体侧卧于手术台。根据侧位腰椎X线判断突出位置,进行标记。对患部实施中线切口,解剖棘突、椎板的

肌肉和肌腱的单侧骨膜,切除黄韧带,直到神经管,并进行小切口,以暴露椎间盘压缩的神经根外部。一旦神经根回缩,开始进行椎间盘切除。切除后逐层缝合伤口。手术完成后,鼓励患者在手术当天自主行走,并在合适的疼痛感觉范围内进行驱背练习。

PTED椎间盘切除术主要参照Gadjradj的手术方法^[13]:患者给予右美托咪定(江苏恒瑞医药股份有限公司,国药准字:H20090248,规格:2 mL:200 μ g)配成4 μ g/mL浓度以1 μ g/kg的剂量进行局部麻醉。由透视图像增强器确诊椎间盘突出部位,并根据视图决定患者的手术姿势。用针从椎间盘突出的下椎骨的切口连接到上关节突,针到达上关节后,插入导丝,引入一系列锥形杆,然后通过套管和杆引入钻或铰刀。钻完上关节突后放大神经根,取出器械,留置导丝,将带有工作通道的内窥镜通过8 mm套管引入椎间盘手术处。通过图像增强器确定套管的位置,用咬骨钳去除椎间盘突出、套管和内窥镜,然后缝合伤口。术后对两组患者通过门诊复查、电话询问等方式进行12个月的随访。

1.3 观察指标及疗效评定

常规观察指标:术中出血量、手术时间、切口长度、卧床时间、住院时间以及并发症发生率。疼痛程度采用视觉模拟(visual analogue scale, VAS)^[14]评分进行评定:在纸上面划一条10 cm的横线,让患者根据自我感觉在横线上划一记号,表示疼痛程度。0分:无痛;1-3分:有轻微的疼痛;4-6分:有明显疼痛并影响睡眠质量,但尚能忍受;7-10分:有强烈的疼痛,难以忍受。Oswestry功能障碍指数(Oswestry disability index, ODI)^[15]评分:ODI是由10个问题组成,包括疼痛的强度、生活自理、提物、步行、坐位、站立、干扰睡眠、社交生活、旅游等方面的情况,每个问题6个选项,每个问题的最高得分为5分,分值越低说明术后恢复的越好。采用MacNab疗效^[16]评定标准评价术后12个月的疗效:标准可分为优、良、可、差,其中优:症状完全消失;良:症状轻微,活动受到轻度限制;可:症状减轻,活动受到较大限制;差:治疗前后症状没有改善,甚至加重。优良率=(优+良)/总例数*100%。

1.4 统计学方法

采用SPSS 21.0进行统计分析,VAS评分、ODI评分等计量资料用 $(\bar{x} \pm s)$ 表示,实施t检验,男女比例、突出节段等计数资料用[n(%)]表示,采用 χ^2 检验,将 $\alpha=0.05$ 作为检验标准。

2 结果

2.1 两组患者常规观察指标比较

PTED组患者在术中出血量、手术时间、切口长度、卧床时间、住院时间、并发症发生率均低于FD组($P<0.05$),见表1。

表1 两组患者常规观察指标比较

Table 1 Comparison of routine observation indexes of patients in two groups

Groups	Amount of intraoperative bleeding(mL)	Operation time(h)	Incision length (cm)	Bed rest time(d)	Hospitalization time(d)	Complications rate(%)
FD group(n=60)	244.66 $\pm$ 55.32	1.67 $\pm$ 0.86	4.12 $\pm$ 2.49	3.45 $\pm$ 0.88	11.23 $\pm$ 3.51	13.33
PTED group(n=60)	42.21 $\pm$ 16.56	1.01 $\pm$ 0.54	0.56 $\pm$ 0.12	1.79 $\pm$ 0.63	6.67 $\pm$ 2.21	3.33
t/ χ^2	8.935	3.336	7.972	4.234	5.763	3.927
P	0.000	0.032	0.000	0.000	0.000	0.048

2.2 两组患者手术前后 VAS 评分比较

术前、术后 24 h、术后 1 周、术后 3 个月、术后 6 个月两组患者 VAS 评分比较差异无统计学意义($P>0.05$);术后 12 个月

PTED 组患者 VAS 评分低于 FD 组($P<0.05$);术后两组患者的 VAS 评分随着时间的推移越来越低,且与上一时间点相比均具有统计学差异($P<0.05$)。见表 2。

表 2 两组患者术前术后 VAS 评分比较($\bar{x} \pm s$, 分)

Table 2 Comparison of VAS scores of patients in two groups before and after operation($\bar{x} \pm s$, scores)

Groups	Before operation	24 h after operation	1 week after operation	3 months after operation	6 months after operation	12 months after operation
FD group(n=60)	8.84± 1.52	3.12± 0.72 ^a	2.26± 0.52 ^{ab}	1.17± 0.51 ^{abc}	0.82± 0.22 ^{abcd}	0.69± 0.12 ^{abcde}
PTED group(n=60)	8.68± 1.31	2.94± 0.69 ^a	2.17± 0.43 ^{ab}	1.11± 0.42 ^{abc}	0.79± 0.16 ^{abcd}	0.41± 0.15 ^{abcde}
t	0.618	1.398	1.033	0.703	0.854	11.291
P	0.583	0.165	0.304	0.483	0.395	0.000

Note: compared with before operation, ^a $P<0.05$; compared with 24 h after operation, ^b $P<0.05$; compared with 1 week after operation, ^c $P<0.05$; compared with 3 months after operation, ^d $P<0.05$; compared with 6 months after operation, ^e $P<0.05$.

2.3 两组患者手术前后 ODI 评分比较

术前、术后 1 周、术后 3 个月、术后 6 个月两组患者 ODI 评分比较差异无统计学意义($P>0.05$);术后 12 个月 PTED 组

患者 ODI 评分低于 FD 组($P<0.05$);术后两组患者的 ODI 评分随着时间的推移越来越低,且与上一时间点相比均具有统计学差异($P<0.05$)。见表 3。

表 3 两组患者术前术后 ODI 评分比较($\bar{x} \pm s$, 分)

Table 3 Comparison of ODI scores of patients in two groups before and after operation ($\bar{x} \pm s$, scores)

Groups	Before operation	24 h after operation	1 week after operation	3 months after operation	6 months after operation	12 months after operation
FD group(n=60)	40.83± 10.25	36.66± 8.72 ^a	25.39± 6.27 ^{ab}	11.26± 3.32 ^{abc}	5.67± 2.87 ^{abcd}	3.45± 1.22 ^{abcde}
PTED group(n=60)	41.19± 11.13	35.49± 8.69 ^a	24.58± 5.96 ^{ab}	10.12± 3.15 ^{abc}	5.18± 2.34 ^{abcd}	2.11± 1.36 ^{abcde}
t	0.184	0.736	0.725	1.929	1.025	5.681
P	0.854	0.463	0.470	0.056	0.307	0.000

Note: compared with before operation, ^a $P<0.05$; compared with 24 h after operation, ^b $P<0.05$; compared with 1 week after operation, ^c $P<0.05$; compared with 3 months after operation, ^d $P<0.05$; compared with 6 months after operation, ^e $P<0.05$.

2.4 两组患者术后 12 个月的疗效比较

PTED 组优良率为 93.33%,与 FD 组的 91.67%比较差异无

统计学意义($P>0.05$),见表 4。

表 4 两组患者术后 12 个月的疗效比较[n(%)]

Table 4 Comparison of efficacy of patients in two groups 12 months after operation[n (%)]

Groups	Excellent	Good	Passable	Inferior	Excellent and good rate
FD group(n=60)	34(56.67)	21(35.00)	2(3.33)	3(5.00)	55(91.67)
PTED group(n=60)	38(63.33)	18(30.00)	2(3.33)	2(3.33)	56(93.33)
χ^2					0.120
P					0.729

3 讨论

LDH 通常是由髓核和纤维环变性引起的,并且拉伤、重伤或创伤也可能导致 LDH^[7]。LDH 的发生往往会影响到椎间盘周围的神经,进而产生剧烈的疼痛以及下腰部和腿部放射性疼痛,且这些疼痛出现的影响因素比较复杂,比如外力压迫^[17]、炎症化学刺激^[18]以及自身免疫^[19,20]等均可引起。对于 LDH 带来的腰腿疼痛,临床上应优先给予保守治疗,主要通过牵引、推拿等中医理疗手段。一般在保守治疗三个月左右时依然疼痛甚至影响正常生活者,则需要进行治疗。传统的 FD 是通过全身麻醉对患者腰椎突出部位进行切口,一般切口较大,并且会迫

使椎板肌肉和肌腱分离,同时需要切除部分椎板以及黄韧带,导致术中出血量增多,术后易发生粘连并影响脊柱稳定性。其次,还有可能会导致脑脊液漏、神经根损伤等并发症^[21,22]。PTED 的出现,很大程度上降低了传统 FD 带来的创伤^[23,24]。PTED 可全程在局麻下进行,大大降低了全麻带来的风险,同时也可以避免脑脊液漏的发生,有效地降低了神经根损伤的风险,并且在手术过程中,手术切口较小,术中出血量较少,减轻患者的疼痛等级并有效地降低了术后切口感染发生的风险^[25-27]。

本文研究结果显示,PTED 组患者在术中出血量、手术时间、切口长度、卧床时间、住院时间、并发症发生率均低于 FD 组($P<0.05$),说明 PTED 术式对于患者的创伤性更小,由于 PT-

ED 术式属于微创性手术, 因此很大程度上会大大降低伤口感染的几率, 有利于术后恢复, 降低并发症发生的几率, 同时, PTED 手术并不会对椎板周围肌肉及肌腱造成损伤, 从而维持了脊柱稳定性并有效减少了术中操作时间, 而 FD 属于开放式手术, 不论是在手术时间、术中出血量还是在伤口大小均大于 PTED 术式, 这就造成了该术式易感染、易出现并发症等特点^[28-30]。此外, 术后 12 个月 PTED 组患者的 VAS 评分、ODI 评分均低于 FD 组, 且随着时间的推移越来越小, 表明在采用 PTED 治疗可更好的改善患者的疼痛程度和生活能力。可能是由于随着时间的推移, 患者在术后伤口慢慢愈合, 身体各项机能逐渐恢复, 并且后续保养恢复较好, 使得患者的生活能力慢慢恢复, 疼痛感减弱, 同时采用 PTED 治疗的患者, 其创面小更加有利于伤口恢复, 感染的几率也较低, 所以 PTED 组患者恢复的更好。本研究结果还显示, PTED 组患者优良率高于 FD 组, 但差异无统计学意义 ($P>0.05$), 结果表明两种术式治疗 LDH 的疗效相似。

综上所述, 两组术式治疗 LDH 患者均有较好的效果, 但采用 PTED 治疗具有手术时间短、术中出血量少、创伤小、并发症发生率低等特点, 且术后疼痛程度减轻、生活能力恢复较快。

参考文献 (References)

- [1] Meng Y, Wang X, Wang B, et al. Aggravation and subsequent disappearance of cervical disc herniation after cervical open-door laminoplasty: A case report[J]. *Medicine (Baltimore)*, 2018, 97(10): e0068
- [2] Inada T, Nishida S, Kawaoka T, et al. Analysis of Revision Surgery of Microsurgical Lumbar Discectomy [J]. *Asian Spine J*, 2018, 12(1): 140-146
- [3] Lin YP, Li YJ, Chen BL, et al. Lumbar laminotomy and replantation for the treatment of adult spinal epidermoid cyst: A case report[J]. *Medicine (Baltimore)*, 2018, 97(1): e9334
- [4] Tulloch I, Papadopoulos MC. Giant central lumbar disc herniations: a case for the transdural approach[J]. *Ann R Coll Surg Engl*, 2018, 100(3): e53-e56
- [5] Islam MA, Akon SI, Shamsuzzaman M, et al. An Evaluation of the Result of Fenestration and Discectomy for the Treatment of Prolapsed Lumbar Intervertebral Disc (PLID)[J]. *Mymensingh Med J*, 2017, 26(4): 732-739
- [6] Kapetanakis S, Gkasdaris G, Angoules AG, et al. Transforaminal Percutaneous Endoscopic Discectomy using Transforaminal Endoscopic Spine System technique: Pitfalls that a beginner should avoid [J]. *World J Orthop*, 2017, 8(12): 874-880
- [7] Wankhade UG, Umashankar MK, Reddy BS. Functional Outcome of Lumbar Discectomy by Fenestration Technique in Lumbar Disc Prolapse - Return to Work and Relief of Pain[J]. *J Clin Diagn Res*, 2016, 10(3): RC09-RC13
- [8] Shi J, Wang Y, Zhou F, et al. Long-term clinical outcomes in patients undergoing lumbar discectomy by fenestration [J]. *J Int Med Res*, 2012, 40(6): 2355-2361
- [9] Liu X, Yuan S, Tian Y, et al. Comparison of percutaneous endoscopic transforaminal discectomy, microendoscopic discectomy, and microdiscectomy for symptomatic lumbar disc herniation: minimum 2-year follow-up results[J]. *J Neurosurg Spine*, 2018, 28(3): 317-325
- [10] Chen Z, Zhang L, Dong J, et al. Percutaneous transforaminal endoscopic discectomy compared with microendoscopic discectomy for lumbar disc herniation: 1-year results of an ongoing randomized controlled trial[J]. *J Neurosurg Spine*, 2018, 28(3): 300-310
- [11] Seiger A, Gadjradj PS, Harhangi BS, et al. PTED study: design of a non-inferiority, randomised controlled trial to compare the effectiveness and cost-effectiveness of percutaneous transforaminal endoscopic discectomy (PTED) versus open microdiscectomy for patients with a symptomatic lumbar disc herniation [J]. *BMJ Open*, 2017, 7(12): e018230
- [12] 查国瑜, 杨阳, 周逸驰, 等. 经皮椎间孔镜与 Mast Quadrant 通道技术治疗腰椎间盘突出症临床疗效比较[J]. *现代生物医学进展*, 2017, 17(20): 3978-3982
- [13] Sairyo K, Chikawa T, Nagamachi A. State-of-the-art transforaminal percutaneous endoscopic lumbar surgery under local anesthesia: Discectomy, foraminoplasty, and ventral facetectomy [J]. *J Orthop Sci*, 2018, 23(2): 229-236
- [14] 李宗超, 刘乙锦, 陈玉辉, 等. 椎旁阻滞术对肝胆手术患者术后疼痛评分和血清细胞因子水平的影响[J]. *实用肝脏病杂志*, 2017, 20(5): 584-587
- [15] Azimi P, Benzel EC. The Low-Back Outcome Scale and the Oswestry disability index: are they reflective of patient satisfaction after discectomy? A cross sectional study [J]. *J Spine Surg*, 2017, 3(4): 554-560
- [16] 杨小荣, 周文来, 吴良绍, 等. 微创和开放手术治疗腰椎间盘突出症的疗效及其炎性因子水平比较 [J]. *临床骨科杂志*, 2017, 20(3): 297-300
- [17] Yang L, Lu HH. Value of a new pathological classification of lumbar intervertebral disc herniation based on transforaminal endoscopic observations[J]. *Exp Ther Med*, 2017, 13(5): 1859-1867
- [18] Wang JN, Zhao XJ, Liu ZH, et al. Selective phosphodiesterase-2A inhibitor alleviates radicular inflammation and mechanical allodynia in non-compressive lumbar disc herniation rats[J]. *Eur Spine J*, 2017, 26(7): 1961-1968
- [19] Moen A, Jacobsen D, Phuyal S, et al. MicroRNA-223 demonstrated experimentally in exosome-like vesicles is associated with decreased risk of persistent pain after lumbar disc herniation [J]. *J Transl Med*, 2017, 15(1): 89
- [20] Wan J, Zhang XS. Pre-operative blood test for antibody to nucleus pulposus may distinguish types of lumbar disc herniation[J]. *Med Hypotheses*, 2010, 75(5): 464-465
- [21] Takahashi Y, Sato T, Hyodo H, et al. Incidental durotomy during lumbar spine surgery: risk factors and anatomic locations: clinical article[J]. *J Neurosurg Spine*, 2013, 18(2): 165-169
- [22] Xu B, Xu H, Ma X, et al. Bilateral decompression and intervertebral fusion via unilateral fenestration for complex lumbar spinal stenosis with a mobile microendoscopic technique [J]. *Medicine (Baltimore)*, 2018, 97(4): e9715
- [23] Eun SS, Lee SH, Erken HY. Transforaminal Percutaneous Endoscopic Lumbar Discectomy for Downmigrated Disk Herniations: Lever-Up, Rotate, and Tilt Technique [J]. *J Neurol Surg A Cent Eur Neurosurg*, 2018, 79(2): 163-168
- [24] Song H, Hu W, Liu Z, et al. Percutaneous endoscopic interlaminar discectomy of L5-S1 disc herniation: a comparison between intermittent endoscopy technique and full endoscopy technique [J]. *J Orthop Surg Res*, 2017, 12(1): 162

(下转第 396 页)

- 20(41): 15190-15199
- [8] Ardengh JC, Malheiros CA, Rahal F, et al. Microlithiasis of the gallbladder: role of endoscopic ultrasonography in patients with idiopathic acute pancreatitis [J]. Rev Assoc Med Bras, 2010, 56(1): 27-31
- [9] Yadav D, Papachristou GI, Whitcomb DC. Alcohol-associated Pancreatitis[J]. Gastroenterol Clin North Am, 2007, 36(2): 219-238
- [10] Clemens DL, Wells MA, Schneider KJ, et al. Molecular mechanism of alcohol associated pancreatitis[J]. World J Gastrointest Pathophysiol, 2014, 5(3): 147-157
- [11] Ewald N, Hardt PD, Kloer HU. Severe hypertriglyceridemia and pancreatitis: presentation and management [J]. Curr Opin Lipidol, 2009, 20(6): 497-504
- [12] Valdivielso P, Ramirez-Bueno A, Ewald N. Current knowledge of hypertriglyceridemic pancreatitis [J]. Eur J Intern Med, 2014, 25(8): 689-694
- [13] Harper SJ, Cheslyn-Curtis S. Acute pancreatitis [J]. Ann Clin Biochem, 2011, 48(Pt 1): 23-37
- [14] Runzi M, Laver P. Drug-associated pancreatitis: facts and fiction[J]. Pancreas, 1996, 13: 100-109
- [15] Chung EK, Lee JH, Jang DK, et al. Causative Agents of Drug-Induced Pancreatitis: A Nationwide Assessment [J]. Pancreas, 2018, 47(10): 1328-1336
- [16] Jones MR, Hall OM, Kaye AM, et al. Drug-induced acute pancreatitis: a review[J]. Ochsner J, 2015, 15(1): 45-51
- [17] Perides G, Laukkanen JM, Vassileva G, et al. Biliary acute pancreatitis in mice is mediated by the G-protein-coupled cell surface bile acid receptor Gpbar 1 [J]. Gastroenterology, 2010, 138: 715-725
- [18] Willemer S, Kloppel G, Kem HF, et al. Immunocytochemical and morphometric analysis of acinar zymogen granules in human acute pancreatitis[J]. Virchows Arch A Pathol Anat Histopathol, 1989, 415: 115-123
- [19] Cruz-Santamaria DM, Taxonera C, Giner M. Update on pathogenesis and clinical management of acute pancreatitis [J]. World J Gastrointest Pathophysiol, 2012, 3(3): 60-70
- [20] Dawra R, Sah RP, Dudeja V, et al. Intra-acinar trypsinogen activation mediates early stages of pancreatic injury but not inflammation in mice with acute pancreatitis[J]. Gastroenterology, 2011, 141: 2210-2217
- [21] Rakonczay Z Jr, Hegyi P, Takacs T, et al. The role of NF-kappaB activation in the pathogenesis of acute pancreatitis [J]. Gut, 2008, 57: 259-267
- [22] Sah RP, Garg P, Saluja AK. Pathogenic mechanisms of acute pancreatitis[J]. Curr Opin Gastroenterol, 2012, 28(5): 507-515
- [23] Sah RP, Saluja A. Molecular mechanisms of pancreatic injury [J]. Curr Opin Gastroenterol, 2011, 27: 444-451
- [24] Li J, Zhou R, Zhang J, et al. Calcium signaling of pancreatic acinar cells in the pathogenesis of pancreatitis [J]. World J Gastroenterol, 2014, 20(43): 16146-16152
- [25] Munsell MA, Buscaglia JM. Acute pancreatitis[J]. J Hosp Med, 2010, 5(4): 241-250
- [26] Ahmed SU, Rana SS, Ahluwalia J, et al. Role of thrombophilia in splanchnic venous thrombosis in acute pancreatitis [J]. Annals of gastroenterology, 2018, 31(3): 371-378
- [27] Hammad AY, Dittilo M, Castanon L. Pancreatitis [J]. The Surgical clinics of North America, 2018, 98(5): 895-913
- [28] Patil PV, Khalil A, Thaha MA. Splenic parenchymal complication in pancreatitis [J]. JOP, 2011, 12(3): 287-91
- [29] Jiang XY, Bian J, Zhang CZ, et al. Transient reduction of spleen density in acute pancreatitis: case reports and literature review [J]. J Comput Assist Tomogr, 2014, 38(4): 568-570
- [30] 李强,陈鸿.急性胰腺炎伴脾密度一过性减低 1 例[J].实用医学杂志, 2012, 28(1): 153
- [31] 胡森森,张芳.急性胰腺炎并脾密度一过性减低 1 例[J].中国临床医学影像杂志, 2009, 20(1): 73-74
- [32] 毛宁,王滨,刘强.高脂血症性急性胰腺炎伴脾脏密度一过性减低 1 例[J].医学影像学杂志, 2015, 25(3): 385-390

(上接第 357 页)

- [25] Konovalov NA, Asyutin DS, Korolishin VA, et al. Percutaneous endoscopic discectomy in the treatment of patients with degenerative diseases of the lumbosacral spine[J]. Zh Vopr Neurokhir Im N N Burdenko, 2017, 81(5): 56-62
- [26] Fan Y, Gu G, Fan G, et al. The effect of preoperative administration of morphine in alleviating intraoperative pain of percutaneous transforaminal endoscopic discectomy under local anesthesia: A STROBE compliant study[J]. Medicine (Baltimore), 2017, 96(43): e8427
- [27] Zeng Y, Bao J, Su J, et al. Novel targeted puncture technique for percutaneous transforaminal endoscopic lumbar discectomy reduces X-ray exposure[J]. Exp Ther Med, 2017, 14(4): 2960-2968
- [28] Yamashita K, Higashino K, Sakai T, et al. Percutaneous full endoscopic lumbar foraminoplasty for adjacent level foraminal stenosis following vertebral intersegmental fusion in an awake and aware patient under local anesthesia: A case report [J]. J Med Invest, 2017, 64(3.4): 291-295
- [29] Kapetanakis S, Giannopoulou E, Charitoudis G, et al. Health-related quality of life (HRQoL) following transforaminal percutaneous endoscopic discectomy (TPED) for lumbar disc herniation: A prospective cohort study - early results [J]. J Back Musculoskeletal Rehabil, 2017, 30(6): 1311-1317
- [30] Heo JH, Kim CH, Chung CK, et al. Quantity of Disc Removal and Radiological Outcomes of Percutaneous Endoscopic Lumbar Discectomy[J]. Pain Physician, 2017, 20(5): E737-E746